

## The role of the school nurse in the management of a child with diabetes mellitus

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### Abstract

The purpose of this study is to investigate the role of the school nurse in the management of children with diabetes mellitus. The identification of the articles included in this study resulted from a relevant search in digital databases with scientific studies such as PubMed and Google Scholar. The search was performed using specific terms in English: diabetes, school nurses, children, parents, safety. The studies included in this scoping review were evaluated based on specific criteria. A total of 15 studies were included in the review. The international bibliography highlights the valuable role of school nurses both in general and in the management of diabetes. School nurses are a particularly important factor in the management and promotion of the health of students in schools where they spend a large part of their daily lives. In collaboration with students as well as teachers and parents, they can contribute to their well-being and good health of them.

**Keywords:** Children; Diabetes mellitus; School; School nurse

### 1. Introduction

Managing diabetes in schools requires ongoing efforts involving many stakeholders. [1] School nurses are health professionals who address the health needs of students and play an essential role in ensuring their health and overall well-being. The presence of the school nurse guarantees the proper management of metabolic control, as well as the safety and academic development of students who face specific health problems such as diabetes. [2] Feeling safe at school is important for adjustment and progress. High self-esteem of students is associated with a strong sense of safety at school. In general, a safe school environment improves the educational experience and enhances the well-being and health of students. [3]

Strategies that make school a safe environment focus on health education, so that students can adopt behaviors that promote health and safety. Therefore, schools are called upon to play an important role in promoting health and preventing diseases and injuries. However, in a recent American study, it was found that school staff were not well trained and lacked confidence in their skills regarding diabetes management. [4]

A qualitative study of 2017 in Brazil revealed that successful diabetes management requires collaboration between school nurses, school staff, and families of children with diabetes. [5] Although families largely determine the development of health-promoting behaviors, the school nurse can reinforce desirable behaviors and reduce undesirable ones [6]. It, therefore, emerges that there is a need for nursing care for students with diabetes in the school environment, so that the school is both a safe environment and offers the same level of access to educational opportunities to all children. [7]

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However, despite global research confirming the benefits of school nursing, there are developed countries where the majority of schools do not have school nurses [8] and even among countries that implement school nursing, there is variation in its practice. [9] In addition to provide care to students in emergency situations, the impact of providing comprehensive school nursing was investigated in a study of 2017 in Turkey which concluded that comprehensive school nursing contributed positively to students' academic performance. [10] A similar study in public high schools in America found a possible link between students attending schools with full-time nursing and significantly higher graduation rates, lower student absenteeism, and higher college admissions scores. This, according to the researchers, was due to the fact that school nursing improves health indicators and at the same time contributed to improving academic performance. [11]

## 2. Methodology

A literature review is an independent academic method that aims to identify and evaluate all relevant literature on a topic in order to draw conclusions about the question under consideration. Specifically, the scoping review is a method that allows the identification of the literature available on the topic under consideration, thus allowing a mapping to be conducted. As a methodology, it allows for the identification of any gaps in the literature, available knowledge, and the direction in which future research should be directed. [12]

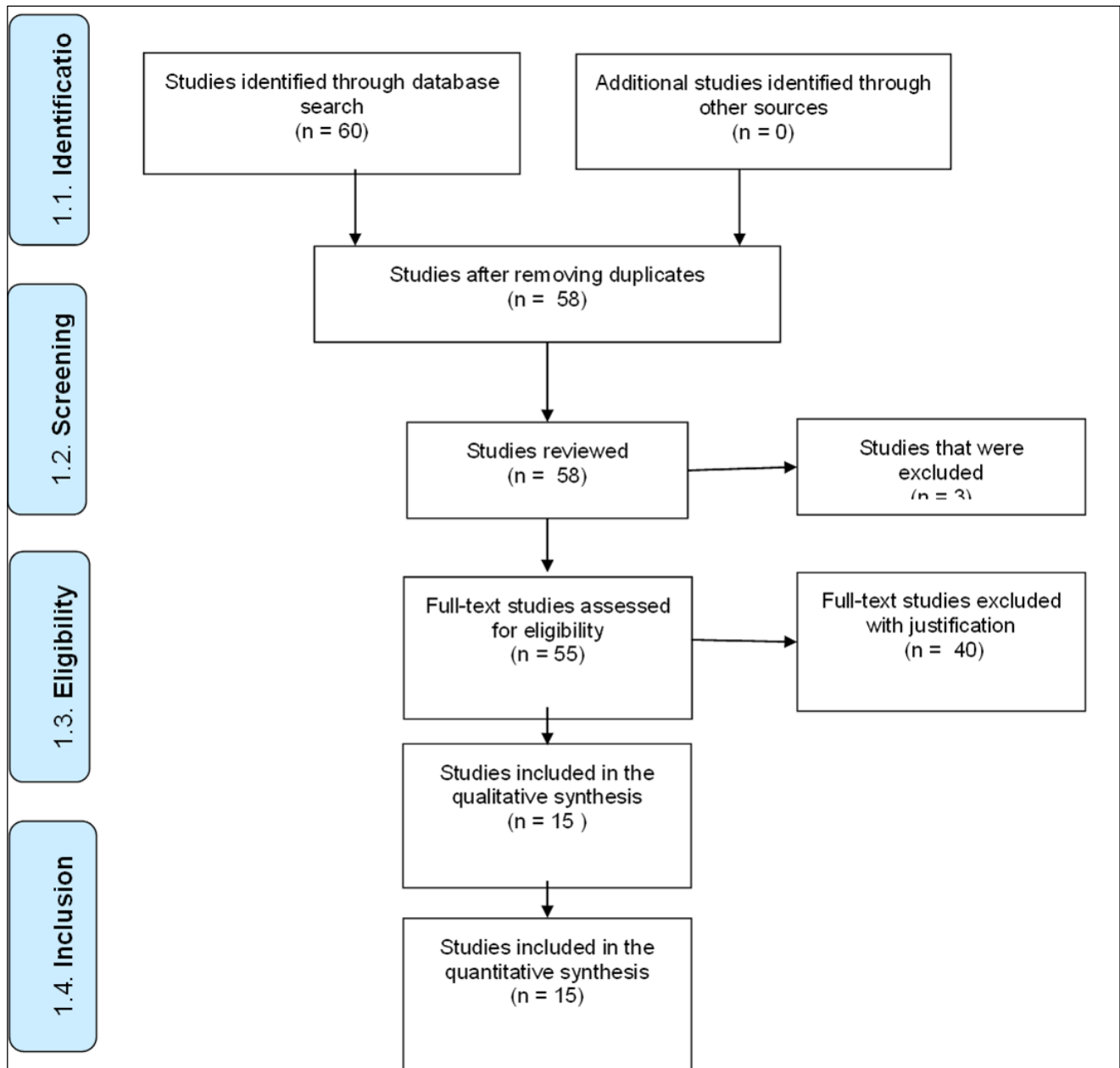
The purpose of this study is to investigate the role of school nurses in the management of children with diabetes mellitus. The main research question that this study seeks to answer is what role school nurses can play in the management of children with diabetes mellitus.

The identification of the articles included in this study resulted from a relevant search in digital databases of scientific studies such as PubMed and Google Scholar. The search was carried out using specific terms in English, specifically: diabetes, school nurses, children, parents, safety. The studies included in this review were evaluated based on specific criteria. The selection and exclusion criteria used in this review are listed in Table 1.

**Table 1** Inclusion and exclusion criteria

Inclusion Criteria	Exclusion Criteria
The studies should concern type 1 diabetes mellitus	The studies should concern hereditary or other pathological conditions or diseases.
Studies should include primary data	Studies should include secondary data
The studies must be published in English.	The studies must be published in a language other than English.
The full text of the study must be published.	The study summary must be published.
The studies must have been published after 2005.	The studies must have been published before 2005.
The studies should concern minor students	The studies should involve adults
The studies should concern school nurses.	The studies should concern other specialties of school or health personnel

### 3. Results



**Figure 1** PRISMA-Scr flow chart for identifying relevant articles related to the role of school nurses in the management of children with diabetes mellitus

Figure 1 outlines the article evaluation process. This article explored the role of school nurses in the management of children with diabetes mellitus using the method of scoping review. The studies included were fifteen in total and were obtained from a search of digital databases. The studies included were research studies and the methodology they used was qualitative, quantitative, mixed and interventional. The surveys were conducted in the USA, Ghana, Sweden, Poland, Greece and South Korea. The tools used in the surveys to collect data were questionnaires with closed and open questions and interviews. The total sample of the studies consisted of more than 1203 school nurses (one study did not report the exact number), 194 children-adolescents with diabetes mellitus, 69 teachers of children-adolescents with diabetes mellitus and 662 parents of children-adolescents with diabetes mellitus.

Nabors et al. examined school nurses' perceptions of how to support adolescents with type 1 diabetes in school. School nurses reported that adolescents, teachers, and school staff needed to improve their knowledge about diabetes. Most believed that teens needed to improve their communication about their diabetes with friends and teachers. 98% agreed

that teens with diabetes needed more support at school. Additionally, school nurses who felt knowledgeable about diabetes were more likely to report that adolescents with diabetes needed more support at school compared to those who felt unknowledgeable. [13]

The purpose of Fisher's study was to measure the perceived self-efficacy of school nurses in providing diabetes care and education to children and to identify factors that were associated with higher levels of self-efficacy in performing these tasks. The results indicated positive relationships between high self-efficacy performance and participation in diabetes education, caring for children with diabetes at school, working with students with type 1 diabetes in the school system, and participating in supervised blood glucose monitoring with children. [14]

The study of Peery et al. examined the relationship between school nurse interventions and parents' and teachers' perceptions of how well students can self-manage their diabetes. This study found that parents and teachers do not always agree on how well a child is managing their diabetes. Students who were identified by teachers as showing improvement were more likely to have received diabetes education from the nurse. [15]

The research of Freeborn et al. attempted to identify the challenges in the school setting faced by children and adolescents with type 1 diabetes and to identify opportunities for school nurses to exercise their leadership skills to provide coordination and direction to children, adolescents, parents, schools, and communities related to the care and management of type 1 diabetes. Many schools only had part-time school nurses with knowledge about type 1 diabetes and its management, who could help other people understand type 1 diabetes and what they could do to help their students and their families. Parents concluded that nurses caring for patients with type 1 diabetes should take an active role in supporting improved management in schools. [16]

The study by Mogre et al. examined the level of knowledge of nurses and related factors in the nutritional management of diabetes. In general, nurses' knowledge in the nutritional management of diabetes was found to be insufficient. Also, nurses' knowledge regarding basic meal planning for patients with diabetes was found to be insufficient. [17]

The purpose of the study by Breneman et al. was to determine the effectiveness of a continuing education program in improving the level of experience and competence in services related to diabetes care in schools. This program was a live lesson for school nurses who provided clinical information about diabetes management and their professional role in caring for students with it. The evaluation of pre- and post-survey results revealed that a greater percentage of school nurses reported in the post-survey that they were able to provide various diabetes care services independently and were capable of teaching others. [18]

The study of Thorstenson et al. aimed to describe the experiences of school nurses in supporting students with type 1 diabetes at school. The school nurses described themselves as coordinators in creating a network around students with type 1 diabetes to support them. This included enabling and maintaining a continuous dialogue with staff at the school as well as between the school and the student's family. This continuous dialogue was, along with responsibility and preparedness, an important factor in supporting these students. [19]

The study of Williams et al. aimed to examine school nurses' perceptions on the ability to provide care and education for children with type 1 diabetes. An important finding was that school nurses' diabetes self-efficacy training scores were associated with their perceived access to resources. Specifically, for school nurses to provide effective care for children with type 1 diabetes, they needed to have readily available resources for managing their care, including parental support, effective communication with physicians and other healthcare providers, and student compliance with diet and medication. [20]

The aim of the study by Kobos et al. was to assess actual and perceived knowledge about diabetes among school nurses. The researchers concluded that there was a need for additional diabetes education among nursing students and trainee nurses to provide safe and effective care for children with type 1 diabetes. [21]

A study by Wilt attempted to determine the relationships between school nurse staffing patterns measured by school nurse to student ratios, self-efficacy, and glycemic control in adolescents with type 1 diabetes. The ratio of tertiary-educated nurses to students was associated with better glycemic control and older age. Higher scores were associated with older age, and women scored significantly higher. [6]

The aim of the study by Drakopoulou et al. was to investigate parents' perceptions regarding the care and safety of their children with type 1 diabetes at school by school nurses. The percentage of parents who felt very/extremely secure with the care their child received during a regular school day was significantly lower compared to cases where the child

himself/ or his parents provided most of the care, while it was significantly higher when most of the care was provided by a school nurse. [22]

Another study by Wilt focused on the dependence of adolescent students with type 1 diabetes and their parents on school nurses. The purpose of the study was to determine the relationship between parental satisfaction with diabetes care at school, parental reports of diabetes-related safety, adolescents' reports of school nurse assistance, and the presence of school nurses in relation to their ratio to students. The research confirmed that the presence of full-time school nurses is crucial for parents of students with type 1 diabetes. When school nurses are not present, the burden of diabetes care at school falls on other school staff or the parents themselves. [2]

The study by Uhm & Choi aimed to examine the collaboration of school nurses and parents in school health care for children with type 1 diabetes and to determine their characteristics. The results showed that the collaboration of school nurses and parents in school health care for children with type 1 diabetes constituted an interactive process of maintaining a balanced responsibility and providing personalized care to meet needs by creating trusting relationships and open communication with transparency. [23]

The aim of the study by Stefanowicz-Bielska et al. was to assess the level of knowledge of school nurses regarding diabetes mellitus, the basic principles of treatment and the occurrence of acute metabolic disorders and complications, as well as to determine the factors that influenced their level of knowledge. Most nurses reported that they could independently perform blood glucose measurements with a glucose meter. The majority of nurses (70.2%, 118/168) stated that they would like to repeat their training on the causes, symptoms, methods of preventing acute metabolic disorders, self-monitoring methods and treatment of type 1 diabetes. [24]

The study by March et al. concerned the Diabetes Device Confidence Scale (continuous insulin infusion pumps and continuous glucose monitoring devices) designed to assess school nurses' confidence in performing practical skills with diabetes devices. The scale demonstrated high content validity and internal consistency reliability. Its score was moderately positively correlated with school nurses' reported confidence in their professional skills in general, suggesting that the scale provided relevant, but distinct, information in a specific area of diabetes management. [25] Table 2 summarizes the results of the scoping review.

**Table 2** Characteristics of the studies fulfilled the insertion criteria of the scoping review

	Authors/Year	Title	Target	Sample	Method	Tool	Results
01	Nabors, L., Troillet, A., Nash et al. [13] USA	School nurse perceptions of barriers and supports for children with diabetes.	Exploring school nurses' perceptions of barriers and supporting factors for diabetes management during and after school.	110 school nurses	Quantitative	Questionnaire with closed and open questions	The findings showed that adolescents needed more support at school.
02	Fisher, K. L. [14] USA	School nurses' perceptions of self-efficacy in providing diabetes care.	Measuring the perceived self-efficacy of school nurses in providing diabetes care and education to children and identifying factors associated with higher levels of self-efficacy in performing these tasks.	115 school nurses	Quantitative	Questionnaire with closed questions	Findings showed positive relationships between self-efficacy and participation in the care of children with diabetes, having children with type 1 diabetes in the school system, and supervising children with

							glucose testing, as well as a significant relationship between higher self-efficacy scores and diabetes curriculum.
03	Peery, A. I., Engelke, M. K., & Swanson, M. S. [15] USA	Parent and teacher perceptions of the impact of school nurse interventions on children's self-management of diabetes.	Investigating the relationship between school nurse interventions and parents' and teachers' perceptions of children's diabetes self-management.	Parents and teachers of 69 children with diabetes	Quantitative	Questionnaires	Teachers and parents did not always agree on how well a child was managing their illness. When school nurses provided more education and counseling, parents were more likely to perceive an improvement in their child's self-management. Teachers were more likely to perceive an improvement when the nurse did more classroom visits.
04	Freeborn et al. [16] USA	Addressing school challenges for children and adolescents with type 1 diabetes: The nurse practitioner's role.	Exploring the challenges faced by adolescents with type 1 diabetes and the role that school nurses can play.	14 mothers, 7 fathers and 16 children-adolescents with type 1 diabetes	Qualitative	Interviews	School nurses should take an active role in supporting improved management of type 1 diabetes in schools, talking to patients and their parents about experiences at school, identifying challenges and discussing potential solutions to improve diabetes management during school hours and accessing online resources to help patients, parents and school staff.

05	Mogre, V., Ansah, G. A., Marfo, D. N. et al. [17] Ghana	Assessing nurses' knowledge levels in the nutritional management of diabetes.	Investigating the level of knowledge of nurses and related factors in the nutritional management of diabetes.	200 nurses	Quantitative	Questionnaire with closed questions	Nurses' knowledge of the nutritional management of diabetes was insufficient.
06	Breneman, C. B., Heidari, K., Butler, S. et al. [18] USA	Evaluation of the effectiveness of the HANDS SM program: A school nurse diabetes management education program.	To investigate the effectiveness of a continuing education program to improve the level of experience and competence in the provision of services related to diabetes care in schools.	105 school nurses	Intervention	Questionnaires (before and after the intervention) with closed questions	The findings showed that participants' levels of experience and competence in diabetes care improved significantly after the program was implemented. A greater number of nurses reported that they were able to perform their services independently and had the ability to teach others.
07	Thorstensson et al. [19] Sweden	Swedish school nurses' experiences in supporting students with type 1 diabetes in their school environment.	Exploring the experiences of school nurses in providing support to students with type 1 diabetes	School nurses (how many are not stated)	Qualitative	Interviews	School nurses' ability to support students with type 1 diabetes varied in relation to their perceived competence in nursing science as well as their ability to enable, enhance, and maintain teamwork and family-school team meetings.
08	Williams, L. F., Russ, M., & Perdue, B. J. [20] USA	Exploration of school nurses' perception of self-efficacy in providing care and education to children with type 1 diabetes mellitus.	Investigating school nurses' perceptions of their ability to provide care and education to children with type 1 diabetes.	84 school nurses	Mixed	Questionnaire with closed questions and interviews	To care for children with type 1 diabetes, school nurses needed resources, parental support, effective communication with doctors and student compliance with instructions.

09	Kobos, E., Imiela, J., Kryczka et al. [21] POLAND	Actual and perceived knowledge of type 1 diabetes mellitus among school nurses.	The assessment of actual and perceived knowledge about type 1 diabetes among school nurses.	230 school nurses	Quantitative	Questionnaire with closed questions	The findings that showed that actual and perceived knowledge about diabetes was not the same for all school nurses. More knowledge was found among nurses with tertiary education, those who had previously received relevant training, and those who had friends or relatives with diabetes.
10	Wilt, L. [6] USA	The relationships among school nurses to student ratios, self-efficacy, and glycemic control in adolescents with type 1 diabetes.	Investigating the role of school nurses in the self-efficacy and glycemic control of adolescent students with type 1 diabetes.	89 pairs of parents and teenage students (10-16 years old)	Quantitative	Questionnaire with closed questions	The ratio of tertiary school nurses to students was associated with better glycemic control and older age.
11	Drakopoulou, M., Begni, P., Mantoudi, A. et al. [22] Greece	Care and safety of schoolchildren with Type 1 Diabetes Mellitus: Parental perceptions of the school nurse role.	Investigating parents' perceptions regarding the care and safety of their children with type 1 diabetes at school.	356 parents of children with Type 1 Diabetes (288 mothers and 68 fathers)	Quantitative	Questionnaire with closed questions	The findings showed that parents believed that the daily presence of a school nurse at school reduced absences, significantly improved school performance, and enhanced diabetic management of students with type 1 diabetes.
12	Wilt, L. [2] USA	The role of school nurse presence in parent and student perceptions of helpfulness, safety, and	Investigating the views of parents and adolescent students with type 1 diabetes regarding the contribution of school nurses to the care provided at school.	89 pairs of parents and teenage students (10-16 years old)	Quantitative	Questionnaire with closed questions	Parents felt satisfied with school safety depending on the extent to which school nurses served their students, while they were dissatisfied with

		satisfaction with type 1 diabetes care.					the small number of school nurses, highlighting the importance of their presence at school.
13	Uhm, J. Y., & Choi, M. Y. [23] SOUTH KOREA	School Nurse-Parent Partnership in School Health Care for Children with Type 1 Diabetes: A Hybrid Method Concept Analysis.	Investigating the collaboration between school nurses and parents of students with type 1 diabetes	22 mothers of children with type 1 diabetes and 20 school nurses	Qualitative	Interviews	The collaboration between school nurses and parents of students with type 1 diabetes should be characterized by trust and communication, as well as by the balancing of responsibilities.
14	Stefanowicz-Bielska, A., Słomion, M. et al. [24] Poland	Knowledge of School Nurses on the Basic Principles of Type 1 Diabetes Mellitus Self-Control and Treatment in Children.	Assessing the level of knowledge of school nurses regarding the basic principles of self-monitoring and treatment of type 1 diabetes mellitus and determining the factors that influence this level of knowledge	168 school nurses	Quantitative	Questionnaire	School nurses' knowledge about the principles of self-monitoring and treatment of type 1 diabetes mellitus was insufficient.
15	March, C. A., Hill, A., Kazmerski, T. M. et al. [25] USA	School nurse confidence with diabetes devices in relation to diabetes knowledge and prior training: a study of convergent validity.	The application of a scale to assess school nurses' confidence with diabetes devices.	271 school nurses	Quantitative	Questionnaires	The scale score was related to the school nurses' previous education and experience, providing evidence for its convergent validity. The scale can be a useful tool for assessing the readiness of school nurses to use devices and to identify areas for improving their knowledge and practical skills.

#### 4. Discussion

The findings of this study show that a large percentage of school nurses do not have sufficient knowledge to effectively manage students with diabetes. [17], [19], [24] The training received by school nurses also plays an important role due to the impact it has on their self-efficacy, as does their number within schools. [2], [14]

Specialized diabetes education is important for all school nurses regardless of their experience. [6], [18]. Given that their presence shows significant benefits not only for disease management but also for school attendance and academic performance of students, it is a necessity providing appropriate education in order to be effective for students with diabetes as well as their parents and teachers. [16], [22]

As the prevalence of diabetes in children continues to increase, it is incumbent on school nurses to maintain a comprehensive knowledge base in order to provide safe and effective care. It is not only an ethical but also a legal imperative. School nurses are required to understand and often follow complex laws in order to provide minimally safe care in the school environment. However, despite these established legal protections, students with diabetes continue to experience discriminatory practices at school that interfere with optimal self-management of the disease. [26]

Students with diabetes are at risk of inadequate glycemic control and critical benefits, such as improved management outcomes, can be achieved when school nurses have resources available to meet the needs of this population. [27] Students with diabetes often face institutional barriers to self-management, such as limited access to diabetes supplies and equipment and blood glucose monitoring, inadequate training of nurses and school staff, restrictions on after-school activities, sports and field trips, as well as lack of daily presence of a school nurse. [28] Removing these unnecessary barriers promotes optimal self-management in students and better glycemic control, which can mitigate the risk of future diabetes complications as well as contribute to better academic performance. [29] School nurses can contribute to the development of a supportive environment through the coordination and implementation of an individualized Diabetes Nursing Management Plan, which addresses the specific needs of the student with diabetes. [26]

In addition to managing the harmful acute and long-term effects of hyperglycemia, such as diabetic ketoacidosis, the role of school nurses is crucial in the prevention and management of severe hypoglycemia, a medical emergency in which the student may not be able to self-manage their diabetes. Alaqeel reported a higher incidence of both hypoglycemic coma and insulin deficiency in Saudi Arabian public schools without nurse or physician health care providers compared to private schools with nurses or medical healthcare providers, both of which can have devastating consequences for students with diabetes. [30]

Students with diabetes and their parents rely on school staff to create a supportive and safe environment by applying current diabetes knowledge and implementing established diabetes standards, protocols, and practices. Parents of students with diabetes face many challenges when interacting with the education system, with safety as a priority. [31] In the United States, parents report the following factors contributing to safe diabetes care at school: the presence of a school nurse, access to diabetes supplies, training for school nurses and school staff, and accommodations for field trips and after-school activities. [32]

Recent literature has identified sociocultural disparities in access to care and treatment outcomes. This finding may provide a key focus for future research. It would also be particularly important to conduct surveys that would examine students with diabetes and their parents regarding what they want from the school nurse in order to cultivate the variables of satisfaction, safety, and service. School nurses must continue to collect data that supports and validates the critical role they play in diabetes management in order to engage stakeholder support and strengthen their presence in schools. [33]

Diabetes is a complex and challenging chronic disease. Therefore, trained school nurses are the most appropriate personnel to care for children and adolescents with diabetes. This implies the existence of policies that ensure their presence in schools and their competence to provide care and support to students. Although older students may appear more independent and capable of achieving proper diabetes self-management, resulting in less frequent visits to the school nurse, school nurses should strive for consistent communication, as they are a risk group for suboptimal treatment compliance. Similarly, regular contact with parents, especially those whose children may not visit the school nurse, can increase both parental satisfaction with diabetes care and the feeling of safety related to diabetes at school. From the data obtained in this study, it is clear that in relation to the management of children with diabetes mellitus, the role of the school nurse is complex since, in addition to the health dimension of his/her work, it is also educational but also coordinating in relation to school staff and parents. At the same time, he must be able to monitor the child's

progress and have knowledge about the treatments that are available as well as the devices that can contribute to better monitoring.

The limitations faced by this review were the lack of more research and the lack of Greek research activity. More specifically, no research relevant to the topic under consideration was identified in Greece, while internationally it is limited. While this issue is particularly important, only fifteen met the criteria for inclusion in this study over a period spanning from 2005 to 2023, almost two decades.

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## 5. Conclusion

In conclusion, it can be said that international literature highlights the valuable role of school nurses both in general and in the management of diabetes. They are a particularly important factor in the management and promotion of the health of students in schools where they spend a large part of their daily lives. In collaboration with students as well as teachers and parents, they can contribute to the well-being and good health of the former.

The data from this study can contribute in this direction, but further research is needed in order to formulate effective policies for school nurses. In this direction and given that the existing research has collected data only from parents and school nurses, it is important to capture the views of the students themselves who need their support. Given that the knowledge of school nurses is the most important factor for the management of diabetes by students, parents and teachers, as demonstrated by this review, It is important to develop relevant training programs to achieve this goal

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## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the primary studies included in this literature review.

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