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Development and Assessment of an Application for Primary Care for Users with Diabetes Mellitus

Theme: Promotion and prevention.

Contribution to the area: Following the advancement of knowledge in health, the original character of this study is highlighted as innovative in the introduction of mobile technology based on a light-hard technology that contributes to consolidate and strengthen nursing in primary health care, constituting itself as an instrument of changes, above all, in the comprehensiveness of care. Even facing the scope of the protocol at the state level, in the case of Pernambuco, Brazil, the results of the study support the destination at lower levels to other regions of Brazil, by promoting the systematization of nursing care and consolidating primary nursing care practices. Furthermore, technological production will increase the scope for supporting theories in the field of nursing and information technology.

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ABSTRACT

Objective: To develop an application on primary nursing care for users with diabetes mellitus and to assess its usability in the light of the Unified Theory of Acceptance and Use of Technology. **Materials and methods:** A methodological study, which used a quantitative and cross-sectional approach, based on the Systematic Design of Instruction method. The product was validated for usability by 11 specialist nurses, using the System Usability Scale questionnaire, based on the Unified Theory of Acceptance and Use of Technology 2 by Venkatesh, Thong and Xu. **Results:** The application was developed through open and free frameworks, based on the updated content of the Nursing Protocol in Primary Care on Diabetes Mellitus, plus the International Classification of Nursing Practices in Public Health. In assessing usability, the application reached a score of 90 points, being classified on a scale of best achievable, with dimensions that ground the theoretical constructs. **Conclusions:** The technology named *Diabetes em Foco* (Diabetes in focus in English) is promising to improve and advance theoretical and practical knowledge, in addition to quick and easy access to the protocol, timely support for decision-making and strengthening the systematization of nursing care in primary health care.

KEYWORDS (Source: DeCS)

Information technology; mobile applications; primary health care; nursing care; diabetes *mellitus*.

Desarrollo y evaluación de una aplicación de atención primaria para usuarios con diabetes *mellitus*

RESUMEN

Objetivo: desarrollar una aplicación de atención primaria de enfermería para usuarios con diabetes *mellitus* y evaluar la usabilidad a la luz de la Teoría Unificada de Aceptación y Uso de la Tecnología. **Materiales y métodos:** estudio metodológico, que utilizó un enfoque cuantitativo y transversal, basado en el método de diseño instruccional sistemático. El producto fue validado para la usabilidad por 11 enfermeros especializadas, mediante el cuestionario de escala de usabilidad del sistema, basado en la Teoría Unificada de Aceptación y Uso de la Tecnología 2, de Venkatesh, Thong y Xu. **Resultados:** la aplicación se desarrolló por medio de *frameworks* abiertos y gratuitos, basados en el contenido actualizado del Protocolo de Enfermería en Atención Primaria sobre Diabetes *Mellitus*, más la Clasificación Internacional de Prácticas de Enfermería en Salud Pública. Al evaluar la usabilidad, la aplicación alcanzó un puntaje de 90 puntos, clasificándose en una escala de la mejor calidad posible, con dimensiones que sustentan las construcciones teóricas. **Conclusiones:** la tecnología llamada "Diabetes em foco" es prometedora para mejorar y avanzar en el conocimiento teórico y práctico, además del acceso rápido y fácil al protocolo, el apoyo oportuno para la toma de decisiones y el fortalecimiento de la sistematización de la atención de enfermería en atención primaria a la salud.

PALABRAS CLAVE (Fuente: DeCS)

Tecnología de la información; aplicaciones móviles; atención primaria a la salud; cuidados de enfermería; diabetes *mellitus*.

Desenvolvimento e avaliação de um aplicativo para os cuidados primários aos usuários com diabetes mellitus

RESUMO

Objetivo: desenvolver um aplicativo sobre cuidados primários de enfermagem aos usuários com diabetes *mellitus* e avaliar sua usabilidade à luz da Teoria Unificada de Aceitação e Uso de Tecnologia. **Materiais e métodos:** trata-se de um estudo metodológico, que utilizou uma abordagem quantitativa e de delineamento transversal, a partir do método *Design* Instrucional Sistemático. O produto foi validado quanto à usabilidade por 11 enfermeiros especialistas, por meio do questionário *System Usability Scale,* fundamentado pela Teoria Unificada de Aceitação e Uso de Tecnologia 2 de Venkatesh, Thong e Xu. **Resultados:** o aplicativo foi desenvolvido por meio de *frameworks* abertos e sem custo, baseado no conteúdo atualizado do Protocolo de Enfermagem na Atenção Primária sobre Diabetes *Mellitus*, acrescido da Classificação Internacional das Práticas de Enfermagem na Saúde Coletiva. Na avaliação da usabilidade, o aplicativo alcançou um *score* de 90 pontos, sendo classificado numa escala de melhor alcançável, com dimensões que alicerçam os constructos teóricos. **Conclusões:** a tecnologia denominada "Diabetes em foco" apresenta-se promissora para melhorar e avançar o conhecimento teórico-prático, além do acesso rápido e facilitado ao protocolo, do apoio oportuno à tomada de decisões e do fortalecimento da sistematização da assistência de enfermagem na atenção primária à saúde.

PALAVRAS-CHAVE (Fonte: DeCS)

Tecnologia da informação; aplicativos móveis; atenção primária à saúde; cuidados de enfermagem; diabetes *mellitus*.

Introduction

Diabetes mellitus (DM) is a chronic, epidemiologically relevant disease, characterized as an important public health problem with high prevalence and incidence at the global level (1, 2).

Currently, according to the International Diabetes Federation (3), 1 out of 11 adults (463 million people) have the disease; 1 out of 6 live births is affected by gestational diabetes and, every six seconds, a person with this condition dies. For 2045, the expectation is 642 million new cases, with developing countries being the most affected. In Brazil, it is estimated that 14.3 million people have the disease, however, 7.15 million have no previous diagnosis (3).

These data show the relevance and the increase of this disease in the population's morbidity, which points the need for care reorganization and qualification for users, since an incorrect treatment due to assistance that does not consider the specificities of its chronicity can cause various complications that, besides causing major economic and social impacts on health services, are among the main causes of mortality, disability, hospital admissions and poor quality of life (4).

The insertion and expansion of knowledge and understanding of health professionals, specifically nurses in Primary Health Care (PHC), about this disease are crucial, since this level of care is characterized by the Ministry of Health of Brazil as the main gateway to services, in addition to having high resolution and coordinating actions for promotion, prevention, protection, treatment and rehabilitation in health care. In this sense, nursing, whose responsibility is to directly monitor PHC users, is the primary health care provider in a timely and essential scenario for the tracking and monitoring of the main diseases, such as DM and the encouragement of self-care (5).

Adequate care, which considers the specificities of the disease, favors a reduction in hospitalization rates and improves the quality of life of the population, as well as the socio-economic impacts of health services (6).

Information and Communication Technologies (ICTs) in health can contribute to care, to the dissemination of information and the timing of communication (7-10). With its arrival, mobile devices, especially applications, have been notorious in recent years, mainly with the increasing use of smartphones, which, besides contributing to reducing mobility limitations, are available to users 24 hours a day, and to provide users in a timing and accurate manner, information for their work (11). Thus, in this study, an application was chosen, which can be a strong ally for the systematization of nursing care.

In the health field, these technologies are not a substitute for professional know-how but constitute an additional device, which favors improvement in clinical decision-making and access to information, as well as contributing to the implementation of qualified conducts (9,12).

Many theoretical models are studied to understand the acceptance and use of technologies, including the Unified Theory of Acceptance and Use of Technology (UTAUT), which emerges intending to try to understand the constructs that involve the acceptance and use of a technological tool (13-15).

Proposed by Venkatesh et al. (16), UTAUT presents four constructs: performance expectancy, effort expectancy, social influence and facilitating conditions, by four moderators: age, gender, experience and intention to analyze the influence of constructs in the development of behavioral intention for the adhesion of a technology. Then, Venkatesh et al. (17) proposed and tested UTAUT2, which incorporated new key factors such as hedonic motivation, price value, and habit (14, 15).

The use and acceptance of support technologies by nursing, the systematization of primary care, as well as the consolidation of a care network, provide PHC nurses with an effective way to act in the tracking, monitoring and prevention of DM complications during their daily practices, besides preventing users from being exposed to unnecessary consultations and/or procedures.

Given the above, this research aims to develop an application on primary nursing care for users with DM and assess its usability in the light of UTAUT2.

Materials and methods

This is a methodological study of a quantitative and cross-sectional approach for the usability assessment, carried out from January 2017 to October 2018, in the state of Pernambuco, Brazil.

To achieve the above-mentioned objectives, the application development process emerged in one of the most widespread methods (18): the Systematic Design of Instruction (SDI), by Walter Dick and Lou M. Carey (19), as follow: (i) analysis and survey of the requirements for the elaboration of the application; (ii) design and development of screen prototyping; (iii) implementation; (iv) assessment and usability (19).

Analysis and survey of the requirements for the elaboration of the application

In this step, it was established how the information would be displayed, the content to be available and the tools used. This moment had the participation of a research group composed of 1 systems developer and 8 nursing professionals, the authors of the study and specialists on the subject, for a better projection of the information, just so all the requirements to better assist the health services professionals were arranged simply and objectively. For this, the methods recommended by the Human Centered Design (HCD) Toolkit were used, which lists forms and tools to guide the processes of innovation and design in the creation of projects (20).

The application, named by the authors as *Diabetes em Foco* (from now on in this paper will be written as Diabetes in focus), has a uniform language and is based on the Nursing Protocol in PHC of the Regional Nursing Council of the State of Pernambuco (COREn-PE)[10], especially in the chapter on DM, developed from the selection of updated content with guidelines, reports, protocols and manuals on strategies for primary nursing care, in an attempt to provide a standardization of care and enable, through the International Classification of Nursing Practices in Collective Health (CIPESC) and the International Classification of Primary Care (CIAP), a health care design system.

CIPESC, as an innovative practice in public health, enables nurses, through its potentialities, to formulate diagnoses, intensify their interventions and carry out health promotion, prevention, protection, and rehabilitation actions. Therefore, it is an instrument of great concern for research and teaching, as it guides the systematization of nursing care in primary care (21).

The CIAP, in the context of care, focuses on the individual's biopsychosocial characteristics, by making available terms that do not replace nursing diagnoses, but encompass the most frequent problems of PHC (22).

In summary, to assist the demands of professionals in their clinical practice, the application has a brief explanation about diabetes mellitus and its types; the processes of tracking, monitoring and preventing complications (diabetic foot); user embracement; exams; prescription; glycemic values; insulin therapy; nutritional education; CIAP and CIPESC.

At first, in the planning for the execution of the application, its logo was created without cost (Figure 1), to expose graphically, its main goal.

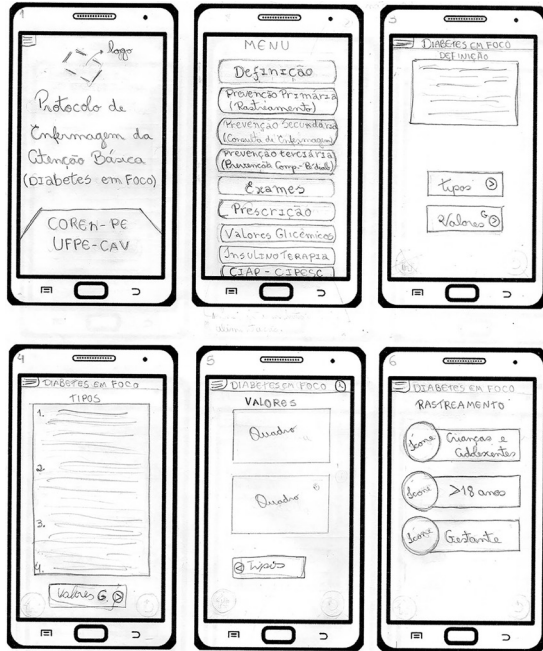**Figure 1.** Diabetes em Foco application logo.

Source: Diabetes in focus APP.

Therefore, to include the largest number of users and facilitate access to information without time and space restrictions, as well as to achieve popularity, it was decided to build an application available offline and with availability for the Android operating system.

Design and development of screen prototyping

In this phase, to provide initial modeling, which could undergo modifications during the development of the application, the screens and flows of the application were manually designed (Figure 2). Then, the AdminLTE[11] template was chosen, as it covered all the needs of the prototype planned by the team.

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10 This document was prepared by a group of 15 specialist nurses and PHC workers from the state of Pernambuco, selected in 2016 by the competent agency. It has 15 chapters in the form of a flow chart. For more information, check the COREn-PE website: http://www.coren-pe.gov.br/novo/protocolo-de-enfermagem-na-atencao-basico

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11 AdminLTE template: https://almsaeedstudio.com

Figure 2. Prototype screens for the Diabetes in focus application

Source: Own elaboration.

To provide users with satisfaction using the tool, the Extreme Programming (XP) was the software engineering selected for the development of the application. XP is an agile and fast execution methodology, created in the United States to produce good quality systems in less time, with continuous feedback from software production in short series of releases, which allows errors or failures in the system to be corrected before proceeding to a new step (23).

For the application development, Apache Cordova version 7.0.1 frameworks and Angular version 4.0 were used; in addition to being free tools, they allow the developer to use JavaScript programming languages, HTML5 (HyperText Markup Language) and CSS3 (Cascading Style Sheets) open and with extensive online support available to define the appearance, structure and the application functioning (24).

Implementation

After the software was finalized, the application was announced and made available free of charge on the Play Store[12], so

12 Google online store where free applications for the Android system are available. Diabetes in focus application: https://play.google.com/store/apps/details?id=br.com.diabetesemfoco

that its access, by the specialist nurses who developed the PHC protocol of COREn-PE, was facilitated.

The sampling was selected in a non-randomly, by intentionality criterion, since the choice to work with an intentional non-probabilistic sample is based on the proposal of free and spontaneous participation, consisting of 11 specialist nurses in the subject of the study, according to the Brazilian Standard ABNT ISO/IEC 25062:2011, which regulates the evaluation of software quality, which recommends a sample of at least eight volunteers in the survey (6).

The study also adopted the criteria proposed by Jasper (25) regarding the characteristics of, at least, two criteria among degree, clinical skills, experience in the subject under discussion, specialized knowledge, approval in a specific test, among others (24).

The selection of judges was carried out by consulting the Lattes Platform curriculum (National Council for Scientific and Technological Development - CNPq), in the search for individuals who met the above criteria in the areas of family health, public or collective health, technologies in health and diabetes, besides being authors of the Nursing Protocol in PHC of COREn-PE.

An invitation letter and the link generated by the Google Docs form to access the version of the usability scale was sent by email to each selected judge. The judges' electronic addresses were found through the Lattes Platform (CNPq), which was free and public access.

Their participation was voluntary, based on free and spontaneous acceptance, by signing the Informed Consent, by completing all the requirements in the usability questionnaire, as well as in the professional characterization session.

Assessment and usability

As a tool for assessing usability, the System Usability Scale (SUS) was used, a validated questionnaire, simple, reliable, easy to manage, available in Brazilian Portuguese and developed by John Brooke (1986) based on ten statements with answer options on a Likert scale, which ranges from one to five: 1 - strongly disagree; 2 - partially disagree; 3 –neutral; 4 - partially agree and 5 - strongly agree (26-29). For the calculation of the SUS score, of the odd questions (1, 3, 5, 7 and 9), written positively regard-

ing the aspects of the application, one point is subtracted from the scale marked by the user, however, for the even questions (2, 4, 6, 8 and 10), written negatively, the score is five minus the scale position marked by the user. Then, the individual scores of the ten statements of each participant are added and the result is multiplied by 2.5 to reach the total system usability scale (SUS Score), that is, the satisfaction index that varies from 0 to 100 points (26, 27).

Systems with SUS Score between 0 and 25 points are classified as the worst achievable; 26 to 39, bad; 40 to 52, acceptable; from 53 to 74, good; 75 to 85, excellent; 86 to 100 is considered the best achievable (30).

According to Tenório et al. (31), the use of SUS also enables to analyze the five main characteristics for usability indicated by Nielsen J. (32): Assess the ease of knowledge of the system - which is in items 3, 4, 7 and 10; verify the efficiency of the system - through questions 5, 6 and 8; identify inconsistencies - based on question 6; evaluate the ease of memorization - assessed through question 2; verify user satisfaction - punctuated by questions 1, 4 and 9 of SUS.

The usability test is a primary step for processing essential aspects in the indication of software quality, since the particularization of user satisfaction is also essential for a good product result. Therefore, to score the individual usability characteristics, the responses obtained were multiplied by 25, draw the range of possible values from 0 to 100.

The mean scores of the questions of each participant were studied using descriptive analysis, and the results were exhibited in tables in Microsoft Office Excel 2016 for a better understanding of the research information. SUS analysis was based on UTAUT2, a medium-range and predictive theory that contextualizes changes in a phenomenon, how they happen and go beyond the explanation and prediction of concepts (33).

The usability assessment through UTAUT2 in nursing interventions is promising for the growing technological production in this science; a contribution so that future research can explain the impact of the real use of technology in the educational, assistance and managerial fields, likewise identifying the level of satisfaction of nurses regarding the attitudes, emotions and feelings provoked by these changes in their daily activities (7).

The project was sent to the Research Ethics Committee of the Health Sciences Center of the Federal University of Pernambuco and approved with the Certificate of Presentation for Ethical Appreciation (CAAE) 80662617.4.0000.5208, according to the ethical precepts of Resolution 466, December 12th, 2012, of the National Health Council of Brazil, in research with human beings (34).

Results and discussion

The application Diabetes in focus takes up 53 Megabytes of storage, it was elaborated from the manual prototyping of approximately 60 screens (Figure 2), it provides nurses with an aid tool for the processes of tracking, monitoring and preventing complications (diabetic foot) in users with DM in primary care.

Currently, there is a diffusion of technologies and applications that cooperate in the organization and systematization of health care, however, few are related to clinical practice. The application Diabetes in focus, as well as the application "Caring tech" (foot exams) (6), helps nurses, through data collection, in the assessment and classification of the risk of diabetic foot in general health care services. Moreover, it includes timely information for the optimization of care and a continuous training-update process to identify clinical findings and proposals for immediate necessary interventions to face the problem.

In addition to presenting the main screen, on which it is possible to access the main topics addressed by the protocol, the Diabetes in focus application has a lateral menu that facilitates the user's navigation while using the application, as the theme can be easily switched. It also has extra resources, such as videos, images, information icons, a communication channel and a calculator that, from the combination of the body mass index and the abdominal circumference values, enables to assess the risk of type 2 DM and propose specific assistance conducts to prevent its complications (Figure 3). Also, its graphical interface was designed so that the options for accessing information were clear and objective.

In the research, the sample for usability assessment was composed of 11 nurses, with a mean age of 36.3 years (SD $\pm$ 6.9) and range from 28 to 54 years. Regarding the length of experience in PHC, the mean was 9.1 years (SD $\pm$ 6.5). It is noteworthy that only 27.2 %, that is, three of these participants, have developed or worked with projects aimed at diabetes before, as well as in the health technologies area.

Figure 3. Screens of the application Diabetes in focus[13]

Source: https://play.google.com/store/apps/details?id=br.com.diabetesemfoco
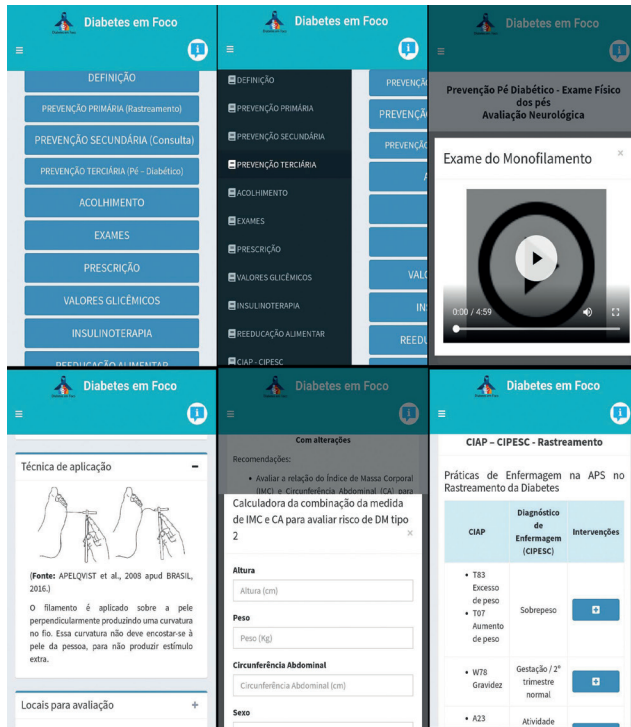
Providing qualification measures for nurses' roles implies recognizing their profile and performance in primary health care in Brazil, and thus developing changes aimed at comprehensive care, implementation of interventions in the face of risk factors, disease prevention, promotion of health and quality of life (35).

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13 SUBTITLE

a. Main screen with information on: Definition of DM, Primary, secondary, and tertiary prevention, User embracement, Exams, Prescription, Glycemic values, Insulin therapy, Eating reeducation and CIAP — CIPESC.

b. Information from the side menu: Definition of DM, Primary, secondary, and tertiary prevention, Reception, Exams, Prescription, Glycemic values, Insulin therapy, eating reeducation, CIAP - CIPESC, Communication channel, References and About the application.

c. Presentation of the "Monofilament testing" video.

d. Calculator to combine Body Mass Index and waist circumference to assess the risk of type 2 DM.

e. Information on the monofilament testing for neurological evaluation in patients affected by peripheral neuropathy due to DM.

f. Information about CIAP - CIPESC for the PHC nursing practice in screening DM.

The variables "age" and "experience in the use of technologies" are aspects to be considered from the UTAUT2, as they can interfere in the attitude towards the expected behavior, as well as explain the acceptance of technology as a requirement for its use (16, 17).

Although in this study, the number of professionals who have already developed or worked with projects aimed at the area of health technologies is low, ICTs (36) appear as potentials in permanent education, in access to information for the dynamization of care, in innovation and the implementation of actions to improve the activities of professionals who are in contact with people with DM (37).

To guarantee the usability of the application, besides the quality and satisfaction index of final users, through the statistical analysis of the answers obtained from the application of the SUS questionnaire, it was observed that the total value referring to the mean of all scores was 90, mode and median 92.5 and a standard deviation of ± 10.1, with a range of 65 to 100.

Thus, as a way to categorize the average usability value resulting from the distribution among the participants, 1 participant (9.09 %) classified it as "good"; 2 (18.2 %), as "excellent" and 8 of the participants (72.7 %), as "best achievable" (Table 1). Therefore, the application Diabetes in focus, within the established parameters, reached the maximum score in terms of usability, since the highest percentages are between 86 and 100 on the categorization scale.

Table 1. Categorization scale and usability classification of the Diabetes in focus application, by PHC nurses who collaborated in the construction of the COREn-PE Nursing Protocol. Pernambuco, Brazil, 2018

Categorization scale	Frequency		Usability classification
	N	%	
0-25	-	-	Worst achievable
26-39	-	-	Bad
40-52	-	-	Acceptable
53-74	1	9.09	Good
75-85	2	18.2	Excellent
86-100	8	72.7	Best achievable

Source: own elaboration.

This result is in line with the findings of the evaluation of the "Oncoaudit" application, developed as consultation for chemotherapy drugs to assist in the nursing audit of hospital bills. This application, using SUS, obtained an average score of 90 (SD ± 5), classified within the usability scale as "best achievable". Therefore, it is considered by nurses to be an easy-to-use, useful, complete, and information-relevant device (29).

For the usability assessment of a website on post-operative breathing exercises (38), the average score was 85.5 (SD ± 6.6). Therefore, just like the application Diabetes in focus, it presents a degree of usability on a "better attainable" scale.

Given these findings, it is confirmed that the benefits of implementing SUS, although it is used in small sample sizes and for the evaluation of different types of technological tools, make it a reliable instrument, because, in addition to being simple, free and easy to manage, it presents understandable results, as well as a reduced number of questions, which can increase the participants' adherence in the research (27, 28).

Usability is understood as a set of quality of measurement of how a technological tool can be used by specific users, to achieve objectives that favor learning, for its efficiency, identification of inconsistencies, ease of memorization and user satisfaction (32).

It is noteworthy that, aside from the relevance of developing technological resources for different contexts, assessing their usability, as for tools with good acceptance and usefulness, before making them available to end-users, is also a central step for achieving good results (39).

Given the average usability mean score reached by converting the possible value ranges from 0 to 100, as a way of quantifying and ratifying the quality components indicated by Nielsen J. (32), the study's findings show a range of 87.75 to 90.75 (Table 2). The application is an easy-to-learn technological resource and reached satisfaction. However, although the speed in the execution of the tasks, the ease of memorization and the inconsistencies have presented value below the general average of usability, the application reached a rating of best achievable.

A virtual learning environment (27), which partially corroborated with the findings of the present research, was created to evaluate the quality of the system provided by the *Ouro Moderno* company, with the average SUS score of 70, 76.05 for learning, 76.45 for efficiency, 76.13 for memorization, 74.68 for inconsistency and 77.85 for satisfaction. However, participants reported difficulties in using this system and technical failures related to hardware and network configurations. Because of this negative assessment, they made updates and created a support manual on the platform usage, to answer questions and assist in reducing the need for online technical support (27).

Table 2. Usability characteristic of the Diabetes in focus application assessment by SUS. Pernambuco, Brazil, 2018

Usability characteristic	Mean	Definition
Ease of learning	90.75	An easy-to-use system when used for the first time.
Efficiency	87.75	Speed in the execution of the established tasks.
Inconsistencies	88.50	Absence of errors.
Ease of memorization	88.50	An easy to execute system even after a long period without using it.
Satisfaction	90.75	Neat design.

Source: own elaboration.

The analysis of the SUS dimensions justifies the behavior, acceptance and use of technologies according to UTAUT2. From the performance expectancy, which demonstrates how the applicability of technology will provide benefits in certain activities, an excellent assessment of this theoretical construct is observed based on the usability characteristics "efficiency" (87.75) and "inconsistencies" (88.5). The effort expectancy, defined as the ease of usability of the technologies, could be represented by the "ease of learning" (90.75) and the "ease of memorization" (88.5). The facilitating conditions, the resources and support available to determine the use of technology and the hedonic motivation, which emphasize utility, the pleasure that the use of technology can provide, were represented by the usability characteristic "satisfaction" (90,75). It is worth mentioning that the use of the SUS questionnaire did not allow the justification for the constructs of social influence, price/cost of consumption and habit (16, 17).

Regarding the sum of each item that varies from 36 to 42 points (Table 3), the application Diabetes in focus achieved better results, in which the highest percentages are found in the odd questions, which results in another positive aspect. Among the positive feedback of the items, which indicate relevant aspects in the developed software, are: "1 - I think I would like to use this system often", "3 - I found the system easy to use", "5 - I found that the system features are well integrated", "7 - I believe that most people will learn to use this system quickly" and "9 - I felt very confident using this system".

Table 3. Results related to the usability of the Diabetes in focus application according to SUS items. Pernambuco, Brazil, 2018

Questions	SUS sum
1	41
2	39
3	40
4	39
5	41
6	39
7	42
8	36
9	40
10	39

Source: own elaboration.

Users of a smartphone application to manage type 1 diabetes have shown general dissatisfaction with the technology currently available, despite their interest in using tools for diabetes from the patient's perspective. To be used at its full, the existing technology must be adapted to better meet the needs of these patients, as well as to innovate in data sharing, between users and health professionals (40, 41).

In addition to the attribution of values, a questionnaire was made available to the evaluators to propose suggestions and comments regarding the application. So, when asked what their opinion about the app, if they would like to suggest, add or remove something, they mentioned that the Diabetes in focus app is an excellent tool, easy to manage, instructive, ideal, practical, with a very well-based updated content, objective, agile, resolute, useful, informative, of extreme applicability importance, as well as a resource that will favor and support nursing conduct in the scope of primary care.

However, nurses also suggested aspects for improvement, such as: updating some screening parameters and adding information on gestational diabetes; as future projects, making the application available for the iOS operating system. These aspects, except the last one, were revised and updated in new versions of the application, which contributed to better usability and improvement of the tool.

All of these feedbacks are of great value, because, in addition to satisfying researchers, they allow the organization, complementation, updating of information, as well as helping to identify weaknesses and opportunities for improvements to make the application qualified for use.

Conclusions

The application Diabetes in focus, on primary nursing care for users with DM based on the nursing protocol in the PHC of COREn-PE, was assessed with a maximum degree of usability on a better achievable scale, with better percentages in the ease of learning and satisfaction items, and improvement aspect in the efficiency, ease of memorization and inconsistencies items.

Because of the growing use of ICTs in several areas such as health, the results of this study contributed to expand knowledge about the need of the development, evaluation and theoretical basis of technological tools that align theoretical and practical information, in addition to minimizing difficulties and needs of nurses concerning clinical practice and facilitate access to the nursing protocol.

As a limitation in the study, we can highlight the resistance of some professionals in the use of ICTs in their work process, as well as the availability of the application only for the Android operating system.

In this scenario, the intention is to promote interoperability of the application, adapting this tool to operate with other systems, to provide the opportunity for information exchange and decision making with a greater scientific basis. It is also designed to raise

nurses' attention for the use of the application in health care, aiming to improve their qualification in the systematization of nursing care for primary health care for people with DM.

The critical analysis by UTAUT2 provided perspectives for expanding its use in the nursing field, thus contributing to the practice, research, education and management at different levels of the nurse's performance, also to the development of new knowledge and reflections on the use and acceptance of health technologies.

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