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RESEARCH

# DIABETES EDUCATION FOR CHILDREN AND ADOLESCENTS: NURSING PRACTICE DURING THE COVID-19 PANDEMIC

## *EDUCAÇÃO EM DIABETES PARA CRIANÇAS E ADOLESCENTES: ATUAÇÃO DA ENFERMAGEM NA PANDEMIA DE COVID-19*

## *EDUCACIÓN EN DIABETES PARA NIÑOS Y ADOLESCENTES: ACTUACIÓN DE ENFERMERÍA DURANTE LA PANDEMIA DE COVID-19*

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## ABSTRACT

**Objective:** to characterize and analyze health education interventions for children and adolescents with type 1 diabetes mellitus (T1D) and their families, as conducted by nurses during the COVID-19 pandemic. **Method:** this was an exploratory, qualitative study utilizing a convenience sample comprising nurses from various Brazilian regions and work sectors who provided care to children and adolescents with T1D and their families. Following approval from the Ethics Committee, data were collected virtually between October 2021 and May 2022 and subsequently subjected to thematic content analysis. **Results:** three distinct categories emerged from the participation of 16 nurses. The first category describes the modifications in care delivery and nurses' workflow processes, alongside changes in care-seeking patterns among families. The second category illustrates the adaptive strategies employed by nurses, particularly the integration of virtual communication methods. The third category delineates the challenges nurses encountered in conducting recreational and play-based activities online, as well as the difficulties in accessing remote resources faced by both the professionals and the patient families. Enhanced communication agility, continuity of care provision, and improved access to information were identified as key strengths realized during this period. **Final considerations:** the pandemic necessitated fundamental adjustments to health education initiatives for children and adolescents with T1D and their families, thereby significantly impacting nursing practice.

**Keywords:** Diabetes Mellitus, Type 1; Health Education; Child; Adolescent; Family; Pediatric Nursing; COVID-19.

## RESUMO

***Objetivo***: *caracterizar e analisar ações de educação em saúde para crianças e adolescentes com diabetes mellitus tipo 1 (DM1) e suas famílias, realizadas por enfermeiros durante a pandemia de COVID-19.* ***Método***: *estudo exploratório, qualitativo, com amostra de conveniência composta por enfermeiros de diferentes regiões brasileiras e setores de trabalho que atendiam crianças e adolescentes com DM1 e suas famílias. Após aprovação do Comitê de Ética, os dados foram coletados virtualmente entre outubro de 2021 e maio de 2022 e submetidos à análise temática de conteúdo.* ***Resultados***: *três categorias emergiram da participação de 16 enfermeiros. A primeira categoria descreve as alterações no atendimento e no processo de trabalho dos enfermeiros, além das mudanças na busca de atendimento pelas famílias. A segunda categoria demonstra a adaptação dos enfermeiros, especialmente no uso de estratégias virtuais. A terceira categoria apresenta as dificuldades enfrentadas pelos enfermeiros em realizar atividades lúdicas online e no acesso aos recursos remotos, enfrentadas tanto por eles quanto pelas famílias. A agilidade na comunicação, a manutenção do atendimento e o acesso às informações foram identificadas como potencialidades evidenciadas.* ***Considerações finais:*** *a pandemia exigiu adaptações nas ações de educação em saúde para crianças e adolescentes com DM1 e suas famílias, impactando o trabalho dos enfermeiros.*

***Palavras-chave:*** *Diabetes Mellitus Tipo 1; Educação em Saúde; Criança; Adolescente; Família; Enfermagem Pediátrica; COVID-19.*

## RESUMEN

***Objetivo***: *caracterizar y analizar acciones de educación en salud para niños y adolescentes con diabetes mellitus tipo 1 (DM1) y sus familias, realizadas por enfermeros durante la pandemia de COVID-19.* ***Método***: *estudio exploratorio, cualitativo, con una muestra de conveniencia compuesta por enfermeros de diferentes regiones de Brasil y sectores de trabajo que atendían a niños y adolescentes con DM1 y sus familias. Tras la aprobación del Comité de Ética, los datos fueron recolectados virtualmente entre octubre de 2021 y mayo de 2022 y sometidos a análisis temático de contenido.* ***Resultados***: *tres categorías emergieron de la participación de 16 enfermeros. La primera categoría describe las alteraciones en la atención y en el proceso de trabajo de los enfermeros, además de los cambios en la búsqueda de atención por parte de las familias. La segunda categoría muestra la adaptación de los enfermeros, especialmente en el uso de estrategias virtuales. La tercera categoría presenta las dificultades enfrentadas por los enfermeros al realizar actividades lúdicas online y en el acceso a recursos remotos, tanto por*

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*ellos como por las familias. La agilidad en la comunicación, la continuidad de la atención y el acceso a la información fueron identificadas como potencialidades evidentes.* ***Consideraciones finales:*** *la pandemia requirió adaptaciones en las acciones de educación en salud para niños y adolescentes con DM1 y sus familias, impactando el trabajo de los enfermeros.*

***Palabras clave:*** *Diabetes Mellitus Tipo 1; Educación en Salud; Niño; Adolescente; Família; Enfermería Pediatrica; COVID-19.*

## INTRODUCTION

Type 1 Diabetes Mellitus (T1D) is characterized by the progressive or total destruction of the pancreatic islet beta cells, which are responsible for insulin production and secretion[1]. In 2021, approximately 8.4 million people worldwide were living with T1D, with 1.5 million (18%) being under the age of 20. The forecast for 2040 projects a significant increase in cases, potentially reaching up to 17.4 million, which represents a growth of up to 107% compared to the preceding year[2]. Brazil ranks third globally in the number of cases, with over 112,240 children and adolescents diagnosed with T1D, exhibiting an annual growth rate of 5% in this age group[3].

Diabetes manifesting in childhood presents a higher risk of early complications, potentially reducing life expectancy by an average of 33 years, particularly in developing countries. Individuals with less access to diabetes education are 56% more likely to die prematurely than those with greater involvement in their care[4].

The impact of the diagnosis extends beyond the child or adolescent to their family, necessitating adaptations to routines to incorporate insulin therapy, continuous glycemic monitoring, and lifestyle habit changes[5]. The family's reorganization in the face of this reality is associated with the stage of the life cycle, the role of each member in the nuclear family, and the strategies adopted to cope with the new condition[6]. From the moment of diagnosis, it is critical that everyone understands the mechanisms of T1D, the signs and symptoms of hypo- and hyperglycemia, as well as the preventive measures required to avert complications[1,6].

Diabetes education constitutes a fundamental component of this process, as it fosters the development of knowledge and skills necessary for self-care[1]. This process can be grounded in the child- and family-centered care model, an approach designed to promote essential skills and competencies for managing chronic conditions while providing greater support to family members[6]. In the context of chronic conditions, comprehensive and multidisciplinary care, combined with health education, plays an essential role in treatment adherence, quality of life promotion, and the reinforcement of autonomy for the child or adolescent[7].

Considering that T1D diagnosis can occur at various stages of childhood, the educational approach must be tailored to the child's developmental stage, age, and sociocultural background. Play-based strategies are recommended to facilitate learning and ensure the family's inclusion in the process[7]. For adolescents, interventions are specifically directed toward the needs of this life stage, preparing them for the transition to adulthood and self-management of diabetes[8].

The COVID-19 pandemic introduced significant challenges to T1D management and the continuity of health education, primarily due to restrictions imposed by social distancing. These restrictions necessitated adaptations in both healthcare facilities and family routines. A study conducted in Brazil identified various barriers faced by people with diabetes during this period, with 59% of individuals experiencing increased glycemia and greater variability in glucose levels, in addition to 38% having postponed medical appointments and examinations. Furthermore, lifestyle changes impacted the glycemic values of these individuals, increasing the risk of acute and chronic complications[9].

The nurse plays a pivotal role in diabetes education for children and adolescents with T1D, serving as the primary professional responsible for guiding and supporting families through this process[10]. During the pandemic, in-person educational practices became unfeasible. Given that these practices are crucial for the self-care of this population, it is pertinent to investigate the strategies employed by nurses to ensure the continuity of care. Analyzing the approaches adopted during this period allows for an understanding of the methodologies used, their strengths and limitations, and how they can be integrated into the educational process beyond the pandemic, within diverse professional contexts.

In light of this scenario, this study seeks to address the following research question: How was health education delivered to children and adolescents with T1D and their families during the COVID-19 pandemic?

## OBJECT

To characterize and analyze the health education interventions intended for children and adolescents with T1D and their families, as implemented by nurses during the COVID-19 pandemic.

## METHOD

This is an exploratory study utilizing a qualitative approach, developed based on the guidelines of the Consolidated Criteria for Reporting Qualitative Research

(COREQ)[11]. Participants included nurses who provided care to children and adolescents with T1D and their families across various levels of healthcare: hospital network, specialized outpatient clinics, and primary care, spanning distinct regions of Brazil.

Sampling was purposive and by convenience, employing the "snowball" technique. In this approach, each referred participant suggests new members for the research, based on their professional or social network. The initial participant was identified through a professional contact of the principal researcher. The method of contact varied according to the referrals, with email and messaging applications being the primary channels utilized.

Inclusion criteria were: being a registered nurse, having a minimum of two years of experience in direct care for children and adolescents with T1D and their families, and working with this population during the COVID-19 pandemic. The two-year period was defined considering the start of the pandemic in Brazil (March 2020), and prior experience was deemed necessary to identify adaptations in the educational process.

Twenty nurses were invited to participate in the study; 18 accepted, two declined, citing lack of time, and subsequently, two were excluded for not meeting the criterion of working in the area before the pandemic. The study setting had no restrictions regarding the region of the country, given that the interviews were conducted online.

Data collection took place from October 2021 to May 2022, through individual, semi-structured, audio-recorded interviews, conducted by previously trained Nursing undergraduates under the supervision of the principal researcher, who is experienced in qualitative research.

During the first contact, the research was presented in detail, followed by an invitation to participate and the scheduling of the interview, which was conducted via videoconference after the virtual execution of the Informed Consent Form. During the invitation and throughout the interview, participants were informed about the study's objectives, the interviewers' role, and the purpose of the research.

Participants were characterized via a brief questionnaire containing information related to age, gender, years since graduation, and duration of experience working with children and/or adolescents with T1D and their families. The following guiding question was used to conduct the interview: Tell me what strategies you use to perform health education with children/adolescents with T1D and their family in the context of the COVID-19 pandemic. A script with auxiliary questions was employed to explore the differences in health education strategies before and during the pandemic, as well as the techniques used according to the children's age groups.

Data collection was concluded when the researchers determined that the study objective had been achieved. As highlighted by Minayo[12], the criterion for finalizing the process is the researcher's conviction that the internal logic of the study object has been reached, considering its connections and interrelationships.

The interviews had an average duration of 40 minutes, were transcribed verbatim, and analyzed according to Bardin's thematic categorical content analysis technique[13]. The analysis proceeded through three stages. Initially, a pre-analysis was conducted, involving an exhaustive and immersive floating reading of all transcripts, aimed at submerging the researchers in the empirical material and organizing the data preliminarily.

Subsequently, in the material exploration phase, the raw data were coded into tables created in Microsoft Excel software. Significant segments of the statements were highlighted and associated with initial codes, which were inductively constructed based on the study objectives and the empirical content. The identified codes corresponded to specific topics, such as: "use of digital technologies," "adaptation of educational strategies," "barriers to remote/online access," "education by age group," and "changes in care practices."

Following this, all codes were analyzed for similarity of meaning and grouped into broader thematic categories, representing the core meanings emerging from the collective interviews.

Data analysis was led by the principal researcher, who guided two undergraduate Nursing students in the initial coding stage of the interviews, with support and discussion provided by a doctoral candidate affiliated with the research group. Analytical triangulation was performed by the principal researcher, who conducted an independent analysis based on the established codifications. To ensure transparency and strengthen the validity of the findings, a summary of the findings was provided to participants, while maintaining the anonymity of the interviewees.

The research adhered to the ethical principles of CNS Resolution No. 466/2012 and was approved by the Research Ethics Committee of the Nursing School at the University of São Paulo (Opinion No. 4.937.820). To guarantee anonymity, interviewees were identified by the letter E, followed by sequential numbers (E1, E2, E3).

## RESULTS

Sixteen nurses participated in the study, ranging in age from 34 to 59 years (mean 44 years), with professional experience in T1D care varying from 3 to 20 years, with an average of 16 years. These professionals operated across diverse settings: two in university-affiliated outpatient clinics, three in public outpatient clinics, three in hospitals (one private and two public), one in a non-governmental organization focused on T1D children's care, and one in an institute for children with diabetes. The participants hailed from different Brazilian states, including Santa Catarina, São Paulo, Rio Grande do Sul, Ceará, Minas Gerais, Rio de Janeiro, and Amazonas. Five professionals held two job positions. Regarding supplementary education, 14 nurses were specialists, ten held master's degrees, five had doctoral degrees, and two possessed postdoctoral qualifications.

The empirical categories that emerged from the data enabled the identification of educational strategies employed and an explanation of the process of adaptation to the changes imposed by the pandemic: (i) reorganization of health services during the COVID-19 pandemic; (ii) diabetes education strategies adopted by nurses during the COVID-19 pandemic; and (iii) challenges and strengths of diabetes education during the COVID-19 pandemic: lessons learned and strengthening of practices.

### Reorganization of health services during the COVID-19 pandemic

The COVID-19 pandemic brought about significant changes in health service delivery, nurses' workflow processes, and the care-seeking behaviors of families with children or adolescents with T1D. These changes manifested differently across primary care, hospital care, and specialized outpatient clinics, though some modifications were common, such as the suspension of in-person group activities, the incorporation of technology, and the adaptation of educational activities to remote modalities.

In specialized outpatient clinics, in-person consultations were suspended, which compromised the continuous and close monitoring previously conducted by nurses.

> *"We had our outpatient clinic with suspended activities, and at that point, the pandemic hit us squarely* [...]."

> *"These were nursing consultations for children with diabetes, who required closer follow-up from nursing staff."* (E2)

> *We ceased having the outpatient clinic modality, but continued with the day hospital and the hotline [quick telephone support line].* (E5)

> *The outpatient clinic was left without service.* (E9)

In hospital care, despite the maintenance of in-person services in some units, it was necessary to re-adjust workflows and interrupt group actions, such as educational and play-based activities. Social distancing and the risk of contamination directly affected practices like therapeutic play sessions and the shared use of objects, which are essential in the approach with children.

> *The Children's Hospital remained open to a certain extent, but we could no longer conduct group activities as we used to.* (E1)

> *Educational groups did not exist during this period. We have a diabetes education unit* [...] *but we lost that, because we couldn't close off spaces or gather different people in the same environment.* (E13)

> *But during the pandemic, we couldn't leave the toy bear with them* [...] *what hampered us most in the pandemic was this issue of preventing contact and object sharing* (E8).

In primary care and longitudinal follow-up of children and adolescents, there was a transition from in-person educational interventions to remote modalities, utilizing telephone calls and online platforms.

> *All our work protocols changed, the interviews that were planned* [...], *they changed and became online.* (E4)

On the part of the families, regardless of the service type, families missed in-person appointments, especially early in the pandemic, due to the fear of coronavirus contamination, except in cases of greater severity or the need for prescription renewals.

> *Many children started missing appointments. Especially in 2020, at the beginning of the pandemic, out of fear.* (E11)

> *Because some patients were afraid to travel, they had that apprehension.* (E6)

> *We have to try to understand which children are most severe and spreadsheet this* [...]. *Based on their glycated hemoglobin, we would create a follow-up schedule. We cannot*

> *wait for them to contact us, because they only sought us out [during the COVID-19 pandemic] when they needed a prescription.* (E14)

The context also demanded structural changes in health services, such as the creation of equipped spaces for teleconsultations, complete with technological resources that would enable remote health education, thus reinforcing nursing practice in diabetes education.

> *We tried to materialize and set up a location here in one of our spaces, with ample audiovisual technology* [...] *so that we can conduct well-organized tele-assistance and distance education.* (E5)

## Diabetes education strategies adopted by nurses during the COVID-19 pandemic

During the pandemic, health education was adapted across all levels of the care network, including hospitals, specialized outpatient clinics, and primary care. Nurses implemented virtual strategies for diabetes education targeting children, adolescents, and their families, utilizing digital technologies such as carbohydrate counting applications, WhatsApp groups, videos, podcasts, and social media profiles. These actions enabled remote health monitoring and the dissemination of information about diabetes and self-care, ensuring continuity of care.

In planning these strategies, they considered the learning needs regarding T1D and the population's preferences concerning activity format (videos, podcasts, social media).

> *Another strategy, during the pandemic, we sought to create educational videos on various topics, such as changing the pump catheter, which sites to use for insulin injection; so, we would record a video instructing, explaining, demonstrating, and sending it to them. This was something I did not do before the pandemic, and now I do* [...]. *We have also been making podcasts; we choose a topic and a professional to record a talk about that topic.* (E10)

> *So, we created a flow here with videos about what diabetes is, insulin administration, monitoring, physical activity* [...] *we created an Instagram account and started making diabetes education posts for that Instagram* [...] *only with diabetes-related themes, covering everything the mothers and patients brought up as difficulties.* (E1)

> *We are also trying to work with Instagram; people have been spending a lot of time with this digital technology in the palm of their hands, so starting this work has been very interesting.* (E15)

Messaging applications were widely utilized, both individually and in groups, as were applications for monitoring goals, such as carbohydrate counting and addressing doubts.

> *In practice, we teach counting by the counting application [for carbohydrates]; currently, I use Glic frequently, and then I form a WhatsApp group: for most of these people with diabetes who need follow-up, I create a WhatsApp group.* (E1)

> *We held workshops and groups like 'Bora Agitar' via WhatsApp and it was very useful; we had great adherence to self-care practices, and we also had the opportunity to develop an application called 'Agito' for adolescents with T1D* [...] *with the Agito application where the professional is represented by an avatar and with whom the youth can ask questions, for example, 'I went to a party and felt unwell, what should I do?', the avatar helps with basic guidance, so it was of great utility to people.* (E15)

To define the strategies to be adopted, nurses also considered the specificities of the target audience, such as the age of the children or adolescents, in addition to characteristics related to development and the time since diagnosis.

> *So I perform this cognitive analysis because I see which game will be used for each age group.* (E11)

> *With younger children, for example, we work a lot with puppets* [...] *even if it's via telehealth, we develop the puppets.* (E15)

> *The world is technological. Today's adolescents are very captivated by this. So, we use this to our advantage; nowadays there are many games and applications that we can use for educational play, providing education to patients in this way.* (E6)

> *We usually divide the groups according to age group, so, and another thing we are careful about is that even with similar age groups, the time since diagnosis differs; thus, the recently diagnosed individual has basic questions relative to someone who has been diagnosed longer and has greater experience.* (E6)

Another aspect considered during the longitudinal follow-up of children, adolescents, and their families relates to their life context, especially concerning socioeconomic conditions.

> *I think the first thing, for us to conduct education, is to know who this child is. Today we are talking about the Brazilian population; we have several social and health determinants; so the first thing I have to ask myself before producing education is: who is this child?* (E3)

> *Social issues—we had several economic impacts, financial issues, accessibility issues—so all of this must be considered so we can be clear about what we want to achieve and what the patient can achieve.* (E6)

> *What was most critical for planning was the social issue because there was a great deal of unemployment; there was truly a lack of food.* (E14)

## Challenges and potentials of diabetes education during the COVID-19 pandemic: lessons learned and strengthening of practices

The changes resulting from the pandemic directly impacted care planning. The initial challenge was adapting in-person activities to the online format, which required the reformulation of educational strategies. However, these changes implied more than the simple utilization of remote contact resources, demanding new knowledge acquisition and the creation of specific resources.

> *In the beginning, we tried to transform the in-person into the online, and with that, we realized that it wouldn't work, that the strategy wasn't exactly the same* [...] *As a strategy, we always tried to do something with 'gamification'; we created dynamic games, for example, 'everyone go to the kitchen and grab a fruit,' and then according to the fruit brought, we discussed the carbohydrate counting strategy* [...] *we tried to make them participate as much as possible, because that was the major challenge of the online format, right. So we tried to introduce games, approaching it in this playful way.* (E10)

It was observed that it was impossible to use in-person recreational strategies, such as instructional and cathartic therapeutic play sessions, which allow for the manipulation of treatment supplies (needles, syringes, pens), addressing the feelings generated by the disease and treatment in children, as well as fostering activities aimed at building rapport. In the case of young children, care was exclusively directed toward family members.

> *It is much harder to conduct education for a young child online than in person. In person, you give them a toy, they play, and then we build rapport based on a drawing or something, and only after that do we start talking about diabetes.* [...] *So for the very young, we ended up focusing much more on the parents than in the in-person setting.* (E10)

> *In the virtual setting, the activities did not stop, but it's no longer possible to hold their hand, see the weight, the shape—in short, to be there manipulating, having that interaction with the real material. What changed is that now they see a PowerPoint.* (E4)

Furthermore, nurses highlighted the impossibility of performing a complete clinical assessment, which precluded comparing recorded data with the physical examination findings. They also pointed out the risk of information omission and the challenge of engaging adolescents in group activities, especially in the presence of parents.

> *The foot sensitivity test, a lipodystrophy assessment—we cannot do that just by looking at the camera.* (E8)

> *They sent me photos of the controls noted in the notebook, and I had to believe it [absence of clinical assessment]. Because in clinical practice, we know that adolescents sometimes omit facts or invent numbers* [...] *adolescent adherence to the online format was terrible; the people who watched online the most were the parents.* (E12)

> *One thing adolescents mention is that they say 'my heart stops when the nurse asks to see the device'; they lie, they put a different value on the spreadsheet, on the annotation map, than what is in the device's memory.* (E9)

> *Adolescents are very reserved; conversations are quite difficult; some conversations I conducted separately from the parents to facilitate communication.* (E14)

Another challenge faced was the limitation of technological resources, both on the part of health services and families, hindering access and the continuity of remote care.

> *It was quite complicated because we are a public service, and the technological resources of the institution and the population to maintain this contact are very limited. In the*

> *institution, managing to get adequate internet, a good working computer—all of that is very difficult.* (E13)

> *But what happens is that, since our hospital is part of the SUS (Unified Health System) and there is still no financial, personnel, or equipment planning for this tele-assistance, we remain somewhat constrained by this.* (E5)

> *Only in the case of more needy people who do not have internet access.* (E8)

Despite the challenges, the new care format extended beyond the walls of offices, clinics, and hospitals, providing more constant communication between the nurse, the child/adolescent, and their family, overcoming geographical barriers. This facilitated immediate contact with the nurse for clarifying doubts and follow-up, in addition to promoting greater visibility of the professional's role.

> *Before the pandemic, I didn't have this contact with the person who has diabetes after the consultation; sometimes I only saw them three months later. So, we didn't have the conversation via WhatsApp.* (E1)

> *Because this helped families with transportation and encouraged families not to miss appointments, which is a problem everywhere.* (E4)

> *Many people with diabetes are from inland areas; sometimes their travel is difficult until they reach us; we manage to shorten the interval between consultations when we provide remote care.* (E6)

> *The pandemic helped us gain more visibility in the live sessions when they happened. We as nurses still have a process of acceptance regarding what a nursing consultation is, what an educational process is as a nurse. I heard several times, "I didn't know a nurse conducted consultations".* (E10)

> *A pandemia ajudou a gente ficar mais em evidência, nas lives, quando elas aconteceram. Nós como enfermeiros, ainda temos um processo de aceitação sobre o que é uma consulta de enfermagem, de um processo educativo como enfermeiro. Eu ouvi diversas vezes 'não sabia que enfermeiro fazia consulta'.* (E10)

The pandemic provided significant learning for nurses, who intend to permanently incorporate strategies to strengthen their practices. Among these strategies, they highlighted the use of innovative and creative approaches in health education, the adoption of a hybrid care model combining virtual and in-person modalities, and the expansion of the reach of educational actions, making large-scale delivery possible.

> *It's not something that will end with the normalization of in-person services; we saw that it's possible to do it, to reconcile, to provide care this way, with some in-person moments and some remote moments.* (E6)

> *Teleconsultation will then transform into our fourth service modality; we will have the outpatient modality, day hospital, hotline, and teleconsultation.* (E10)

> *I believe I will never remove Instagram; I think it is a phenomenal strategy for education, because it remains as educational material.* (E1)

> *Truly what came to reinforce and remain in the pandemic context are video consultations, nursing teleconsultation, the use of software, use of applications, use of remote audiovisual resources for us to truly strengthen this care in diabetes education.* (E7)

> *I think WhatsApp is a very good means of communication that should continue.* (E14)

> *There are several things we can optimize to speak more and with more people, and not just with small niches. I think the pandemic can help precisely with this; I can record a video of what I am telling a patient, put it on a platform, and millions of patients can access it whenever they want, as many times as they want because we can review it up to a thousand times—I think it helps a lot in the educational process.* (E8)

## DISCUSSION

This study verified that nurses across different services and levels of care maintained health education activities for children and adolescents with T1D and their families throughout the COVID-19 pandemic, through adaptations in the strategies and resources utilized. In this context, their experience involved identifying and testing innovative educational strategies, given that the previous scenario was predominantly based on in-person activities.

New protocols aimed at containing viral transmission necessitated that individual and group nursing appointments be suspended, postponed, and ultimately, rearranged into virtual and telephone formats. The pandemic

demanded rapid adaptation of diabetes education, including the routine incorporation of social media, messaging applications, the use of videos and podcasts, as well as the demonstration of techniques during teleconsultations.

The shift in educational strategies was imperative for the nurses in this study, as they considered diabetes education the primary tool for managing T1D in children and adolescents during the pandemic, regardless of the type of treatment employed. In this process, they recognized the need to adopt resources and strategies that could bring remote care closer to the various actions involved in diabetes education, such as clinical nursing assessment via physical examination, the manipulation of supplies for teaching insulin administration techniques, blood glucose testing, and the assessment of lipodystrophy.

The discontinuity of in-person care, with the subsequent interruption of these actions, was also noted in other studies[15,16], which similarly highlighted the challenge of adapting the workflow process to online activities and teleconsultations[17]. The movement to maintain population access to healthcare across different regions globally resulted in an increase in telehealth appointments for individuals with chronic conditions, such as diabetes[14].

It is important to note that, in Brazil, the incorporation of new remote care strategies was made possible by the approval of COFEN Resolution No. 634/2020, which authorized remote nursing consultations during the COVID-19 pandemic.

As identified in another study[17], the educational strategies most commonly used by nurses before the pandemic were instructional therapeutic play sessions, recreational activities to promote interaction and rapport, groups and conversation circles, and collective educational dynamics. Furthermore, the literature highlights that these professionals play a crucial role in the diabetes education process, utilizing cognitive-behavioral techniques focused on problem-solving, goal setting, communication skills, motivational interviewing, family conflict resolution, and the development of coping and stress management abilities[7,23].

Additionally, considering that the care of children and adolescents involves the specificities of the pediatric context, remote technologies must be adapted according to child development to ensure access to guidance and minimize acute and chronic complications resulting from the health condition[18].

The adaptation of diabetes education did not merely consist of reproducing in-person activities in an online format, but rather in adjusting resources and strategies based on criteria involving specific knowledge of developmental stages, time since diagnosis, learning needs regarding T1D, and the target audience's preferences for activity format.

This result corroborates the guidelines of the International Society for Pediatric and Adolescent Diabetes[19], which direct care toward young children, preschoolers, and adolescents, emphasizing the specificities of diabetes education at each phase, with support for families and encouragement of progressive independence in diabetes management by children and adolescents.

In adapting strategies, nurses also considered the families' context and social vulnerabilities related to nutrition, health, employment, and financial resources, as these factors could limit the scope of educational interventions and impact the continuity and quality of care offered to children with diabetes. The effects of the pandemic on low- and middle-income families with children, beyond social isolation, intensified their vulnerabilities due to unemployment, low-wage work, lack of daycare, precarious housing, food insecurity, and limited access to health care[20].

Thus, the use of technological resources allowed for the continuity of monitoring children and families; however, it brought new challenges for nurses, given that, due to the characteristics of child development, young children did not demonstrate interest in longer online consultations and recreational activities. In these instances, health education was directed toward parents and family members, so that they could share and guide their children.

The low involvement of adolescents in online groups, especially when parents and/or guardians were included, was similar to what has been observed in other contexts, where adolescents were found to be more comfortable discussing in private conversations or in groups composed only of youth, as well as consuming information posted on websites and illustrative content on digital media[21].

One of the main perceived barriers to the virtual follow-up of children and adolescents was the lack of accuracy in the information recorded in applications and blood glucose annotation sheets (glycemic diary). Nurses identified a discrepancy between the clinical picture and the recorded data, particularly among adolescents.

The lack of technological resources in health services and restricted internet access for families constituted significant limitations for the implementation of virtual activities. In this context, social inequalities, which were more clearly evidenced during the pandemic, became a critical factor, as unequal access to technology among

families directly impacted the effectiveness of remote monitoring strategies.

Although the outcome of remote educational actions on care provided and glycemic control was not assessed, even despite all the observed difficulties, the nurses' experience was positive regarding adherence to the follow-up offered. Thus, the nursing team played a central role in diabetes education for children and adolescents during the pandemic, favoring the continuity of care.

Another study indicated that this leadership role was present in routine activities, such as insulin administration, blood glucose testing, correction of hypo/hyperglycemia, and necessary adaptations to changes in diabetes treatment and the child or adolescent's routine[22]. This context justifies the proposition for the permanent incorporation of remote activities as part of regular care, considering that the difficulties identified during completely remote monitoring—be it in clinical assessment or the adherence of children and adolescents themselves to activities—can be overcome through the integration of in-person activities. Following the completion of this research, such a proposition was legally supported by COFEN Resolution No. 696/2022, which regulates nursing practice in digital health, standardizing telenursing.

This study also demonstrated the central role of nursing in ensuring communication agility between the team, children/adolescents, and families, as well as in providing structured, high-quality, and age-appropriate education, aiming to maximize treatment efficacy, in addition to contributing to facilitated access to the service and health information. Nurses adapted and innovated to confront challenges and enhance the incorporation of new educational strategies. Among the strategies cited for permanent and systematized incorporation, in conjunction with in-person care, are messaging groups, teleconsultations, educational videos, telephone calls, social media posts, and the use of applications.

A study evaluating telehealth from the perspective of caregivers at a reference center for diabetes mellitus emphasized the numerous advantages of this strategy, also identified by the nurses in this research, such as ease of access, overcoming geographical barriers; this reduces the use of emergency services and the length of hospital stays, as it brings users closer to the health service through well-directed guidance[23].

Furthermore, a systematic review investigating types of nursing interventions to improve the quality of life for people with diabetes mellitus identified that guidance via WhatsApp and application resources for diabetes management showed significant effects, such as a reduction in HbA1c and glycemia, and message exchange was considered a feasible and pleasant intervention by adolescents. The study highlighted that text messages represent a low-cost and wide-reaching modality of education[24].

Nurses possess leadership skills and specialized knowledge that can contribute to reducing disparities, as well as ensuring high-quality health care[25]. The lessons and advancements in health education learned by these professionals demonstrate their potential to strengthen care practices, especially those focused on diabetes.

In summary, the findings of this study indicate the utilization of information and communication technologies for treatment monitoring and health education for children and adolescents with T1D and their families, emphasizing the use of innovative tools that can be permanently incorporated into health services, in conjunction with nurses' in-person care, in a hybrid care model.

The difficulties and strengths perceived by the nurses correspond to those already identified in other studies[22], in addition to others that should be considered, such as the reimbursement for actions in this format. It should also be considered that the remote format and the adopted strategies must be conceived according to an underlying pedagogical model for these choices and their application, prioritizing high-quality attention to users, rather than merely cost reduction, for example.

This study presented as a limitation the impossibility of data generalizability as representative of diabetes educator nurses, as the results reflect the individual experience and context of each participant's practice. Nevertheless, the findings suggest that technology can be an ally in health education for children and adolescents with this condition.

Although the effective use of technology for remote educational actions requires investigation into aspects not addressed in this research, the results provide support for nursing practice, making it possible to implement more creative and dynamic educational strategies. These strategies can be further evaluated to establish evidence of their safe use, minimizing geographical barriers and strengthening the bond with children, adolescents, and their families, thereby promoting safe and high-quality care even in the face of adversity.

## FINAL CONSIDERATIONS

The experiences of nurses across different levels of health care demonstrated that, given the interruption of in-person activities, it was necessary to rapidly adapt the diabetes educational process to a remote format.

The incorporation of digital technologies, such as applications, messaging groups, videos, social media, and teleconsultations, allowed for the continuity of monitoring and guidance for children and adolescents with T1D and their families, even amid the restrictions imposed by the pandemic.

Despite the challenges faced, such as unequal internet access, limited direct supervision for handling supplies, and difficulties in engaging young children and adolescents, nurses observed positive effects on treatment adherence and the maintenance of the bond with families. Remote strategies, when well-planned and adapted to the user profile, expanded the reach of educational activities, demonstrating the viability of a hybrid healthcare model.

These results indicate the importance of incorporating such strategies into routine care, combining in-person and virtual modalities synergistically and complementarily. To this end, it is fundamental that public policies support the technological infrastructure and the continuous training of health professionals, especially within the context of the Unified Health System (SUS).

It is also necessary that future studies evaluate the long-term impact of hybrid strategies, particularly concerning service quality, user satisfaction, and treatment effectiveness over time. The consolidation of innovative and accessible educational practices can contribute significantly to strengthening comprehensive care for children and adolescents with T1D, promoting equity, safety, and continuity of care.

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