

Virtual Nursing Care for School Children with Diabetes

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Access to safe health care when a nurse is not present is a public protection issue facing many boards of nursing. This is especially true in schools where a nurse is not present to provide care for children with diabetes. This study examined the safety and effectiveness of a model of care that linked trained unlicensed school personnel to registered nurses (RNs) via telehealth technology to delegate and supervise diabetes care tasks, including insulin administration. The study took place from December 2010 to May 2013, and 5,568 doses of insulin were administered safely by unlicensed personnel. Surveys taken before and after implementation measured the perceptions of parents and school personnel regarding the safety and efficacy of the model of care. Statistical results showed large degrees of effectiveness. This study provides preliminary evidence supporting regulatory changes for the delegation of insulin administration and other diabetes care tasks by RNs.

The Virtual Nursing Care for Children with Diabetes in the School Setting project is a model for having a virtual nurse presence in settings where a nurse is not present or needs help to meet the health care needs of the population. The Virtual Nurse project was inspired by three major concerns for the citizens of South Dakota: access to care for individuals with diabetes in settings where a nurse is not always present, legal barriers to the delegation and supervision of insulin administration, and the cost of sustaining the current model of care.

The model was based on the nursing principles of delegation and supervision of trained unlicensed personnel by licensed nurses in South Dakota (South Dakota Legislature, 2013). The literature shows several critical factors that influence the effectiveness of nursing delegation. Boards of nursing (BONs) have jurisdiction over licensed nurses and the nursing care they provide, including the care they delegate (Mueller & Vogelsmeier, 2013). Nurse practice acts (NPAs) define the legal limits of nursing practice and, in most jurisdictions, NPAs or administrative rules refer to delegation, though not all NPAs authorize delegation by registered nurses (RNs) (Corazzini et al., 2011).

The RN's obligation to provide safe, quality care creates distinct challenges when delegating care to unlicensed personnel. These challenges are amplified for school nurses by budgetary constraints, the lack of qualified nurses, and the increased use of unlicensed personnel (Gordon & Barry, 2009). Compounding the issue are federal and state requirements of the Individuals with Disabilities Education Act that mandate school services

for complex student health needs as well as state and school administrators' directives requiring school nurses to delegate to unlicensed personnel (Resha, 2010). Thus, delegation to unlicensed personnel in schools has become a necessary and challenging practice, and school nurses struggle to meet the expectations of their role, maintain their standards, and comply with their NPAs and other regulatory statutes.

School Children with Diabetes

South Dakota, like many other states, has been examining the management and treatment of children with diabetes in schools. Numerous concerns regarding less-than-adequate care have been cited by parents of children with diabetes attending schools where a nurse is not present. Parents reported that some school children have been transported to nursing homes for insulin administration during the school day. Other reports indicated that some schools required a parent to come to the school to administer insulin. Given the rural nature of South Dakota, this requirement presented several challenges for parents. In one instance, school officials administered insulin to children, citing their authority as an exemption to the NPA for gratuitous care of family and friends. These concerns as well as proposed legislation allowing unlicensed personnel to administer insulin were the basis for the South Dakota BON to examine the delegation of diabetes care in schools.

In 2008, a state bill (HB 1152) was drafted to provide diabetes management and treatment for school children (South Dakota Legislature, 2008). The bill stated

that in the absence of a school nurse, trained diabetes personnel could administer insulin and perform other diabetes care. The School Nurses Association in South Dakota strongly opposed allowing unlicensed personnel to administer insulin, while the South Dakota Diabetes Educators Association strongly supported the proposed legislation and formally requested that the BON support it. The sponsoring legislator did not introduce the bill in committee because of the lack of consensus in the nursing community. The BON agreed the issue would be studied and methods for meeting the needs of children with diabetes in the schools would be examined.

At the same time, assisted living centers and residential care facilities were seeking ways to help those with diabetes receive care when a nurse was not present. Clients who could not administer their own insulin had to be admitted to a skilled nursing facility. One client was taken to the emergency department of a local hospital to receive insulin because a nurse was not present. These methods were neither desirable nor economically sustainable. As a result, the BON was challenged to find ways to overcome barriers to the provision of diabetes care in settings where a nurse is not always present.

In response to these challenges, the BON and the South Dakota Center for Nursing Workforce hosted conversations on diabetes care in two locations. Key stakeholders participating in the conversations were school administrators, policy makers, physicians, diabetes clinical nurse specialists, school nurses, and concerned parents. The overall question was: "What possibilities exist to enhance diabetes management when a nurse is not present?" The findings of these two conversations were used to convene a task force to begin planning a pilot project. What emerged was a model linking trained unlicensed personnel with a virtual RN by means of technology to manage the care of school children with diabetes.

South Dakota Demographics

The geography of South Dakota lends itself to a model of care using virtual RNs. South Dakota is a large state with an estimated population of 833,354 (U.S. Census Bureau, 2012). Of the 38 counties in western South Dakota, 33 are considered frontier (having fewer than 7 people per square mile). South Dakota is one of the least urbanized states with more than 50% of South Dakotans living in rural areas. Only four counties have more than 30,000 people.

Though South Dakota has the highest RN-to-resident ratio in the country, 1,247.7 RNs per 100,000 residents (U.S. Department of Health and Human Services [HHS], 2013b), most of the state's rural and frontier counties are experiencing shortages of nurses and

other health care professionals. According to the Health Resources and Services Administration (HRSA), 55 of South Dakota's 66 counties (83%) are listed as primary care health professional shortage areas. Furthermore, 47 entire counties are considered by HRSA to be medically underserved, meaning these areas cannot support sufficient health care services. This represents 71% of the counties (HHS, 2013a). Because of South Dakota's rural nature, nurses cannot be present 24 hours a day in all settings where people with diabetes need assistance.

Testing the Model

The current study was intended to determine whether diabetes care tasks including insulin administration could be safely delegated to trained unlicensed personnel by a virtual RN. The study received approval from the Avera Health Institutional Review Board. RNs certified in diabetes education were linked with unlicensed personnel via telehealth technology to implement the diabetes medical management plan. The virtual RNs could clearly see and speak to the unlicensed personnel and the school children by means of the technology.

The main purpose of the study was to answer the following question: "To what extent is a model of nursing care utilizing a virtual RN linked to a trained unlicensed provider through telehealth technology safe and effective in the care of school children with diabetes, including insulin administration?" The study objectives were as follows:

- Implement and test a model of virtual nursing delegation to and supervision of trained unlicensed providers caring for school children with diabetes, including insulin administration.
- Develop evidence-based quality indicators of safety for virtually managed care of school children with diabetes through the evaluation of clinical case management records.
- Measure the difference in perceived levels of satisfaction, timeliness, communication patterns, responsiveness, and use of technology in the care of school children with diabetes before and after model implementation.
- Formulate a resource guide for school nurses, administrators, and unlicensed providers who deliver care to school children with diabetes.
- Discover the implications of virtual nursing care delivery for regulatory infrastructure expansion through analysis of research data.

Method

An exploratory pilot project was performed in which clinical data were collected and a survey was conducted before and after model implementation. The project was implemented from December 1, 2010, through May 31, 2013. The sample population included school administrators, parents or guardians of children with diabetes, virtual RNs, and trained unlicensed personnel. Survey tools were designed to measure multiple variables, including satisfaction, safety, timeliness, communication patterns, responsiveness, and technological proficiency. Clinical diabetes outcome measures were collected by the virtual RNs and analyzed by the primary investigators.

Advisory Council

A core consultant panel, including the principal investigators, a clinical nurse specialist certified diabetes educator, technology experts, school nurses, and a research consultant provided the expertise for project implementation. This panel met monthly. Additionally, an advisory stakeholder council was appointed by the investigators. The advisory council met face-to-face three times during the course of the project: initially, at the midpoint, and at the conclusion. The council consisted of the core consultants of the project; parents or guardians of children with diabetes; primary care providers; school administrators; nursing administrators; and representatives of the South Dakota Diabetes Coalition, South Dakota Certified Diabetes Educators Association, South Dakota School Nurses Association, South Dakota BON, South Dakota Department of Health, and South Dakota Nurses Association. The role of the advisory panel was to guide and assist the investigators in the implementation of the project and to identify and support policy recommendations for regulatory changes to the BON.

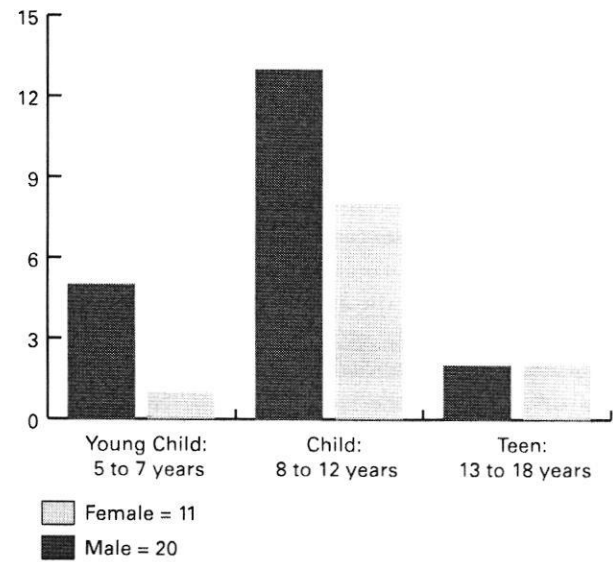
Participants

A convenience sample was utilized for the study. In the first year, administrators of public and private schools in the central, northeast, and southeast regions of South Dakota were sent a letter of invitation to participate. Administrators interested in participating contacted the principal investigators, and face-to-face meetings were conducted.

A second method of recruiting participants was used for the remainder of the study. The certified diabetes educators invited parents of children who were their clients and who met study inclusion criteria to participate. At the start of the study, the principal investigators were contacted by other parents and school administrators to

FIGURE 1

Student Demographics



request participation. In some cases, administrators were willing to participate, and the parents were not interested. In other cases, parents wanted their children to participate, but the schools declined to participate.

A total of 31 students participated: 20 males and 11 females. (See Figure 1.) Six students were ages 5 to 7; 21 were ages 8 to 12; and 4 were ages 13 to 18.

Inclusion Criteria

The following criteria were established for inclusion in the study:

- The school in South Dakota must have students diagnosed with type 1 or type 2 insulin-dependent diabetes.
- The student must require insulin administration by injection or pump on a regularly scheduled or sliding-scale basis during the school day.
- The school must not have a licensed nurse present every day to assist children with diabetes during lunch time.
- The school must have the appropriate technology to connect to the virtual RN.
- The school must be able to identify an unlicensed person who can partner with the virtual RN for the management of students with diabetes during the school day.
- Informed consent must be obtained from the student and his or her parents or guardian before participation in the project.

Parents and guardians of children meeting the inclusion criteria received the consent form, and the children received an age-appropriate assent form. By signing the document, the parents or guardians voluntarily consented to their children's participation.

Measures

The measures used to evaluate the safety and effectiveness of the nursing model of care were insulin administration, blood glucose monitoring, carbohydrate counting, activity monitoring, and the survey before and after implementation. The trained unlicensed personnel documented the care provided in a weekly diabetes care log. The logs were submitted to the virtual RNs at the end of each week and were the basis for clinical data collection for the study.

Virtual RNs calculated the total number of insulin doses administered by unlicensed personnel and the number administered correctly according to the six rights of medication administration (Potter & Perry, 2005).

Unlicensed personnel recorded the dates, times, and results of blood glucose monitoring tests. These records were evaluated by the virtual RNs to determine if the times and results of the routine tests were recorded. The virtual RNs also evaluated the extra blood glucose monitoring tests performed and the actions taken in response to the results.

The documentation of carbohydrate counting by unlicensed personnel was evaluated by the virtual RNs for accuracy. Virtual RNs also determined whether unlicensed personnel performed the task independently or needed assistance from a virtual RN.

Activity monitoring was evaluated based on blood glucose testing before and after physical education classes or other physical activity as directed by the diabetes medical management plan (DMMP).

The survey tool measured participants' perceptions about safety, satisfaction, timeliness, communication patterns, responsiveness, and the use of technology for the virtual care of school children with diabetes before and after implementation. The surveys were developed by the research consultant, and the content was validated by the diabetes clinical nurse specialist consultant. Each parent was asked to rate the school's level of ability to care for his or her child with diabetes; school administrators were asked to rate the school's ability; and unlicensed school personnel were asked to rate their own ability to provide care to the children. Respondents rated their ability according to a five-point Likert scale with 1 as "not at all" and 5 as "very well" in seven categories:

- Provide safe, quality care.

- Obtain immediate assistance if a child experiences complications or conditions calling for instant decisions.
- Communicate with an RN who will supervise medication administration.
- Respond appropriately to questions about diabetes care.
- Make sound evidence-based decisions in a timely fashion within policies, procedures, and standards.
- Use technology to assist with the care of children with diabetes.
- Experience a level of satisfaction that the best care is provided to children with diabetes.

Additionally, respondents were asked to identify personal goals for the Virtual Nursing Care project.

Procedure

Essential components of the study included the technology, the virtual RNs, diabetes education for unlicensed personnel, clinical interventions, and the survey.

Technology

Each school that met the inclusion criteria was evaluated by technology consultants for sufficient network access and equipment. It was anticipated that most schools would meet the technology demands because a statewide project in the 1990s provided Internet access and computer capability to all public school districts. Unfortunately, almost all the schools were at capacity with network utilization, and broadband width was not available for the required clarity of the virtual RN connections. Therefore, separate Internet connections were installed. The technology consultants ordered and installed identical hardware and software for the schools and virtual RNs. The technology included desktop video units, laptop computers, Logitech Quickcam Pro 9000, Polycom PVX v8.0 Conferencing Application, Cisco VPN, and VPN Appliance.

The software ensured a secure internet connection to the virtual RN at the hub site. The hardware and software were designated for exclusive use with this study, and computers were locked, so no other access was allowed. Training on the use of the hardware and software was provided to the virtual RNs and unlicensed personnel by the technology consultants. Mock calls were conducted between the virtual RNs and the schools to test the technology and network connections. Backup protocols were established in case the technology did not work as intended. A help desk was available for troubleshooting technology-related issues. The virtual RNs could clearly

see and speak to the unlicensed personnel and the children by means of the technology.

Virtual RNs

The project had six virtual RNs. All six were certified as diabetes educators. Four held a bachelor of nursing degree, and two were licensed as clinical nurse specialists and held a master of nursing degree. All six were employed in two hospitals that served as the virtual RN hub sites. During the project, the virtual RNs were contracted and paid to provide a total of 2,636 hours for their services. Services included training and competency evaluation, delegation and supervision of diabetes care tasks including insulin administration, assisting with the development of the DMMPs for all 31 students, and evaluation of clinical outcomes on a weekly basis. Virtual RNs were available to unlicensed personnel by telephone and in weekly telehealth consultations.

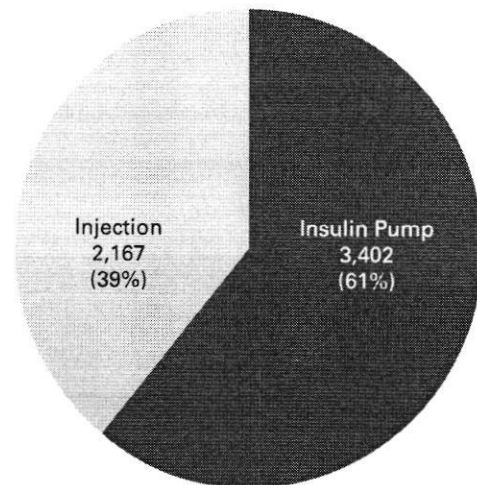
Diabetes Education for Unlicensed Personnel

Each school in the project selected one or more unlicensed persons to participate. Personnel included teachers, school administrators, and administrative assistants who agreed to be responsible for assisting with the management of children with diabetes. The American Diabetes Association's (ADA) standardized curriculum in *Diabetes Care Tasks at School: What Key Personnel Need to Know* (ADA, 2008) provided the basis for the education of the unlicensed personnel. The curriculum was developed and reviewed by a team of ADA expert volunteers and staff.

The didactic portion was 10 hours and taught by the clinical nurse specialist, certified diabetes educator who served as the clinical expert for the project. The entire 10-hour program was video and audio recorded, and unlicensed personnel received a DVD copy and a training manual. Additionally, each unlicensed person received a kit of diabetes supplies to use in developing competence in carbohydrate counting and insulin administration by vial and syringe and by insulin pen. Before implementation, one-to-one competency evaluations and return demonstrations were conducted with each unlicensed person on carbohydrate counting, preparing and injecting insulin via syringes, dialing and injecting insulin via an insulin pen, and assisting with entering data and delivering insulin via an insulin pump. Virtual RNs conducted the competence evaluations either in person or through the virtual technology units. In addition, each unlicensed person received a resource manual entitled *Helping the Student with Diabetes Succeed: A Guide for School Personnel* produced by the National Diabetes Education Program (2011).

FIGURE 2

Number of Insulin Doses Administered by Injection and Pump

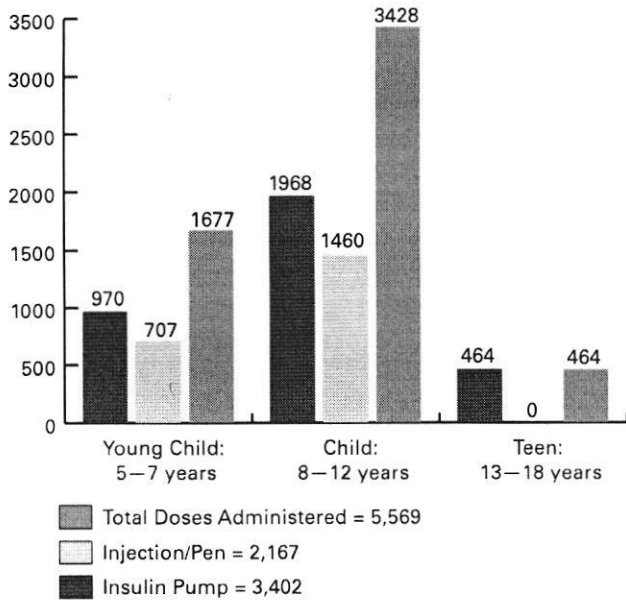


Clinical Interventions

A DMMP was completed for each student participating in the project. The DMMP detailed the specific needs of the child and formed an agreement among the student's health care team, parent or guardian, and school personnel to meet the child's needs. All schools that received federal funds were required to have a written plan for children with special health needs according to Section 504 of the Rehabilitation Act of 1973 (ADA, 2003). The DMMP form for this project was similar to the example provided by the ADA. The unlicensed personnel were responsible for implementing diabetes care tasks based on the DMMP in consultation with the virtual RN. Virtual consultation dates and times were arranged by the virtual RNs and the unlicensed personnel, and consultations took place once a week or more frequently if necessary. The amount of consultation and supervision needed for each unlicensed person was determined by the virtual RN. The virtual RN determined the amount of supervision based on an assessment of the child's health status, diabetes management needs, and the unlicensed person's level of comfort and proficiency in providing care. The virtual RN was available during the school day by phone and virtual meeting if an unanticipated consultation was needed. Calls made to the virtual RNs outside the routine consultations were recorded in the clinical care record, which was submitted to the virtual RNs weekly. The trained unlicensed personnel also recorded the number of calls made to parents. These calls were made in compliance with elements of the DMMP.

FIGURE 3

Number of Insulin Doses Administered: 5,569



Diabetes care tasks implemented and recorded by the unlicensed personnel included insulin administration, blood glucose monitoring, carbohydrate counting, activity monitoring, hypoglycemic recognition and treatment, emergency glucagon administration, and hyperglycemic recognition. The unlicensed personnel documented each of the clinical elements and provided the information to the virtual RNs weekly. Data were analyzed to determine the safety and efficacy of the care provided. Of particular concern to the primary investigators was the safety of delegating insulin administration to unlicensed personnel.

Survey of Parents and School Personnel

Parents were mailed a survey and consent form before their children participated in the project. When the project was completed or a child withdrew from the study, parents received a second survey. Nonresponding parents received a second mailing.

School personnel received the survey before the study at their school addresses. Because the investigators then obtained the e-mail addresses of school personnel, the survey following the study was e-mailed. A second request was e-mailed to nonresponders.

Clinical Data Results

Clinical data and the survey were analyzed to evaluate the effectiveness of the model. The clinical data included

insulin administration, blood glucose monitoring, carbohydrate counting, and activity monitoring.

Insulin Administration

Over the course of the project, 5,569 doses of insulin were administered subcutaneously by trained unlicensed personnel to children enrolled in the project. (See Figures 2 and 3.) The insulin was administered by pen, syringe and vial, or pump and was based on the child's DMMP. The unlicensed personnel entered the grams of carbohydrates consumed into the pumps, and the pumps calculated and administered the programmed doses of insulin. Unlicensed personnel also administered insulin by dialing the dose on an insulin pen and by drawing up insulin from vials into syringes. The virtual RNs reported the vast majority of students used either an insulin pump or insulin pen, not the syringe and vial method.

Of the 5,569 insulin doses administered, 3,428 (61.6%) were administered to children ages 8 to 12 (Figure 3). Of these 3,428 doses, 1,968 (57.4%) were administered by insulin pump, and 1,460 (42.6%) were administered by insulin pen. Children ages 5 to 7 received 1,677 (30.1%) of the total doses in the study. Of these doses, 970 (58%) were administered by insulin pump, and 707 (42.2%) were administered by insulin pen or syringe. Only 464 (8.3%) of the total doses were administered to children ages 13 to 18. All were administered by insulin pump.

Only one administration error (wrong dose) was reported; it resulted from the wrong number of carbohydrates being programmed into an insulin pump. This error was discovered by the unlicensed person who then called the virtual RN. Appropriate actions were taken, and the error did not cause a negative outcome.

During the course of the project, emergency glucagon was not administered, and no calls were made to emergency medical services. The records indicated that 59 calls were made to parents during the project. A total of 265 calls were made to the virtual RNs outside of the prearranged consultations.

Blood Glucose Monitoring

Blood glucose monitoring was performed according to the DMMP, and the weekly records submitted to the virtual RNs indicated that monitoring was completed accurately 92.5% of the time. Records showed that 7.5% of the time the unlicensed personnel did not record blood glucose monitoring accurately or documentation was missing. The weekly logs also tracked the number of blood glucose monitoring tests beyond those required by the DMMP. An additional 1,737 tests were recorded.

Episodes of hypoglycemia and hyperglycemia were also recorded. Each child's primary care provider identified specific indications of a hypoglycemic or hyperglycemic episode for the child on the DMMP. The provider also listed appropriate actions to take in response to the episodes. The unlicensed personnel recorded 708 episodes of hypoglycemia. Of those episodes, 703 (99%) were treated accurately based on the DMMP. In less than 1% of the cases, either the episode was not treated according to the DMMP, or the unlicensed person did not enter the data in the weekly log. Unlicensed personnel recorded 415 episodes of hyperglycemia. Nearly all (99.8%) were recorded as accurately treated according to the DMMP.

Carbohydrate Counting

The virtual RNs reported that 81% of the time unlicensed personnel performed carbohydrate counting accurately, and 19% of the time they did not. Of the unlicensed personnel, 70% indicated that carbohydrate counting was completed independently, and 30% indicated that they needed assistance from the virtual RN.

Activity Monitoring

The child's blood glucose level was monitored before and after physical education, sports, and other times as specified on the child's DMMP. The virtual RNs reported that blood glucose monitoring was performed by the unlicensed personnel 75% of the time. The investigators believe that activity monitoring was not completed and recorded 100% of the time because it was not required for all children in their DMMPs.

Overview of Clinical Data Results

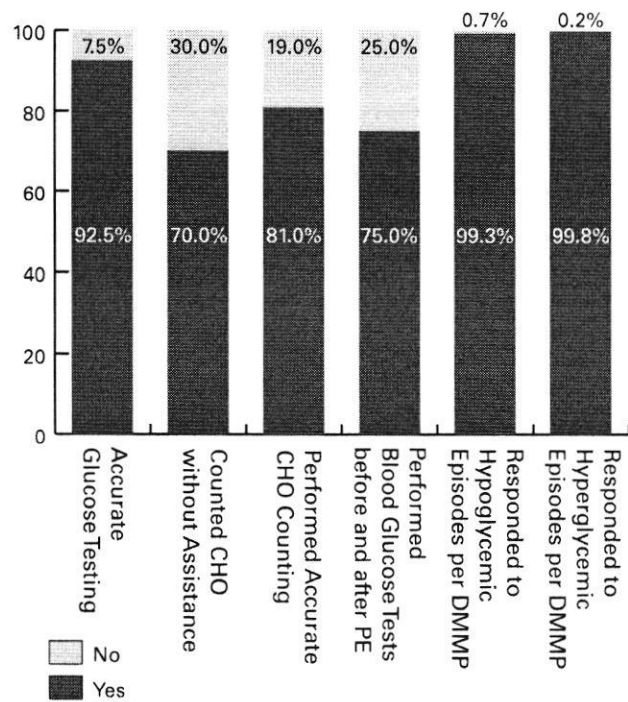
Figure 4 represents the results of the clinical findings with the exception of insulin administration.

Findings from the clinical measures revealed 5,568 doses of insulin over a 2½ year period were administered safely by unlicensed personnel. Of these doses, 61% were administered by insulin pump. Administration by pen or syringe and vial accounted for 39% of the doses. Only 69 doses were administered by the syringe and vial method.

The performance on carbohydrate counting by unlicensed personnel was of more concern to the investigators than the delegation of insulin administration. Carbohydrate counting is a complex task and is closely connected to insulin administration because the grams of carbohydrates consumed often determine the amount of insulin administered. It is clear from the clinical outcome measures that trained unlicensed personnel had the most difficulty with carbohydrate counting, which is a diabetes care task that nurses may delegate in South Dakota.

FIGURE 4

Performance of Delegated Tasks by Unlicensed Personnel



In the opinion of the investigators, trained unlicensed personnel should have access to an RN for assistance with all aspects of diabetes care. Such access may require new models of care to enhance the presence of the nurse in settings where a nurse is not routinely present. Overall, the clinical data results suggest that RNs can safely delegate and supervise insulin administration after unlicensed personnel complete diabetes education training and competency validation.

Survey Results

Before the study, 31 surveys were sent to the parent group, and all were returned. Completion of this survey was required to enroll a child in the study. After the study, surveys were distributed to parents with two follow-up requests; the response rate was 32.3% (N = 10). Before the study, 50 surveys were sent to the school personnel group, which included administrators and trained unlicensed providers. Completion of this survey was required for inclusion in the study. After the study, 28 surveys were returned for a 56% response rate. Parents were asked to rate their perceived level of ability to trust the school with care of their children with diabetes before and after the study. School personnel were asked to rate

TABLE 1

Results of Paired-Samples t-test: Survey Responses of Parents and School Personnel Before and After the Study

Item	Before	After	<i>t</i> (<i>df</i>)	<i>p</i>	Cohen's <i>d</i>
	Parents				
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)			
Provide safe, quality care.	3.56 (1.13)	4.56 (.73)	2.68 (8)	.028	1.05
Obtain immediate assistance if a child experiences complications or fast-paced conditions calling for instant decisions.	3.67 (1.22)	4.44 (.73)	1.79 (8)	.111	.77
Communicate with registered nurse (RN) to supervise medication administration.	2.70 (1.83)	4.30 (1.25)	2.85 (9)	.019	1.02
Respond appropriately to parent's or teacher's questions about diabetes care.	3.30 (1.70)	4.60 (.70)	2.51 (9)	.033	1.00
Make sound evidence-based decisions in a timely fashion with-in policies, procedures, and standards.	3.30 (1.64)	4.60 (.70)	2.62 (9)	.028	1.03
Use technology to assist with the care of children with diabetes.	3.33 (1.50)	4.56 (.73)	2.05 (8)	.074	1.04
Experience a level of satisfaction that I am doing my best in caring for children with diabetes.	3.70 (1.16)	4.60 (.70)	2.38 (9)	.041	.94
Rate the extent to which this project met your expectations.	--	4.71 (.49)			
	School Personnel				
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)			
Provide safe, quality care.	3.61 (1.13)	4.54 (.58)	3.55 (27)	.002	1.04
Obtain immediate assistance if a child experiences complications or fast-paced conditions calling for instant decisions.	3.78 (1.25)	4.52 (.80)	2.39 (26)	.024	.71
Communicate with RN to supervise medication administration.	3.36 (1.47)	4.50 (.92)	3.32 (27)	.003	.93
Respond appropriately to parent's or teacher's questions about diabetes care.	3.32 (1.28)	4.39 (.63)	3.81 (27)	.001	1.06
Make sound evidence-based decisions in a timely fashion with-in policies, procedures, and standards.	3.50 (1.14)	4.25 (.75)	2.63 (27)	.014	.78
Use technology to assist with the care of children with diabetes.	3.00 (1.41)	4.18 (.90)	3.45 (27)	.002	1.00
Experience a level of satisfaction that I am doing my best in caring for children with diabetes.	3.50 (1.20)	4.64 (.68)	3.83 (27)	.001	1.17
Rate the extent to which this project met your expectations.	--	4.21 (.92)			

their perceived level of ability to provide safe care of a child with diabetes in the school. The questions on the surveys were identical for both groups.

A series of paired-samples t-tests were conducted to examine differences in responses before and after the study. Only participants who completed both surveys were included in the analyses. Effect sizes indicated large differences in responses before and after the study. (See Table 1.)

Despite a small sample size, results of the before and after surveys completed by parents indicated statistically

significant differences for all items except the *ability to use technology*, $t(8) = 2.05$, $p = .074$; and the *ability to obtain immediate assistance if a child experiences complications*, $t(8) = 1.79$, $p = .111$. However, these items had large ($d = 1.04$) and medium ($d = .77$) effect sizes. Regarding the technology item, the unlicensed personnel and virtual RNs were the primary users of the technology. Regarding the immediate assistance item, the absence of a significant difference in parent responses before and after the study should be explored further, though it must be noted that no emergency situations arose during the study.

Results of the before and after surveys completed by school personnel indicated statistically significant differences for all survey items. Effect sizes were large ($d > .80$) for most survey items. Every measure for the parent group indicated a large effect size with the exception of *make sound evidence-based decisions in a timely fashion*, which had a medium effect size ($d = .78$). For the school personnel, *obtaining immediate assistance if a child experiences complications* also had a medium effect size ($d = .71$).

Overall, survey results showed large changes in parents' perceptions of the school's ability to provide safe care for their children and in unlicensed personnel's perception of their ability to provide safe care for children with diabetes. The survey findings complement the clinical outcome data and lend support to the safety and efficacy of RNs delegating and supervising diabetes clinical care tasks, including insulin administration, to trained unlicensed personnel using the Virtual Nursing Care for Children with Diabetes in the School Setting model of care.

Limitations of the Study

One of the limitations of this study was the small sample size of students with diabetes. The investigators intended the sample size to be between 30 and 32 students to make the project feasible given the human and financial resources available. Safety was also a consideration in keeping the sample size small. A second limitation was the lack of survey data from the virtual RNs. Despite the limitations, the investigators believe that valuable information was obtained for evidence-based decision making by nursing regulators.

Implications for Nursing Regulation

The clinical outcome data and survey results support the Virtual RN model as safe and effective. The study also provides preliminary evidence for BONs to support policy changes regarding the delegation of insulin administration and diabetes care tasks in the school setting.

Additional investigation in the area of handling complications and conditions that call for immediate assistance is needed based on the responses of parents and school personnel. Carbohydrate counting also needs more study because it required more-than-anticipated assistance from the virtual RN. Diabetes training programs may need to ensure unlicensed personnel are competent in this task.

Access to care in the safest manner possible is a public protection issue for BONs. In this study, virtual

nursing practice, including coordination of care, education and training, delegation and supervision, and evaluation of outcomes was safely and successfully implemented. The investigators believe RN involvement is necessary to assure the public that safe diabetes care is being provided. Nursing regulators need to be open to the exploration of new models of care that maximize the knowledge, skills, and abilities of RNs and reduce the legal barriers to the delegation and supervision of nursing tasks.

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A video demonstration of a virtual RN consultation is available on the South Dakota Board of Nursing's website www.nursing.sd.gov.

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