Evaluating Type 1 Diabetes Management

in an Elementary School Setting

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**Abstract**

**Purpose:** Type 1 diabetes management practices of school nurses and other staff were compared with guidelines in place by the American Diabetes Association (ADA). Objectives were 1) complete an assessment of diabetes management in the county elementary schools by reviewing care plans, education materials, school health policies, and meeting with key informants to discuss their involvement with disease management and 2) to make 2-3 recommendations, based on findings, to the county school nurses. Overall project goal was to facilitate the delivery of best practice diabetes care to support positive student learning experiences.

**Background:** Type 1 diabetes (T1D), is a chronic disease that affects 208,000 youth and children in the United States (American Diabetes Association, 2014). Managing the disease requires intermittent monitoring throughout the day, including checking blood glucose levels, insulin administration, and counting carbohydrates. Depending on a child’s ability to self-manage T1D, some must rely on school nurses and staff to aid in this management, especially elementary students. The ADA (2014) has established key aspects of successful diabetes management in an elementary school including: (a) detailed care plans (b) effective education for school staff, and (c) clear communication and collaboration between all involved persons.

**Implementation**: This project is being implemented in several elementary schools in a North Carolina county that currently has 62 children diagnosed with T1D. Using the ADA guidelines, we compared data about diabetes management and discussed roles with key informants such as the school nurses, nursing coordinator and school staff.

**Findings:** a) every student with diabetes had an Individualized Health Plan and Emergency Health Plan on file; b)effective communication between school nurses, parents, and doctors exists; c) many teachers are not confident in managing emergency diabetes situations; d) students seemed reluctant to discuss their diabetes for fear of being singled out as different from their peers.

**Recommendations:** A county wide evaluation of T1D management needs to be completed. The county school board should consider modifying staff diabetes education and incorporate various forms of media. Nurses should make use of the county’s case management program which emphasizes physical, psychological, social health and school performance. Students should be offered diabetes peer support groups that provide a therapeutic environment to discuss any concerns students may have.

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This program evaluation was performed in conjunction with a community health nursing course in a four-year university baccalaureate program. The community health course which has both a lecture and clinical component, is completed during a student’s last semester of the nursing program. Each student is paired with a registered nurse (RN) preceptor in a community health setting such as the health department, school, or home health agency to gain clinical experience. This program evaluation was part of a community service learning project (CSLP), which allows students to apply concepts learned in the lecture portion of the course to a focused population in their clinical setting. The project involved a community assessment to target a priority health need, collaboration with a community agency to help meet that need, action plan, implementation, and evaluation of actions. In spring 2015, two students collaborated with school nurses to evaluate practices to manage type 1 diabetes (T1D) in the elementary school setting. The overall project goal was to provide an evaluation that can be used to facilitate the delivery of best practice type 1 diabetes care and support positive student learning experiences.

**Review of Literature**

Searches were conducted using the databases CINAHL, Ovid, PubMed and Google Scholar. Main search terms used were “Type 1 diabetes management programs in schools,” “Type 1 diabetes case management,” “Type 1 diabetes education programs for teachers,” and “school nurse and diabetes management.” Articles were limited to journal articles published between 2010 and 2014, because it is important to have the latest information about T1D care. Initially, 20 articles were retrieved. 13 quantitative and qualitative studies, three literature reviews and two informative articles were used. The informative articles, one from the American Association of Diabetes Educators (AADE) and the other from the American Diabetes Association (ADA), provided guidelines for diabetes management in a school setting.

The literature showed evidence of successful and unsuccessful T1D management in schools. Five themes were identified and used to organize this review of the literature. The first theme addressed the impact of diabetes on a child’s learning experience in the classroom. The next four themes addressed factors that determined a successful T1D management plan: (a) detailed care plans; (b) individual roles of the school nurse, parents, and teachers in management; (c) training and continuing education about the disease; and (d) effective communication and collaboration between all parties.

**Impact on School Day**

A diagnosis of T1D can greatly interfere with a student’s school day. One impact that T1D has on the child’s school experience is the number of school days missed due to management of the disease. It has been found that students with T1D missed twice as many school days as their healthy counterparts due to direct issues of diabetes management (Wodrich, Hasan, & Parent, 2011). For some students, entire school days were not missed due to the disease, but instructional class time was missed. When students have to perform T1D management skills outside of the classroom, valuable instruction time is lost. In a survey of 58 students diagnosed with T1D, 56% stated they had to miss class to test their blood sugar, eat a snack, or administer insulin (Marks, Wilson, & Crisp, 2013). Some students may feel more comfortable performing care tasks outside of the classroom in the nurse’s office, while others perform their management in the classroom in order to not interrupt their daily routine (Nurmi & Stieber-Roger, 2012).

**Detailed Care Plans**

The first step to providing management interventions is the importance of developing written diabetes care plans for school age children (American Diabetes Association [ADA], 2012). According to the American Association of Diabetes Educators (2014) there are two types of plans that can be developed, the Diabetes Medical Management Plan (DMMP) and the Individual Health Care Plan (IHP). The DMMP is developed by the provider and should include

* specific instructions for blood glucose monitoring (frequency);
* dose of insulin to be administered and timing;
* meals and snacks allowed;
* treatment of hypoglycemia and hyperglycemia;
* regulations on physical activity;
* what to do in special situations (field trip); and
* emergency contact information (ADA, 2012).

The IHP is developed by the school nurse and is based on the DMMP. This plan includes the student’s needs and nursing management strategies for the child while at school. It is used as a quick reference for teachers and staff for treating hyperglycemia or hypoglycemia. An emergency care plan is created based on both the DMMP and IHP and explains what to do in an emergent event (American Association of Diabetes Educators, 2014). This emergency plan is given to school staff to be aware of actions to take in an emergent situation.

**Roles**

Main participants in the management of T1D in a school setting are the student, school nurse, teachers and parents.

**Students.** Responsibilities of students may include checking their own blood sugar, administering insulin and counting carbohydrates. The ability to self-administer insulin is greatly affected by the child’s age, level of maturity, and length of diabetes diagnosis (ADA, 2012). Elementary school aged children will usually need supervision during T1D management skills.

**School nurse**. The school nurse plays an extensive role in overseeing diabetes management in schools. The nurse’s T1D management responsibilities include developing the diabetes care plan, checking blood sugars, administering insulin and glucagon, counting carbohydrates for children, teaching other staff about diabetes care, and acting as a liaison between the school, parents, and provider (Peery, Engelke, & Swanson, 2012). As the connection between all groups involved with management, the school nurse will be an active part in advocating for the student.

**Teachers.** If a school nurse is not present at the school every day, a child’s teacher must be able to supervise diabetes care and intervene in an emergency if necessary. If a nurse is not in the building, or the child is on a field trip or at extracurricular activities, at least one adult must be present who is trained in providing diabetes care in a timely manner (ADA, 2012). Concerns shared by teachers include loss of instructional time and feeling underqualified to give medical assistance (Marks et al., 2013). The most common issue found when looking at the literature was inadequate training of classroom teachers in checking glucose, giving insulin, and recognizing hyperglycemia and hypoglycemia (Engelke, Swanson, Guttu, Warren, & Lovern, 2011; Marks et al., 2013; Nurmi & Stieber-Roger, 2012; Skelley et al., 2013; Wodrich et al., 2011). Because TID requires management all of the time, teachers must be equipped to handle any situation that may occur in their classroom

**Parents.** The ADA (2012) has included providing the school nurse with supplies necessary for diabetes management and maintenance of these supplies as part of the role of the parent in T1D management. According to the ADA, if there is a malfunction with a piece of equipment it is the parent’s job to provide the nurse with new equipment. Many times the parent will be the liaison between the school nurse and health care provider and as such provides the school nurse with the diabetes medical management plan from the health care provider which includes emergency phone numbers to contact in case of an adverse episode (ADA, 2012).

**Training and Education**

In a survey of parents of students with T1D, 45% of them did not feel that school personnel were adequately trained to manage their children’s disease (Schwartz, Denham, Heh, Wapner, & Shubrook, 2010). According to the ADA (2012), in order to manage T1D effectively in a school setting, all parties must be adequately educated on the disease processes and trained on skills required to manage the disease based on the most up to date information. Diabetes training for teachers varies from a general overview of symptoms to teaching how to perform insulin injections (ADA, 2012). Training teachers in type 1 diabetes management should be a priority when schools have students with type 1 diabetes. Even if the child is not in a particular grade level, multiple staff members should be prepared to manage the disease if a school nurse is not present.

**Collaboration and Communication**

Adequate T1D management in school age children requires extensive collaboration and communication to provide the best care possible. A strong partnership must occur between the school nurse, physician, parents, students and teachers (Foley, Dunbar, & Clancy, 2014). According to Foley et al. (2014) open communication between the school nurse and physician ensure that correct orders are included in the diabetes medical management plan and that these orders are being carried out properly. Other staff included in this collaboration may include school administrators, coaches, physical education teachers, school bus driver, cafeteria worker, and secretaries (ADA, 2012). A large part of T1D management is ensuring that the child receives enough carbohydrates during the day and this daily carbohydrate count should be included in the diabetes medical management plan (Evert, 2009). Supportive information such as menus and nutritional information should be available to parents and staff so that children can be informed before ingesting carbohydrates. When everyone involved in T1D management works together to benefit the child, consequences due to lack of communication should be limited.

**Method**

**Setting**

This program evaluation took place in a county located in eastern North Carolina. The county is diverse, with both agriculturally-based rural areas and urban areas. In 2013, the county population was 185,220 comprised of young couples with children, military members and spouses, and elderly community members.  (United States Census Bureau (USCB), 2014).  In 2011, age demographics included, 47% of the population was 24 years or younger, 37% was between the ages of 25 and 54 and the population between 55 and older was the lowest percentage at 16%.  The median age is 26 years old, which makes it the county with the youngest population in the state (OCHD, 2012). The county is home to a large military installation, and there is a focus on the military population with many chain restaurants, hotels, stores, pawn shops and military haircut establishments.   The biggest indicator for work is the military base.

There is a wide variety of healthcare available in the area such as a hospital, specialty doctors’ offices, the health department, and various pharmacies. The health department, located downtown, provides many different services such as the sexually transmitted infections and communicable diseases services, immunizations and family planning including birth control, pregnancy tests, and prenatal care.  During 2009-2013, the median household income in the county was $45,450 which is decreased from the North Carolina amount of $46,334 (USCB, 2014). There were 15.2 % of people that lived below the poverty line from 2009-2013, which is less than North Carolina’s 17.5% (USCB, 2014). The top overall health issues in the eastern North Carolina county are tobacco use, PTSD, DUIs, alcohol and drug abuse, overweight/obesity, MVI, underage drinking, and mental health issues (OCHD, 2012)**.**

The program evaluation was performed in three public elementary schools, one in a rural area and two in the city. The county currently has 62 children diagnosed with type 1 diabetes enrolled in public schools and 15 of these students are of elementary school age. Because these schools are located near the military base, there is a large turnover in the school populations month to month. This means that the number of students with Type 1 diabetes can change throughout the year, which is why it is important for all staff to be prepared for involvement in disease management.

During the community health course each nursing student was assigned an RN preceptor and evaluated the diabetes management performed at the preceptor’s assigned school. The clinical experience was approximately two days/week for seven weeks. While implementing this project, it was also possible to see the day-to-day duties of a public school nurse regarding other illnesses and diseases. The project was considered a program evaluation to determine whether students were receiving care that corresponded to the American Diabetes Association and the American Associations of Diabetes Educators standards of best practice for type 1 diabetes in an elementary school.

**Intervention**

Using the ADA guidelines and information gathered from evidence-based articles, data about diabetes management in the schools was collected and analyzed. For schools in North Carolina that serve children with T1D, it is required by state law that students are provided with an individualized diabetes care plan that includes an emergency action plan (Care for School Children with Diabetes Act, 2002). Individualized care plans and emergency plans of each student diagnosed with type 1 diabetes were reviewed to see if they matched standards. Disease management was discussed with key informants such as the school nurse, principal, school staff, and school nursing coordinator regarding their roles in providing diabetes care. This determined if staff felt comfortable in their roles managing diabetes and if they felt that they had sufficient training to carry out these roles. This was important to determine as a school nurse may not be present at an elementary school each day, so qualified staff must be available to aid students with type 1 diabetes. Elementary students were observed as they performed diabetes related tasks such as checking blood glucose levels, counting carbohydrates and administering insulin. This supported making a determination of the ability of each student to self-manage their disease and allowed communication with the elementary students regarding their perception of disease management at school. By reviewing these aspects of disease management, 2-3 recommendations for improvement were presented to the county school nurses.

**Findings**

During the time spent in the county, the target population included five students diagnosed with type 1 diabetes who were located at three schools. Four of the five students were in fifth grade and one student was in first grade. Overall, school nurses were providing care that met ADA standards.

**Care Plans**

Through review of the students’ care plans, it was found that every student with type 1 diabetes had an Individualized Health Plan and Emergency Health Plan on file. This means that the county school nurses are following the North Carolina law that requires these plans. Diabetes School Care Plans reviewed began with the child’s name, date of birth and the school nurse’s name. They included the type of insulin received, how insulin is delivered (pump or injections), when to monitor glucose (before or after meals/snacks), and special considerations for physical activity. Care plans also indicated if the student could perform blood glucose monitoring independently or if supervision was needed. Information about target blood sugars, a prescribed sliding scale, and insulin-to-carbohydrates ratio for each child was also included. Step-by-step instructions of nursing actions in both hypoglycemic and hyperglycemic events were included. Plans stated specifically whether to use juice, candy, or a glucose tab for hypoglycemic episodes. For hyperglycemia, the plan provided a specific minimum blood sugar to begin testing for urine ketones and when to transport the child to a specified hospital. Emergency action plans stated when to call 911, which parent/guardian to call in an emergency and which hospital to take the child to. This information was provided by the child’s physician and given to the school nurse. School nurses explained that it was their job to ensure that children monitored their glucose according to the plan and received the correct dose of insulin. If a child needed supervision when performing management tasks, the school nurse would schedule for them to come to the nurse’s office or the nurse would visit the classroom. Each school nurse was aware of the plan of action for each child if he/she were in an emergent diabetic situation.

Another aspect of T1D management that was implemented by one school nurse was a comprehensive case management program. The program could be used for multiple diseases frequently seen in children and included a section for T1D. The program considered not only the physical aspects of the disease, but also the social aspect of the disease as well as the impacts on students learning. Areas included were student’s knowledge of the pathophysiology of their disease, number of absences, and if the students are connecting with their peers. This case management program was used each year by the school nurse to evaluate effectiveness of T1D management over time.

**Communication**

In discussing their role in overseeing diabetes management school nurses explained that good communication between school nurses, parents, and doctors existed. School nurses had cell, home, and work phone numbers for the parents of each student. If a student’s blood glucose was too high or too low, the school nurse would notify the parent of the value and discuss actions taken. They would also explain to parents if these actions were helpful or if further care was needed. School nurses had contact information for the child’s physician on the care plan. The school nurse explained that if she had a question about anything on the plan, she could call and talk to the doctor. The nurse discussed that most details of the plan were clear so calls to the doctor were not made very often. Each school nurse stated that they felt comfortable to contact the child’s physician or parents with a question about the plan of care if needed.

**Diabetes Training Among Teachers**

Through discussion of diabetes management with teachers, mixed answers were received. Seven teachers, 1 principal and 1 vice principal served as key informants during this program evaluation. All teachers in this county receive general diabetes training every year but the training includes only the identification of signs and symptoms of type 1 diabetes. This information is presented as a powerpoint presentation during a large group staff meeting at the beginning of each year. The school nurse stands in front of the group, presents the information and answers questions the teachers may have. Principals mandate the training that staff is required to have each year. Teachers can volunteer to attend 4 hour diabetes training, but many do not make time to devote to this training. A select number of teachers attend a 4 hour diabetes training session that includes not only signs of hyperglycemia and hypoglycemia, but they are also taught how to check a child’s glucose and how to administer insulin and glucagon when needed. School staff who received the 4 hour training stated that they felt more confident in helping a child manage their type 1 diabetes and responding to a diabetic emergency. All teachers did state that they felt comfortable going to the school nurse for any diabetes related questions.

**Student Perceptions of Diabetes Management**

Five student’s views of diabetes management at school were evaluated through discussion and observation. The students seemed reluctant to discuss their diabetes for fear of being singled out as different from their peers. The students explained that while they do not feel isolated by teachers or peers on a day to day basis, they did not feel that their peers understood what they go through to manage their disease. The students did state that they feel comfortable talking to the school nurse, classroom teacher and guidance counselor about their feelings related to having type 1 diabetes.

**Implications for Practice and Policy**

After reviewing the findings of this evaluation, the following recommendations were made and presented to county school nurses at their monthly meeting. A handout was provided to each nurse and included program objectives, major findings, examples of questions used when discussing management with key informants and recommendations made. Information and recommendations presented include:

* An evaluation of type 1 diabetes care in all county public schools would be beneficial to identify an overall picture of diabetes management. It would also be beneficial to evaluate and compare management practices throughout the year and from year to year so improvements can be measured.
* Based on information received from school staff regarding training, one recommendation was to change how the information for diabetes management is being delivered. Instead of having staff watch a powerpoint presentation on the signs and symptoms of hyperglycemia and hypoglycemia, a role playing video was suggested. The American Diabetes Association has videos available online for school nurses to use as a resource. This would allow the staff to have a visual representation of what the student will look like in a diabetes emergency and will be able to act as the teachers did in the video. After watching the video, teachers may feel more confident in carrying out their role in diabetes management.
* One school nurse was using a case management program for her student with type 1 diabetes. It was recommended that all school nurses implement this program in the individual schools to promote consistent management in all aspects of diabetes related care. A nurse can see which aspects of the child’s care need improvement and make changes to the plan of care as necessary. It is important that school nurses assess not only the child’s physical disease but how the disease affects their educational performance, social interactions and feelings of self-worth in order to promote the child’s overall health.
* Collaboration between the nurse and school counselor in providing a diabetes support group for students would be beneficial for those with T1D. Support groups allow those with T1D to discuss topics such as incorporating diabetes into day-to-day activities, peer interactions with those who are and are not familiar with the disease, and feelings of stress related to disease management. In one study about T1D support groups, post survey results indicated a lower score on diabetes problem areas, a higher score in self-care behaviors and an improved hemoglobin A1C result (Markowitz & Laffel, 2012). In groups such as these the students can discuss their disease, how it interferes with their life, and any fears/questions they may have. In order to not interfere with instructional time, it was recommended that it be done maybe once or twice a month either after school or during lunch. School nurses can pair older students with younger students as a mentor. With this support group, students can connect with others who know firsthand exactly what they go through on a day to day basis.

**Limitations**

This program evaluation was limited due to the number of schools visited during the implementation. Of the 15 elementary school aged children in the county diagnosed with type 1 diabetes, care plans of five students were reviewed and disease management was discussed. It would have been a more effective program evaluation if the data of all students and staff members involved with type 1 diabetes in the county could have been compiled. Also, the majority of students spoken to were in the 5th grade, so they all were very self-sufficient in managing their disease. The school nurse provided supervision to the students while they counted their carbohydrates, configured the number of units of insulin to administer, and actually gave themselves the insulin injection. A more representative view of diabetes management could have been obtained if it had been possible to compare the ability of students to self-manage their diabetes in various grades of elementary school.

**Conclusion**

Essential public health services and interventions, including assessment, collaboration and policy review, were used to conduct this evaluation. This program evaluation met the goal of providing information to facilitate the delivery of best practice type 1 diabetes care and support positive learning experiences for children attending elementary school. Objectives were met as care plans and emergency action plans were reviewed, disease management was discussed with key informants, and four recommendations based on findings were presented to school nurses. Best practices based on evidence will provide students the right environment to succeed in disease management and will support their learning in the classroom.

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