








Development of a mobile application to support self-care for people with intestinal stomas*

Desenvolvimento de aplicativo móvel para apoiar o autocuidado de pessoas com estomias intestinais

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 Isabelle Pereira da Silva¹
 Iraktânia Vitorino Diniz²
 Luana Souza Freitas¹
 Pétala Tuani Candido de Oliveira Salvador¹
 Helena Megumi Sonobe³
 Simone Karine da Costa Mesquita¹
 Isabelle Katherine Fernandes Costa¹

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¹Universidade Federal do Rio Grande do Norte. Natal, RN, Brazil.

²Universidade Federal da Paraíba. João Pessoa, PB, Brazil.

³Universidade de São Paulo. Ribeirão Preto, SP, Brazil.

Corresponding author:

Isabelle Pereira da Silva
Departamento de Enfermagem. Campos Universitário
BR-101, s/n – Lagoa Nova, CEP: 59.072-970.
Natal, RN, Brazil.
E-mail: isabelle.silva.015@ufrn.edu.br

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Special Call - Promoting the health of vulnerable populations

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ABSTRACT

Objective: to develop a mobile application to support self-care for people with intestinal stomas. **Methods:** descriptive study of technological innovation, guided by Theory of Self-Care to organize the application's content and production. Design Science Research that followed the steps: problem knowledge identified in practice; determination of the artifact objectives; development; demonstration. Before the technology development, a qualitative study was conducted to understand difficulties in self-care and a scope review to map the content. Two specialized professionals helped in the application development. **Results:** *ostocuide* application has 36 screens subdivided into menus: registration and record; feeding; self-care; stomas types; health care; laws; curiosities; contact and interactive questions. The application offers the diary function for photos and texts records about care performed with the stoma and the possibility of sending questions to researchers responsible for the application. **Conclusion:** the application was successfully developed and gathered resources that may collaborate with the self-care of people with intestinal stomas. **Contributions to practice:** the application can contribute to the population learning with intestinal stomas and to health education carried out by nurses.

Descriptors: Ostomy; Self Care; Educational Technology; Health Education; Nursing.

RESUMO

Objetivo: desenvolver aplicativo móvel para apoiar o autocuidado de pessoas com estomias intestinais. **Métodos:** estudo descritivo, de inovação tecnológica, norteado pela Teoria do Autocuidado para organização do conteúdo e produção do aplicativo. Seguiu-se o referencial *Design Science Research*, a partir das etapas: conhecimento do problema identificado na prática; determinação dos objetivos do artefato; desenvolvimento; demonstração. Para as primeiras etapas, que antecederam o desenvolvimento da tecnologia, realizou-se estudo qualitativo a fim de se compreender as dificuldades no autocuidado e revisão de escopo para mapear o conteúdo. No desenvolvimento do aplicativo, contou-se com o auxílio de dois profissionais especializados. **Resultados:** o aplicativo *Ostocuide* possui 36 telas subdivididas nos menus: cadastro e registro; alimentação; autocuidado; tipos de estomias; assistência à saúde; leis; curiosidades; contato e perguntas interativas. O aplicativo oferece a função de diário para registros de fotos e textos sobre os cuidados realizados com o estoma e a possibilidade de envio de dúvidas aos pesquisadores responsáveis pela aplicação. **Conclusão:** o aplicativo foi desenvolvido com êxito e reuniu recursos que poderão colaborar com o autocuidado de pessoas com estomias intestinais. **Contribuições para a prática:** o aplicativo poderá contribuir no aprendizado da população com estomias intestinais e na educação em saúde realizada pelo enfermeiro.

Descritores: Estomia; Autocuidado; Tecnologia Educacional; Educação em Saúde; Enfermagem.

Introduction

Intestinal stomas are surgical openings that result in the attachment of an intestinal loop to the abdomen. Estimates indicate that approximately 100,000 surgeries of this type are performed in the United States annually, and around one million people live with a stoma in the country⁽¹⁾. In Brazil, there is little epidemiological data, but projections indicate that there are more than 207,000 people with stomas⁽²⁾. This population experiences several changes in biopsychosocial aspects, which culminate in new demands of self-care and rehabilitation needs. Such context requires family support and the support of specialized professionals to achieve adaptation by these people⁽³⁾.

Self-care is one of the main factors modified with stoma and consists of actions that people deliberately perform to provide for their needs and achieve health and complete well-being. When any difficulty occurs in this process, nursing care is necessary to support individuals in the development of the required skills and knowledge⁽⁴⁾.

In teaching integral self-care to people with intestinal stomas, one should pay attention to the social and contextual barriers of health care and physical disability. Thus, one can overcome a reductionist view of assistance, providing care focused on the procedure to rehabilitate this population and help them achieve quality of life⁽⁵⁾. Issues related to self-care are essential for the resumption of autonomy and independence of the person with stoma.

To work on the self-care of this population, it is essential to use resources that facilitate the learning and rehabilitation process. Based on that, the information technologies are inserted as solutions to optimize records and help in the education of patients. Therefore, nursing professionals have an important role in the planning and creation of technological resources, as well as in their implementation, integrating direct customer care through technology⁽⁶⁾.

Among the technological resources that can be used in health care, mobile applications (app) are expanding tools, especially in the process of learning self-care for patients with chronic conditions. The apps have allowed communication and active participation of patients together with health professionals in the management of clinical conditions⁽⁷⁾.

Thus, there is a need to produce apps to meet this demand, to enable communication and self-care. Apps are software that store various information and enable the promotion and innovation of teaching and learning in a dynamic and interactive way⁽⁷⁾. However, there are still few apps developed around stomal therapy, especially regarding the self-care of people with intestinal stomas and their multiple aspects⁽⁸⁾. Thus, this study has an unprecedented character and will contribute to the advancement of nursing science, especially in the field of assistance to the population with stomas.

The resource developed here can contribute to the work of nurses in the care of this population, to assist in education and facilitate the remote obtaining of information. Furthermore, it will contribute to overcome the limitations related to physical distances, providing information in a simple and fast way, favoring the continuous follow-up.

Thus, in view of the above, motivated by the difficulties of self-care observed in this population from academic experiences of research and professional assistance, and with the intention of helping these people and improving the process of health education led by nursing, our objective in this study was to develop a mobile application to support self-care for people with intestinal stomas.

Methods

Descriptive study around technological innovation, carried out in the period from August to November 2020. The development of the app had as a refe-

rence the Design Science Research, which is based on three cycles: the Relevance Cycle relates to the identification of difficulties in the practical field to subsidize the elaboration of the solution; the Rigor Cycle refers to the theoretical knowledge that underlies the production of the artifact, with the addition of new knowledge; and the Design Cycle deals with the development and evaluation of the artifact. To operationalize these cycles and build the technology, the following steps were followed: identification of the problem and motivation; definition of the objectives of a solution; design and development; and demonstration⁽⁹⁾.

The first step referred to the delimitation of the problem to understand the difficulties observed in practice and to produce viable solutions⁽⁹⁾. For this, a qualitative study was produced to understand the main difficulties experienced by people with intestinal stomas in their adaptive process. The study was conducted with 30 people with stomas in a reference center in the care of this population, from the criterion of saturation, using the parameter of semantic repetition. The collection involved a semi-structured interview, with characterization data and an open question to understand the difficulties that the participant experienced in stoma care⁽⁵⁾.

The interviews were transcribed and underwent thematic content analysis. The results comprised categories on hygiene and management of the collecting equipment, revealing difficulties in the skills: cleaning, emptying, changing, and clipping the collecting device; problems with peristomal skin care and presence of complications; leakage of fecal content; difficulties in returning to social life; and insufficient orientation⁽⁵⁾.

In the second step, the objectives of the app were defined, based on the emerging problem, for the logical planning of the artifact and its contribution to solving this problem⁽⁹⁾. Thus, the final objectives consisted in helping people with stomas with difficulties

in self-care and improve access to specialized information, based on the main difficulties experienced.

Based on this, a scoping review registered in the Open Science Framework platform (<http://dx.doi.org/10.17605/OSF.IO/XRH5K>) was carried out between August and September 2020, to map the self-care recommendations for people with intestinal stomas in their process of return to activities of daily living, as well as regarding self-care actions for the stoma. The search was conducted in eight databases and five gray literature repositories, and studies that presented at least one self-care recommendation for people with intestinal stomas were included. The search resulted in the final sample of 83 studies, which presented requirements related to stoma and peristomal skin; management of the collecting equipment; feeding; stomal and peristomal complications; types of stoma collectors and products; physical and social activities; and sexual and body aspects. The recommendations identified in the review are aligned with those of the Brazilian Association of Stomal therapy (SOBEST)⁽¹⁰⁾ and were included as content of the application.

The cycle of rigor outlined the methodological path for the creation of the artifact, linking scientific research to technological production and not just to a usual project⁽⁹⁾. To this end, Orem's Self-Care Deficit Theory was used, relating it to the technology production process.

In convergence with the theory, the application provides various information about physical, social, emotional, and other aspects that facilitate the development of self-care in a holistic way. In addition, the search for qualified information present in the app and discussed in the consultation with the nurse encourages the individual to become an active subject of his care, an indispensable condition of the theory.

Although the app does not have individualized content for each person who accesses it, in it is possible to obtain varied knowledge, and from this, each

user can use the information according to the need of the moment. The app also allows the documentation of individual information for future consultations and presentations during care with health professionals.

As for innovation, we highlight the use of a tangible technological product for education based on theory, which adds knowledge in a practical way so that the person with a stoma can develop self-care. Thus, the content of the app, mapped in the scope review, was organized according to the self-care requirements proposed by Orem, to contemplate the actions necessary for the provision of self-care after the creation of the stoma.

From this, the app menus were elaborated, and functionalities were included that could also help identify when nursing support is needed, such as feedbacks from the quiz and the information provided. In addition, it allowed records of the care performed by the person with stoma that can be presented to the nurse during nursing consultations, thus allowing the professional to verify the need for interventions.

In the third development stage, the artifact was elaborated through the functional requirements, making the software architecture through the delimitation of the content and the application of the product functions⁽⁹⁾. In this stage, two software development professionals participated in the production of the app, integrating the research team, because some steps of the app design require specific knowledge of Information Technology.

The survey of requirements for the app production occurred from September to November 2020, through five biweekly meetings with the team of developers. The elements to compose the content of the screens, layout, hypertexts, graphic images, flows, and functions were defined. The main menus related to

self-care and additional functions of information search, record of daily stoma care, sending questions to the researchers, and interactive quiz with feedback were also determined.

To structure the layout of the screens, a flow chart (Figure 1) was drawn up, providing the input and output of the main screens, and underpinning the operationalization of the prototype and its functionalities.

After the organization of the screen flows, the content for the composition of the prototype was defined, with the self-care recommendations of the scope review. Subsequently, the low fidelity prototype was produced with resources that included hypertexts, animations, and images, as they constitute attractive visual resources that facilitate understanding, handling, and practicality. Among the aspects that provide an attractive experience to the user when using apps, the simplicity of the app's content, structure, and operationalization stand out⁽¹¹⁾. The layout was developed for a multiplatform app and can be operated on Android and iOS systems. Adobe Illustrator was used to build the screens, and Figma was used for the application.

After this process, the elaboration of the high-fidelity prototype was completed, and the fourth stage began, referring to the demonstration phase, which is related to initial operational tests of the application and was carried out by the Information Technology professionals involved in the research, to evaluate the operability of the application, including technical aspects of screen flows.

This study was not submitted to the Research Ethics Committee, for being methodological research to produce a technology that did not involve the participation of human beings.

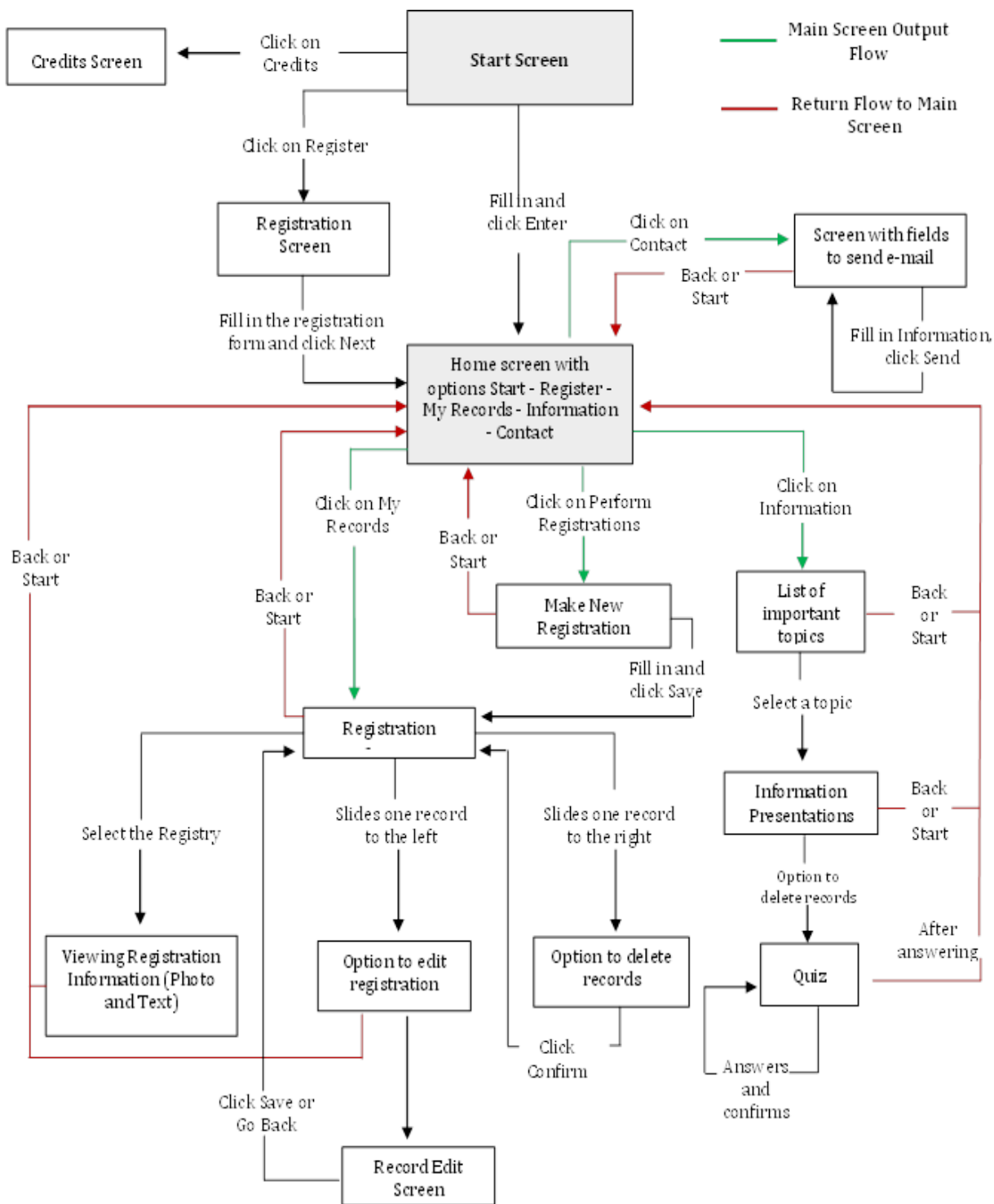


Figure 1 – Flow diagram of the prototype screens. Natal, RN, Brazil, 2020

Results

The app was named Ostocuide and resulted in the production of 36 screens, with the following main menus: registration and record, feeding, self-care, types of stomas, health care, laws, curiosities, contact,

and interactive questions. The content and selection of the menus were based on the scope review and qualitative study, as well as on the aspects for ease of access by the user. Figure 2 shows the home screen and the main menus that make up the application.

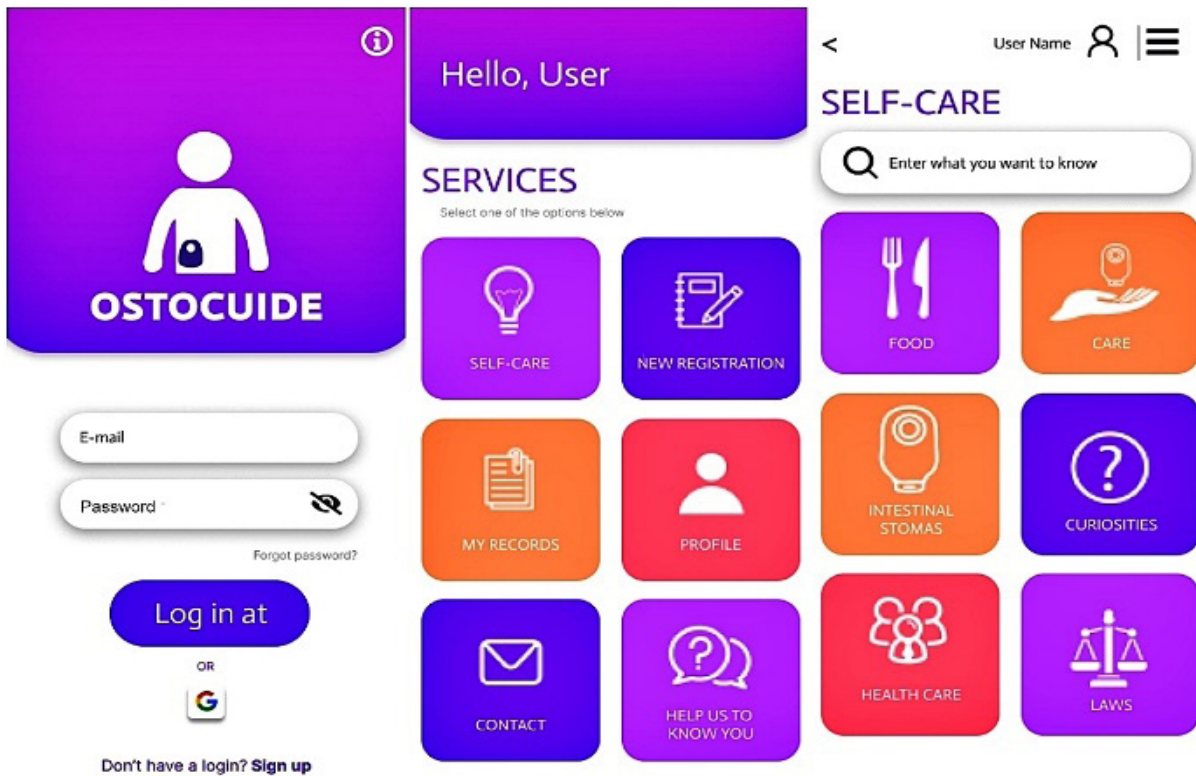


Figure 2 – Start screen, main menu, and self-care menu of the Ostocuide app. Natal, RN, Brazil, 2020

The Ostocuide layout presents a list of icons, with the menus arranged in parallel. When accessing the app for the first time, the user is directed to the login screen, where he can register and enter information of socio-demographic and clinical characterization related to the stoma, such as name, date of birth and type of stoma, which will be stored for future access.

By logging in, the user has access to the main menu, which provides as icon options: “self-care”, “my records”, “profile”, “contact” and “help us to know you”. The record allows the user to enter information about stoma-related care in a textual field, as well as attach images from the camera. This menu organizes the

visualization of this information in chronological order, according to the date and time selected by the user, available in “my records”. In addition, the app allows the user to later edit or delete the stored data.

The “self-care” menu directs access to the icons “feeding”, “care”, “types of stomas”, “curiosities”, “health care” and “laws”.

In the icon on “feeding” the user has access to general guidelines on the care of the nutritional aspects after the preparation of the stoma, and on the common intestinal effects of some foods related to feces and flatus.

The “intestinal stomas” icon brings the definition of stomas and their types; characteristics of the

colostomy and ileostomy; and the “classification of stomas”, according to the surgical method used. The “health care” icon presents the services that assist people with stomas, with guidelines on the role of associations and rehabilitation centers.

The “care” icon addresses content related to the normal characteristics of the ostomy and peri-

stomal skin; hygiene, exchange and emptying of the collecting equipment; products used in the treatment and prevention of complications; physical and social activities; sexuality and body image; and the main stomal and peristomal complications. Figure 3 shows the screens of registration, care, and types of stomas.

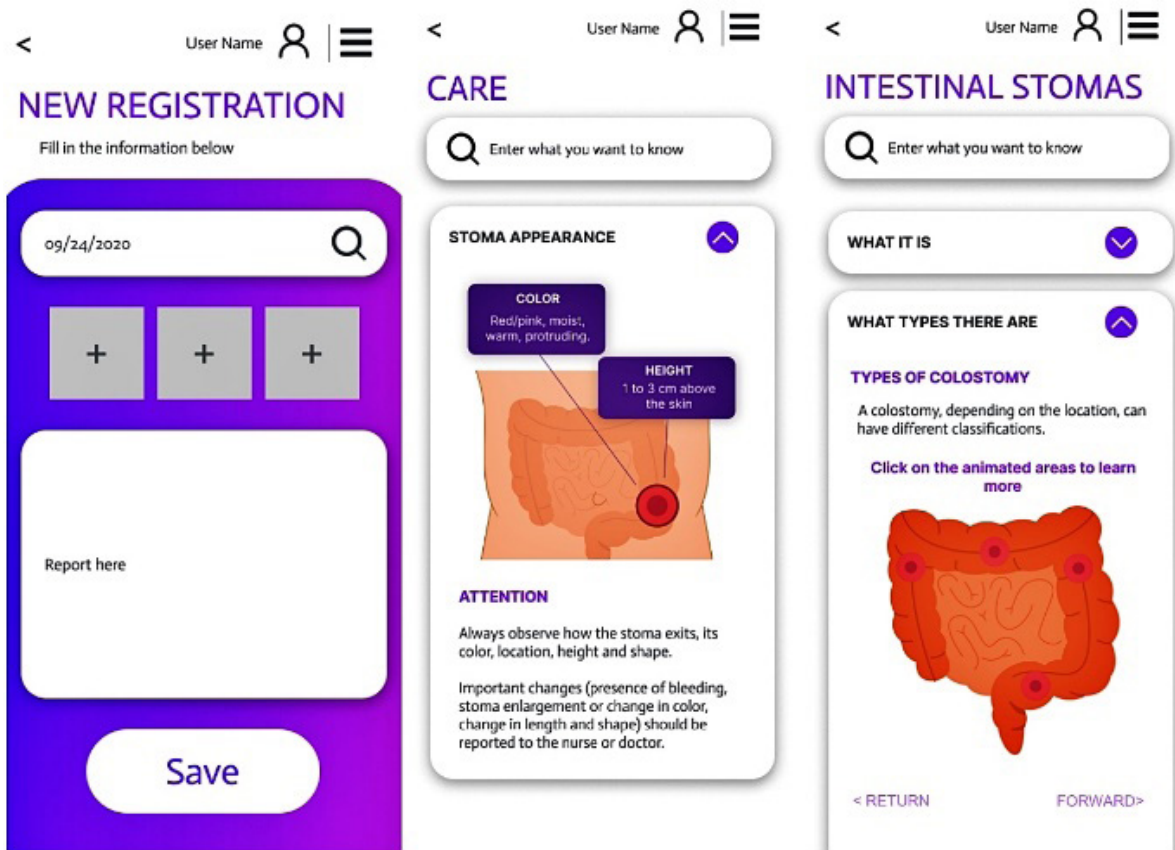


Figure 3 – Daily records screen and “care” screen related to the stoma and peristomal skin. Natal, RN, Brazil, 2020

In the “products for stomas” icon, it is possible to access information about the functions and images of products used for prevention and treatment of complications, as well as the available collecting equipment. The “physical activity and leisure” icon presents guidance on the benefits and care needed to start practicing physical exercises. In this icon, there are also guidelines related to social activities, with tips on strategies for handling and changing the collection equipment in social environments. And the “sexuality

and body image” icon offers orientations and tips about self-image and sexual aspects.

The “complications” icon is the only one that directs to another screen, with presentation of the elements “general care” and “types of complications”. In the “laws” icon, there is access to the main legislations that support the assistance and rights of the person with stoma, arranged in the format of a timeline to facilitate the presentation of the laws according to the year of reference.

In “curiosities”, the main doubts that people with stomas have about the stoma were addressed, such as bathing with the collecting equipment, use of perfumed products, and skin exposure to the sun. In addition, the application offers the possibility to send questions to the researchers responsible and view their answers.

The “Help us get to know you” quiz has 19 interactive questions that help to get to know the users’ profile and reinforce the information provided, through feedbacks that the app offers with each answer.

Discussion

The construction of educational technologies to promote self-care of the population helps to increase knowledge about the health situation, to reduce problems and complications arising from the condition, and to understand how to take care of themselves, from the perspective of becoming independent and autonomous⁽¹²⁾. These resources empower the person, contributing to the encouragement of changes in health behavior and the adoption of a healthy lifestyle, complementing the assistance of multi-professional health teams, with the construction of shared knowledge for improvements in well-being and quality of life⁽¹³⁾.

Nevertheless, a systematic review analyzed works and apps related to various health conditions and pondered that, although there is many software available, not all of them are reliable or effective, suggesting that new forms of evaluation should be used to identify quality apps that benefit the target population⁽¹⁴⁾.

The development of an app for mobile devices has stood out in the healthcare field and contributed to the assistance of different populations and scenarios⁽¹⁵⁾. Ostocuide was designed and produced to benefit the person with stoma, helping in self-care and in various aspects of life affected by the procedure, and the content of the technology is in accordance with the recommendations of the SOBEST Consensus⁽¹⁰⁾.

Regarding the layout and design of the app screens, there is the importance of considering factors such as attractive interface, clear information, presence of visual resources, customization, and capacity for data recording. These features are important to improve the user experience in using the app and facilitate the learning process⁽¹¹⁾.

Apps need to allow easy access through interesting interfaces and meet the demands of users with understandable data so that they can be downloaded and used, thus achieving their purpose⁽¹⁶⁾. Thus, the use of the app developed in this study enables greater autonomy of the person with stoma and complements health care, because the person visualizes characteristics and information necessary for the process of adaptation to stoma, the improvement of quality of life and social reintegration.

In line with this, other apps developed to assist in self-care of chronic health conditions have shown good results in the process of acquiring patient autonomy in the face of the disease^(15,17), as well as contributing to nursing care in the prevention and monitoring of chronic conditions and complications, besides allowing nurses to expand and update their knowledge on the subject⁽¹⁸⁾.

From the perspective of the public with intestinal stomas, the generalist training of nurses can generate some weaknesses in the care provided, and the population may lack basic information. However, educational technologies have been increasingly used, indicated, and encouraged as tools with potential to assist in the resolution of difficulties⁽¹⁹⁾.

However, the need for continuous updating for these technologies to provide the proposed benefits is pondered. A study developed by Harvard researchers pointed out that it has not yet been possible to establish a set of characteristics that indicate a quality application. Therefore, it must be constantly updated because outdated information may cause concerns about patient safety⁽²⁰⁾.

Ostocuide, in addition to providing information, also has a diary function for storing text and photo re-

cords. Mobile diaries, as compared to written diaries, have benefits and potential because they allow continuous recording of information and provide ready access to the content. In addition, they facilitate mobility and disease monitoring, as well as the recording of subjective data from the user's experiences⁽²¹⁻²²⁾.

Regarding the specific themes addressed by the app, food is one of the major concerns of the person with stoma. Doubts about diet are common after surgery, such as what can be consumed or should be avoided, foods that cause flatulence, diarrhea, or constipation⁽²³⁾. With the app, it is possible to make quick queries about these issues.

Stoma care is also essential for the person's adaptation. The recognition of the appearance of a normal stoma and of the peristomal skin, as well as the identification of its complications for the care follow-up⁽¹⁸⁾, are information addressed in the app, in addition to hygiene care and handling of the collecting equipment, which can also be favored by access to technology when the user is outside a care institution⁽¹⁹⁾. Most people living with stoma reported having at least one self-care problem⁽²⁴⁾. Therefore, the benefits provided by health education mediated by assistive technologies are highlighted.

In relation to physical and leisure activities, sexuality, and body image, Ostocuide provides orientation, demystifying and elucidating questions and incoherent information. The person with stoma can resume his sexual life and all other possible activities of daily life and leisure, paying attention to the limitations that can harm the stoma. The social reinsertion of the individual must be explored during rehabilitation, so that the daily life is rescued, and autonomy and independence are recovered, including what concerns sexuality⁽²⁵⁾.

The activities of daily living can be difficult or facilitated by the stoma, depending on the individuality of each person, as well as in consequence of the previous situation of this person. Although some individuals report sadness due to the changes caused by the stoma, other people see the procedure as an al-

ternative of life, since previously they could not stay away from home for many periods and could not work due to the disease⁽²⁶⁾.

Issues such as body image can be modified after the surgery, originating a new perception of the physical appearance by the person with intestinal stoma. However, with the support of a multi-professional team and access to qualified information, the person can develop a new look about his/her body, seeking adaptation and rehabilitation⁽²⁷⁾. In the intestinal stoma icon, it is possible for the user to know and identify his type of stoma, as well as obtain information about the types of surgeries, helping in the understanding of the surgical treatment and in the assimilation of the theme⁽¹⁹⁾.

Moreover, Ostocuide also provides information about associations and reference centers for the rehabilitation of people with stoma, which are responsible for supporting this population in the public health system. In these places, patients can also find support groups that enable the sharing of experiences lived by everyone, collaborating to the adaptation⁽²⁸⁾.

Regarding the legislation, addressed in the app, it is noteworthy that the fight for the rights of this population has ensured fair conditions, such as retirement and preferential care, because it is a disability, having also ensured specialized multidisciplinary care, as well as providing free collection and adjuvant equipment. Therefore, it is necessary that these are known by the public, as they ensure citizenship rights and social benefits.

As for the "curiosities" icon, it addresses: the possibility of bathing with the collection equipment, especially when changing the bag, because water facilitates the removal of its base, minimizing the occurrence of traumas; the importance of morning exposure of the skin to sunlight to strengthen it⁽¹⁹⁾; and the contraindication to the use of perfumed products, due to the risk of dermatitis, and for impairing the adhesion of the collector. These are the main doubts, also addressed in other educational technologies⁽²⁹⁾.

Therefore, Ostocuide is in line with other stu-

dies in stomal therapy in providing information and functions that assist in health care and in the identification of nursing support needs^(8,30). These applications can promote beneficial behaviors, being important the robustness in the development and evaluation of these technologies.

The development of mobile technologies can assist in promoting the health of people with intestinal stomas, as shown by studies conducted nationally and internationally^(8,19,30). These tools allow the user or family member to consult basic information and clarify simple doubts at anytime and anywhere, without the need for an appointment with a specialist to receive general guidance, aiming to minimize the occurrence of complications, improving self-care and adaptive process⁽¹⁹⁾.

Study limitations

The limitations of this study are related to the fact that the technology development process requires specialized third-party service and incurs financial costs, and that the app's reach is limited to the public who have smartphones and the ability to read.

Contributions to practice

The results presented here contribute to technological innovation around stomal therapy, in helping the self-care of the population with stomas, and can support professionals in the education of these people. Moreover, they are replicable and encourage new similar studies in the health field.

The use of this technology can provide important information on self-care to assist in the learning of the population, besides enhancing the health education provided by nurses and overcoming limitations of time and space, with the provision of information in a simple and fast way for continuous follow-up. We emphasize the need to evaluate the technology with specialists and the target audience, with which aspects of content, appearance, usability, and functiona-

lity will be evaluated, data to be presented in future studies, since the research is ongoing.

Conclusion

The Ostocuide app was successfully developed and provides information and resources about self-care for people with stomas, from the main menus: registration and record; eating habits; care; types of stomas; health care; legislation; curiosities; contacts; and questions. Moreover, the app makes available to the user a space for the registration of daily care with the stoma, has dynamic animations, quiz, and the option to send questions to the researchers responsible.

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Authors' contribution

Conception and design or data analysis and interpretation: Silva IP, Diniz IV, Freitas LS, Salvador PTCO, Sonobe HM, Mesquita SKC, Costa IKF.

Writing of the manuscript or relevant critical review of the intellectual content: Silva IP, Diniz IV, Freitas LS, Mesquita SKC.

Final approval of the version to be published: Silva IP, Salvador PTCO, Sonobe HM, Costa IKF.

Responsibility for all aspects of the text in ensuring the accuracy and completeness of any part of the manuscript: Silva IP, Diniz IV, Freitas LS, Salvador PTCO, Sonobe HM, Mesquita SKC, Costa IKF.

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