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## Improving Diabetes Management for School Health Workers using a Live, Virtual Training Course

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## Improving Diabetes Management for School Health Workers using a Live, Virtual Training Course

### Abstract

**Background:** Type 1 diabetes is one of the most common chronic diseases in childhood. Optimal school nurse and staff education is critical to creating a safe learning environment and influencing long term outcomes of students with type 1 diabetes. The purpose of this project was to develop a virtual continuing education diabetes management course for school health workers to improve their knowledge of diabetes management and evaluate the effectiveness of the learning platform.

**Methods:** A total of 199 participants completed the live, virtual continuing education course. Participants completed a pre and post-test to assess improvements in the key learning objectives of the course content which included diabetes pathophysiology and delivery of appropriate diabetes care in the school setting.

**Results:** There was an improvement in knowledge in all questions from the baseline pre-test scores to the post-test scores. 99% of participants responded that they would use what they learned from the course in their professional practice, and 97% reported that they were able to list at least one concept learned from the conference. 60% reported that the diabetes management course was exceptionally better when compared to other virtual events, and the overall rating of the course was 4.82 on a 5-point Likert scale.

**Conclusions:** The live virtual diabetes management course for school healthcare workers was successful, with an improvement in participants' knowledge of key diabetic management skills. The benefit of the virtual platform was the ability to expand beyond our local region to a larger audience outside of the state and could be adapted for other institutions to utilize. Appropriate and accessible training for school health workers is critical to ensuring safe practices for children with diabetes to attend and thrive at school.

### Keywords

School Nursing, Diabetes Education, Virtual Education, Quality Improvement

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## Introduction

Type 1 diabetes is one of the most common chronic diseases in the school-aged child, affecting approximately 1 out of 465 youth aged less than 20 years (Hamman et al., 2014). Appropriate care of the student with diabetes in school is necessary for safety, long-term well-being, and academic performance. As a significant amount of the school-aged child's day is spent at school, optimal diabetes management during these hours is essential for long-term health outcomes in children with diabetes. Students with type 1 diabetes require intensive blood glucose monitoring, insulin administration, and appropriate recognition and treatment for issues such as hypoglycemia and hyperglycemia. School nurses are in a unique role to provide care for students with diabetes and therefore must be appropriately trained to ensure effectiveness of their practice. Unfortunately, the majority of school staff members have an inadequate understanding of diabetes, which can lead to inappropriate care and sub-optimal outcomes (Bobo et al., 2011; Fisher, 2006; Joshi et al., 2008; Kobos et al., 2020; Wang & Volker, 2013). Additionally, parents of children with type 1 diabetes often express safety concerns about the care that their children receive at school (Jacquez et al., 2008; Kise et al., 2017).

Various factors can impact diabetes management at school including school nurse training and skills, school staff and teachers' awareness and knowledge, and varying policies at the school district, local, and state levels (An et al., 2022). Barriers to effective school diabetes care include lack of appropriate training for school nurses and staff due to time constraints, difficulty with initiation and continuation of education programs, no standardized diabetes training for school nurses or staff, lack of experience or knowledge, or lack of appropriate communication between the family, medical team, and school (An et al., 2022).

Position statements from organizations including the American Diabetes Association and the National Diabetes Education Program recommend basic diabetes education for all school staff members and more advanced training for staff members who have a direct responsibility to care for students with diabetes (Jackson et al., 2015; Siminerio et al., 2018).

The aim of this project was to improve the knowledge base of school healthcare workers involved in the care of students with diabetes using a continuing nursing education (CNE) virtual diabetes management course. The virtual platform was chosen to extend the reach to participants located beyond the local region as well as a safety measure during the COVID-19 pandemic.

## Design and Methods

### Methodology

The project was a single group quasi experimental pretest-posttest design. The implementation team consisted of a multidisciplinary planning committee including CNE nurse planners, a community relations coordinator, an endocrinologist, and a clinical nutrition manager. The team reviewed feedback from prior in-person diabetes school nurse education sessions to determine educational gaps and tailor the education for the virtual CNE session.

## Planning the Interventions

The team developed a virtual diabetes education curriculum (**Table 1**) and identified speakers who were regarded as experts in their field to provide the content for the virtual education. The live virtual event was advertised through a hospital-wide internal communication website as well as an external website to capture participants from other geographical areas. Participants completed an electronic pre and post-test to assess baseline and post event knowledge. Unique identifiers were utilized to de-identify participants in order to compare pre and post-test answers.

**Table 1**  
*Virtual Diabetes Management Course Curriculum*

Topic	Speaker Role
Pathophysiology of Type 1 and Type 2 Diabetes	Endocrinologist
Staying Current with Diabetes Technology: Continuous Glucose Monitoring Devices, Pumps, and Pens	Endocrinologist
Urgent Diabetes Care 101	Endocrine Nurse Practitioner
	Registered Dietitian (RD), Licensed Dietitian (LD), Certified Diabetes Care and Education Specialist (CDCES)
Insulin to Carbohydrate Ratio Practice	Registered Nurse (RN), CDCES
Panel Discussion: Real World Scenarios in the School Setting	Social Worker
	Endocrinologist
	Endocrine Nurse Practitioner
	Master of Science in Nursing (MSN) degree holder, Board Certified Advanced Diabetes Management (BC-ADM) professional, RN, CDCES
Psychosocial Considerations of Diabetes Care in the School Setting	Psychologist
Carb Counting	RD, LD, CDCES

## *Components of the Virtual Course*

As outlined in Table 1, the virtual course curriculum covered a broad spectrum of diabetes education topics. The course began with a discussion of the pathophysiology Type 1 vs. Type 2 diabetes and an overview of diabetes management. Participants received updates on current diabetes technology including insulin pumps and continuous glucose monitors. They were able to review and practice calculating insulin doses appropriately for meals. A session on management of urgent diabetes issues such as hypoglycemia and hyperglycemia with elevated ketones provided practical case examples that could be utilized in the school setting. A discussion of the psychological considerations in diabetes care highlighted emotional and behavioral concerns and reviewed how to identify diabetes distress and burnout in the school

setting. The Q&A panel discussion on real-world scenarios allowed the participants to submit questions about challenging situations they had experienced and receive expert advice.

### **Evaluation Tool**

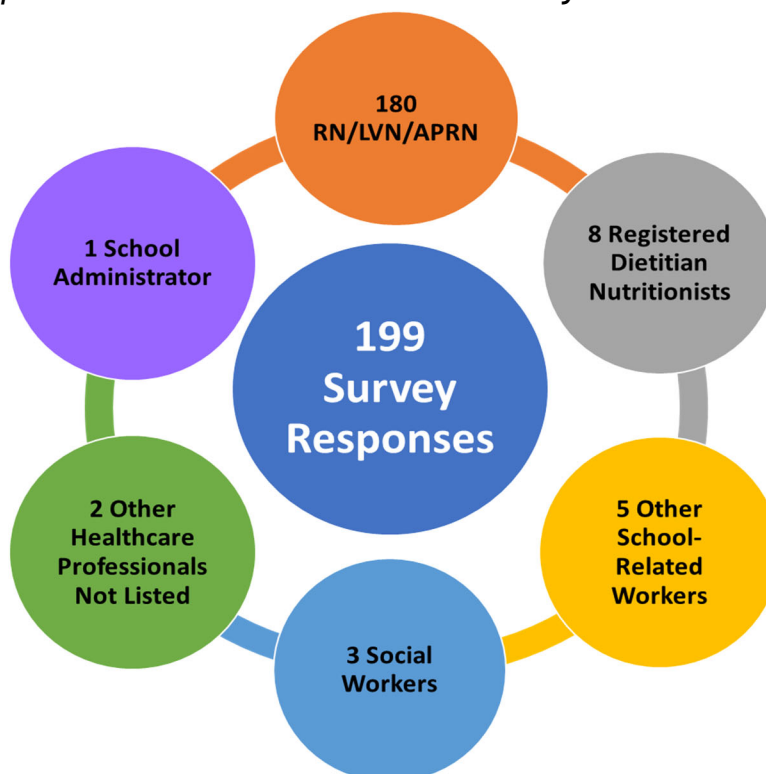
The pre/post-test tool was created by content experts and reviewed by members of the planning committee for clarity and accuracy. The tool included 7 multiple-choice questions and one true/false question to address the key learning objectives of the course. The pre- and post-test scores were compared to assess for an improvement in knowledge after the virtual diabetes management course. Participants completed evaluations for each individual speaker, the virtual diabetes management course as a whole, and how this virtual education event compared to others that they had attended previously.

### **Results**

A total of 213 participants completed the live, virtual diabetes management course. Ninety-three percent (n=199) of the attendees completed both the pre-test and post-test. **Figure 1** describes the attendees who completed the evaluations by role. Amongst the 242 people who registered for the course, 174 were located within the local region, 42 were within the state but outside of the region, 20 were out of state, 3 were out of the country, and 3 did not provide their location.

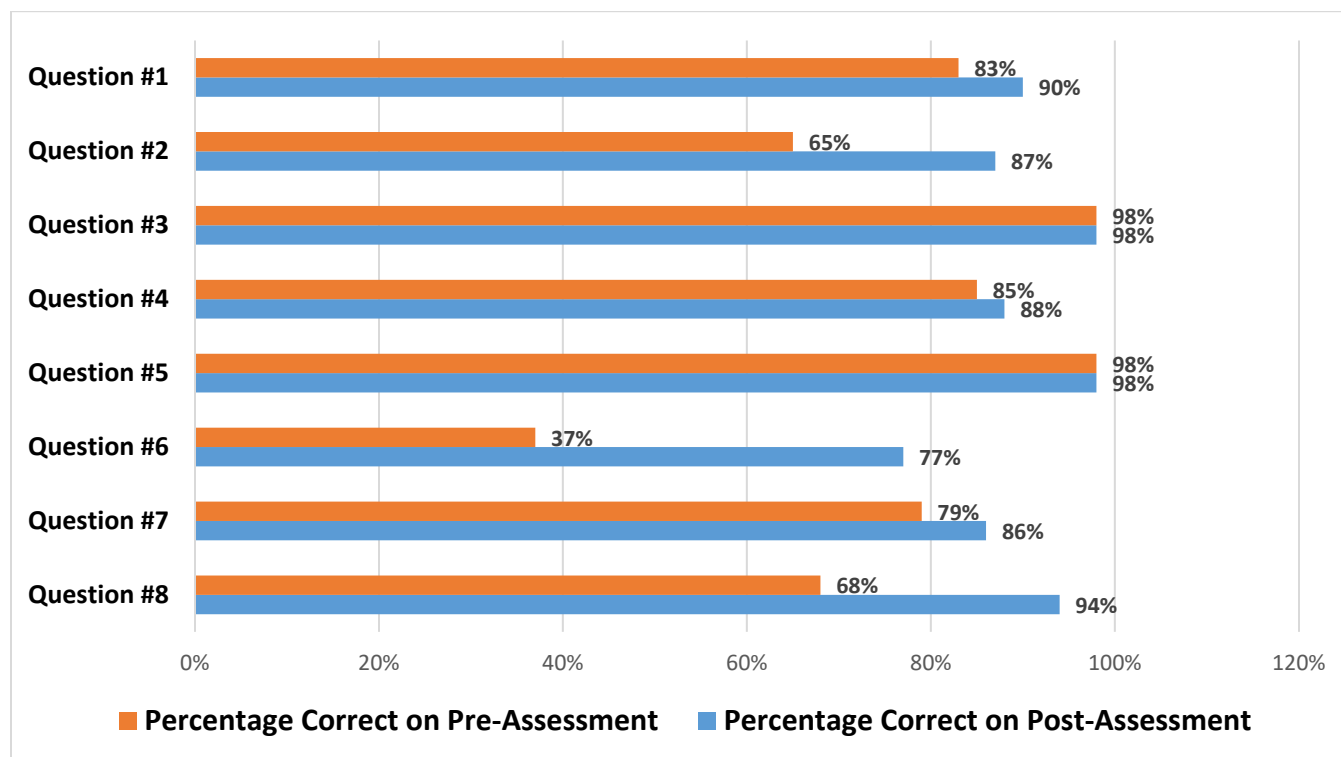
#### **Figure 1**

*Attendees Who Completed Pre and Post-Test Evaluations by Role*



Cumulatively, the scores showed an improvement from a baseline of 76% on the pre-test to 89% on the post-test (**Figure 2**). **Table 2** shows the test questions and the correct answers. On the 3 pre-test questions that had the lowest scores, the diabetes management course produced noticeable knowledge gains upon course completion.

**Figure 2**  
Pre- and Post-Test Results



Note: 213 attendees completed the pre-test and 199 attendees completed the post-test.

**Table 2**  
Pre- and Post-Test Questions and Correct Answers

	Question	Answer
Question #1	Students with diabetes are at greater risk for all of the following mental health outcomes EXCEPT: <ul style="list-style-type: none"> <li>• Depression/Anxiety</li> <li>• Burnout</li> <li>• Eating Disorders</li> <li>• Attention Deficit Hyperactivity Disorder</li> </ul>	Attention Deficit Hyperactivity Disorder
Question #2	How many carbohydrates are in a medium/large banana?	30 grams
Question #3	What are the benefits of a continuous glucose monitoring system? <ul style="list-style-type: none"> <li>• Improved quality of life</li> <li>• Reduced risk of hypo and hyperglycemia</li> <li>• Reduced glycemic variability</li> <li>• All of the above</li> </ul>	All of the above

<b>Question #4</b>	What would you do FIRST if a student with type 1 diabetes had a blood glucose of <50 mg/mL before lunch?	Treat with 15 grams of rapid carbohydrate and re-check blood glucose in 15 minutes
<b>Question #5</b>	A student with type 1 diabetes is about to eat lunch. Their insulin to carbohydrate ratio is 1:25 (one unit of insulin for every 25 grams of carbohydrate). The student's blood glucose is within the target range. If the student plans on eating 100 grams of carbohydrate, how many units of insulin should they receive?	4 units
<b>Question #6</b>	Which of the following statements is false? <ul style="list-style-type: none"> <li>• Type 2 diabetes can present with ketosis</li> <li>• Pancreatic antibodies are common in Type 2 diabetes</li> <li>• It is more common for a Type 2 diabetic to have an affected relative than it is for a Type 1 diabetic</li> <li>• Type 2 diabetes has a polygenic inheritance</li> </ul>	Pancreatic antibodies are common in Type 2 diabetes
<b>Question #7</b>	Which of the following situations would it be appropriate to check for ketones in a type 1 diabetic? <ul style="list-style-type: none"> <li>• 4-year-old female with a blood sugar of &gt;300 mg/dl</li> <li>• 8-year-old male with vomiting</li> <li>• 15-year-old female with abdominal pain and nausea</li> <li>• All of the above</li> </ul>	All of the above
<b>Question #8</b>	Which of the following is a diagnostic criterion for diabetes? <ul style="list-style-type: none"> <li>• Fasting blood sugar &gt; 100 mg/dl</li> <li>• Hemoglobin A1C of <math>\geq</math> 6.5%</li> <li>• Random plasma glucose level of &gt; 180 mg/dl with symptoms</li> <li>• 2 hour glucose tolerance test reading <math>\geq</math> 180 mg/dl</li> </ul>	Hemoglobin A1C of $\geq$ 6.5%

99% of participants reported that they intended to use what they had learned in their professional practice as a result of attending the virtual diabetes conference. 97% of participants reported that they were able to list one concept learned related to school-aged children with diabetes. In comparison to other virtual education events, 60% rated the diabetes management course as exceptionally better, 23% rated it as somewhat better, and 17% rated it as about the same. The overall rating of the diabetes management conference was 4.82 on a 5-point Likert Scale.

### Discussion

This virtual live education course aimed to improve the knowledge of diabetes management for school health workers. Gains in knowledge scores were seen on all of the questions posed on the pre/post-tests after participants completed the course. Overall, participants highly rated the course, and a majority (60%) responded that the course was exceptionally better than other virtual education events they had previously attended.

## **Effectiveness of Diabetes Education Platforms**

Limited studies have evaluated the effectiveness of diabetes education for school nurses. A meta-analysis evaluated studies looking specifically at diabetes education and school personnel including mainly teachers and school nurses (Pansier & Schulz, 2015). Three studies reviewed for this paper showed a significant improvement in diabetes knowledge in school personnel who completed an in-person or computer-based education training program. Only one study looking at the effectiveness of computer-based training did not show a statistically significant increase in knowledge measured by randomized controlled trial. Another more recent study evaluated the effectiveness of a continuing education diabetes management course for school nurses and noted that the participants' experience and competence for four categories of diabetes care improved after participation in the course (Breneman et al., 2015). Higher self-perceived confidence and efficacy of school nurses in providing diabetes care has been seen in school nurses who have completed continuing diabetes education programs (Bachman & Hsueh, 2008; Bullock et al., 2002; Fisher, 2006; Smith et al., 2012).

The findings of our live, virtual continuing education program are similar to what is seen in the literature in terms of increased knowledge and a plan to apply what was learned during the course in the care of students with diabetes.

## **Project Strengths and Limitations**

The live virtual platform was a strength of this project as it provided an opportunity to reach a larger audience not confined to a specific school district. 17% of the participants were outside of the local region and 9% were out of state. Limitations included the ability to follow up with participants at a later date to determine their perception of how the education program improved their clinical practice. Therefore, a next step is to conduct a long-term follow-up assessment to determine if attendees' clinical practice was improved and if knowledge was retained.

## **Conclusion**

The project team was able to develop a successful, highly rated live virtual CNE diabetes management program for school health workers with an improvement in knowledge in key skills. As there continues to be an increase in the prevalence of diabetes worldwide, it is critical that school health workers have the ability to participate in accessible, up-to-date, and evidence-based diabetes education. The virtual live learning platform allowed for participant interaction with the speakers and the course content, as well as the ability to reach a larger audience that is not confined to a particular geography. This course could be adapted and utilized by other institutions who are interested in diabetes education. Future directions include looking at long-term knowledge retention for participants in this course, evaluation of outcomes of students with diabetes, and creation of "on-demand" virtual education for school health workers.



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