

Mobile apps for patient safety education: integrative review

Aplicativos de celular para educação sobre segurança do paciente: revisão integrativa

Aplicaciones móviles para la educación en seguridad del paciente: revisión integrativa

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ABSTRACT

Objective: to analyze mobile applications available in the literature for patient safety health education.

Method: this is an integrative review on the use of mobile applications for patient safety health education. The search took place from July to August 2023 in the following databases/portals: Scielo, PubMed/PMC, EMBASE, Web of Science, SCOPUS, CINAHL, and COCHRANE, with no time and language restrictions. **Results:** sixteen studies on applications were analyzed, which were predominantly developed for surgical patients awaiting elective surgeries with the aim of providing information on patient safety in all perioperative periods. Educational technologies directed at guiding and managing polypharmacy in elderly individuals at home, as well as care related to adverse events in the hospital setting, also stood out. **Conclusion:** health education applications showed good usability and user satisfaction scores, being effective in improving knowledge and risk management. The use of resources such as images, sounds, games, and reminders can enhance the learning process during health education provided by the nursing team.

Descriptors: Educational Technology; Health Education; Mobile Applications; Nursing; Patient Safety.

RESUMO

Objetivo: analisar aplicativos disponíveis na literatura para educação em saúde sobre segurança do paciente. **Método:** revisão integrativa sobre o uso de aplicativos móveis para educação em saúde sobre segurança do paciente. A busca ocorreu de julho a agosto de 2023 nas bases/portais de dados: Scielo, PubMed/PMC, EMBASE, Web of Science, SCOPUS, CINAHL e COCHRANE, sem restrição de tempo e idioma. **Resultados:** foram analisados 16 estudos sobre aplicativos, os quais foram predominantemente desenvolvidos para pacientes cirúrgicos que aguardavam cirurgias eletivas, com o objetivo de informar sobre segurança do paciente em todos os períodos perioperatórios. Destacaram-se também as tecnologias educacionais direcionadas à orientação e manejo do uso de polifarmácia por idosos no domicílio, bem como os cuidados relacionados a eventos adversos no ambiente hospitalar. **Conclusão:** aplicativos de educação em saúde apresentaram boas médias de usabilidade e satisfação de uso, sendo efetivos na melhora do conhecimento e gerenciamento dos riscos. A utilização de recursos como imagens, sons, jogos e lembretes pode potencializar o processo de aprendizagem durante a educação em saúde realizada pela equipe de enfermagem.

Descritores: Aplicativos Móveis; Educação em Saúde; Enfermagem; Segurança do Paciente; Tecnologia Educacional.

RESUMEN

Objetivo: analizar las aplicaciones móviles disponibles en la literatura para la educación en salud sobre seguridad del paciente. **Método:** revisión integrativa sobre el uso de aplicaciones móviles para la educación en salud sobre seguridad del paciente. La búsqueda se realizó de julio a agosto de 2023 en las siguientes bases/portales de datos: Scielo, PubMed/PMC, EMBASE, Web of Science, SCOPUS, CINAHL y COCHRANE, sin restricciones de tiempo ni idioma. **Resultados:** se analizaron dieciséis estudios sobre aplicaciones, que fueron predominantemente desarrollados para pacientes quirúrgicos que esperaban cirugías electivas con el objetivo de proporcionar información sobre la seguridad del paciente en todos los períodos perioperatorios. También se destacaron tecnologías educativas dirigidas a guiar y gestionar la polifarmacia en personas mayores en el hogar, así como la atención relacionada con eventos adversos en el entorno hospitalario. **Conclusión:** las aplicaciones de educación en salud mostraron buenas calificaciones en cuanto a usabilidad y satisfacción del usuario, siendo efectivas para mejorar el conocimiento y la gestión de riesgos. El uso de recursos como imágenes, sonidos, juegos y recordatorios puede mejorar el proceso de aprendizaje durante la educación en salud proporcionada por el equipo de enfermería.

Descriptores: Aplicaciones Móviles; Educación en Salud; Enfermería; Seguridad del Paciente; Tecnología Educacional.

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INTRODUCTION

Patient safety consists of an organized set of activities encompassing cultures, processes, procedures, behaviors, and technologies designed to reduce the occurrence of preventable harm and its associated negative impacts.¹ Healthcare professionals have been concerned with developing strategies to ensure the quality of healthcare services and prevent adverse events (AEs) in patients. To achieve this, safety goals have been established to mitigate these risks, including the correct identification of patients, effective communication, safe administration of high-alert medications, safe surgical practices, reduction of healthcare-associated infection risks, and prevention of harm from falls.²

It is believed that many of these harms could be prevented by providing guidance to patients, and an effective means of reducing costs and harm caused by AEs is by involving patients in managing their own risks. Consequently, outcomes related to this issue, such as unplanned care, exacerbation of clinical conditions, and deterioration in the quality of life, can be mitigated through proper self-management, which can be enhanced through health education.³

In this context, healthcare managers and professionals view health education as a tool for promoting patient safety and their engagement in safe practices. This process can be facilitated through the use of educational tools. Professionals can employ mechanisms that enhance patient learning, such as videos, games, printed materials, and applications. Currently, Information and Communication Technologies (ICTs) are prominent and increasingly used for communication, monitoring, and patient education.⁴

The process of health education through mobile applications is considered an efficient platform for health interventions, given that these tools are accessible to specific target audiences and cost-effective compared to other phone-based interventions.⁵

Given the above, it becomes relevant to gather and synthesize evidence regarding available applications designed for patient safety health education. The outcomes of this review can assist researchers in understanding the functionalities of available applications and

contribute to the development of future interventions. Moreover, it is possible to identify the information needs related to patient safety and the potential effects of these applications.

Thus, this review can support healthcare professionals, researchers, policymakers, and other care providers in gaining an overview of mobile applications, including their content, procedures, benefits, and application scenarios.

OBJECTIVE

To analyze applications documented in the literature for health education on patient safety.

METHOD

An integrative literature review was conducted, a research method grounded in the meticulous integration of all key evidence on a specific topic, with the aim of guiding practice based on scientific knowledge.⁶ This study followed six stages: selection of the guiding question based on the Population, Intervention, and Context (PICO) strategy and determination of inclusion and exclusion criteria; literature search; definition of the information to be extracted and categorization of the studies; evaluation of the studies included in the integrative review; interpretation of the results; and presentation of the review with a synthesis of the generated knowledge.⁷

The search was guided by the question: "What is the evidence regarding mobile applications for patient safety health education?" and considered the following criteria: P = patients; I = educational intervention through mobile applications; Co = patient safety. The search was conducted from July to August 2023, without a time restriction.

For the selection of articles, the following databases and/or portals were utilized: Scielo, Pubmed/PMC, EMBASE, Web of Science, SCOPUS, CINAHL, and COCHRANE. To expand the identification of relevant articles, a manual search of references available in primary studies was conducted, and those meeting the inclusion and exclusion criteria were also included in the sample.

Articles published in any language that addressed the use of mobile applications for patient health education were included. The exclusion criteria were as follows: studies involving other educational technologies, such as pamphlets, videos, and oral communication and studies that did not pertain to patient safety.

For the search, descriptors from the Health Sciences Descriptors (DECS) and Medical Subject Headings Section (MESH) were selected, including: "Health education," "Patient education," "Smartphone," "Cell Phone," "Mobile Applications," "Patient Safety," "*Educação em Saúde*," "*Educação do Paciente*," "Smartphone," "*Telefone Celular*," "*Aplicativos Móveis*," and "*Segurança do Paciente*".

Due to the characteristics of the selected databases, it was not possible to conduct a broad search in all of them using a single strategy. Therefore, a combination of descriptors was tested and used with the purpose of retrieving the highest number of articles related to the study topic (Figure 1).

Database	Search query
EMBASE	("Health education" OR "Patient education") AND ("Mobile Applications" OR Smartphone OR "Cell Phone" OR mHealth) AND "Patient Safety"
Scopus	
PuBMed	"Health education" AND "Mobile Applications" AND "Patient Safety"
Web of Science	("Mobile Applications" OR Smartphone OR "Cell Phone" OR mHealth) AND "Patient Safety"
CINAHL	
Cochrane	
SciELO	(Smartphone OR "Cell Phone" OR "Mobile Applications") AND "Patient Safety"

Figure 1 - Search strategy in the databases used in the research and study selection process. Fortaleza, CE, Brazil, 2023.

The studies retrieved through the search were analyzed by title and abstract, and data collection and analysis were carried out independently by two reviewers. An instrument created by the authors was used, containing the following fields: article title, journal title, authors, country, language, year of publication, study type, research objective or question, study population, study period, methodology, methodological rigor, interventions performed, and main results.

The obtained data were summarized in a table with the following fields: author, number of participants, objective, and intervention. The classification of evidence levels was defined as follows: Level I – Meta-analyses of controlled and randomized studies; Level II – Experimental study; Level III – Quasi-experimental study; Level IV – Descriptive/non-experimental or qualitative approach study; Level V – Case report or experience; and Level VI – Expert consensus and opinion.⁸

It is important to note that this study adhered to the ethical and legal principles outlined in Resolution 510/2016 of the National Health Council, which pertains to research involving publicly available content.

RESULTS

The database search yielded 830 articles. Of these, 26 were excluded as duplicates, leaving 804 articles. After reviewing titles and abstracts, 781 articles were excluded for not meeting the inclusion criteria, leaving 23 articles. Out of the remaining 23 articles, 7 were excluded as they focused on patient safety applications aimed at healthcare professionals. Therefore, at the end of this analysis process, 16 articles were selected. Figure 2 illustrates the study selection and inclusion process.

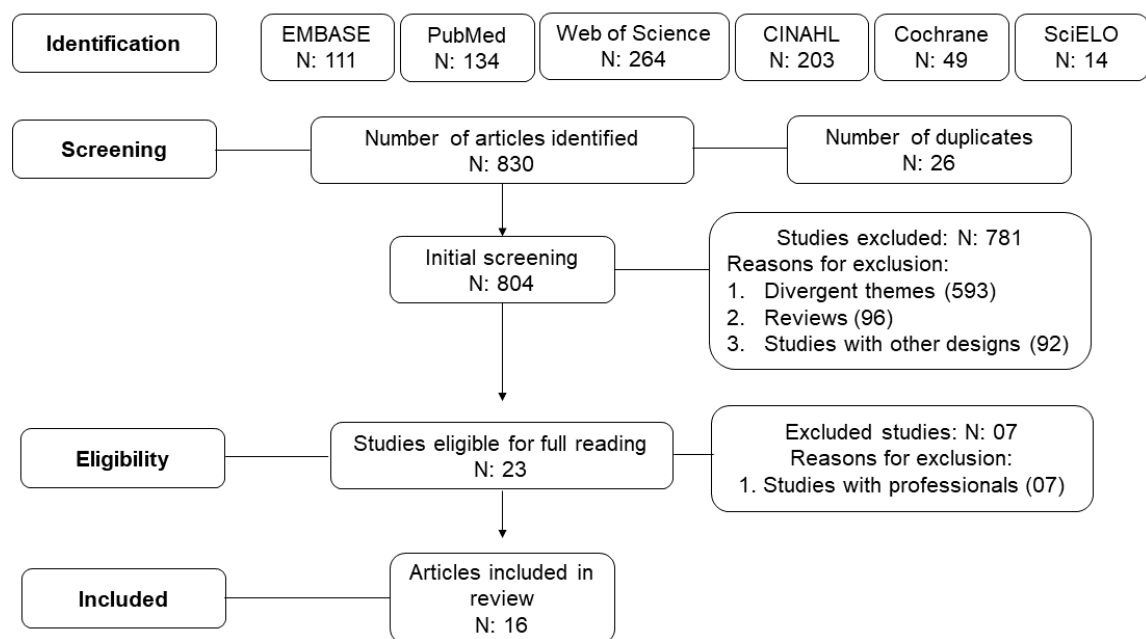


Figure 2 - Study selection process. Fortaleza, CE, Brazil, 2023.

Thirteen (81.2%) studies utilized mobile applications developed in the English language, two (12.5%) were produced in Portuguese, and one (6.2%) was in Korean. The articles included in this review were published between 2014 and 2022, with notable peaks in 2014 and 2020. The studies were published in the following journals: Health Expect⁹; Journal Nurs Scholarsh¹⁰; Healthcare Informatics Research¹¹; Central European Journal of Urology¹²; Research in Social and Administrative Pharmacy¹³; JMIR mHealth and uHealth¹⁴; BMJ Innovations¹⁵; CIN: Computers, Informatics, Nursing¹⁶; Journal of Pediatric Nursing¹⁷; Revista Latino-Americana de Enfermagem¹⁸; The American Journal of Surgery¹⁹; Revista de Saúde Digital e Tecnologias Educacionais²⁰; Journal of Medical Internet Research²¹; International Journal of Medical Informatics²²; Korean Journal of Adult Nursing²³; and Technology and Health Care.²⁴

Regarding the location and origin of the studies, six (37.5%) were conducted in South Korea^{9-11,16-17,23}, two (12.5%) in Brazil^{18,20}, two (12.5%) in the United States^{13,14}, two (12.5%) in Spain²¹⁻²², and one (6.2%) in each of the following countries: India¹², England¹⁴, the Netherlands¹⁵, and China.²⁴

Regarding the research design of the studies, randomized clinical trials were observed^{10,20-21}, quasi-experimental studies^{9,10-13,15-17,19,22-24}, action research¹⁶, and methodological studies¹⁸. In terms of the level of evidence, 12 (75%) presented level III^{9,11-17,19,22-24}, three (18.8%) had level II^{12,20-21}, and one (8.3%) had level IV.¹⁸

Participants included in the studies were of both sexes, with most research conducted on adults and the elderly, except for two studies that targeted preschool-age children^{10,17}. The sample sizes of the studies ranged from 12 to 123 participants, with sample calculations performed in four (28.5%) studies^{12,18,20-21}. The research included ambulatory elderly patients^{9,20-22,24}; surgical patients^{10-19,23}, and hospitalized children^{10,17}, adverse events in hospitalized adult patients.^{9,11-12}

Figure 3 presents the synthesis of the studies included in the review, containing author, sample, objective, intervention, measurement instrument, result, and level of evidence.

Year/ Evidence level	N	Objective	Intervention	Main results
2022/ Level III ⁹	97	To develop and evaluate the effect of a mobile application on patient participation in their safety in the hospital environment.	The APPSE application addresses educational materials with 12 patient safety topics according to four patient safety competencies in the hospital environment.	The intervention group obtained higher global scores than the control group regarding patient safety knowledge ($p < 0.001$), self-effectiveness of participation ($p = 0.001$), willingness to participate ($p = 0.010$), and participation experience ($p = 0.038$).
2021/ Level I ¹⁰	116	To determine the effectiveness of the mHealth Safe Kids Hospital (SKH) mobile application for preventing safety incidents in hospitalized children.	The SKH application with content focused on adverse events, mainly burns, medication use, falls, and communication, among others, with preschool children in the hospital environment.	The use of the SKH application generated a significant increase in knowledge scores about falls ($p < 0.001$), burns ($p = 0.002$), and medical devices ($p = 0.002$). In hospital safety knowledge and safety behavior, the experimental group had the highest mean score after the intervention compared to the control group.
2021/ Level III ¹¹	94	To determine and evaluate whether a smartphone application to address patient safety concerns could improve patients' self-efficacy and safety behaviors.	An application with learning content about the importance of patient involvement in their safety and preventing adverse events related to hospital infections, surgeries, medication errors, and falls.	The mean level of self-efficacy increased from 2.53 ± 0.49 to 2.95 ± 0.61 after patient safety self-education intervention using the smartphone application ($p < 0.001$). Furthermore, the result showed that the average safety behavior score also increased significantly from 2.00 ± 0.67 to 2.62 ± 0.76 , and there were improvements in all safety behavior assessments after app intervention ($p < 0.001$).
2021/ Level II ¹²	33	To analyze the use of the 'Urostentz' smartphone app in stent procedures and whether it improved communication and patient safety during the COVID-19 pandemic lockdown.	The Urosentz, an application used to improve communication between patients and professionals after the procedure to place an indwelling urethral stent and have content on symptoms and possible doubts.	The Urostentz app effectively communicated to provide guidance and personalized digital remote healthcare during the COVID-19 pandemic. Its use avoided possible complications linked to the stent and allowed the stent to be removed at a mutually convenient time for professionals and patients.
2020/ Level III ¹³	40	To test the usability and viability of the Brain Buddy mobile app.	An application used to inform and train elderly people in primary health care about the risks and benefits of anticholinergics.	Overall usability was acceptable I for 100% of participants. There was an average score of 78.8 on the System Usability Scale, corresponding to "Good". Usage issues have been observed in tasks that require data entry. All participants felt more informed after using the app, and 94% planned to talk to their doctor about the risks related to the anticholinergic. At follow-up, 82% reported speaking to their doctor about the medication.
2020/ Level III ¹⁴	42	To evaluate surgical	The MySurgery mobile application	The vast majority agreed that the app was helpful and informative,

		patients' perceptions of the MySurgery app.	for use in the perioperative period.	easy to use, provided new information, and enabled patients to engage in conversations and ask questions about their care. They believed that using the tool would make the surgery more successful and intended to use it in the future. Suggestions to improve the application included accessibility for certain groups, such as people with disabilities.
2016/ Level III ¹⁵	17	To investigate the usability and reliability of the MyMedication (MMa) application to assist with medication reconciliation during hospital admission for elective surgery.	MyMedication (MMa), an application used by hospitalized patients for elective surgeries.	The mobile app proved viable in helping patients compile an up-to-date medication list. The lists created by patients in the application were considered reliable. The average score for usability was 68 out of 100. This result corresponds to ease of use. Therefore, MMA improved the safety of patients awaiting elective surgery.
2017/ Level III ¹⁶	123	To determine the effect of the Safe Patients application in surgical units of a tertiary hospital in South Korea.	Health education mediated by the Safe Patients application during hospitalization in surgical units.	The percentage of correct answers increased from 64.5% to 75.8% ($p < 0.001$) after the intervention with the application. The study demonstrated that Safe Patients can effectively improve knowledge about safety issues, enabling patients to engage in safe practices and prevent adverse surgery-related events.
2019/ Level III ¹⁷	30	To describe the development, feasibility, acceptability, and effectiveness of the Safe Kids Hospital (SKH) application for preventing security incidents.	The Safe Kids Hospital (SKH) app for hospitalized Korean children aged 3 to 6 years.	The SKH is a promising educational tool in pediatric settings. After using the application, children's level of security awareness increased significantly ($p=0.001$). Participants found the app easy to use and a fun way to learn, expressing overall satisfaction with the educational program.
2019/ Level IV ¹⁸	30	To develop, evaluate, and correlate the acceptability of an educational application for patients undergoing orthognathic surgery.	The OrtogApp application used during the perioperative period of orthognathic surgery.	The application presented valid content, which included five learning sessions to manage perioperative care. Usability resulted in an average of 79.8 ± 15.4 , considered good, and the satisfaction rate was 82.9%. There was no association between the usability of the application and the variables age and education.
2020/ Level III ¹⁹	100	To test the usability and usefulness of an application run in the preoperative period of general surgery.	An application with text messages containing information about surgery for patients in the preoperative period of general surgery.	The average usability score was 86, correlating with the 90th usability percentile. Of the 100 patients enrolled, 86% reported improvements in their surgical experience, 96% expressed that the tool provided essential reminders, and 84% did not identify any inconsistencies between the app's information and the surgeon's guidance.

2020/ Level II ²⁰	42	To verify the effectiveness of the “Don’t let grandma fall” application on the knowledge of elderly people regarding the prevention of falls at home.	An application to advise elderly people about falls at home.	The application was used uniquely and combined with verbal guidance. The two groups that used the application improved their level of knowledge about preventing falls at home. However, the group that received the application and verbal guidance showed a greater change in knowledge. No difference was found between the two isolated interventions. Therefore, it is not possible to say that one is better than the other.
2014/ Level II ²¹	99	To design, implement, and evaluate medication self-management application called ALICE for elderly patients using polypharmacy.	The ALICE application used to help elderly people self-manage medication use.	Patients who received the intervention had better medication adherence scores ($p < 0.001$) and fewer missed doses of medication ($p = 0.02$). The average satisfaction score was 8.5 out of 10. Overall, 88% of participants felt the app improved their independence in managing their medications. Elderly patients with no previous experience with information technologies were able to use the application effectively and use their medications more safely.
2015/ Level III ²²	61	To design, develop, and evaluate an application that transforms barcodes or quick response (QR) codes on medication packaging into verbal instructions.	The TUMEDICINA application used to help elderly people using polypharmacy in self-managing their medications.	The degree of satisfaction with TUMEDICINA was 8.3 points out of a maximum of 10. The attributes with the best value of the application were simplicity and verbal clarity of the messages (96.7%), clarity of the information provided (95.1%), and usefulness of verbal messages for the safe use of their medications (93.4%). There was no difference in the satisfaction assessment between patients with or without experience using a cell phone or browsing the internet.
2017/ Level III ²³	73	To evaluate patient safety applications in preventing adverse events among surgical patients.	An application on safety in surgical patients.	The application had a significant impact on increasing patient knowledge. The experimental group had significantly higher scores on the three knowledge variables analyzed: patient safety ($p < 0.001$), attitude towards security ($p = 0.004$), and right to information provision ($p = 0.024$).
2014/ Level III ²⁴	20	To design an application for support and safety in medication use by elderly people with multiple chronic diseases.	A support application for elderly people at home, used for two weeks.	The application presented a user satisfaction level of 90%. All interviewees responded that they were satisfied with the perceived usefulness and confidence when using the application. Furthermore, 95% of participants intended to use the proposed system. Therefore, this tool was a viable strategy to support elderly people in improving the safety of medication use at home.

Figure 3 - Summary of studies included in the review. Fortaleza, CE, Brazil, 2023.

Most of the applications were developed for elective surgical patients to promote safe practices throughout the perioperative periods, provide knowledge related to surgery, wound care, and minimize postoperative risks. Additionally, there were applications aimed at guiding and managing polypharmacy use by elderly patients at home. Most studies included in this review named the applications and provided free versions on Apple (iOS) and Android platforms.

Regarding the components of the applications, the studies delivered interventions through messages, images, animations, games, and reminders. Most applications showed a significant improvement in patients' knowledge who used them, as well as high levels of usability, feasibility, and acceptability.

DISCUSSION

Publications on mobile applications for patient safety health education are still relatively recent and represent an area of research that is relatively unexplored by healthcare professionals in Brazil. However, research has shown positive results regarding the knowledge gained and user satisfaction with the use of these new technologies.^{13-14,16}

A bibliographic search on behavior change in health through the use of applications has shown that these tools can be used in various care settings and have a range of functions, including information and time management, communication and consultation, patient monitoring, health record maintenance and access, data collection, and clinical decision-making.²⁵

In this review study, there was a predominance of applications for elderly home support. These tools were used to support the preoperative period and assist in the administration of polypharmacy by providing guidance for self-management of medication use. However, even though they were designed for outpatient contexts, many applications extended to the hospital environment, establishing comprehensive and longitudinal care connections during the perioperative period.

Digital interventions can involve various delivery functionalities, content, learning objectives, or pedagogical approaches. Therefore, they may include games, gamification, online courses, virtual reality environments, augmented reality, virtual patient simulations, and mobile digital education.²⁶

The identified applications in this study corroborate these findings, using resources such as games, text messages, images, and reminders to provide safety guidance regarding the safe use of medications, safe surgery, fall prevention, hospital safety, and improved communication between professionals and patients. Therefore, the effectiveness of these applications in improving individuals' knowledge and attitudes may be related to the tools used to facilitate the teaching process.

A systematic review of mobile applications for asthma self-management showed that multiple functionalities were associated with the effectiveness of the applications. These resources provided by the applications enhance their accessibility. Thus, it is expected that they are more effective than other technology-based interventions such as text messages, phone calls, and websites, which have limited resources or low accessibility.²⁷

The results of this study showed that the functionalities of the Safe Kids Hospital (SKH) application, based on 2D games¹³, and ALICE, with image-based interface; medication reminders; sounds and flashes²¹ were effective in reducing accidents in children during hospitalization and reducing rates of forgetfulness and medication errors in elderly individuals at home, respectively.

Given this evidence, mobile applications are becoming viable and useful tools for care, enabling the transmission of information and guidance to patients. Furthermore, they allow learning anywhere and anytime, and they can be easily found through keyword searches in app stores, recommendations, or categories determined by app stores.²⁸

Many of the patient safety applications are focused on safe surgery and safe medication use. It is worth noting that only two studies addressed applications for preventing accidents in children in the hospital environment and fall prevention in elderly individuals at home. The results indicate that there is still a limited number of studies on mobile applications for fall prevention.

A study conducted in Korea that compared educational intervention on safe surgery using a patient safety application and an educational booklet demonstrated an association between the use of the application and increased knowledge about patient safety ($p < 0.001$) and attitudes toward patient safety ($p = 0.004$).²³ Thus, there are advantages to mobile applications compared to traditional methods of information transmission, such as pamphlets. Additionally, the use of these tools with a specific target audience is also advantageous, as it is not always possible to generalize these educational interventions.

Therefore, it is increasingly evident that mobile health technologies, especially for adults and the elderly, should be designed with a user-centered approach and tested for usability, acceptability, and feasibility in real clinical settings⁹ to ensure personalized interfaces and functionalities. Information and communication technologies (ICTs) often lack important inclusive resources, resulting in inconsistent engagement of patients with special needs.²⁹ A study conducted in England that developed the MySurgery application found that the technology was less suitable for certain patient groups. Those with disabilities encountered difficulties using the application and were less likely to recommend it to others¹⁴. Adding audio, videos, signaling, easy-to-read versions, and support in using the application could help in this regard, as well as other useful tools like reminders and text messages, which were used in the applications in this review.

Thus, despite the clear benefits of using mobile applications, there are challenges to be faced, particularly related to the inclusion of hospitalized populations or the expansion of outreach to populations such as children and the elderly. Therefore, these technological resources require more studies and investigations because, in addition to technical knowledge, theoretical foundations are needed to develop interfaces that meet the needs of the target audience, minimize access barriers, and facilitate digital inclusion.

It is believed that the digital health movement can transform patient care services by providing knowledge, especially in low- and middle-income countries. However, it is still difficult to determine whether the applications available in online stores have been built based on scientific studies.²⁹ Thus, the importance of investing in research projects on the development

of applications is emphasized to offer free, scientifically validated technologies with proven effectiveness to patients and healthcare professionals.

Regarding the limitations of this integrative review, it is worth noting that the search was conducted with English language descriptors, so articles not available in English that would have been eligible to be included in the study sample may not have been found. To minimize this, a manual search was conducted in the reference lists of the included studies. The second limitation is related to differences in the methods, results, and quality of the included studies, making comparisons more difficult. The final limitation is that, due to the recent nature of the applications, results of unpublished and ongoing studies related to this field were not available.

In conclusion, these findings reinforce the innovative and beneficial nature of these tools for assisting patient health education. It is also important to further discuss this topic and the applicability of these tools in patient health education and self-care. For future work, it is recommended to conduct more research in the field of healthcare, using or developing new information technology tools for patient safety, especially mobile applications that meet the real needs of patients and consider their sociocultural specificities.

CONCLUSION

The mobile applications available in the literature for patient safety have proven effective in improving knowledge and risk management. Furthermore, they have shown good usability and user satisfaction scores, which were not related to prior experience with mobile app usage. It is worth highlighting that the use of resources such as images, sounds, games, and reminders can enhance the learning process.

The results of this study benefit nursing practice by providing a theoretical foundation based on scientific evidence to guide the choice of health education as a tool to enhance patient safety. It emphasizes the advantages of using apps by nursing professionals, which can mediate health education moments facilitated by nurses and offer benefits such as patient engagement, awareness of safety, risk perception, self-care, self-efficacy, and consequently, adherence to preventive care.

CONTRIBUTIONS

All authors contributed equally to the design of the research project, collection, analysis and discussion of data, as well as writing and critical review of the content, with intellectual contribution, and final approval of the study.

CONFLICT OF INTERESTS

Nothing to declare.

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