Original Article
doi: https://doi.org/10.1590/1983-1447.2024.20230165.en

Needs and preferences regarding a mobile application to support diabetic foot self-care

Necessidades e preferências relativas aaplicativo móvel de suporte ao autocuidado com o pé diabético

Necesidades y preferencias sobre una aplicación móvil de apoyo al autocuidado del pie diabético

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How to cite this article:
Lopes GSG, Landeiro MJL, Sousa MRMGC. Needs and preferences regarding a mobile application to support diabetic foot self-care. Rev Gaúcha Enferm. 2024;45:e20230165. doi: https://doi.org/10.1590/1983-1447.2024.20230165.en

ABSTRACT

Objective: To identify the needs and preferences of individuals with type 2 diabetes regarding the functionalities and characteristics for a mobile application to support foot self-care.

Method: Qualitative research with 16 individuals diagnosed with type 2 diabetes recruited during clinical care at a university hospital in Porto, Portugal. Data were collected through semi-structured interviews between March and June 2022 and analyzed using inductive content analysis.

Results: Three categories and nine subcategories were identified. Categories included informational needs, essential functionalities for foot health self-care, and user-relevant experience. The preference for objective, limited data input, flexible, and customizable applications was an important factor influencing technology engagement.

Conclusion: The research highlighted a preference for customizable and flexible applications, aiding nurses in creating solutions that transform care delivery and enhance the quality of life for individuals living with diabetes.

Descriptors: Mobile applications. Self-care. Needs assessment. Diabetic foot. Mobile applications.Patientpreference. Smartphone.

RESUMO

Objetivo: Identificar as necessidades e preferências de pessoas com diabetes tipo 2 relativamente às funcionalidades e características de um aplicativo móvel de suporte ao autocuidado com os pés.

Método: Pesquisa qualitativa com 16 pessoas com diabetes tipo 2 recrutadas durante o atendimento clínico em um hospital do Porto, Portugal. Os dados foram coletados por meio de entrevistas semiestruturadas entre março e junho de 2022 e analisados utilizando análise de conteúdo indutiva.

Resultados: Identificamos três categorias e nove subcategorias. Categorias incluíram necessidades informacionais, funcionalidades essenciais para o autocuidado dos pés e experiência relevante do usuário. A preferência por aplicativos objetivos, com entrada de dados limitada, flexível e personalizável, foi um fator importante que influenciou o envolvimento com a tecnologia.

Conclusão: A pesquisa destacou a preferência por aplicativos personalizáveis e flexíveis, ajudando enfermeiros a criarem soluções que podem transformar a prestação de cuidados e melhorar a qualidade de vida de quem vive com diabetes.

Descritores: Aplicativos móveis. Autocuidado. Determinação de necessidades de cuidados de saúde. Pé diabético. Preferência do paciente. Smartphone.

RESUMEN

Objetivo: Identificar las necesidades y preferencias de personas con diabetes tipo 2 con respecto a las funcionalidades y características de una aplicación móvil de apoyo al autocuidado del pie.

Método: Investigación cualitativa con 16 personas diagnosticadas con diabetes tipo 2 reclutadas durante la atención clínica en un hospital universitario de Porto, Portugal. Los datos se recopilaron mediante entrevistas semiestructuradas entre marzo y junio de 2022 y se analizaron utilizando análisis de contenido inductivo.

Resultados: Identificamos tres categorías y nueve subcategorías. Las categorías incluyeron necesidades informativas, funcionalidades esenciales para el autocuidado del pie, y experiencia relevante del usuario. La preferencia por aplicaciones objetivas, con entrada limitada de datos, flexibles y personalizables fue un factor importante que influyó en el compromiso con la tecnología.

Conclusión: La investigación resaltó la preferencia por aplicaciones personalizables y flexibles, ayudando a los enfermeros a crear soluciones que transforman la prestación de cuidados y mejoran la calidad de vida de las personas que viven con diabetes.

Descriptores: Aplicaciones móviles. Autocuidado. Evaluación de necesidades. Pie diabético. Prioridad del paciente. Teléfono inteligente.

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INTRODUCTION

Diabetic foot is a significant complication of diabetes because it is related to premature deaths caused by complications[1]. Daily diabetic foot care is a burden imposed on people with diabetes, as they must monitor their diet, physical exercises, blood glucose levels, medication management and clinical follow-up[2].

As can be seen in the literature, many diabetic foot complications are preventable, and there is a high success rate in treating ulcers when detected early. To achieve this, constant and effective self-surveillance is necessary[3]. Therefore, self-care, outside of the clinical setting, is essential in preventing worsening.

Self-care is essential in the management of chronic diseases and concerns the ability to take care of oneself, consciously, to maintain or promote health and well-being[4,5]. Although self-care is essential, studies show that people do not have the skills or competencies to take care of their feet on a daily basis, which results in low adherence to self-care practices[6–8]. Therefore, it is recommended that new strategies be created that involve people in foot care[9,10].

These recommendations include offering emotional and psychosocial support to help these people, who commonly report feelings of lack of control in preventing ulcers; greater access to the healthcare team to clarify doubts; and providing detailed educational information about foot self-care through a smartphone application[10]. Considering these suggestions, it can be seen that people with diabetes would benefit from technological advances in diabetic foot ulcers. Furthermore, there is evidence that this population is inclined to use technologies, e.g. continuous glucose monitoring, which can facilitate adherence to various technological resources[11]. According to one study, 73.1 of the participants affected by diabetes and who had a smartphone were interested in using a mobile application to help them monitor their foot health[12]. Therefore, such an instrument can provide access to involvement in self-care.

In the context of healthcare, applications emerge as innovative tools, transcending conventional approaches and providing a customized experience capable of increasing adherence to self-care[13]. In addition to traditional practices, these digital innovations allow customization, enabling individuals to explore their own health in depth, raising awareness to informed decision-making[13]. In the specific context of foot self-care, designing adapted applications is a specialized task. With their unique expertise in the field of self-care, nurses are the ideal professionals to lead a team for this purpose. These applications, aimed at people with type 2 diabetes mellitus (T2DM) and their caregivers, not only offer detailed information but also establish a personal connection, transforming data into meaningful knowledge and empowering users to adopt more effective care. There is a wide variety of health applications for caring for individuals with T2DM, with the aim of monitoring blood glucose, diet and physical exercise, each with its own advantages and challenges. While some offer intuitive interfaces and real-time monitoring, other applications may have issues related to customization or the offer of expert guidance[13].

It is known that the involvement of end users in the various phases of the construction of the technological resource can reduce challenges and improve the therapeutic impact of these applications[13]. One of these steps includes the identification of needs and preferences, which enhances the benefits of the referred technology[14,15]. Therefore, designing an application focused on users' needs and preferences can ensure effectiveness, efficiency and satisfaction, requirements that support usability.

A study on the topic indicates that the use of technologies to encourage self-care is associated with a series of significant benefits. These include improvements in patient empowerment, motivation, adherence to the therapeutic plan, self-monitoring of risk factors, as well as support for adopting a healthy lifestyle and effective management of daily routine resources[16]. Building interventions through mobile technologies from users' perspectives can make them inclusive, more accessible and increase the perception that technology can improve health outcomes[17]. It is important to consider the needs and preferences of potential users, as this can engage them emotionally, potentially making them more likely to use the technology consistently[18]. However, despite the relevance of this approach, there is still little evidence about the needs and preferences of people with T2DM for the development of mobile applications regarding foot health.

Based on this research gap, the following guiding question for this study emerged: "What are the needs and preferences of people with T2DM regarding the functionalities and characteristics of a mobile application to support self-care with foot health?" In this regard, the present study aimed to identify the needs and preferences of people with T2DM regarding the functionalities and characteristics of a mobile application to support foot self-care. After analysis of these aspects, the results obtained can offer a comprehensive overview of users' needs and preferences, which, in turn, can contribute considerably to the future design of applications that improve general self-care and well-being results for this population.

METHOD

This is a qualitative, exploratory-descriptive study. The investigation followed the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist.

Convenience sampling was used. Data were collected at a teaching hospital located in the city of Porto, Portugal. It is a referral hospital that is a center of excellence for the entire northern region of Portugal with 1,105 beds, covering various medical and surgical specialties, in addition to emergency services and clinical production support facilities. Participants were recruited during clinical care in the diabetic foot room and during diabetes consultations. The researcher introduced herself, informed her credentials, explained the objectives of the research and invited each of the patients to participate in the study.

This study was approved by the Research ethics committee of the aforementioned teaching hospital under protocol CES CHUSJ: 422/2021, in accordance with the Helsinki Declaration guidelines; and the confidentiality of the data collected was guaranteed. The participants, who voluntarily agreed to take part in the study, signed the Informed Consent Form. Their anonymity was guaranteed through exclusive numeric codes, with identifiable data being omitted. Furthermore, strict security measures were observed to protect information, including storing data on password-protected servers and restricting access to authorized research staff only.

Participants met the following inclusion criteria: being 18 years old or older; have some experience with mobile applications in the field of health (the presence and habitual use of health applications on participants' smartphones were investigated, including applications for fitness, nutrition, mental well-being, monitoring of medical conditions, weight control, sleep); and having been diagnosed with T2DM more than 12 months ago. This temporal delimitation aimed to capture more enriching contributions on the continuous care of T2DM, since people who have been diagnosed with the disease longer ago may have a more comprehensive understanding of their condition as they have faced and overcome challenges over time. The exclusion criteria adopted were: patient with clinical instability at the time of the approach or cognitive changes; not capable of adequate self-management of the condition. "Clinical instability" was considered any event that causes discomfort, accompanied by changes in vital signs, such as blood pressure, heart rate and/or state of consciousness. To examine the executive functions of the cognitive state, the Mini Mental State Examination[19] was used. Finally, to assess the participants' capability of performing self-care activities, open-ended interviews were carried out to explore how individuals managed their health condition on a daily basis. The questions helped understand people's ability to manage their health independently People who needed help from others to use medications, monitor blood glucose levels or care for their own feet were not considered capable of self-management behavior.

Data were collected between March and June 2022, during the days of clinical care, which occurred regularly on Mondays, Tuesdays and Fridays. In addition to the semi-structured interview with an interview guide, a questionnaire was applied for sociodemographic and clinical characterization. The questions concerned content/functionalities to be suggested by the participants for building a mobile application aimed at supporting foot self-care, its presentation and what additional features they would want to make the tool usable and attractive. The interviews lasted an average of 22 minutes, were carried out in a private room, recorded and carried out by the first researcher (woman, nurse, PhD student in Nursing Sciences, with experience in qualitative research methods obtained in previous studies and through active participation in research groups). During the data collection period, 16 individuals met the eligibility criteria. No one refused to participate, and no participant withdrew. Shortly after the interviews, field notes were taken to assist in the interpretation of the data.

All interviews were fully transcribed and then subjected to inductive content analysis from Bardin's perspective[20]. In this approach, researchers do not start from predefined hypotheses, allowing categories and themes to emerge organically from the data. Such flexibility makes the analysis particularly useful for exploring new phenomena or research questions without a prior framework, enabling a deeper understanding of the data collected. Each interview was analyzed separately, and the primary coder (first author) reviewed the data and recorded her initial impressions. A preliminary codebook was created and revised through discussions among the investigation team. After consensus was reached, all data were coded to the point at which the researchers determined that no new codes or themes would emerge. Thus, the codebook was completed with 32 codes. The subsequent stage began, with constant comparisons being carried out to discern patterns and construct categories that answered the research question.

Semi-structured interviews were conducted until data saturation was obtained. This means that data collection was stopped when the statements no longer provided new information and the recruitment of new participants would probably not provide new results.

RESULTS

Sixteen people participated in this study, of which 11 were men. The average age was 56.93 years (standard deviation = 10.45), ranging from 42 to 76 years. Regarding educational level, half of the participants (50%) had between one and nine years of schooling, 31.25% had between 10 and 12 years of schooling, while 18.75% had completed higher education. Regarding occupation, the results revealed that 31.25% of the participants were employed, 37.5% were unemployed, and another 31.25% were retired. The average time elapsed since diagnosis of T2DM was 12.87 years. Seven participants had amputations in the foot, part of the foot, or leg. Regarding the use of mobile applications for health, 50% used one application, 37.5% used two applications, and 12.5% used more than two applications.

The participants reported several needed and preferred features in an application to support foot self-care. The content obtained from the analysis of the interviews was grouped into three categories and nine subcategories, as shown in Chart 1.

Informational needs about foot health

This category was formed by 34 registration units. The subcategories revealed the need for specific informational content to take care of foot health within the scope of T2DM. Educational needs were noticeable even for participants with a higher educational level.

The first subcategory — Therapeutic educational information about diabetic foot — expressed the need to know about the identity of diabetes, its complications, the relationship with diabetic foot, treatment methods, and preventive and curative care.

> [...] *I would like more information about the relationship between diabetes and foot wounds and how this protection (prevention) is obtained. What causes the wounds... I really can't explain.* (I13)

> [...] *about the care, signs and symptoms of diabetic foot. If I had known more about this, I would have been more aware. At that time, I could have avoided some things, but I didn't have the necessary information. I started to*

Chart 1 – Needs and preferences of people with T2DM regarding a mobile application from the perspective of foot health. Porto, Portugal, 2022

Categories	Subcategories
Informational needs about foot health	Therapeutic educational information on diabetic foot
	Information about support resources and activities in the National Health Service
Essential features for foot health self-care	Tracking signs and symptoms through photographic records and a diary
	Reminders for daily care and appointments
	Motivational feedback
	Interactivity with healthcare professionals
	Psychosocial and professional support
Relevant user experience for driving engagement with a mobile application	Ease of use
	User satisfaction

Source: Research data, 2022.

feel a lot of tingling [paresthesia] in my feet, but I wasn't worried about it, because as I used to stand for a long time, I associated this tingling with other things and not with diabetes. If I had received more warnings about paying attention to very cold feet or lack of sensation or that tingling, perhaps I would have been more aware of all this. (I5)

[…] *care with the feet and the type of clothing to be worn, in this case, socks that we should wear, and even the shoes. The main care that we are not generally concerned with on a daily basis… related to mycoses, cutting* [nails]. (I7)

The second subcategory – Information about support resources and activities in the National Health Service (SNS) – highlighted patients' desire to receive information about the consumable resources available for the treatment of diabetic foot and about the flow of patients in the SNS, encompassing information about health services and medical specialties in the area of diabetic foot.

[…] *information about the existence of a podiatry service at the hospital and how to schedule an appointment. But I don't know how to make an appointment, I don't know if it's available. All of this would help.*(I2)

[…] *if they advise you to go to a health center, to come here [to the hospital], if I need to go to the angiology department, if I can go to the hospital, when would it be, which specialty is the most suitable for my case… it would be important to know all this. Right now, after having undergone surgery, I have questions about whom I should look for, where to go, and the app could help* (I6)

[…] *and, as we know, there are so many diabetics in Portugal that the products are free, all access, all available materials are free. Diabetes is considered a priority disease; and, therefore, doctors can prescribe all medications for diabetics free of charge, in addition to the materials for bandages. It is important to have access to this information.* (I8)

Also, it is clear that participants are aware that there is a set of unknown information, but which is necessary for self-care, and, therefore, they would like such information to be available on the application.

[…] *I would like to see something more than just this basic information, because there is a lot that we don't know. I think you have more capacity than me to make this successful. After all, you studied your whole life for this, right?* (I14)

In this category, the participants emphasized the need for access to detailed educational information, covering everything from daily care to resources in the health system. This awareness of gaps in their knowledge highlights the importance of an application that offers comprehensive information while meeting their self-care needs. This can create a safe and reliable environment for managing foot health.

Essential features for foot health self-care

This category was made up of 57 recording units and revealed the way in which the application can help in the operationalization of foot self-care in everyday life. The participants expressed the need for a set of functionalities for managing foot health, such as tracking signs and symptoms through photographic records and a diary, reminders for daily care and appointments, motivational feedback and interactivity with health professionals. Finally, they emphasized that this technology must also offer psychosocial and professional support.

[…] *It would be great to have this feature [photography] in the app, as well as a site available for a photo album of the feet [in the app] to share with healthcare professionals.* (I8)

[…] *a diary would be something more stimulating. And we could share this diary with our observations of the feet.* (I9)

[…] *especially for those who face this problem, a reminder not to forget to use moisturizer on their feet would be interesting. That would be good.* (I14)

[…] *a reminder [for appointments with doctors and nurses] shown the day before, or two days before appointments, for example, would be great.* (I6)

[…] *I think we also need something motivational, because sometimes we feel unmotivated, it's not easy, it makes us want to give up.There's no need to text every day because it can be tiring. Once a week or every 15 days would be fine. I think it's important to help people stay focused and on target.* (I12)

[…] *it would be good to talk to a nurse, because sometimes an urgent problem arises, a wound… we can call and say: "Look, this happened, I'll send you a photo of my foot."* (I5)

[...] *put the camera on your foot or something similar, and if the doctor asked me to show it, I would show it. As if it were a teleconsultation. This would help me with this difficulty of going to the health center.* (I3)

[...] *it would be interesting to be able to talk to other patients who are facing the same problem, to form groups of diabetic patients. Exchanging experiences helps.* (I12)

[...] *I think that support, not psychiatric, but psychological, would be good.* (I2)

In the category of essential features for foot health self-care, the need for an application that transcends the elementary is clear. Participants highlighted the importance of a comprehensive approach, incorporating features such as visual and daily tracking, customized reminders and motivational interaction. This integration of functionalities on a digital platform can not only improve the management of physical conditions related to the lower limbs, but also recognize the emotional impact, providing global support. Therefore, in addition to being a potential tool for foot care, the application is a facilitating space for emotional well-being, thus enriching the users' experience.

Relevant user experience for driving engagement with a mobile application

This category highlighted the characteristics of the applications, which, when well designed, promote a positive emotional, cognitive and behavioral experience, contributing to users' involvement with the intervention. This category was developed based on two subcategories: 1) Ease of use and 2) User satisfaction.

The participants reported preferring objective, less complex applications with limited data entry. One of them suggested that the tool be user-friendly and mentioned that difficult-to-use technology can reduce engagement among older people. Some participants said they preferred a flexible, customizable application. According to reports, such characteristics can give rise to a feeling of belonging and promote greater involvement among users.

[...] *if I click on a button and the information becomes available, everything is fine. However, if I have to enter data or passwords, or an email, or a phone number, I won't find it practical. If I have to press many buttons to get what I want, I won't like the app. I like to click on a button and then see on the screen what I'm looking for.* (I13)

[...] *the application should be more user-friendly, more logical, more intuitive and more accessible to people who have more difficulty using these applications, older people who may have the app, but find it too complicated and are not interested in it.* (I2)

[...] *I like an application with a smooth appearance and soft colors. People would decide the font size themselves. Have you ever thought that a person with diabetic foot may already have a vision problem?And this could impact the use of the application. People should be able to increase the font size. All applications should be flexible. It has to be flexible to allow the user to choose the desired font size. What is the design like? If the person does not like the white background, they should be able to change it to a blue background, or black, or another color. When the user can choose what they want, I think there is more involvement, more belonging, and the individual feels like they own it.* (I9)

The participants also expressed a greater preference for content in video format and with real case presentations. Additionally, some realized that the possibility of mixing content presentation formats could benefit more people. Another aspect mentioned concerned user satisfaction and comprised two dimensions: trust and usefulness. Participants mentioned the importance of having trained health professionals supporting the application and content curation. Such aspects can give credibility to the technology. Finally, the tool was recognized by participants as a useful resource to support them in self-care. One participant said that if he had been using such an application, he could have identified the signs of complications and sought clinical evaluation earlier.

[...] *maybe, the video would be easier. A video that shows things as they are* [about diabetic foot]. *I think a video would be better, where you see the person, the real person. Show the wounds, how the wounds evolve if they are not taken care of.* (I10)

[...] *I like to read. So, I prefer texts. There are people who don't like reading, and, therefore, prefer a video with people teaching. Maybe if you can have video, audio and text simultaneously, everyone would be satisfied.* (I9)

[...] *It is important to have* [health] *professionals to convey the important issues in the app. The more professionals who join an application like this, the more reliable it will be and patients will trust it more.* (I16)

[...] *it would be good to have [the application]. Yes, I would use it, of course. I would download it to my cell*

phone. If I had an app like this, I wouldn't have let the situation get to this point! I would have gone to the hospital straight away. [...] *If I had seen the symptoms on the app, I would have recognized that it was diabetic foot.* (I3)

In this category, a user experience with a foot health mobile application is outlined. An intuitive and informative design, backed by experts, is the cornerstone for engaging users effectively and lastingly.

DISCUSSION

The needs and preferences of people with T2DM for mobile applications to support foot self-care were identified with the use of inductive content analysis. The data obtained provides new insights into what content, functionality and engagement-enhancing features are desired by potential users and will serve as a valuable resource for designing usable and interactive applications. Although previous studies have provided relevant information about applications to support T2DM self-management[21,22], user needs and preferences regarding mobile technologies that aim to support foot self-care have still been little explored. The present study aims to fill this gap.

The scientific literature recognizes smartphone applications as an effective and innovative tool in self-care for chronic conditions. One study reported significant improvement in the self-efficacy of patients with T2DM who used applications, highlighting the importance of this technology[23]. Furthermore, a quasi-experimental study, carried out in a context other than diabetic foot/diabetes, revealed a significant increase in the self-efficacy of patients with thalassemia who used smartphone applications compared to the lecture method, highlighting the potential of these interactive and customized platforms in promoting self-care capacity in individuals with chronic conditions[24]. The main advantage of this technology is its ability to provide detailed educational information, accurate monitoring and customized guidance. In contrast, traditional methods such as manuals and folders tend to be generic and static, unable to offer the dynamic monitoring and interactive tools provided by applications. Therefore, the integration of these innovative technologies into care not only represents a major advance compared to traditional approaches, but also reflects a crucial step towards more effective and patient-centered self-care, improving the quality of life of people with T2DM.

Informational needs remain a key element in practicing self-care. Participants expressed the need for knowledge about the nature of the disease, therapeutic and preventive measures, consumable resources to support treatment and flow to the NHS specialties and services in the context of diabetic foot. Education has a positive impact on foot self-care behaviors and self-efficacy, although there is poor data quality to support this correlation[25]. Additionally, the International Working Group on the Diabetic Foot recommends education to improve knowledge and increase adherence to guidelines[26]. Another factor to be considered is that applications facilitate access to educational content[27]. Therefore, this study provides evidence that informational needs are close to recommendations in the scientific literature and that such knowledge can support decision-making outside the clinical context, allowing patients to be active agents in managing their own condition.Therefore, investment must be made in incorporating informational needs into application.

The needs regarding functionalities that can assist in the operationalization of day-to-day care were explored. Based on the analysis, one feature was repeatedly mentioned: photography as a means of tracking signals. Systematic review showed that it is a viable and applicable resource[28]. However, other investigations have shown that, although photographic records can safely evaluate ulcers, self-image photographs are challenging for many people, as they do not guarantee images of the entire surface of the foot and can generate artifacts, thus compromising the quality of the evaluation[29]. In addition, a study produced evidence that there is low inter-rater and moderate intra-rater reliability in detecting changes based on photographs taken on smartphones[30]. Overall, these findings suggest that images produced by a smartphone help with some assessments of the diabetic foot. However, it has limited use in other clinical judgments. Thus, this potential aspect reported in the present study as a need requires further exploration.

The need for interactivity emerged during interviews with participants, especially in emergency scenarios. They expressed a desire for two-way communication with healthcare professionals via the application, seeking precise guidance on how to deal with critical situations. Analysis of the results raised essential questions about the criteria for incorporating interaction functionality. Given the nature of the application, which is to support self-care and include monitoring signs and symptoms, especially disorders that may raise concerns, it is clear that interactivity is an essential feature. In this context, interactivity not only suggests a connection with nursing professionals, but also provides a fundamental channel for responding to users' concerns. However, it is imperative to recognize the challenges associated with its implementation,

including time constraints and potential increase in nurses' workload. A recent study has shown that ambiguity and anxiety can arise when patients are faced with changes in their health, further highlighting the importance of some level of interactivity, even if limited, with support during critical conditions[31]. This interactivity, although restricted, emerges as a fundamental element to dispel apprehensions and catalyze significant behavioral changes. Thus, when considering the complexity of users' needs, a balanced approach to interactivity, in addition to alleviating concerns, can promote an effective transformation in the behaviors of people with T2DM.

Data analysis allowed us to understand how meeting user preferences can interfere with the dynamics of engagement with the application. From this perspective, participants highlighted aspects related to ease of use. Consistent with previous research, which showed the importance of the application having qualities that allow easy use of the user interfaces[32], it was found that patients prefer quick access, without the need to enter too much information: it must be intuitive, smooth in appearance; and allow quick identification of the resource to be used. However, something more revealing was the preference for a flexible application, so that users could customize the layout, adapting it to their needs and, thus, have the feeling of owning the technology. It can be affirmed that even technology can allow care to be person-centered.

Care centered on people (CCP) with T2DM focuses on the active participation and engagement of patients with effective self-management of their health condition, being sensitive to individual values, needs and preferences, as well as the relationships between the patient and nurses, within the context of the care environment[33,34]. Results of a systematic review and meta-analysis revealed that patient-centered interventions for self-management are associated with a considerable reduction in glycated hemoglobin levels and improved self-care behaviors, especially foot care[33]. This result suggests that patient-centered interventions for self-management are related to positive health outcomes. It is also known that the mobile application is one of the resources that facilitate the provision of CCP between the nursing team and the patients[34]. Therefore, designing well-developed applications in a CCP environment can increase the chances of effectiveness of the technological tool[35,36]. Thus, the findings can contribute to the design of a mobile technology that facilitates CCP, by identifying the needs and preferences of people with T2DM.

In this context, a mobile application can also be used to facilitate the creation of customized care plans by providing resources to define specific therapeutic goals, monitor progress, and adapt strategies based on individual patient needs. Another way of coordinating a CCP with the application would be by sending customized messages, a need also mentioned by the participants in this study. In addition, practical guidance ("how to do it") and suggestions for specific situations ("what to do when") can be included. Additionally, the data collected by the tool can be analyzed to identify behavior patterns and specific needs of people with T2DM. This information makes it possible to adjust care strategies, offering more accurate and customized interventions.

Interventions to support self-care based on the CCP through face-to-face care and home visits have been shown to improve adherence to self-care[33]. However, many of these approaches face limitations due to lack of investment in the healthcare system and shortage of resources for patients. It is critical, then, to develop and test new self-care interventions that are scalable and enable patients to manage their health in a cost-effective way. From this perspective, mobile applications within the scope of T2DM can offer scalable and accessible opportunities to improve foot self-care behaviors, engaging people in healthy behaviors and expanding the provision of nursing care services to populations, especially those with access difficulties.

The aspects related to user satisfaction with applications aimed at self-management of T2DM are known[37], but, in the context of diabetic foot, they still need to be characterized. The findings made it possible to identify the usefulness perceived by potential users and the specific confidence in the area of foot health. It should be noted that trust was associated with the presence of a nurse in the mobile technology programming team, which raises the question of whether the fact that the application was supported by that professional would have led the user to not actively seek information and guidance on self-care practices in other sources. Further studies are needed to validate this perception of trust on the part of users and understand whether the presence of nurses in the team of programmers satisfies the users to the point that they use the application as the sole source of information.

The study has several strengths and some limitations. The main advantage was the use of inductive content analysis. As this is a field of research that is still in its infancy, more discoveries were allowed to be included. Before indicating a limitation, it is important to highlight that qualitative studies

do not seek representative samples, but rather samples with the possibility of generating data that add real value. The sample was heterogeneous in terms of age and occupation. However, the participants mostly had 12 years of schooling. Therefore, the opinions of people with higher levels of education may not be adequately represented. It is known that the educational level can change the perception of people's needs regarding applications. Another limitation is that, although the age of the participants varied between 42 and 76 years old, most of them were non-elderly (elderly people accounted for 25% of the sample). Although that age group is the one most likely to use a mobile app, it is possible that seniors have needs and preferences that differ from those mentioned above.

CONCLUSION

This study identified the needs and preferences of people with T2DM regarding a mobile application to support foot self-care. The identification of three categories and nine subcategories highlighted fundamental nuances that can shape future application development in this domain. These ranged from the need for detailed information to essential functionalities to operationalize foot health self-care. Notably, participants prefer flexible and customizable applications, highlighting the need for adaptable technological solutions. The main advances and contributions of this study concern the construction of a panorama formed by a set of needs and preferences of potential users with T2DM. Based on these advances, nursing can catalyze a considerable change in the way care is provided, promoting a better quality of life for people with T2DM.

In this context, the key role of nursing is evident. As an indispensable mediator between technology and patients, it is responsible for recognizing quality requirements and integrating these new care technologies into the clinical setting. In teaching, it is essential that future nurses become familiar with these tools, preparing to guide patients in their use. In care, the integration of these applications into the care plan can improve patients' adherence to foot self-care outside of the clinical setting, providing more effective management of the condition. Furthermore, in management, nurses can request financial resources and training necessary to implement these technologies, ensuring that they are available to those who need them. In the research, it is suggested that nurses investigate the professionals' perspective on the requirements necessary for the application to become an effective tool to support self-care. Engaging key stakeholders and examining their views can help understand whether the roles considered important by people with T2DM align with what is considered important by professionals. Moreover, it would be very useful to develop personas so that programmers understand users' needs more comprehensively and, thus, design more appropriate solutions. In this regard, it will be possible to build more interactive and usable mobile applications over time from the perspective of foot health.

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The authors declare that there is no conflict of interest.

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Associate editor:
Luccas Melo de Souza

Received: 08.09.2023
Approved: 11.06.2023

Editor-in-chief:
João Lucas Campos de Oliveira