journal homepage: http://kont.zsf.jcu.cz
DOI: 10.32725/kont.2023.013

KONTAKT / Journal of nursing and social sciences related to health and illness

Original research article

Evaluation of awareness and attitude of paediatric nursing students, nurses, and adolescents regarding type one diabetes advanced devices and virtual nursing

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Abstract

Purpose: To examine the awareness and attitude of paediatric nursing students, adolescents, and nurses towards virtual nursing and advanced devices for type one diabetes.

Design and setting: This research adopted a descriptive correlation design. It was conducted at the faculty of Nursing in Benha University, and the Paediatric Department and Outpatient Clinic at the specialized paediatric hospital in Benha city, Egypt.

Sample: Simple random sampling was used to select participants over a period of two months.

Instruments: Demographic details and a structured questionnaire were used to assess awareness of advanced devices and virtual nursing. An adapted Likert scale was used to evaluate the attitudes of participants.

Results: Most paediatric nurses demonstrated high levels of awareness, whereas adolescents and paediatric nursing students showed relatively poor awareness. The majority of participants exhibited positive attitudes towards virtual nursing and the use of advanced devices for managing type one diabetes. The relationships between the awareness and attitudes of participants, and their age, gender, and economic status were found to be positive and statistically significant.

Conclusions: Most research participants had no previous experience with virtual nursing care and so their awareness of the topic was poor; even though they generally exhibited positive attitudes towards virtual nursing care and the use of modern devices to manage type one diabetes.

Keywords: Adolescent; Advanced devices; Attitude; Awareness; Nurses; Pediatric nursing students; Type one diabetes; Virtual nursing

Introduction

Type 1 diabetes (T1D) is a chronic autoimmune condition characterized by the partial or full destruction of beta-pancreatic cells in the Islets of Langerhans, which means the body is unable to produce the insulin required for metabolism. T1D is the second most common chronic disease that occurs during childhood. It has significant complications to disease-related deaths. T1D patients require intense, lifelong insulin treatment which has significant physical, psychological, and financial costs. In recent years, the prevalence of T1D has increased substantially, and this has ultimately caused a sharp rise in paediatric hospitalisations (Kotsani et al., 2018).

The treatment of children with diabetes includes insulin, diet, and regular exercise. Therefore, paediatric nurses must be qualified and well educated about diabetes management to help such children and their families. They must obtain the necessary knowledge and skills required to effectively manage the disease in order to avoid acute and chronic diabetes-related complications in children. To help reduce the burden associated with T1D and to improve glycaemic outcomes, advanced device technologies are being developed (Zobair et al., 2020). Technological advancements in this field include the development of a continuous glucose monitoring system, sensor-augmented pump, artificial pancreas system, predictive glucose suspension, low glucose suspension, and advanced hybrid closed-loop (Bergenstal et al., 2021). Moreover, smartphones, smartwatches, and data can be used to help patients monitor their condition. Advancements in artificial intelligence, nanotechnology, and machine learning have been significant, and can be used to process data to facilitate the automatic development of therapy adjustment recommendations. Software solutions have also been created to automatically calculate the optimal insulin doses (Moon et al., 2021).

The global nursing paradigm of the twenty-first century has incorporated technology to satisfy the demands for services with geographical, physical, and budgetary limitations. Virtual nursing is now a broad term that encompasses all remote and/or technology-driven nursing care (Afik and Pandin, 2021). It also overcomes the issues associated with providing efficient and high-quality health care. Remote patient visits,

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http://doi.org/10.32725/kont.2023.013

Submitted: 2023-01-12 • Accepted: 2023-05-15 • Prepublished online: 2023-05-18
KONTAKT 25/2: 100–108 • EISSN 1804-7122 • ISSN 1212-4117

patient education, and behavioral management education are conducted via virtual nursing (Plotzky et al., 2021). Moreover, virtual nursing initiatives can increase access to care and reduce the barriers faced by patients in terms of reaching healthcare providers, particularly in remote or resource-constrained settings (Arneson et al., 2020).

In recent years, there has been a rapid increase in virtual nursing and the presence of remote nursing providers. This is a positive trend that shows great potential for the future of healthcare and patient services (Birkhoff et al., 2021). It will also be extremely beneficial to healthcare professionals. In essence, virtual nursing has limitless applications and can play a critical role in the triage process (Canamo et al., 2021).

The study in question was conducted by Chan et al. (2021), and it revealed that when applying virtual care to manage glycaemia in diabetes patients, glycohemoglobin outcomes are similar (or even superior) to those associated with routine care. Systems that involve telemonitoring and personalized feedback seem to enhance patients' motivation, self-management skills and sense of security, so long as the burden on patients is low. Moreover, virtual care systems can also benefit healthcare providers as they can automatically collect and monitor data in a reliable manner, which facilitates patient-centred care (Mbunge et al., 2022).

Virtual nursing is an innovative approach, in which healthcare professionals provide remote care to their patients. It involves providing safe and cost-effective care, advice, and triage over the telephone, online chats, or video platforms. It also involves the use of advanced devices for managing type 1 diabetes (T1D) (Jain et al., 2020). A study by El-Ziny et al. (2014) revealed that the incidence of TID in children under 15 years of age in Egypt is 8/100,000 per year. In virtual nursing, technology is employed to provide patients in remote areas with access to nursing care. Technologies such as phones, Webcams, VoIP, and the Internet are used to provide care to patients over long distances. It is important to note that virtual nursing is still successful over long distances and that virtual nurses have the same core competencies and skills as onsite nurses (Sherwood et al., 2020). Virtual nurses have a responsibility to monitor patients from a distance, whereas onsite nurses are responsible for providing care to a patient and advocating for patient care plans. Virtual nurses help hospitals and healthcare facilities by reducing the workload for onsite nurses and identifying the subtle signs and symptoms that may be indicative of status changes. It is seldom the case that virtual nurses are new graduates as it is important that they are detail-oriented and well-versed in monitoring T1D. Virtual nurses can help onsite nurses by using video conferencing technology and dedicated devices to monitor patients from a remote digital center (Chen et al., 2020, Ortiz et al., 2017).

In adolescent T1D patients, virtual nursing care can provide enhanced nursing support through the use of technologies such as blood glucose monitors, continuous glucose monitors, sensor-augmented insulin pumps, low glucose suspend functions, internet applications (*i.e.*, videoconferencing), mobile applications (*i.e.*, text messaging and online gaming (Puryaghoob et al., 2021). In turn, this can foster more effective glycaemic control. Additionally, virtual nursing care can help specialist staff to train and motivate adolescents via virtual telephone, which may, in turn, motivate teenagers to comply with self-care and disease management practices. The involvement of the nurse, as well as the systematic and tailored care provided through virtual nursing, is critical in managing T1D (Nerpin et al., 2020).

Research goals

- To explore the level of awareness of paediatric nursing students, nurses, and adolescents surrounding the use of virtual care and advanced devices for managing T1D.
- To identify the challenges associated with using advanced devices and virtual nursing to manage T1D.
- To examine the attitude level of paediatric nursing students, nurses, and adolescents towards the use of advanced devices and virtual nursing for managing T1D.
- To examine the correlation between the participants' demographic details and their awareness/attitudes towards the use of advanced devices and virtual nursing for managing T1D.

Materials and methods

Research design: A descriptive correlation design was employed in this study.

Setting: the research was performed at Benha University's Faculty of Nursing, and the inpatient and outpatient departments of the Specialized Paediatrics Hospital in Benha city, Egypt.

Sample: Simple random sampling was performed over a period of two months, after which 200 paediatrics nursing students, 50 paediatrics nurses, and 150 adolescent T1D patients were selected from the aforementioned setting.

Sample size: Calculated by Cue math sample size formula = [z3 * p(1-p)] / e3 / 1 + [z3 * p(1-p)] / e3 * N], Critical value at 95% confidence level, Z = 1.96. Margin of error, e = 0.05.

Research tools

Tool 1, part one: this tool was used to gather the demographic details of paediatrics nursing students, nurses, and adolescents with diabetes, including age, gender, economic status, and previous experience. Part two: structured questionnaires assessed the awareness of paediatrics nursing students, paediatrics nurses, and adolescent patients regarding the concepts, outcomes, and challenges associated with advanced devices and virtual nursing care for T1D.

Tool 2: a modified Likert scale was employed to evaluate the attitudes of the paediatrics nursing students, nurses, and adolescent patients towards the use of virtual nursing care and advanced T1D management devices.

Evaluation of awareness and attitude of paediatric nursing students, nurses, and adolescents regarding type one diabetes advanced devices and virtual nursing (Fig. 1).

Scoring

1. Awareness of advanced devices and virtual nursing care was measured using a total awareness score. Satisfactory responses were given two points, average responses were assigned one point, and unsatisfactory responses were assigned 0 points. Participants were categorized into the following three groups, based on the total percentage scores.
   a) those who achieved ≥60% were deemed to have acceptable awareness;
   b) those who achieved 60% were deemed to have average awareness;
   c) those who achieved <60% were deemed to have poor awareness.
2. To uncover the attitudes of the research participants, 17 statements relating to the use of T1D management de-

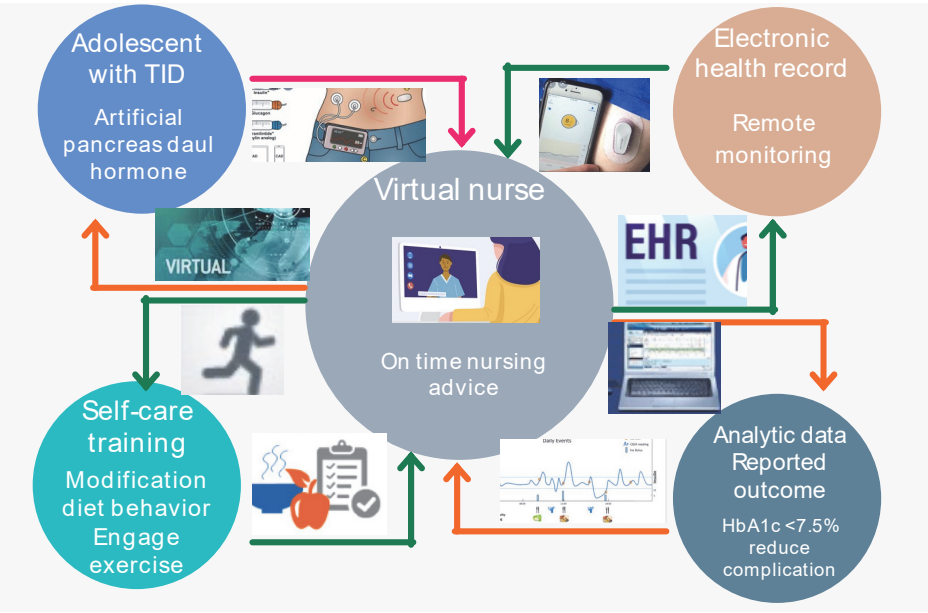

Fig. 1. Virtual nursing framework using advanced T1D devices

vices and virtual nursing care were applied, each of which was rated using a three-point Likert scale (ranging from "agree" to "disagree"). After the total attitude score was calculated, attitude was classified into three main groups, namely:

a) those who scored ≥60% (*i.e.*, >20.4 points out of 34 points), were deemed to have positive attitudes;
b) those who scored <60% (*i.e.*, less than 20.4 points out of 34 points) were deemed to have negative attitudes);
c) Those who scored 60% (*i.e.*, 20.4 points out of 34 points) were deemed to have a neutral attitude.

3. The perceived challenges associated with the use of advanced devices and virtual nursing care were classified into three groups, namely "not important", "important", or "very important".

Reliability and validity

A jury consisting of three experts from the field of paediatric nurses was recruited to test the questionnaire for content validity. Their task was to assess the content validity of the tool and to highlight any changes that needed to be made. Subsequently, to measure the reliability of the questionnaire tool, its internal consistency was assessed. The tool was calculated to have a Cronbach's (α) coefficient value of 0.86, which shows its reliability is high.

Operational design

After completing all the necessary administrative arrangements, the data collection phase started. The researcher met with the participants two days a week during their work breaks. The researcher introduced themselves to the participants, handed out the questionnaires, and asked participants to complete them whilst they were present in order to ensure that the responses were impartial. The researcher also enlisted the help of session tutors to collect the data. The completed questionnaires were subsequently collected and reviewed for accuracy. Questionnaires took about 15–20 minutes to complete. The information was gathered over a two-month period between the months of July and August 2021.

Pilot study: The researcher applied the survey to 5% of the participants in the study. The necessary adjustments were made in the measurement tools, and results were excluded from the final results.

The researcher had to seek permission to carry out this study. Moreover, the research aim was explained to the participants, after which they were asked to complete informed consent forms. They were also informed of their right to withdraw from the study at any time. The researcher also assured participants that their information would remain confidential and would only be used to fulfil the research purpose.

Descriptive analysis data were presented in the form of percentages, frequencies, awareness scores, and attitudes. A one-way analysis of variance (ANOVA) test was carried out to compare variables. Spearman's rank correlation coefficient ($p < 0.05$) was employed to assess the relationship between participants' attitudes and levels of awareness. The Statistical Package for Social Sciences (IBM SPSS Statistics, version 26) was used. The acceptable statistical significance level was set at $p < 0.05$.

Results

Adolescent T1D patients were aged 14-18 years, and 68% had a good economic status. There were equal numbers of both sexes. 85.5% of the selected paediatric nursing students were between the ages of 18 and 22, with 78.5% being female and 44% having a good economic status. 38% of the selected children's nurses were older than 30 years, 76% were women, and 64% had a good economic status (Table 1).

Most participants had no prior experience with virtual nursing care or advanced T1D management devices (Fig. 2).

Alertness of adolescent patients, paediatric nursing students, and paediatrics nurses regarding virtual nursing was satisfactory; the exact values were 36.7%, 34.5%, and 44%, respectively. In terms of the participants' awareness of the benefits of using virtual care, 36.7% of the paediatrics nursing students and paediatric nurses reported that such approaches

Table 1. Socio-demographic features of the participants

Items	Paediatric nursing students (*N* = 200)	Paediatric nurses (*N* = 50)	Adolescent with T1D (*N* = 150)	ANOVA (*F*-test)	*P*-value
	N (%)	*N* (%)	*N* (%)		
Age					
11–14	0	0	41 (27.3)	3.87	0.05
14–18	0	0	109 (72.7)		
18–22	171 (85.5)	7 (14	0		
22–26	29 (14.5)	11 (22)	0		
26–30	0	13 (26)	0		
≥30	0	19 (38)	0		
Mean ± SD	21.18 ± 2.41	23.24 ± 2.17	13.16 ± 2.31		
Gender					
Male	43 (21.5)	12 (24)	75 (50)	3.50	0.01
Female	157 (78.5)	38 (76)	75(50)		
Economic status					
Good	88 (44)	32 (64)	102 (68)	4.10	0.05
Moderate	76 (38)	13 (26)	19 (12.7)		
Poor	36 (18)	5 (10)	29 (19.3)		

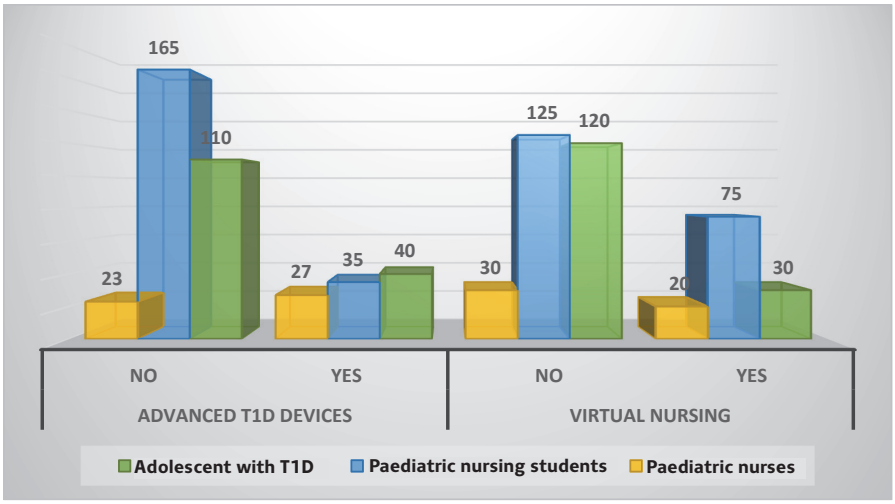

Fig. 2. The distribution of participants' previous experiences with virtual nursing care and T1D advanced devices

provide high-quality care, whilst 48.5% believed it saved time and effort for the patient and their parents, and 68% stated that it could address nurse shortages (Suppl. 1).

We found that 64% of adolescent patients believed that devices were too expensive, and 44% reported that staff training was poor. We found that the most significant challenges were associated with applying virtual nursing care to T1D management. While 47.5% of paediatrics nursing students reported a lack of direct contact between the nursing staff and the patient, and 62% reported patient satisfaction (Suppl. 2).

Approximately 50.7% of adolescents demonstrated adequate awareness of flash glucose monitoring (FGM) devices, whilst 19.5% of paediatrics nursing students had satisfactory levels of awareness of predictive low glucose suspension. 30% of paediatrics nurses demonstrated satisfactory awareness of real-time continuous glucose monitoring (CGM) systems (Suppl. 3).

As regard experience in using virtual T1D management, 81.3% of adolescents agreed, whilst 64% of paediatrics nursing students agreed that this is a major disadvantage impacting communication in virtual nursing care. Finally, 88% of paediatric nurses agreed that virtual care has generated advantages for nursing care (Suppl. 4).

There are 79.3% of adolescents with T1D agreeing that devices are safe and efficient to use. Meanwhile, 75.3% of paediatrics nursing students agreed that advanced devices are easy-to-use. Finally, 84% of paediatrics nurses agreed that advanced technologies have reduced the burden of managing T1D in children (Suppl. 5).

Most paediatrics nurses had a good awareness of the topic. This is in contrast to adolescent patients and paediatrics nursing students, who demonstrated poor awareness of virtual nursing care and advanced T1D devices (Fig. 3).

Fig. 4 shows that most research participants exhibited positive attitudes towards virtual care and the use of advanced T1D management devices.

Table 2 shows that the correlation between the participants' awareness and attitude scores was positive and statistically significant. Table 3 showed that the correlation between participants' awareness and attitude towards virtual nursing and advanced devices of T1D with their age, gender and economic status were found to be positive and significant.

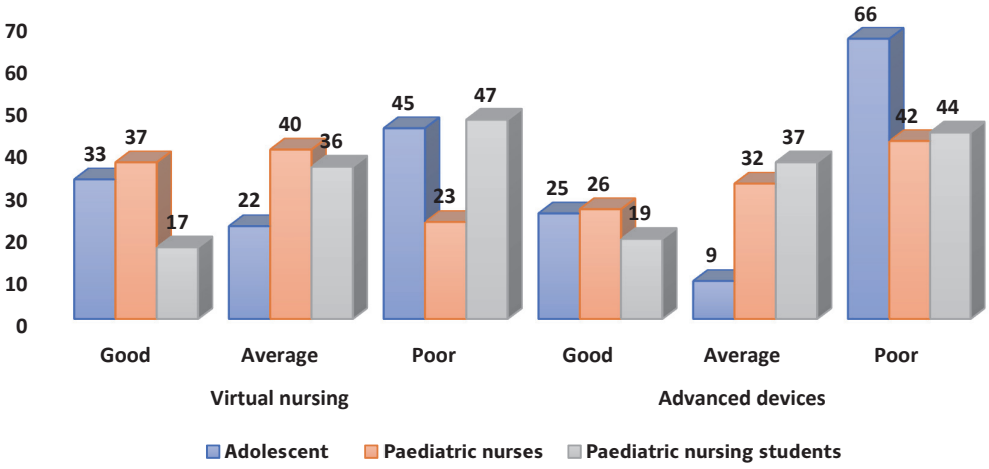

Fig. 3. Participants' total awareness of virtual nursing and the use of advanced devices in managing T1D

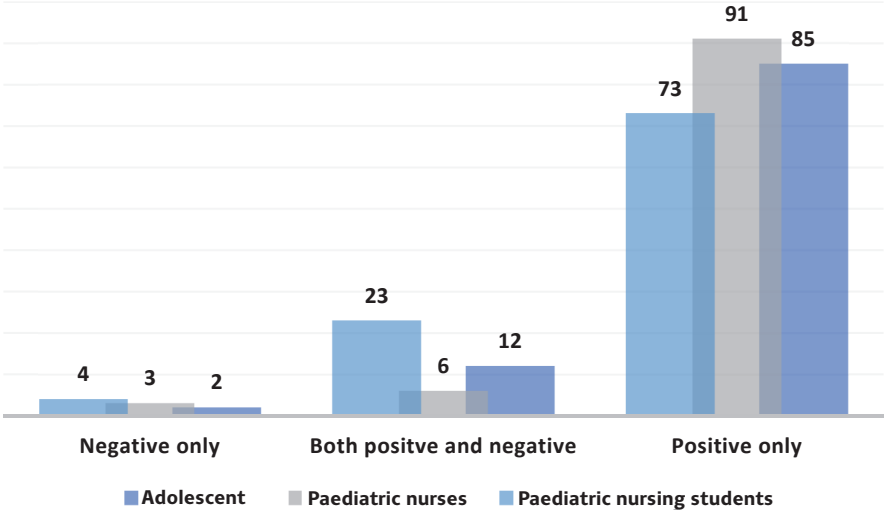

Fig. 4. The attitudes of participants towards virtual nursing and advanced devices for T1D

Table 2. Correlation coefficient between participants' awareness and attitude scores

Score	Adolescents	Paediatric nursing students	Paediatric nurses
Awareness-Attitude			
Correlation	0.989	0.128	0.192
P	0.001	0.05	0.05
n	150	200	50
Attitude-Awareness			
Correlation	0.285	0.383	0.196
P	0.001	0.01	0.05
n	150	200	50

Table 3. The correlation between demographic factors and participants' awareness and attitudes towards advanced T1D management devices and virtual care

Variable	Paediatric nursing students		Paediatric nurses		Adolescents with T1D	
	Awareness	Attitude	Awareness	Attitude	Awareness	Attitude
Age	r = 0.160	r = 0.017	r = 0.044	r = 0.116	r = 0.091	r = 0.031
	P = <0.000	P = <0.001	P = <0.010	P = <0.05	P = <0.001	P = <0.001
Gender	r = 0.211	r = 0.045	r = 0.061	r = 0.099	r = 0.057	r = 0.153
	P = <0.05	P = <0.001	P = <0.010	P = <0.001	P = <0.000	P = <0.05
Economic status	r = 0.089	r = 0.053	r = 0.189	r = 0.321	r =0.471	r = 0.546
	P = <0.000	P = <0.05	P = <0.001	P = <0.05	P = <0.001	P = <0.001

Discussion

Virtual nursing is increasingly being adopted in the healthcare field to provide efficient, safe, and cost-effective nursing care. New technologies have shown great promise for improving glycemia, long-term T1D outcomes, and reducing the burden of disease management. In this study, the awareness and attitudes of paediatrics nursing students, paediatrics nurses, and adolescents with T1D regarding virtual nursing and advanced T1D monitoring devices have been examined.

All of the paediatrics nurses who took part in this study were aged thirty and over, whilst more than three-quarters of the paediatrics nursing students were aged between eighteen and twenty-two. Over two-thirds were female with a good economic status. This contradicts the findings of Seboka et al. (2021), who found that two-thirds of nurses were males aged less than thirty with moderate incomes. Moreover, Glinkowski et al.'s (2013) study examined Polish nursing students' perceptions and knowledge of telenursing and discovered that the majority of participants (220 [71%]) were aged between 20 and 23.

The findings of the present study indicate that over a third of adolescent T1D patients, paediatric nursing students, and paediatric nurses had satisfactory awareness of virtual nursing, the author view this is likely due to attendance at nursing conferences. Abdel-Aleem (2019) carried out a study to examine perceptions of virtual care amongst nursing students at Port Said University and found that more than half of the participants were able to accurately define the terminology. Thus, these findings are largely in line with those revealed in the present study.

Additionally, the research findings indicate that approximately one-third of the participants had an adequate awareness of the desired outcomes of virtual nursing, *i.e.*, to provide efficient, safe, and high-quality care whilst also saving money and time for patients and their parents. Virtual care also plays a critical role in addressing nursing shortages. Kotsa et al. (2015) carried out a study in the USA to investigate virtual nursing and found that it is a useful tool that can be used to optimize control in T1D patients, as well as to improve glycaemic fluctuations and compliance with self-care treatment plans. Moreover, Damgaard and Young (2014) conducted research in South Dakota to explore the topic of virtual nursing care for school children with diabetes. According to the findings, most participants believed that virtual care models were safe, effective, and efficient.

Regarding the challenges that hinder the use of virtual nursing for T1D management, less than half of the participants reported problems. The reported challenges included poor patient education and staff training, loss of direct contact, and reduced patient satisfaction. It is important to note that these findings contradict those revealed by Chan et al. (2021), who studied the application of virtual care in Canada and found that using virtual care in combination with routine care is more effective in general and improves glycaemic control outcomes. The participants indicated satisfaction with the delivery of virtual care but were unhappy with the choice of technology selected. Likewise, Jain et al. (2020) reported that technical support and training are critical in ensuring that meaningful interventions promoting the self-management of diabetes through technology are effective. Additionally, March et al. (2020) discovered that nurses found it difficult to access technology-specific training and would thus like communication systems to be improved. Zimmerman et al. (2019) reported that education for healthcare provider teams is also essential in facilitating the establishment of uniform data review approaches.

In relation to T1D devices, more than half of adolescents who participated in this study had satisfactory awareness levels of the flash glucose monitoring (FGM) system, whilst one-third of paediatric nursing students demonstrated satisfactory awareness of predictive low glucose suspension. Additionally, one-third of paediatric nurses had adequate awareness of real-time continuous glucose monitoring (CGM). Fleming et al. (2020) points out that the technological developments of the last ten years have significantly enhanced processes of diagnosing, monitoring, and treating serious health issues, such as blood glucose monitoring and the development of threshold of fully closed-loop systems, and automated insulin delivery to reduce the disease burden.

Furthermore, March et al. (2020) discovered that most nurses are aware of the increasing popularity of modern devices and that these are reshaping paediatrics diabetes care. They also understand the benefits of modern diabetic devices in controlling glycaemia and improving the quality of life for T1D patients. Likewise, Fuchs and Hovorka (2021) found that many children used closed-loop insulin delivery as it improves glycaemic control in children whilst simultaneously reducing the management burden of T1D. In turn, this improved the quality of life for the whole family.

In the same vein, Hilliard et al. (2019) stated that real-time continuous glucose monitoring reduced worry about glucose trips, enhanced sleep, and increased the sense of safety in chil-

dren who are unable to recognize or manage the symptoms of hypo- or hyperglycaemia. It also increases the comfort of other caregivers, particularly when using remote monitoring functionality while away from children. Moreover, Barnard et al. (2016) found that approximately half of T1D participants reported a reduction in the incidence and severity of hypoglycaemia as a result of device use.

Regarding the participants' attitudes towards advanced T1D management devices, more than three-quarters of respondents believed that such devices were safe and efficient to use. They also believed that the devices helped to reduce the disease burden on children with T1D. Zimmerman et al. (2019) found that the using advanced devices to manage diabetes and improve patients' quality of life lead to reducing the disease burden caused by the intensive care required to manage the disease. However, it is critical to motivate patients to comply with care practices in order to reap the benefits of the new technologies. Tanenbaum et al. (2017) discovered that children with diabetes had higher positive attitudes toward technology. Ju (2020) asserts that virtual nursing plays a vital role in the adoption and integration of technological innovations in healthcare practices and in improving care in underserved areas.

On the other hand, the results of this study largely contradict the findings of Cerna and Maresova (2016), who examined patients' attitudes towards modern technology use in T1D management in the context of the Czech Republic and found that technologies are not often used for such purposes. The key issue hindering its adoption was found to be poor technological knowledge amongst patients. What's more, Seboka et al. (2021) carried out a study in Northwest Ethiopia to examine the attitudes regarding the use of technological devices in diabetes management and found that participants generally displayed positive attitudes towards remote monitoring. Moreover, participants' willingness to adopt electronic technologies to manage their diabetes was found to be high.

It is the researcher's opinion that T1D is a serious chronic disease, and virtual nursing care can help patients to cope with the acute and long-term impacts of diabetes. Self-management is an important element of diabetes therapy; patients with T1D frequently miss routine diabetic care appointments, and this issue requires special attention. A well-designed virtual nursing care framework incorporating modern T1D devices will improve a wide range of issues (*e.g.*, glucose control and perceived care) and reduce hospitalizations.

Recommendations

- Hospitals establish a specialist virtual nursing unit or department with nurses who have substantial experience and the necessary skills to remotely diagnose and advise patients without the need to see them in person. Such nurses should also undergo sessions in computer science and technology use.
- Technological devices have been found to be effective in monitoring and controlling T1D and minimizing the disease burdens on children and their families. They also enable virtual nursing care to take place, which ultimately saves patients and their family members time and effort as they can simply sign in to an electronic system by entering their username and password to make electronic files for diabetic children. This also enables parents to remotely monitor their children's health status.
- It is important to increase the amount of information available to paediatric nursing students regarding developments in virtual nursing care. To do this, a technology component should be added to the paediatric nursing curricula. Students should require qualifications in technology in order to use the virtual nursing platform to care for children with T1D.
- Enhancing adolescent patients' understanding of how to access and use virtual nursing care and modern devices to control T1D is also critical.

Conclusions

The paediatrics nurses had high awareness of virtual nursing care and the use of advanced devices for T1D management. On the other hand, the awareness of paediatrics nursing students and adolescent patients was found to be poor. The participants also highlighted a lack of direct contact, poor patient and staff training, and the costs of such devices as significant challenges hindering the adoption of virtual nursing care. Participants exhibited positive attitudes towards virtual nursing care and the use of modern devices to manage T1D.

Ethical aspects and conflict of interests
The author has no conflict of interests to declare.

Hodnocení informovanosti a postoje studentů dětského ošetřovatelství, sester a dospívajících vůči pokročilým zařízením pro diabetes 1. typu a virtuálnímu ošetřovatelství

Souhrn
Cíl: Zkoumat informovanost a postoj studentů pediatrického ošetřovatelství, dospívajících a sester k virtuálnímu ošetřovatelství a pokročilým zařízením pro diabetes 1. typu.
Design: Tento výzkum přijal deskriptivní korelační design. Byl proveden na fakultě ošetřovatelství na Benha University a na pediatrickém oddělení a ambulanci ve specializované dětské nemocnici ve městě Benha v Egyptě.
Vzorek: Jednoduchý náhodný výběr byl použit k výběru účastníků po dobu dvou měsíců.
Nástroje: Demografické údaje a strukturovaný dotazník byly použity k posouzení informovanosti o pokročilých zařízeních a virtuálním ošetřovatelství. K hodnocení postojů účastníků byla použita upravená Likertova škála.
Výsledky: Většina dětských sester prokázala vysokou úroveň informovanosti, zatímco adolescenti a studenti dětského ošetřovatelství vykazovali relativně nízkou informovanost. Většina účastníků projevila pozitivní postoje k virtuálnímu ošetřovatelství a používání pokročilých zařízení pro zvládání diabetu 1. typu. Bylo zjištěno, že vztahy mezi informovaností a postoji účastníků a jejich věkem, pohlavím a ekonomickým postavením jsou pozitivní a statisticky významné.
Závěr: Většina účastníků výzkumu neměla žádné předchozí zkušenosti s virtuální ošetřovatelskou péčí, a tak jejich informovanost o tématu byla malá, i když obecně projevovali pozitivní postoje k virtuální ošetřovatelské péči a používání moderních přístrojů k léčbě diabetu 1. typu.

Klíčová slova: diabetes 1. typu; dospívající; informovanost; pokročilá zařízení; postoj; studenti pediatrického ošetřovatelství; virtuální ošetřovatelství; zdravotní sestry

References

1. Abdel-AleemMegahed MM (2019). Telenursing perception among nursing students at Port Said University. IOSR J Nurs Health Sci 8(4): 18–23. DOI: 10.9790/1959-0804081823.
2. Afik A, Pandin MGR (2021). Telenursing as a new nursing paradigm in the 21st century: A literature review. Preprints. DOI: 10.20944/preprints202103.0704.v1.
3. Arneson S, Denman D, Mercier M (2020). Virtual critical care nursing: A look behind the cameras. Nurs Crit Care 15(5): 11–17. DOI: 10.1097/01.CCN.0000668564.81987.a0.
4. Barnard K, Crabtree V, Adolfsson P, Davies M, Kerr D, Kraus A, et al. (2016). Impact of type 1 diabetes technology on family members/significant others of people with diabetes. J Diabetes Sci Technol 10(4): 824–830. DOI: 10.1177/1932296816645365.
5. Bergenstal RM, Nimri R, Beck RW, Criego A, Laffel L, Schatz D, et al. (2021). A comparison of two hybrid closed-loop systems in adolescents and young adults with type 1 diabetes (FLAIR): a multicentre, randomised, crossover trial. Lancet 397(10270): 208–2199. DOI: 10.1016/S0140-6736(20)32514-9.
6. Birkhoff SD, McCulloh Nair J, Bald K, Frankum T, Sanchez SR, Salvatore AL (2021). Facilitators and challenges in the adoption of a virtual nurse visit in the home health setting. Home Health Care Serv Q 40(2): 105–120. DOI: 10.1080/01621424.2021.1906374.
7. Canamo LJ, Bejar JP, Davidson JE (2021). Converting to a Synchronous Virtual Nursing Research Conference Amidst a Pandemic: A Case Study. Creat Nurs 27(2): 118–124. DOI: 10.1891/CRNR-D-20-00096.
8. Cerna L, Maresova P (2016). Patients' attitudes to the use of modern technologies in the treatment of diabetes. Patient Prefer Adherence 10: 1869–1879. DOI: 10.2147/PPA.S118040.
9. Chan CB, Popeski N, Hassanabad MF, Sigal RJ, O'Connell P, Sargious P (2021). Use of Virtual Care for Glycemic Management in People with Types 1 and 2 Diabetes and Diabetes in Pregnancy: A Rapid Review. Can J Diabetes 45(7): 677–688. DOI: 10.1016/j.jcjd.2021.02.007.
10. Chen FQ, Leng YF, Ge JF, Wang DW, Li C, Chen B, Sun ZL (2020). Effectiveness of virtual reality in nursing education: meta-analysis. J Med Internet Res 22(9): e18290. DOI: 10.2196/18290.
11. Damgaard G, Young L (2014). Virtual nursing care for school children with diabetes. Journal of Nursing Regulation 4(4): 15–24. DOI: 10.1016/S2155-8256(15)30106-X.
12. El-Ziny MA, Salem NA, El-Hawary AK, Chalaby NM, Elsharkawy AA (2014). Epidemiology of childhood type 1 diabetes mellitus in Nile Delta, northern Egypt-a retrospective study. J Clin Pediatric Endocrinol 6(1): 9–15. DOI: 10.4274/Jcrpe.1171.
13. Fleming GA, Petrie JR, Bergenstal RM, Holl RW, Peters AL, Heinemann L (2020). Diabetes digital app technology: benefits, challenges, and recommendations. A consensus report by the European Association for the Study of Diabetes (EASD) and the American Diabetes Association (ADA) Diabetes Technology Working Group. Diabetes Care 43(1): 250–260. DOI: 10.2337/dci19-0062.
14. Fuchs J, Hovorka R (2021). Benefits and challenges of current closed-loop technologies in children and young people with type 1 diabetes. Front Pediatr 9: 679484. DOI: 10.3389/fped.2021.679484.
15. Glinkowski W, Pawłowska K, Kozłowska L (2013). Telehealth and telenursing perception and knowledge among university students of nursing in Poland. Telemed J E Health 19(7): 523–529. DOI: 10.1089/tmj.2012.0217.
16. Hilliard ME, Levy W, Anderson BJ, Whitehouse AL, Commissariat PV, Harrington KR, et al. (2019). Benefits and barriers of continuous glucose monitoring in young children with type 1 diabetes. Diabetes Technol Ther 21(9): 493–498. DOI: 10.1089/dia.2019.0142.
17. Jain SR, Sui Y, Ng CH, Chen ZX, Goh LH, Shorey S (2020). Patients' and healthcare professionals' perspectives towards technology-assisted diabetes self-management education. A qualitative systematic review. PloS One 15(8): e0237647. DOI: 10.1371/journal.pone.0237647.
18. Ju HH (2020). Using telehealth for diabetes self-management in underserved populations. The Nurse Pract 45(11): 26–33. DOI: 10.1097/01.NPR.0000718492.44183.87.
19. Kotsa K, Kotsani K, Tsaklis P, Kazakos K (2015). Telenursing Is a Useful Tool to Optimize Metabolic Control in Patients with Type 1 Diabetes Mellitus. Conference: American Diabetes Association 75th Scientific Sessions, June 5–9, 2015, Boston, MA. DOI: 10.13140/RG.2.2.31060.40327.
20. Kotsani K, Antonopoulou V, Kountouri A, Grammatiki M, Rapti E, Karras S, et al. (2018). The role of telenursing in the management of Diabetes Type 1: A randomized controlled trial. Int J Nurs Stud 80: 29–35. DOI: 10.1016/j.ijnurstu.2018.01.003.
21. March CA, Nanni M, Kazmerski TM, Siminerio LM, Miller E, Libman IM (2020). Modern diabetes devices in the school

setting: perspectives from school nurses. Pediatr Diabetes 21(5): 832–840. DOI: 10.1111/pedi.13015.

22. Mbunge E, Muchemwa B, Batani J (2022). Are we there yet? Unbundling the potential adoption and integration of telemedicine to improve virtual healthcare services in African health systems. Sens Int 3: 100152. DOI: 10.1016/j.sintl.2021.100152.
23. Moon SJ, Jung I, Park CY (2021). Current advances of artificial pancreas systems: a comprehensive review of the clinical evidence. Diabetes Metab J 45(6): 813–839. DOI: 10.4093/dmj.2021.0177.
24. Nerpin E, Toft E, Fischier J, Lindholm-Olinder A, Leksell J (2020). A virtual clinic for the management of diabetes-type 1: study protocol for a randomised wait-list controlled clinical trial. BMC Endocr Disord 20(1): 137. DOI: 10.1186/s12902-020-00615-3.
25. Ortiz LM.O, Damião EBC, Rossato LM, Alves RCP (2017). Best nursing practices in diabetes education for the hospitalized child: an integrative review. Rev Eletrôn Enferm 19: a56. DOI: 10.5216/ree.v19.45655.
26. Plotzky C, Lindwedel U, Sorber M, Loessl B, König P, Kunze C, et al. (2021). Virtual reality simulations in nurse education: A systematic mapping review. Nurse Education Today, 101: 104868. DOI: 10.1016/j.nedt.2021.104868.
27. Puryaghoob M, Doosti Irani M, Masoumi N, Parvizy S (2021). The Effect of Virtual Self-Care Education on the Perception of Type 1 Diabetes-Related Stigma in Female Adolescents with Diabetes: A Clinical Trial. J Res Dev Nurs Midw 18(2): 21–25.
28. Seboka BT, Yilma TM, Birhanu AY (2021). Factors influencing healthcare providers' attitude and willingness to use information technology in diabetes management. BMC Med Inform Decis Mak 21(1): 24. DOI: 10.1186/s12911-021-01398-w.
29. Sherwood JS, Russell SJ, Putman MS (2020). New and emerging technologies in type 1 diabetes. Endocrinol Metab Clin Nirth Am 49(4): 667–678. DOI: 10.1016/j.ecl.2020.07.006.
30. Tanenbaum ML, Hanes SJ, Miller KM, Naranjo D, Bensen R, Hood KK (2017). Diabetes device use in adults with type 1 diabetes: barriers to uptake and potential intervention targets. Diabetes Care 40(2): 181–187. DOI: 10.2337/dc16-1536.
31. Zimmerman C, Albanese-O'Neill A, Haller MJ (2019). Advances in type 1 diabetes technology over the last decade. Eur Endocrinol 15(2): 70–76. DOI: 10.17925/EE.2019.15.2.70.
32. Zobair KM, Sanzogni L, Sandhu K (2020). Telemedicine healthcare service adoption barriers in rural Bangladesh. Australas J Inf Syst 24. DOI: 10.3127/ajis.v24i0.2165.