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Digital educational technologies for people with intestinal stoma: a technological prospect**

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ABSTRACT

Objective: To identify and analyze digital technologies developed to guide care for people with intestinal ostomies. **Method:** Technological prospecting conducted through documentary research conducted between March and September 2024. Data collection took place in patent registration databases, theses/dissertation repositories, and mobile app stores, including educational technologies in Portuguese, English, and Spanish, with no time or geographic limitations. **Results:** The results were organized into the following categories: software/hardware, mobile app, virtual environment, and educational video. Twelve productions were included: one patent, five theses/dissertations, and six mobile apps. The patent refers to software/hardware for postoperative care; the theses/dissertations resulted in an app prototype, an app, a virtual environment, and two educational videos. **Conclusion:** The conclusion is that, although still incipient, the digital technologies analyzed in this research, with an emphasis on mobile applications, which predominate over other technologies, have the potential to strengthen health education, self-care, and nursing practice. Furthermore, they represent innovative strategies for providing guidance on intestinal ostomy care.

KEYWORDS: Enterostomal therapy. Nursing. Ostomy. Biomedical technology. Health education.

Tecnologias digitais educativas para pessoas com estomias intestinais: uma prospecção tecnológica

RESUMO

Objetivo: Identificar e analisar tecnologias digitais desenvolvidas para orientar cuidados voltados para pessoas com estomias intestinais. **Método:** Prospecção tecnológica mediante pesquisa documental desenvolvida entre março e setembro de 2024. A coleta de dados ocorreu em bases de registros de patentes, repositórios de teses/dissertações e lojas virtuais de aplicativos móveis, incluindo tecnologias educativas em português, inglês e espanhol, sem limitação de período ou delimitação geográfica. **Resultados:** Os resultados foram organizados nas categorias *software/hardware*, aplicativo móvel, ambiente virtual e vídeo educativo. Foram incluídas 12 produções: uma patente, cinco teses/dissertações e seis aplicativos móveis. A patente refere-se a um *software/hardware* para cuidados pós-operatórios; as teses/dissertações resultaram em um protótipo de aplicativo, um

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Extracted from one of the stages of the dissertation "My little pink belly button: mobile application for guidance on intestinal ostomy care in children," presented to the Programa de Pós-Graduação em Gestão do Cuidado em Enfermagem da Universidade Federal de Santa Catarina, em 2024/2025.

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aplicativo, um ambiente virtual de aprendizagem e dois vídeos educativos. **Conclusão:** Concluiu-se que, embora incipientes, as tecnologias digitais analisadas nesta prospecção, com ênfase nos aplicativos móveis, predominantes em relação às outras tecnologias, apresentam potencial para fortalecer a educação em saúde, o autocuidado e a prática da enfermagem. Além disso, configuram estratégias inovadoras voltadas para orientações sobre cuidados com estomias intestinais.

DESCRITORES: Estomaterapia. Enfermagem. Estomia. Tecnologia biomédica. Educação em saúde.

Tecnologías digitales educativas para personas con estoma intestinal: una prospecció tecnológica

RESUMEN

Objetivo: Identificar y analizar tecnologías digitales desarrolladas para orientar cuidados dirigidos a personas con estomías intestinales. **Método:** Prospección tecnológica mediante investigación documental realizada entre marzo y septiembre de 2024. La recolección de datos se llevó a cabo en bases de registros de patentes, repositorios de tesis/disertaciones y tiendas virtuales de aplicaciones móviles, incluyendo tecnologías educativas en portugués, inglés y español, sin limitaciones de periodo ni delimitación geográfica. **Resultados:** Los resultados se organizaron en las siguientes categorías: *software/hardware*, aplicación móvil, entorno virtual y video educativo. Se incluyeron doce producciones: una patente, cinco tesis/disertaciones y seis aplicaciones móviles. La patente corresponde a un *software/hardware* para cuidados postoperatorios; las tesis/disertaciones resultaron en un prototipo de aplicación, una aplicación, un entorno virtual de aprendizaje y dos videos educativos. **Conclusión:** Se concluye que, aunque incipientes, las tecnologías digitales analizadas en esta prospección con énfasis en las aplicaciones móviles, predominantes frente a otras tecnologías, presentan potencial para fortalecer la educación en salud, el autocuidado y la práctica de enfermería. Además, configuran estrategias innovadoras dirigidas a la orientación sobre cuidados de estomías intestinales.

DESCRIPTORES: Estomaterapia. Enfermería. Estomía. Tecnología biomédica. Educación en salud.

INTRODUCTION

Intestinal elimination ostomies, classified as ileostomy or colostomy, aim to divert fecal contents to the external environment and may be temporary or permanent[1].

In Brazil, there is no definitive data on the number of people with intestinal ostomies, which makes it difficult to define their epidemiology. This scarcity stems from the fact that ostomies are the result of diseases or trauma, and not a disease in themselves. However, the International Ostomy Association (IOA) estimates that there is approximately one person with an ostomy for every thousand inhabitants in countries with a good level of medical care[2]. Applying this ratio to the Brazilian reality, which according to the 2024 Census has 212,583,750 inhabitants, it is estimated that there are approximately 213,000 people with ostomies[3]. Among the main risk factors for this procedure are colorectal cancers, which account for 75% of cases[4].

Faced with the need to undergo intestinal ostomy surgery, a range of changes emerge in the daily lives of these individuals and their families/caregivers. These changes range from loss of fecal and gas control to loss of self-esteem resulting from changes in body image[4]. In addition, the person will require specific care to ensure the maintenance of quality of life and a return to daily activities[5,6].

This process of coping and adaptation depends intrinsically on the understanding and learning of these individuals and their families/caregivers. Therefore, both need to be guided and trained from the preoperative period, extending to the continuity of care after hospital discharge. It should be noted that, among the professionals of the multidisciplinary team, nurses play a key role, as they act directly in promoting health education and self-care[7,8].

In this context of education and ongoing support, the growing role of information and communication technologies (ICTs) as support tools for nurses stands out. ICTs constitute a set of technological resources, including digital educational technologies, which promote agility in the processes of communication, transmission, and distribution of information, news, and knowledge[9], acting as mediating tools for the educational process as a whole[9]. It can therefore be said that access to health education is not restricted to a specific time or place.

In addition, the use of ICTs in people's daily lives is becoming increasingly common, mainly through mobile devices and the internet, so that the use of these tools to promote health and engagement with it is becoming a trend. It is clear that this scenario was strongly driven during the COVID-19 pandemic, when it was necessary to expand health education strategies for the population due to the need for social distancing[9,10].

Thus, the relevance of technological foresight studies is evident, as they enable analysis of the current scenario in the healthcare sector[11,12]. This type of prospecting consists of preliminary, structured research aimed at recognizing and analyzing the state of existing and emerging technologies[11-13]. Its purpose is to offer a comprehensive overview of a given technological product, supporting the decision-making process regarding the development of new technologies, the definition of content to be produced, the choice of application method, and market positioning after its development[11-13]. This makes it possible to identify how digital technologies have been designed and introduced into the market, as well as to assess their competitiveness, weaknesses, and potential for improvement and evolution[11-13].

Considering technological prospecting as an essential tool for gathering the knowledge necessary for launching a product, this study's research question was: "What digital educational technologies have been developed to provide guidance on caring for people with intestinal ostomies?"

OBJECTIVES

To identify and analyze digital technologies developed for care guidelines for people with intestinal ostomies.

METHODS

This is technological research developed through documentary research conducted between March and September 2024. To this end, the analysis of primary documents was used as a method of exploration and justification for the study[13].

The preparation of this technology research was based on the following steps:

1. Definition of the question and objective;
2. Definition of inclusion and exclusion criteria;
3. Definition of the search strategy;
4. Search for publications in thesis/dissertation databases, patents, and online app stores;
5. Selection of educational digital technologies;
6. Categorization;
7. Data analysis;
8. Presentation of results;
9. Conclusion and observations on the implications of the findings[14].

The prospecting was developed by writing the protocol registered in the Open Science Framework (OSF) under registration number 10.17605/OSF.IO/4Q2RM. This protocol was prepared by the researchers and validated externally by two professors from a graduate program in Nursing Care Management, specialists in Stoma Therapy and with expertise in technological product development.

The guiding question was developed using the PIO mnemonic, where P stands for population/patients, I stands for intervention, and O stands for outcome[15]: "What digital educational technologies have been developed for guidance on caring for people with intestinal ostomies?"

The inclusion criteria were digital technologies (mobile applications, educational videos, virtual environments, and digital booklets, among others) focused on education about intestinal ostomy care for people with ostomies and their family members/caregivers, in line with the objective of this research; without limitation of period or geographical delimitation; available in English, Portuguese, and Spanish. It also included patent or software registrations; theses or dissertations that present the development and/or validation of digital technologies for teaching and/or caring for intestinal ostomies; and mobile applications available on iOS and/or Android systems focused on this topic.

The exclusion criteria were applications/patents/software/dissertations/theses that refer only to the dissemination or sale of materials and/or equipment for ostomies or that were aimed at the education of health professionals and repeated productions, which in this case will be considered only once.

To define strategies and build a search strategy protocol, according to the Chart 1, the assistance of a specialist librarian was requested. The bibliographic data was collected on March 13, 2024. The specificities of each database were respected, and the descriptors from the Health Sciences Descriptors (DeCS) and Medical Subject Headings (MeSH) were used, employing the Boolean terms AND and OR. The descriptors used were Educational Technology, Mobile Applications, Ostomy, and Enterostomy.

The patent databases used were the National Institute of Industrial Property (INPI), Espacenet (a European service that provides information on European patents), World Intellectual Property Organization (WIPO Patentscope), Derwent Innovations Index, and Google Patents. The thesis and dissertation databases used were those covering Brazil, available in the Brazilian Digital Library of Theses and Dissertations (BDTD) and the Thesis and Dissertation Catalog (CAPES), and those covering the international scope (ProQuest Dissertations & Theses Global (PQDT Global)).

The virtual app stores included in this study were the Play Store (Android) and APP Store (Apple) platforms — Brazil/United States (US)/Europe. In the app stores, keywords in Portuguese, English, and Spanish placed in quotation marks were used as a search strategy: "estomia", "*estom**", "ostomia", "*ostom**", "colostomia", "*colostom**", "ileostomia", "enterostomia", "estomaterapia", "*ileostomy*", "*colostomy*", "*stomas*", "*ostomy*", "*estomía*", "*ileostomía*" and "*colostomía*".

The selection process was carried out independently by two reviewers, both nurses who study and conduct research in the field. In the event of disagreement regarding the selection of any work, a third reviewer would have been called in, but this was not necessary.

Rayyan software was used to remove duplicates and screen the search for theses/dissertations. The removal of duplicates and the screening of the search for patents and mobile applications researched in online stores were carried out "manually" using tables created in Microsoft Office Word®, as it was not possible to export the data to software.

The process of identifying and selecting the digital technologies that comprise the body of this technology prospecting was systematized and adapted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR)[16], illustrated in Figure 1.

To select and categorize the information related to the included productions, three tables were constructed, organized with data and attributes according to the search performed and the technology found.

The table created for selecting and categorizing patent database searches included the following information: title, inventors, registration number, year of filing in the registry, country of origin, language of the technology, description of the technology (purpose/application, functionality), and type of digital technology registered.

The table for searches in theses and dissertations included: title, authors, type of publication (whether it was a thesis or dissertation), year of publication, country of origin, digital technology developed, and respective description.

The table developed for selecting and categorizing searches in virtual app stores included: the virtual store where the app was found, the name of the app, developer, year of release, version, language, whether it was free or paid, purpose, application, functionality, and user ratings.

The productions found were categorized into software/hardware, mobile application, educational video, and virtual environment. To analyze the data, it was organized in Microsoft Office Word® software, through which a descriptive analysis was performed, presenting the absolute/relative frequencies in tables. Educational digital technologies and their attributes were distributed and analyzed according to the productions and types of search.

Regarding ethical aspects, this study was conducted using freely available data, respecting copyright principles.

Chart 1. Search strategies for databases. Florianópolis (SC), 2024.

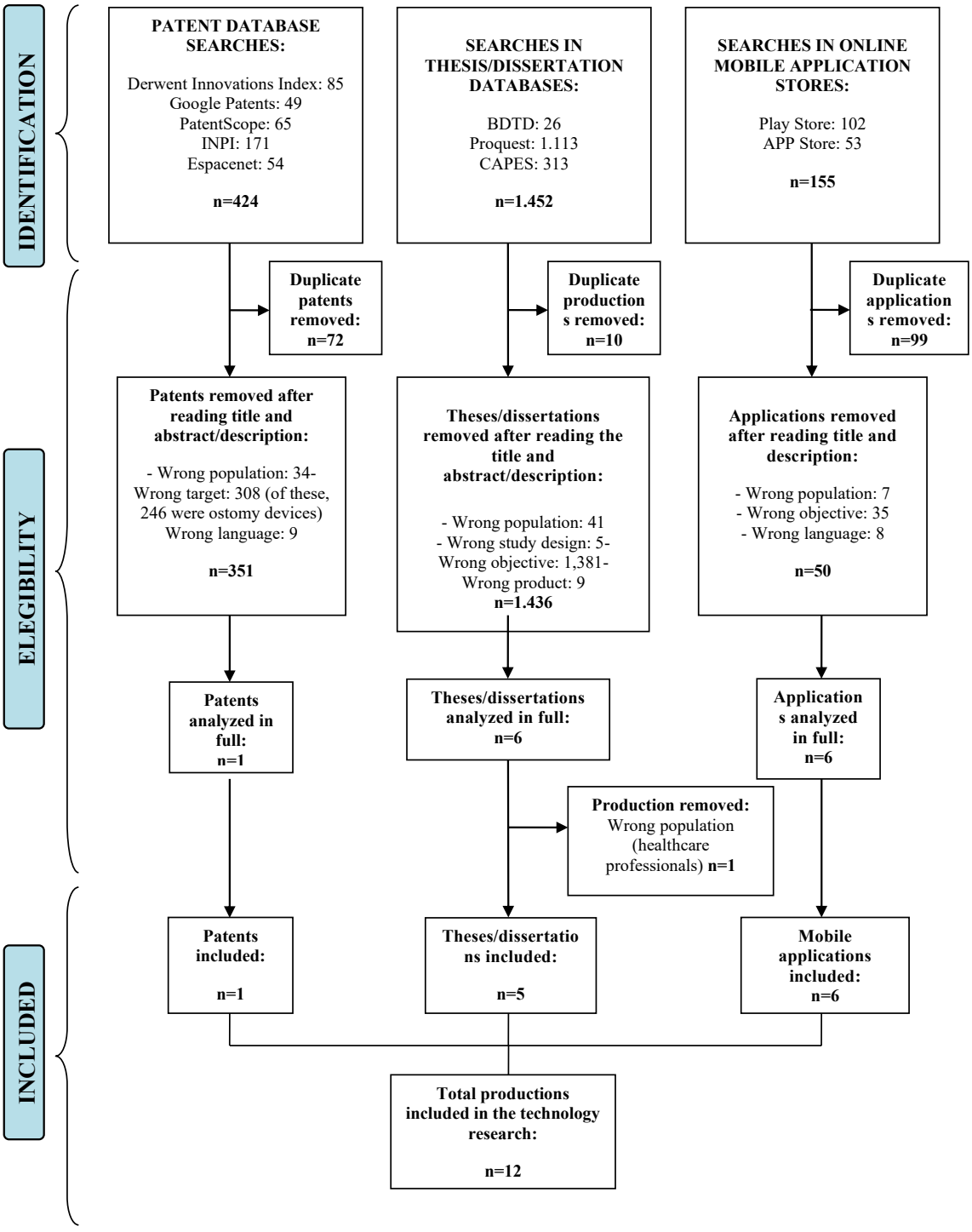
Databases	Search strategy
Biblioteca Digital Brasileira de Teses e Dissertações (BDTD) (theses and dissertations from Brazil)	("Educational Technology" OR "Educational Technologies" OR "Instructional Technologies" OR "Instructional Technology" OR "animated infographic" OR "animated infographics" OR "animated video" OR "animated videos" OR "animated resources" OR "Mobile Applications" OR "App" OR "Apps" OR "Video Games" OR "Computer Game" OR "Computer Games" OR "Video Game" OR "Information Technology" OR "Information Technologies" OR "Tecnologia Educacional" OR "Tecnologia Instrucional" OR "material educacional digital" OR "infográfico animado" OR "infográficos animados" OR "vídeo animado" OR "vídeos animados" OR "recurso animado" OR "recurso tecnológico" OR "recursos tecnológicos" OR "Aplicativos Móveis" OR "Apps Móveis" OR "Jogos de Vídeo" OR "Jogos de Computador" OR "Videojogos" OR "Tecnologia da Informação" OR "TIC em Saúde" OR "TIC na Saúde" OR "Tecnologia em Saúde" OR "Tecnologias em Saúde" OR "Tecnología Educacional" OR "Tecnología Educativa" OR "Tecnología de Instrucción" OR "infografía animada" OR "infografías animadas" OR "Aplicaciones Móviles" OR "Juegos de Video" OR "Juegos de Computadora") AND ("Ostomy" OR "Ostomies" OR "Enterostomy" OR "Enterostomies" OR "Estomia" OR "Ostomia" OR "Enterostomia")
Catálogo de Teses e Dissertações (CAPES) (theses and dissertations from Brazil)	estom* OR osto* AND criança OR pediatr* OR Child* estomia em criança
ProQuest Dissertations & Theses Global (PQDT Global) (theses and dissertations; worldwide coverage)	("Educational Technology" OR "Educational Technologies" OR "Instructional Technologies" OR "Instructional Technology" OR "animated infographic" OR "animated infographics" OR "animated video" OR "animated videos" OR "animated resources" OR "Mobile Applications" OR "App" OR "Apps" OR "Videogames" OR "Computer Game" OR "Computer Games" OR "Video Game" OR "Information Technology" OR "Information Technologies") AND ("Ostomy" OR "Ostomies" OR "Enterostomy" OR "Enterostomies")
Instituto Nacional da Propriedade Industrial (INPI) (Brazilian patent office)	Estomia OR Ostomia OR Ileostomia OR Colostomia
Espacenet — European Patent Office (European Patent Office)	(ctxt all "mobile app" OR ctxt all "software*" OR ctxt all "smartphone*" OR cl all "G06F" OR cl all "G06Q" OR ctxt all "mobile apps") AND (ctxt any "Ostom*" OR ctxt any "Ileostom*" OR ctxt any "Colostom*")
Patentscope (World Intellectual Property Organization — international patent applications within the scope of regional and national patent collections *Patent Cooperation Treaty* (PCT) from all participating countries)	(EN_AB:("Mobile app" OR "Mobile apps" OR Smartphone* OR Software*) OR CLASSIF:(G06F OR G06Q)) AND (EN_AB:(Ostom* OR Ileostom* OR Colostom*))
Google Patents (worldwide patents)	(TAC=("Mobile app") OR TAC=("Mobile apps") OR TAC=(Smartphone*) OR TAC=(Software*) OR G06F OR G06Q) TAC=(Ostom*) OR TAC=(Ileostom*) OR TAC=(Colostom*)
Derwent Innovations Index (worldwide patents)	https://www-webofscience.ez46.periodicos.capes.gov.br/wos/diidw/summary/2f786db5-4aaf-4d3b-9a96-1c59e01a94a9-d48037c5/diidw-relevance/1 https://www-webofscience.ez46.periodicos.capes.gov.br/wos/diidw/summary/c038402a-909f-4c62-9d89-45eed710165e-d4807f77/diidw-relevance/1

Source: Authors; 2024.

RESULTS

The initial search returned 2,031 records of publications (theses, dissertations, patents, and mobile applications). A total of 181 duplicate publications were excluded, and after reading the descriptions and analyzing the titles and abstracts, 12 publications were included in the final sample: one patent, five theses/dissertations, and six applications.

Regarding the patent search, a deposit made in 2019 on Google Patents in the United States was included, concerning the development of software/hardware for postoperative care information for people with intestinal ostomies, remote care, and integration of data from ostomy device sensors. The technology was developed by 11 Health and Technologies Inc., a care platform for people with chronic conditions, and licensed to Convatec Technologies Inc. (Chart 2)[17].



Source: Authors; 2024, adapted from the PRISMA-ScR Flowchart[16].

Figure 1. Flowchart of the production selection stages. Florianópolis (SC), 2024.

In the search of thesis and dissertation databases, four dissertations and one thesis were selected, all produced at Brazilian universities. The dissertations were published in two editions in 2021, one in 2022, and one in 2023, and the thesis was published in 2020. The technologies developed included a prototype application, an application, a virtual environment, and two educational videos.

The technologies addressed aspects related to promoting self-care, education about the rights of people with ostomies, health care, and practical support for these individuals and their caregivers. Two productions addressed issues related to

self-care and guidance on ostomies: a prototype mobile application for self-care and the EstomAM application. The educational videos on the rights of people with ostomies and health education and the virtual learning environment called Colostomia Virtual (Virtual Colostomy) offer support for patients and caregivers (Chart 3)[18-22].

In the Mobile Application category, the six applications selected in the search in virtual stores were also included. All are available in free versions, three of which are found in both virtual stores, two in Apple and one in the Play Store. In terms of language, three were in English, two in Portuguese, and one in Spanish. In terms of timing, two were developed in 2019, two in 2023, one in 2021, and one in 2024. According to user reviews, only one received a 5-star rating, while the others did not yet have such a rating.

All apps were focused on intestinal ostomy care, offering resources and support from professionals, ranging from practical and educational guidance to tools for monitoring care. EStomia, Ostomy 101, and Contigo Me+ address specific aspects, such as ostomy care, products, general guidance, and support from consultants or professionals. Pessoa com Deficiência 3 and Baby Care Tech address educational and informational content about caring for people with ostomies, and Stoma Steps is a tool focused on recording and monitoring daily ostomy care, wellness guidance, and the support community for people with ostomies (Chart 4)[23-28].

Chart 2. Production included through patent database searches. Florianópolis (SC), Brazil, 2024.

Title **Inventors** **Registration number** **Year of filing** **Country of origin** **Language of technology**	**Description of the technology**	**Type of technology (category)**
System and method for caring for ostomy patients[17] Michael SERES, Karen Anaid Solís González 2019EUA11291577B2/2019 United States English	Systems and methods for providing post-operative care to patients with ostomies. These include software and/or hardware that facilitates patient care, with a patient coach providing remote care to the patient or coaching via a network for a person with an ostomy. Care may be provided by former patients, nurses, or other specially trained caregivers. Systems may integrate data from ostomy device sensors and inputs from patients, healthcare professionals, and/or device manufacturers to provide postoperative care.	*Software/hardware*

Source: Authors; 2024.

Chart 3. Productions included through searches in thesis and dissertation databases. Florianópolis (SC), Brazil, 2024.

References	**Description of the technology**	**Type of technology (category)**
Silva[18]	The mobile app prototype called OSTOCUIDE has features for teaching self-care to people with ostomies. It provides information on caring for the stoma and peristomal skin, such as hygiene, changing and emptying the collection equipment; nutrition; complications with ostomies; leisure and physical activities; sexuality and body image. In addition, there is a "Questions" icon, where users can contact researchers for further inquiries.	Mobile application
Barbosa[19]	The educational video Information for People with Ostomies was developed with the aim of providing information about the rights of people with ostomies.	Educational video
Albuquerque[20]	The principles of Dorothea Orem's theory have been incorporated into an app, EstomAM, to assist people with intestinal ostomies in self-care so that it can be used in situations where there is no nurse or other healthcare professional present to mediate the individual's self-care actions.	Mobile application
Silva[21]	The animated video was made available on free online video platforms and shared on social media in order to disseminate important information to people with intestinal ostomies and assist healthcare professionals in promoting health education for the social adaptation of these individuals.	Educational video
Monteiro[22]	Virtual Colostomy offers support and guidance to people with colostomies and their caregivers. It consists of five modules containing videos, forums, quizzes, podcasts, and the "Learn More" box".	Virtual environment

Source: Authors; 2024.

Chart 4. Productions included in the Mobile Application category, through searches in online app stores. Florianópolis (SC), Brazil, 2024.

Title Developer Release year Language App store	Application description (purpose, application, functionality)	Version Purchase User reviews
EStomia[23] Coloplast sp. z o.o. 2024 English *App Store*	EStomia offers guidance on ostomies and peristomal skin, as well as allowing users to request free collection bags and baseplate samples. The tools incorporated into the app allow users to quickly contact a Coloplast consultant via chat or send a question to a specialist.	1.2.5 Free No reviews
Ostomy 101[24] Ostomy 101 Inc. 2023 English *Play e App Store*	Users can consult a stoma therapist nurse or connect with a patient coach and find education about ostomies. This includes free educational videos, articles, and tools that provide information and resources for successfully living with an ostomy.	1,5 Free No reviews
Person with Disabilities 3[25] SAITE Group 2023 Português *Play Store*	It consists of a library of educational and informational materials in PDF format about people with disabilities, including materials aimed at people with ostomies.	1.1.1 Free No reviews
Baby Care Tech[26] A R F Rios 2021 Portuguese *Play* and *App Store*	Designed for the care of premature babies with special needs to assist family members in the care of gastrostomy, enteral feeding tubes, oxygen catheters, tracheostomy, and colostomy.	1.7.7 Free 5,0
Contigo Me+[27] Sinopsis Servicios y Soluciones 2019 Spanish *Play* and *App Store*	Aimed at patients and healthcare professionals, it offers guidance before, during, and after ostomy creation. It also includes videos on hydration and nutrition, with content about ConvaTec products.	1.73.0 Free No reviews
Stoma Steps[28] Eakin Healthcare Group Ltd. 2019 English *App Store*	Stoma Steps provides articles relevant to the surgical recovery stage, as well as tips and suggestions on how to manage your stoma. It includes tools that allow you to record a pouch change with your nurse, consult and record practical notes, such as fluid intake, sleep patterns, and how you are feeling. In addition, it provides access to a community of other people with stomas who have had similar experiences, helping you get the information and support you need to adapt to your new life.	2.37 Free No reviews

Source: Authors; 2024.

The EStomia app was developed by Coloplast®, version 1.2.5, in English, in the medical category and aimed at users aged four years and older. The app has not yet received any reviews. In terms of functionality, it provides guidance on ostomies and peristomal skin, requests for collection bags and adjuvant products, and consulting services to answer questions[23].

The Ostomy 101 app, version 1.6, in English, is sponsored by several companies and aimed at the healthcare sector, for users over the age of 17. It offers educational and visual content, with video icons, some of which are aimed at caregivers/family members of children with ostomies. It accepts donations and provides free samples of ostomy products, as well as support groups[24].

Pessoa com Deficiência 3 (Person with Disability 3) is available in Portuguese and was developed by the Saite group for ages 12 and up. The technology features a library with video lessons and illustrative texts in Portable Document Format (PDF) for people with spinal cord injuries and ostomies in general (tracheostomy, gastrostomy, among others)[25].

The Baby Care Tech app is available in version 1.7.7, in Portuguese. It is aimed at families of children with special needs who depend on health technologies, including colostomy care. The app is intuitive, with clear language for easy understanding, as well as visual information and illustrations[26].

Contigo Me+, version 1.73.0, is available in nine languages. Developed for users aged 12 and over, the app presents a conflict of interest with Convatec®. The technology features icons with guidelines for pre- and post-ostomy care, videos

on nutrition and hydration, and guidelines for healthcare professionals on the evaluation and application of specific brand products (Convatec®)[27].

The Stoma Steps app is in version 2.37, in English, and in the medical category. It has an intuitive interface and interactive features, offering detailed guidance on stoma care, helping users change collection equipment, and providing guidance on general health, as well as promoting access to the support community for people with stomas[28].

DISCUSSION

This technology prospecting study revealed unprecedented results by mapping that, despite the high number of records initially identified, digital technologies specifically aimed at caring for people with intestinal ostomies are still few and poorly consolidated, with only 12 productions included.

A relevant and little-explored finding in the literature is that, in Brazil, these technologies are mainly produced in the Northeast Region, in public universities, with emphasis on the Federal University of Rio Grande do Norte (UFRN), highlighting the academic leadership in educational innovation aimed at this population.

In addition, it was observed that international initiatives focus on applications and patents from private companies, while in Brazil, prototypes, experimental applications, educational videos, and virtual environments in the development or validation phase prevail.

Thus, this study contributed by revealing the asymmetry between national academic production and the international market, in addition to highlighting the scarcity of validated and widely available technologies, responding to the gap identified in the introduction regarding the lack of knowledge about the real dimension and characteristics of digital educational technologies for people with ostomies.

These findings are consistent with evidence that the introduction of technologies in the health context contributes not only to cost reduction but also to improving the quality of care, reinforcing their potential to enhance nursing practice[29].

The asset deposit, which consists of software/hardware with numerous features to support people with ostomies, was developed in the US and licensed to Convatec®. From this perspective, the available data converges as presented in the Global Innovation Index Report, which points to North America as the most innovative region in the world in terms of patent development[30]. According to WIPO[32], the aforementioned report shows that, after the decline caused by the COVID-19 pandemic, there was a record number of patent applications from several countries, including China, Korea, and the US, in the areas of medical technology, biotechnology, and pharmaceuticals, pointing to the commercial potential for inventions during the pandemic.

It is worth noting that the patent analyzed in this prospectus highlights the potential of digital technologies as tools to support people with ostomies. The software described offers a series of features that aim to reduce doubts, improve the work of professionals, and optimize care management.[32]. This plurality of resources, brought together in a single technological solution, demonstrates the trend toward combining innovation, efficiency, and comprehensiveness in healthcare[30].

Daily, in the context of healthcare, technology is used to support nurses in providing guidance to parents/caregivers, as well as to equip other healthcare professionals with the tools they need to perform certain care and/or procedures. Thus, mobile technologies that address guidance for certain surgical procedures, including intestinal ostomy creation, are of great relevance to patients, integrated into the Contigo Me+ and Stoma Steps applications[27,28]. The information covered by these technologies, such as surgical context, preoperative guidelines regarding necessary tests, fasting time, recommended clothing, and documents required by the institution, as well as postoperative information regarding possible complications, follow-up appointments, hygiene and dressing care, diet, pain relief, and frequently asked questions about the surgery in question, are extremely relevant to the patient[33].

The use of technological products, including apps, consists of far-reaching tools to promote health education both in the care setting and at home. Health education is important for adapting to the new reality, with up-to-date information on self-management of ostomies for patients in the preoperative period, as well as in the postoperative period[34].

To provide health education at different levels of care, the applications include a multitude of guidelines and care instructions on specific topics, empowering the target audience. The development of applications for the health sector offers numerous advantages, such as quick access to information and the reproduction of scientific information, enabling appropriate conduct in the face of health conditions, such as peristomal complications, both by professionals and patients[35]. These applications show promise as a strategy for interacting with patients, but they must be innovative, use language that is appropriate for users, and be intuitive so that the guidance provided regarding the surgical procedure is effective and truly necessary in the perioperative period[36].

It should be noted that the mobile application prototypes that make up this prospectus address nutritional guidelines, ostomy and peristomal skin care, stoma cleaning, as well as emptying and changing collection equipment, ostomy products, leisure and physical activities, sexuality and body image, and complications. In view of this, the prototype developed covers the necessary guidelines for people with ostomies[37,38]. The development of an app aimed at people with ostomies must take into account that these individuals have a health condition and need to know how to care for their ostomy. For example, there is a need to clarify questions related to cutting the adhesive base, changing, emptying, and cleaning the collection equipment, sanitizing the peristomal skin, and using adjuvant products[39].

Regarding nutritional guidelines on water intake and nutrition, the ContigoMe+, Stoma Steps, and Ostocuide and EstomAM prototype apps contain features in the form of reminders about the importance of hydration and nutrition[18,20,27,28], because reduced nutritional status and fluid intake in patients, especially those who have undergone ileostomy, increases the risk of hospital readmission[40].

Some of the mobile technologies included offer patient support services, with an icon directing questions to a specialist to assist with care guidance. The importance of this support provided by specialists is emphasized, avoiding unnecessary trips by patients to health facilities to obtain clarification of questions related to intestinal ostomy care. It is important to mention that, in order for nurses to provide quality health education, they need to be equipped with knowledge on the subject[41]. Health education ensures patient autonomy, which is achieved through resources that enable knowledge, dialogue, and shared decision-making[42].

The development of an application involves several stages, among which the search for scientific evidence to support the purpose of the proposed technology stands out, ensuring the reliability of the information and guidance provided. In this context, applications contribute significantly to the improvement of nursing care, while allowing healthcare professionals responsible for providing care to take on other roles. This redistribution of tasks provides greater flexibility at work and makes it possible to care for patients who are difficult to access. In addition, these technologies favor improvements in the organization of services and the quality of care provided.

It is worth noting the importance of inclusive education on this topic for people with hearing and/or visual impairments. In this study, it was found that one of the technologies provides a library of subtitled videos with audio features. ICTs are fundamental resources in the learning process for people with hearing impairments, as are applications that provide photographed text and subtitles in videos in order to reduce segregation and motivate the acquisition of knowledge[38].

Among the apps included, only one was specifically aimed at the pediatric population, with an emphasis on the care provided by family members and caregivers to premature babies with special needs, using technologies such as gastrostomy, enteral feeding tubes, oxygen catheters, tracheostomy, and colostomy. Digital technologies can support care through the use of educational technologies to provide support and guidance to people with ostomies and caregivers, in order to meet the needs of these users, stimulating learning and improving quality of life[43,44].

Health support offered through the use of apps with different self-care features enhances people's involvement, improving self-care and the feeling of safety at home, as well as maintaining a healthy lifestyle and addressing psychosocial needs[45,46].

Still regarding the results of this study, two productions brought about the development of educational videos with the purpose of providing information to people with ostomies. The actions or information resources contribute to improving communication and understanding among individuals, since health technologies offer advances to improve nursing care, in order to facilitate understanding and promote changes in care practices[47].

It is worth noting that educational videos are excellent technologies for capturing the viewer's attention, as they contain elements that stimulate curiosity about the information and guidance on a given subject. Among the technological resources for health education, educational videos are a pedagogical tool that integrates various elements, such as images, text, and audio, into a single resource that promotes learning and knowledge. An example of this is the identification of participants' perceptions about the use of educational videos as support for people with ostomies[48].

Combined with other technologies aimed at people with intestinal ostomies and caregivers, the development of AVA to provide support and guidance is important for promoting care and self-care. According to user usability assessments, this health education resource is easy to understand and visually appealing, promoting knowledge and support for people with ostomies and caregivers[49].

Reducing hospitalization time and discharge plan limitations, as well as preparing patients and their families, combined with the use of accurate and reliable resources available on the internet, such as AVA, can complement health education[49].

Study limitations

The limitations of this study included the scarcity of technologies developed specifically for the pediatric population, requiring the search to be conducted using equivalent terms, referring to products aimed at the adult audience.

It is worth noting that most applications did not receive user reviews, which may raise doubts about their effectiveness. However, it is important to highlight that there were numerous update versions.

Recommendations from the study

As evidenced in this study, digital technologies, with an emphasis on mobile applications, can be a potential health education strategy for people with intestinal ostomies and their support network who need to adapt to their new condition.

Corroborating the research, ICTs combined with health education have been widely developed and are increasingly emerging today by nurses to convey guidance, overcoming barriers such as time/space limitations, becoming accessible tools capable of reaching the largest number of people. However, it is important to emphasize the need for them to be evaluated in order to ensure the quality of their content and the effectiveness of their objectives.

CONCLUSION

This study identified and analyzed 12 digital technologies developed to guide care for people with intestinal ostomies, including one international patent, five academic publications (four dissertations and one thesis), and six mobile applications available in online stores.

Mobile applications were the predominant technology, constituting innovative strategies for health education, although no records were identified in patent databases.

In the national scenario, prototypes, applications, educational videos, and a virtual learning environment stood out, covering everything from practical guidance on collection equipment, hydration, and nutrition to the rights of people with ostomies and support from specialized professionals. International applications presented practical and monitoring features but, for the most part, lack scientific validation and consistent user evaluations.

It was concluded that, despite the diversity of initiatives identified, these technologies are still in their infancy, but represent a promising field for instrumentalizing nursing practice and strengthening health education and self-care for people with intestinal ostomies.

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