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Original Article

Inform Diabetes: validity of content on a web portal for self-care*

Informa Diabetes: validade de conteúdo de um portal *web* para o autocuidado

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ABSTRACT

Objective: to develop and validate the content of an informative and collaborative portal to support self-care for people with type 2 diabetes. **Methods:** a methodological study based on the seven self-care behaviors was conducted with nine technical professionals and content specialists, using two validation instruments: one for health education content and another for the appearance of health education technology. **Results:** the Inform Diabetes Portal presented Content Validity Indices (0.83) and appearance (1.00). It contains 12 pages, 76 figures, six forums, one video based on the seven self-care behaviors, three sessions with quizzes, a dictionary with technical terms, and a "Did you know?" tab with interesting facts about diabetes. **Conclusion:** the Inform Diabetes Portal was deemed valid in terms of content and is a reliable, informative, and collaborative technological tool that promotes and supports self-care in health for individuals with type 2 diabetes. **Contributions to practice:** the Inform Diabetes Portal can be a valuable resource in both primary and specialized care, providing guidance for patients with diabetes and supporting health professionals in their clinical care.

Descriptors: Validation Study; Health Education; Diabetes Mellitus; Biomedical Technology; Self Care.

RESUMO

Objetivo: desenvolver e validar o conteúdo de um portal informativo e colaborativo para subsidiar o autocuidado de pessoas com diabetes tipo 2. **Métodos:** estudo metodológico com base nos sete comportamentos do autocuidado, realizado com nove profissionais técnicos e especialistas no conteúdo, utilizando dois instrumentos de validação: um para conteúdo educativo em saúde e outro para a aparência de tecnologia educacional em saúde. **Resultados:** O Portal Informa Diabetes apresentou Índices de Validade de Conteúdo (0,83) e aparência (1,00). Contém 12 páginas, 76 figuras, seis fóruns, um vídeo, baseados nos sete comportamentos do autocuidado, três sessões com *quiz*, um dicionário com termos técnicos e uma aba "Você sabia?" com curiosidades acerca do diabetes. **Conclusão:** o Portal Informa Diabetes foi considerado válido em conteúdo e apresenta-se como uma ferramenta tecnológica informativa e colaborativa válida que propicia e subsidia o autocuidado em saúde à pessoa com diabetes tipo 2. **Contribuições para a prática:** o Portal Informa Diabetes pode ser um recurso valioso tanto na atenção primária quanto na especializada para apoiar a orientação aos pacientes com diabetes e auxiliar os profissionais de saúde no cuidado clínico.

Descritores: Estudos de Validação; Educação em Saúde; Diabetes Mellitus; Tecnologia Biomédica; Autocuidado.

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Introduction

Health technology has become a rich and diverse tool for intervening in and supporting healthcare practices. In the field of diabetes mellitus (DM), the use of websites, apps, and tech devices has become increasingly necessary and essential for diagnosing, treating, and predicting the disease[1]. It's worth noting that the growing number of tech studies is mainly focused on supporting diabetes care, given its chronic nature and increasing epidemiology[2].

Thus, in 2019, the World Health Organization (WHO) issued a guideline on the use of information technologies as a resource to strengthen health education actions, mitigate and reduce the risks of complications, and expand the possibilities for care actions, considering an expanded concept of health[3].

In this context, DM is one of the chronic diseases that has long been a significant public health problem. The global prevalence of adults living with DM is 589 million, with projections for 2050 of growth to 853 million in the world population, generating an increase in the demand for health services, which makes well-founded, planned, and continuous care essential[4].

Given this scenario, the Association of Diabetes Care & Education Specialists (ADCES) has developed an evidence-based tool that identifies key areas of attention and skills that individuals with diabetes should focus on developing to achieve reasonable glycemic control and improved coexistence with this clinical condition. This tool proposes Seven Self-Care Behaviors for Good Diabetes Management that are interconnected and encouraged among health practices, namely: 1- Healthy eating, 2- Physical activity, 3- Monitoring levels, 4- Taking medication, 5- Solving problems, 6- Reducing risks, and 7- Adapting healthily[5].

Given this, people with diabetes need to be aware of the needs related to their diagnosis to avoid worsening their health and the importance of self-care monitoring. Thus, this activity requires attention, safety, and routine to track symptoms, signs, and actions[6]. Digital technologies, as well as their effects and applicability, have been shown to positively influence the promotion of self-care in individuals with diabetes[2].

In addition, there are web-based systems that provide information on self-care and also create channels of communication with visitors, such as the Self-care Management Health Education e-Learning Program (ScMHEeLP)[7], My Health Education & Resources Online (MyHERO)[8], and The METABO system, a system similar to an electronic diary filled out by patients to support diabetes management[9].

However, there is currently no *web* portal that clearly and understandably brings together all this information, confirming the need to develop a comprehensive and accessible resource to fill this gap. What is available are several applications[10], self-management programs[11-12], and platforms that address specific issues related to diabetes, such as foot care, complications of chronic kidney disease[13], disease acceptance[14], and interventions through text messages[15], confirming the originality of the study.

All of them present a specific theme, without, however, addressing other behaviors, which justifies this study, which seeks to present a current and practical technology that adults with type 2 diabetes can easily use. This technology can assist in the care of these individuals and be utilized in both primary and specialized services, as well as support professionals in clinical care and patient self-care.

Thus, the objective of this article was to develop and validate the content of an informative and collaborative portal to support self-care for people with type 2 diabetes.

Methods

A methodological study was conducted from May 2022 to June 2023, based on the theoretical and methodological framework of User-Centered Design (UCD), a design process that focuses on users and solutions to their problems, considering their primary needs[16], which resulted in the creation of an informative and collaborative portal.

To develop technology, field research was conducted at a specialized diabetes care service and two primary health care units to assess the level of health literacy and the primary needs reported for self-care by individuals with diabetes.

Subsequently, a scope review was conducted to identify the health needs of people with diabetes[17], as well as consultations with reference materials in the field, such as guidelines from the Brazilian Diabetes Society[18], the American Diabetes Association[19], and the International Federation Diabetes[20].

A programmer and two web designers worked with the authors to build the *web* portal. The visual identity and some figures were taken from the website https://www.freepik.com/, where images are provided for use.

Two groups of professionals participated in the content validation process: content judges and technicians. The content judges were selected based on at least two of the following criteria: having developed prevention and/or health promotion activities aimed at people with diabetes for at least 10 years; having published scientific papers on DM and/or the development and validation of educational materials; being a diabetes specialist and having a master's or doctoral degree with scientific output in the field of diabetes or educational technology.

For technical judges, the following criteria were adopted: training in the areas of design and information technology; published work on the validation or development of digital educational materials; experience in design and/or marketing; and expertise in graphic design or information technology[21].

The judges were selected for convenience and by snowball sampling, after an initial search on the Lattes platform of the National Council for Scientific and Technological Development. To delimit the sample, the criterion found in the literature, which requires between 6 and 20 judges, was used[22].

Forty-three and 50 invitations were sent to content judges and technical judges, respectively. Nine judges responded and proceeded to analyze the portal. Of these, eight participants were selected for the second round of validation, which focused on evaluating only those aspects that did not achieve adequate agreement in the first round.

The portal was evaluated using the Health Education Content Validation Instrument (IVCES)[23] and the Health Education Technology Appearance Validation Instrument (IVATES)[24]. The IVCES consists of 18 items divided into three domains: objectives (five), structure/presentation (10), and relevance (3), with three types of responses and the following ratings: 0 = disagree; 1 = partially agree; 2 = totally agree[23]. IVATES, on the other hand, has 12 items arranged on a 5-point Likert scale, ranging from "strongly disagree" to "strongly agree"[24]. For qualitative data, there was an open field for judges to provide comments and suggestions they considered relevant.

These instruments and a characterization form were inserted into the Google Forms platform, which remained open for 58 days due to the judges' delay in responding, even after messages and reminders for evaluation.

Data analysis was performed through content validation carried out by the judges, who calculated the Content Validity Index (CVI). A global CVI equal to or greater than 0.80 (22) was adopted as the cutoff point. The calculations were performed using SPSS software, version 20.0.

The research was approved by the Ethics and Research Committee of the State University of Ceará, with opinion number 5,349,334/2022, Certificate of Ethical Review: 55871522.3.0000.5534, in accordance with Resolution 466/2012 of the National Health Council.

Results

During the construction phase, the portal was named "Inform Diabetes" due to its educational function, which is to provide relevant information about diabetes to visitors. The portal was built on the Heastgator platform and can be found at the following web address: https://www.informadiabetes.com.br/.

For the cards and buttons, which are command

elements for user interaction, light blue, dark blue, gray, and white were used in addition to the logo colors. Three types of buttons were created: one to indicate the selected section, another to continue reading the content in the *post*, and a third button that encourages visitors to continue reading and browsing the site.

The portal comprises a total of 12 main pages (posts), covering essential content, as well as six forums that pose questions to promote interaction and active participation by visitors, and a video created for the portal that addressed the first self-care behavior of "adapting healthily."

The content was organized according to the most common needs identified in the field research, following this sequence: introduction to diabetes, adapting healthily, eating healthily, practicing physical activity, using medication, monitoring levels, reducing risks, and solving problems.

There is also an "About me" tab with information about the project's creators; a "Did you know?" tab with interesting facts about diabetes; a quiz designed to measure knowledge about diabetes; and a tab with technical terms entitled "Diabetes dictionary."

Each page was finalized with national bibliographic references and the inclusion of new evidence on the topic, identified in the literature review.

Nine judges participated in the validation phase of the portal, six of whom were content judges and three were technical judges. All were women (90%), aged between 33 and 60, with a predominance of master's degrees (44.4%), and most had already participated in validation processes (88.8%). There was participation from the states of Rio de Janeiro (3, or 33.3%), São Paulo (2, or 22%), Santa Catarina, Minas Gerais, Rio Grande Sul, and Ceará, each with 1 (11%) participation for each state.

Of the content judges, five (83.3%) were nurses and six (100%) were diabetes specialists, with between nine and 37 years of training. Of note is the participation of one (16.6%) nutritionist among the evaluators. The technical judges were two researchers (66.6%) and two graphic design specialists (66.6%) with 15 years of experience.

Table 1 presents information on content validation by domains and items, namely: Objectives (1 to 5); Structure and presentation (6 to 15); and Relevance (16 to 18).

Table 1 – Content validation of the Informa Diabetes portal (n=9). Fortaleza, CE, Brazil, 2023

Items	CVI*	IVC
	Round 1	Round 2
Field: Objectives		
1. Contemplates proposed theme	0.5	1.00
2. It is suitable for the teaching-learning process	0.83	-
3. Clears up doubts about the subject matter	0.5	1.00
4. Provides reflection on the topic	0.83	-
5. The content encourages behavior change	0.83	-
Field: Structure and presentation		
6. language appropriate to the target audience (people with type 2 diabetes)	0.83	-
7. Language appropriate to the educational material	0.5	0.83
8. Interactive language, allowing active involvement in the educational process	0.33	0.83
9. Correct information	0.16	0.66
10. Objective information	1.00	-
11. Clarifying information	0.5	0.5
12. Necessary information	0.83	-
13. Logical sequence of ideas	1.00	-
14. Current topic	0.83	-
15. Appropriate text size	0.66	1.00
Domain: Relevance		
16. Stimulates or learned	1.00	-
17. Contributes to knowledge in the field	0.83	-
18. Sparks interest in the topic	1.00	-
Overall agreement	0.72	0.83

*Content Validity Index

The overall CVI was considered by domain of the instrument. In the first round, the CVI was lower than expected, so a second round of validation was carried out, specifically for domains 1 (Objectives) and 2 (Structure/Presentation). Thus, the first and second domains were validated only in the second round.

Thus, the first and second domains were validated only in the second round. After the second round, the overall CVI was CVI = 0.89 for the objectives domain and CVI = 0.83 for structure/presentation. The third domain, relevance, was validated in the first round with an overall CVI = 0.94.

Thus, the second round aimed to validate the changes made to the portal, especially in relation to spelling corrections and suggestions made by the judges (Figure 1).

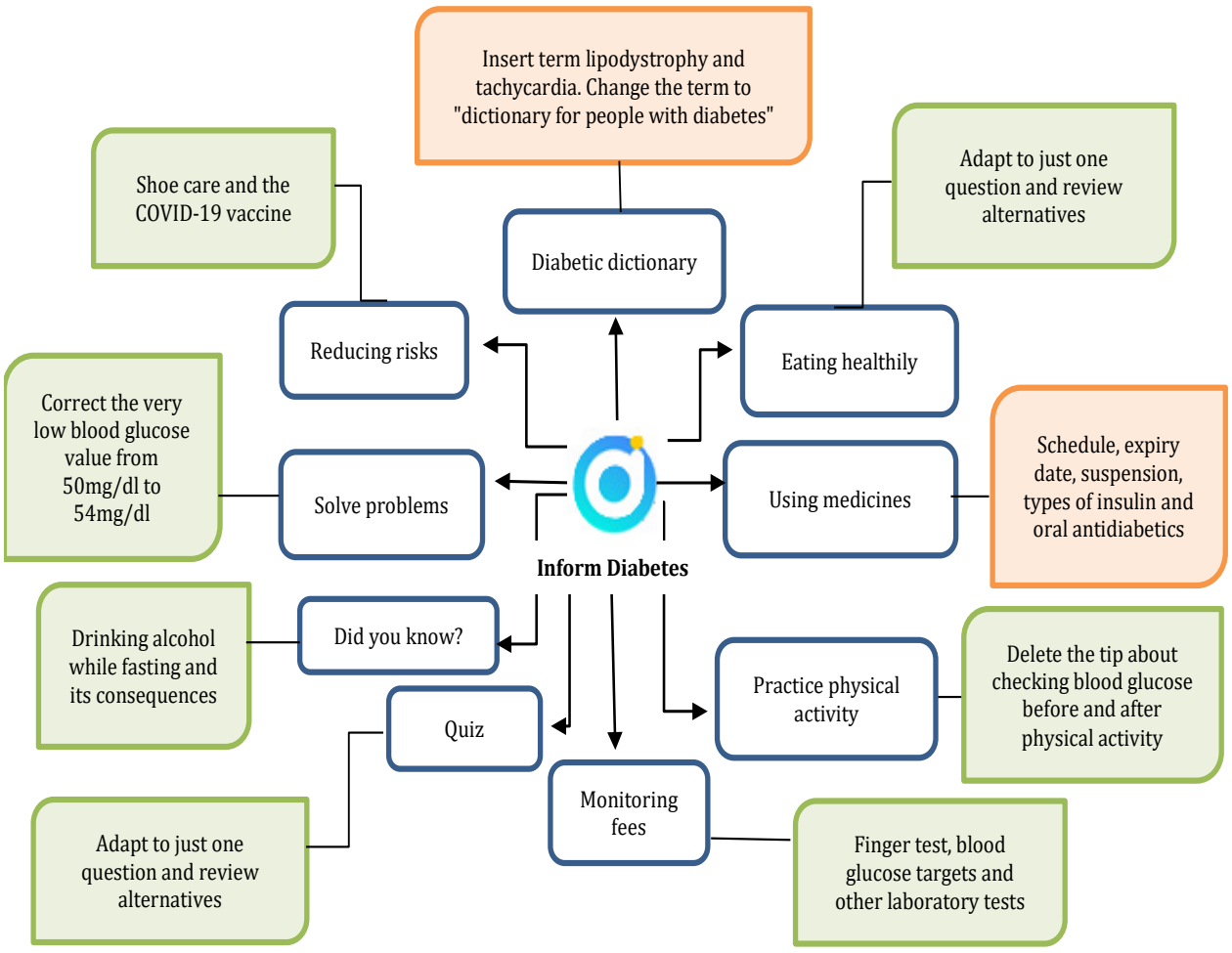


Figure 1 – Judges' suggestions for the first round of validation of the Inform Diabetes web portal. Fortaleza, CE, Brazil, 2023

The suggestions highlighted in green were accepted, while those highlighted in orange were partially accepted. Suggestions regarding oral medication classes were not accepted, as this information was considered too technical for the target audience and could cause confusion. The change to the term "diabetic dictionary" was also rejected, as it was considered a less appealing term than the judge's suggestion.

Changes were also made to the appearance of the portal, such as font size, colors, image replacements, and the application of more interactive tools that could be accessible to a visually impaired audience. There was also introductory content on diabetes and its types.

The suggestions of the technical judges who evaluated the appearance of the portal reaffirmed the importance of presenting more realistic images of food and other topics presented in behaviors that represent the ethnic diversity of diabetes. They also suggested improvements in the contrast of the portal. For this reason, most of the illustrations on the portal were replaced with more realistic, high-quality images. The following are the judges' suggestions regarding the appearance of the Inform Diabetes website: *The biggest problem is the contrast between the background and the typography and the font size, in case the person has low vision* (J1). *Scale of the drawings adjusted so that one food is not much larger than the other* J2. *I think there is a discrepancy between languages.*

Between illustrations and images (J3). *The scale of the illustrations and photographs in the content need to be adjusted to suit their function* (J4).

Most suggestions were accepted, except for changing the term "diabetic dictionary" and adding medication classes. Some content judges did not identify the behavior "adapt healthily," which had to be reallocated in the presentation and structure of the project, highlighting it through the video and directing visitors to this content by clicking on the PROJECT tab.

After the first round of validation, it was decided to use more balanced contrasts (black on white), in addition to using the logo colors in a harmonious way (blue and yellow). The font used for the texts was Inter in various sizes, with 36 for bold titles in Inter Bold, regular Inter size 20 for texts, and Inter medium size 18 for smaller texts.

To make the site more interactive, a trigger question was placed in a forum format on all pages related to each behavior, so that users can share their questions and parts of their daily lives. The layout and illustrations were improved throughout the site. The menu was also placed in rectangular blocks below each piece of content to make it easier for users to navigate. This was reaffirmed by the judges in their evaluation of appearance in the second round, as shown in the data in Table 2.

Table 2 – Analysis of illustrations and figures from the Inform Diabetes portal (n=9). Fortaleza, CE, Brazil, 2023

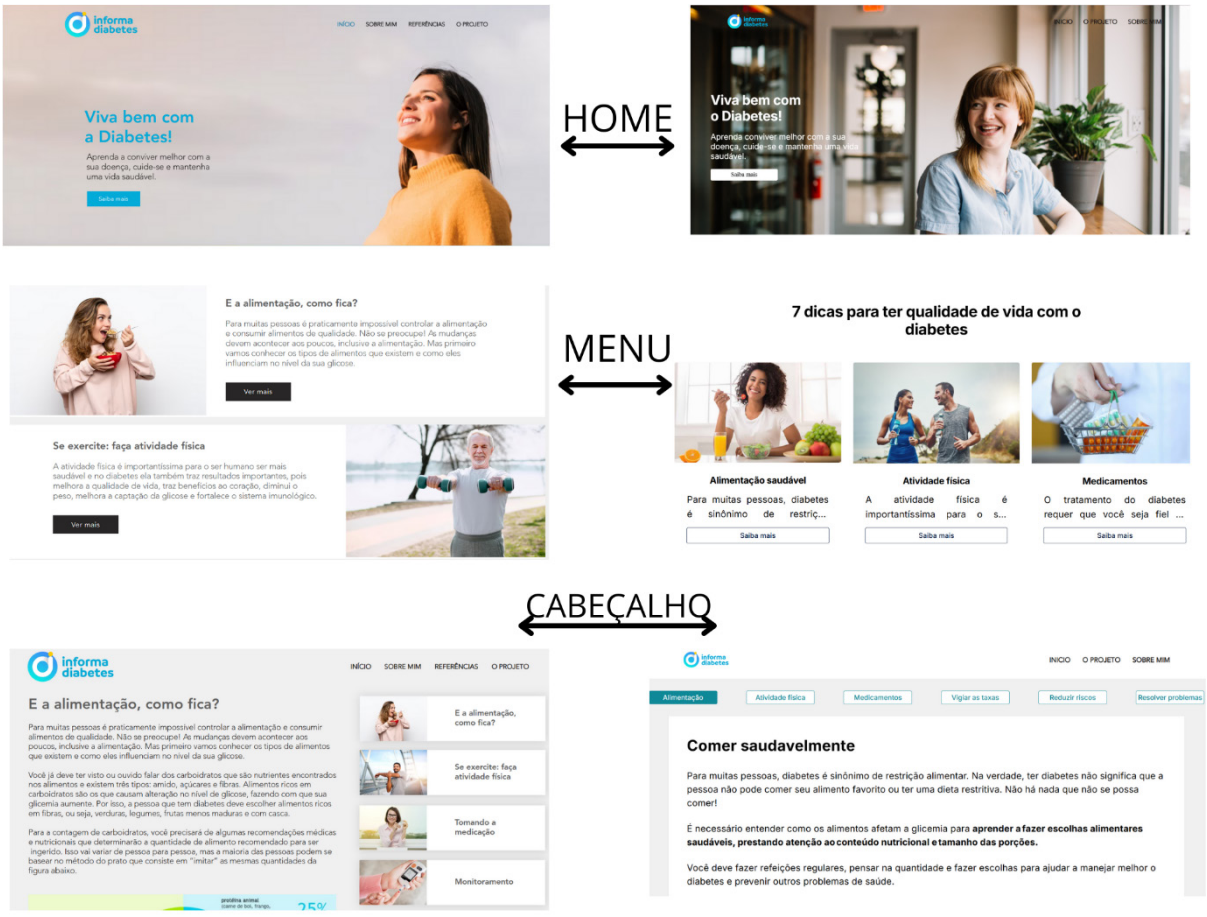
Items	CVI* Round 1	CVI Round 2
1. The illustrations are suitable for the target audience	0.66	1.00
2. The illustrations are clear and easy to understand	0.66	1.00
3. The illustrations are relevant to the target audience's understanding of the content	1.00	1.00
4. The colors of the illustrations are appropriate for the type of material	0.66	1.00
5. The shapes of the illustrations are appropriate for the type of material	1.00	1.00
6. The illustrations depict the daily life of the intervention's target audience	0.33	1.00
7. The layout of the pictures is in harmony with the text	0.33	1.00
8. The figures used clarify the content of the educational material	0.66	1.00
9. The illustrations help to explain the theme and are in a logical sequence	0.66	1.00
10. The illustrations are in adequate quantity	0.33	1.00
11. The illustrations are the right size	0.00	1.00
12. The illustrations help to change the behavior and attitudes of the target audience	0.66	1.00
CVI Global	0.58	1.00

*Content Validity Index

In the analysis of the illustrations and figures on the Portal, only items 3 and 5 obtained an IVC of 1.00, while the other items had to undergo a new round of validation with judges to become valid.

Thus, the Inform Diabetes portal was validated after two rounds, presenting excellent agreement indices (CVI=0.83) with moderate internal consistency for content and almost perfect internal consistency for appearance (CVI=1.00). It should be noted that in the second round, minor corrections were also suggested, which were implemented, such as changing the terms "chronic disease" to "chronic condition" and "take" to "apply," and formatting the references.

Figure 2 shows how the portal interface looked before and after the validation process.



Note: the illustrations above (screenshots from the mobile app) were only available in Portuguese

Figure 2 – Portal layout before and after validation. Fortaleza, CE, Brazil, 2023

Discussion

The Inform Diabetes portal has been validated in terms of content by technical judges with excellent agreement rates. It is presented as an educational technology and brings together a wealth of information that is essential for the proper management of diabetes. As an aid to change, it is based on presenting the main points to clarify doubts about the disease, with reliable sources and construction processes[25].

Digital technologies provide a broad scenario for diabetes intervention that includes all types, such as the importance of building websites or programs focused on the clinical management of diabetes[11-12].

All these innovations reinforce the seven self-care behaviors, especially regarding diet, while respecting the cultural characteristics of each country[12]. Similarly, Informa Diabetes sought to express and value the food culture of the Brazilian population, represented by the figures in the "Eating Healthily" section.

Dietary guidelines are necessary and help people make better decisions when in doubt, preparing food, or buying food[26]. Therefore, we decided to include information on labels.

It should be noted that the structure of the Seven Self-Care Behaviors underpins health education practices and highlights important topics for diabetes management. Diet, medication, and physical activity

are parallel behaviors in the self-care structure and are full of accurate and necessary, but complex, information. As assessed, the topics arising from these three areas of self-care should be promoted and presented in a balanced manner. The absence or excess of information of this nature can hinder good management and interest in seeking such information[25,27].

In Inform Diabetes, the behavior of "adapting healthily" was explored through video and text with tips on how to take care of mental health, as well as a forum with questions to spark the sharing of problem situations. A similar strategy was presented on the website *My diabetes Perfil,* which used audiovisual resources to answer recurring questions from people with diabetes, especially those newly diagnosed[28].

For all changes to occur, it is essential to encourage acceptance of the disease to adapt healthily. This requires a lighter process to prevent other mental comorbidities, such as anxiety and depression, from becoming associated with diabetes, which can make management more difficult. Thus, motivational information is better accepted by people and facilitates openness to guidance, without specific judgments[27]. Monitoring on the portal is highlighted as "Watch your rates" and should be continuous, with results depending directly on previous behaviors related to diet, medication, and physical activity.

As shown on the portal, problem solving involves three skills: identifying the problem, developing alternative solutions, selecting, implementing, and evaluating the solutions. These skills were also listed by professionals from the self-management program featured on the EatSmart website in Australia. They found that their patients were more informed, confident, and determined to adopt healthy eating habits, basing assertive decisions on concern situations[26].

Audiovisual resources allow people who visit the portal to feel welcome and motivated to associate textual content with the images and information provided. It should also be noted that the content of health technologies should use simple language and visual messages to meet the needs of people with low-income and low education levels[26-27]. Technological tools are essential for diabetes management, and innovations have the potential to further improve and enhance patient care, enabling people with diabetes to manage their condition more effectively[29].

Regarding forums, they are an additional tool that meets some communication needs identified by another study and interventions that use educational content for people with diabetes[26]. This space allows communication with other people who have DM or visitors, as well as health professionals, to address issues and avoid misinformation, requiring only an email account. This tool is well accepted because it provides an interactive, safe, and welcoming space[11].

As a result, the importance of the mediator in the Informa Diabetes portal forums stands out, where it is possible to check the interaction between visitors, as well as clarify doubts. This contributes to the consistency and supervision of information that appears on the portal. This functionality is considered assertive when building technologies of this nature[29]. In addition, the quiz adapted from Spoken Knowledge in Low Literacy Patients with Diabetes (SKILLD) and validated for Brazil[23] allows the knowledge of website users about diabetes to be measured.

People with diabetes are increasingly seeking the use of technologies for lifestyle guidance on issues related to their condition, but there is limited evidence on the effectiveness and safety of these platforms[29]. This highlights the importance of technologies developed with methodological rigor and validated with the target audience, where the construction process requires diligence.

Another feature of the Portal is the organization of content into cards, a strategy to direct visitors to the topic that most interests them now. The content is divided according to behavior, and as users navigate the portal, they can explore the topic that most catches their attention, directing them to their needs and helping them acquire information that improves their quality of life[12].

It is worth noting that people with diabetes

must be very well educated to achieve the best results and a better quality of life. The optimal use of diabetes can help them achieve these goals. When barriers to the use of technology are overcome and the potential benefits of these devices are better understood, the potential for cost savings in the healthcare system is increased[29].

Simultaneously, it is essential that a single technology bring together direct and substantial elements with content that fills the main gaps in diabetes education and self-care. In addition, the problem situations in each post allow for a space for dialogue between visitors to the portal, healthcare professionals, and supporters. This will strengthen the support network that should exist in diabetes care, promoting person-centered care, so that scenarios can be set, achievable goals can be outlined, and decisions can be made daily.

Study limitations

Among the limitations of the study, we highlight the small number of responses from judges and the number of categories of health professionals who evaluated the content of the portal. It should also be noted that the use of two groups of judges led to some contradictions in the evaluation, which were minimized through careful evaluation and the expertise of the authors.

Another limitation of the study was the lack of apparent and clinical validation with users. We therefore recommend continuing the research to further improve the technology through tests that can subsequently evaluate its clinical applicability to people with DM.

Contributions to practice

The Inform Diabetes portal is a tool designed to assist in the clinical care of people with type 2 diabetes, regardless of how long they have been diagnosed. It can be used as an educational strategy and self-care aid in a wide range of services, both primary and specialized. It also provides guidance to people with diabetes and gives healthcare professionals a tool for the clinical care of their patients. It is important to note that the effectiveness of the portal needs to be evaluated with the target audience before it can be used.

Conclusion

The Inform Diabetes portal was built based on the needs reported by people with DM and the literature, based on current and reliable scientific evidence. It is presented as an informative and collaborative technology that promotes and supports self-care in the health of people with type 2 diabetes. Thus, it is considered a valid educational resource, since it presented satisfactory content ratings.

Authors' contribution

Conception and design or analysis and interpretation of data; Writing of the manuscript or critical revision of intellectual content; Final approval of the version to be published; Agreement to be responsible for all aspects of the manuscript related to the accuracy or integrity of any part being investigated and resolved appropriately: Nascimento FG, Belchior AB, Oliveira SKP. Writing of the manuscript or critical review of the intellectual content; final approval of the version to be published; Agreement to be responsible for all aspects of the manuscript related to the accuracy or integrity of any part being investigated and resolved appropriately: Ferreira MA, Brilhante RRC, Moreira TMM, Carvalho REFL.

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