Produção científica sobre aplicativos móveis como ferramenta para a segurança do paciente: revisão bibliométrica

Scientific literature on mobile applications as a tool for patient safety: a bibliometric review

Literatura científica sobre aplicaciones móviles como herramienta para la seguridad del paciente: una revisión bibliométrica

Ana Caroline Batista da Silva de Oliveira[1], Xaene Maria Fernandes Duarte Mendonça[2], Alexandra Cordovil da Luz Mascarenhas[3].

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1. Fundação Santa Casa de Misericórdia do Pará. Belém, PA, Brasil. https://orcid.org/0000-0002-1361-2749

2. Fundação Santa Casa de Misericórdia do Pará. Belém, PA, Brasil. https://orcid.org/0000-0002-0958-276

3. Fundação Santa Casa de Misericórdia do Pará. Belém, PA, Brasil. https://orcid.org/0000-0002-8224-04831 .

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RESUMO

Objetivo: Analisar a produção científica sobre aplicativos móveis aplicados à segurança do paciente no período de 2021 a 2025. **Métodos:** Estudo bibliométrico realizado nas bases BVS, BDENF, MEDLINE, LILACS e CAPES, utilizando os descritores "Segurança do Paciente" e "Aplicativos Móveis". A amostra final consistiu em 16 artigos analisados por estatística descritiva e Lei de Bradford. **Resultados:** Observou-se predominância de estudos sobre desenvolvimento e validação tecnológica (62,9% voltados à prevenção de erros de medicação). A enfermagem destacou-se como principal área desenvolvedora e público-alvo. **Conclusões:** Os aplicativos móveis possuem alto potencial para fortalecer a segurança assistencial, porém há carência de estudos clínicos que comprovem sua efetividade na prática.

Descritores: Segurança do paciente; Aplicativos móveis; Gerenciamento de riscos.

ABSTRACT

Objective: To analyze scientific literature on mobile applications for patient safety published between 2021 and 2025. **Methods**: A bibliometric study was conducted using the BVS, BDENF, MEDLINE, LILACS, and CAPES databases, with the descriptors "Patient Safety" and "Mobile Applications." The final sample comprised 16 articles, analyzed using descriptive statistics and Bradford's Law. **Results:** A predominance of studies on technological development and validation was observed (62.9% focused on preventing medication errors). Nursing emerged as the primary field for both development and the target audience. **Conclusions:** Mobile applications hold significant potential to enhance care safety; however, there is a lack of clinical studies demonstrating their effectiveness in practice.

Descriptors: Patient safety; Mobile applications; Risk management.

RESUMEN

Objetivo: Analizar la literatura científica sobre aplicaciones móviles para la seguridad del paciente publicada entre 2021 y 2025. **Métodos:** Se realizó un estudio bibliométrico utilizando las bases de datos BVS, BDENF, MEDLINE, LILACS y CAPES, con los descriptores "Seguridad del paciente" y "Aplicaciones móviles". La muestra final estuvo compuesta por 16 artículos, analizados mediante estadística descriptiva y la Ley de Bradford. **Resultados:** Se observó un predominio de estudios sobre desarrollo tecnológico y validación (el 62,9% se centraba en la prevención de errores de medicación). La enfermería surgió como el ámbito principal tanto para el desarrollo como para el público destinatario. **Conclusiones:** Las aplicaciones móviles poseen un potencial significativo para mejorar la seguridad de la atención; sin embargo, existe una falta de estudios clínicos que demuestren su eficacia en la práctica.

Descriptores: Seguridad del paciente; Aplicaciones móviles; Gestión de riesgos.

REVISIÓN

Introduction

Patient safety constitutes one of the main pillars of the quality of health care, being widely recognized as a global priority by the World Health Organization (WHO), especially following the implementation of strategies aimed at reducing avoidable harm in health systems.[17,18] In Brazil, the establishment of the National Patient Safety Program reinforced the need to incorporate safe practices and the use of technologies capable of contributing to the improvement of care quality.[7]

In this context, the advancement of digital resources has promoted significant transformations in the health field, with particular emphasis on the growth of mobile health (mHealth), characterized by the use of mobile devices and applications to support care. Mobile tools have been widely used for clinical monitoring, health education, communication among professionals, and decision-making support, establishing themselves as promising tools for promoting patient safety.[13]

Recent studies show that mobile applications have been applied to different dimensions of patient safety, including the prevention of medication errors, support for safe communication, health education, and monitoring of adverse events. A scoping review identified that these technologies are frequently associated with international patient safety goals, with emphasis on reducing care failures and improving the quality of care.[14]

Furthermore, evidence indicates that applications focused on health education contribute to increasing the knowledge of patients and professionals, improving practices related to safety and risk management, especially in hospital settings and home care.[13,19]

Despite these advances, recent literature highlights important challenges related to the implementation and use of these technologies. Among them are issues related to usability, adherence by health professionals, integration with institutional systems and, above all, aspects related to information security and user data privacy. Such limitations highlight the need for greater rigor in the development, validation, and regulation of health applications. Additionally, recent reviews indicate that, although there is growth in scientific production on mobile applications aimed at patient safety, gaps remain regarding the evaluation of clinical effectiveness, methodological standardization, and measurement of impact on the reduction of adverse events.[13]

Given this scenario, it is relevant to analyze the scientific literature on mobile applications applied to patient safety in the period from 2021 to 2025, with the aim of identifying trends, contributions, and knowledge gaps, thereby supporting the development of safer and more effective technologies for health care.

Methods

This is a bibliometric study with a quantitative approach, aiming to analyze the scientific literature on mobile applications applied to patient safety, in the period from 2021 to 2025, in national and international databases.

Bibliometrics consists of the application of statistical and mathematical methods to the analysis of the production and dissemination of scientific knowledge, making it possible to identify publication patterns, the most relevant journals, and research trends. In this study, Bradford's Law, proposed by Samuel C. Bradford, was used; it describes the dispersion of scientific literature into zones of productivity, allowing the identification of the core journals of a given field of knowledge.

The search for studies was conducted in the databases of the Virtual Health Library (VHL/BVS), BDENF, MEDLINE, LILACS, and CAPES. To construct the search strategy, controlled descriptors from the DeCS (Health Sciences Descriptors) and MeSH (Medical Subject Headings) vocabularies were used, combined using the Boolean operators AND and OR.

The descriptors defined were: DeCS: "Segurança do Paciente" [Patient Safety], "Aplicativos Móveis" [Mobile Applications]; and MeSH: "Patient Safety," "Risk Management," "Mobile Applications," "mHealth."

The search strategy was structured as follows: ("Segurança do Paciente" OR "Seguridad del Paciente" OR "Patient Safety") AND ("Aplicativos Móveis" OR "Aplicaciones Móviles" OR "Mobile Applications").

Complete scientific articles published between 2021 and 2025, in Portuguese, English, and Spanish, addressing the use of mobile applications in the context of patient safety were included. Duplicate studies, editorials, letters to the editor, dissertations, conference abstracts, and articles not directly related to the proposed topic were excluded.

Data collection was carried out using a structured form covering the following variables: title, authors, year of publication, journal, country of origin, field of knowledge, type of study, and main topics addressed.

For the bibliometric analysis, Bradford's Law was applied, making it possible to identify the concentration of articles in specific journals by dividing them into zones of productivity. Based on this analysis, it was possible to identify the journals most relevant to the topic studied. Data were organized in spreadsheets and analyzed using descriptive statistics. Results were presented in tables and figures. The interpretation of the findings makes it possible to identify trends in scientific production, knowledge gaps, and directions for future research in the field of mobile applications applied to patient safety.

Results

The database search yielded 57 articles. Of these, 21 were excluded for being duplicates, leaving 36 articles. After reading the titles and applying the inclusion and exclusion criteria, 16 articles remained. Figure 1 visually represents the selection and inclusion process for the articles.

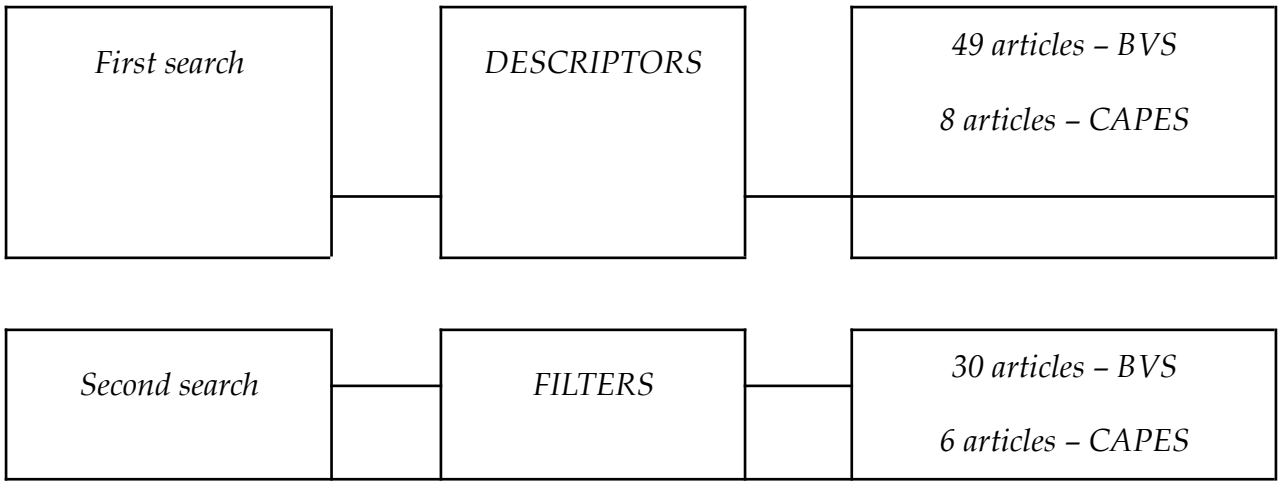

Figure 1. Flowchart of the study selection process included in the bibliometric review. Belém, PA, Brazil, 2026.

The selection process was conducted according to previously established criteria. The studies analyzed showed a predominance of research focused on the development and evaluation of digital technologies applied to patient safety, especially mobile applications aimed at health care. The application of Bradford's Law made it possible to identify the core group of journals responsible for the largest concentration of publications on the topic, showing a predominance of journals in the fields of Nursing and Health Informatics. A predominance of methodological studies focused on the development, validation, and evaluation of mobile applications was observed, followed by scoping reviews, integrative reviews, and technology-prospecting studies. Among the main topics addressed, the following stood out: surgical patient safety, drug therapy, prevention of health care-associated infections, sepsis, hospital shift handover, cardioactive drugs, patient safety culture, and prehospital care. Nursing emerged as the main target audience of the technologies developed, reinforcing the strategic role of the profession in incorporating technological resources aimed at improving the quality of care.

Narrative review, integrative review, and scoping review studies were also identified, which showed the advancement of mobile technologies in the context of patient safety over the last decade. In addition, technology-prospecting studies demonstrated growing scientific interest in the use of mobile applications as instruments for education, monitoring, and support for safe health practices.

Despite the progress observed, a smaller number of studies with robust experimental designs, such as randomized controlled trials, was found, indicating gaps related to the evaluation of the clinical effectiveness of the technologies developed. Thus, the findings suggest that, although there is significant expansion in technological production aimed at patient safety, there is still a need for research assessing the impact of these tools on care outcomes and quality of care.

Table I. Characterization of the studies included in the bibliometric review (2021–2025).

ID	TITLE	STUDY TYPE	AUTHOR(S)	YEAR	JOURNAL
01	Pediatrix Safe Kids: a serious game on pediatric patient safety.	Technological.	Mendes LA, Antunes CC, Sant'Ana MF, Costa ACL, Tourinho FSV, Manzo BF.	2025	Rev Esc Enferm USP
02	Efficacy and safety of an algorithm using C-reactive protein to guide antibiotic therapy applied through a digital clinical decision support system: a study protocol for a randomised controlled clinical trial.	Randomized controlled trial.	Rezende VMLR, et al.	2025	BMJ Open

ID	TITLE	STUDY TYPE	AUTHOR(S)	YEAR	JOURNAL
03	Mobile application for nursing on drug therapy in adults and older adults: a methodological study.	Methodological study, quantitative approach.	Muniz EF, Goulart MCL, Eugenio AC, Oliveira AC, Almeida YFRC, Góes FGB.	2025	Online Braz J Nurs
04	Patient safety and technology: a narrative review of the main innovations in the last decade.	Narrative review.	Silva EDMMS, et al.	2025	Rev Enferm Atenção Saúde
05	Safe surgical patient care application: development, content validation, and usability.	Methodological study.	Silva LLT, Lima RC, Silva RI, Poveda VB.	2024	Rev Gaúcha Enferm
06	The development pathway of a mobile application for intensive care nurses on cardioactive drugs.	Experimental development study of an application.	Borges MD, Correia DM, Tavares RM, Lima AS, Ferreira DB, Lemos KP, et al.	2024	Enferm Foco
07	Educational applications to support education on hospitalized patient safety: a technology prospecting study.	Technology prospecting.	Mendes LA, Antunes CC, Alves TF, Manzo BF.	2024	Online Braz J Nurs
08	Mobile applications for patient safety: a scoping review.	Scoping review.	Silva LLT, Andrade	2024	Texto Contexto Enferm
09	Contributions of mobile applications to prehospital care: an integrative review.	Integrative literature review.	Pereira CB, Barra DC, Lanzoni GM, Boell JE, Sousa PA, Sardo PM.	2024	Acta Paul Enferm
10	Development and validation of a mobile application prototype for hospital shift handover.	Technological production.	Dematte LPG, Jaques AE, Souza CM, Tonon MM, Dell'Agnolo CM, Radovanovic CAT, et al.	2024	Rev Bras Enferm
11	Mobile phone applications for patient safety education: an integrative review.	Integrative literature review.	Ximendes MAM, et al.	2023	Rev Enferm UFPE On Line
12	Development of a mobile application for health education about sepsis.	Methodological study.	Limeira JBR, Silva VC, Galindo Neto NM, Silva CRDT, Oliveira VL, Alexandre ACS.	2023	Rev Esc Enferm USP
13	Applications on intravenous therapy and prevention of catheter-associated bloodstream infection: a technology prospecting study.	Technology prospecting.	Silva TL, Souza SDE, Rocha PFA, Tourinho FSV, Manzo BF, Rocha PK.	2023	Cogitare Enferm
14	Model of a mobile application to support wound treatment.	Literature review.	Saggioro MF, et al.	2022	MEDINFO
15	Mobile applications for assessing patient safety culture: a scoping review.	Scoping review.	Pacenko CLP, et al.	2023	Braz J Health Rev

ID	TITLE	STUDY TYPE	AUTHOR(S)	YEAR	JOURNAL
16	Mobile applications on the safety of elderly surgical patients: a technology prospecting study.	Technology prospecting.	Ferreira JM, Alvarez AM, Tourinho FSV, Fabrizzio GC, Barbosa SS, Alves TF.	2024	Braz J Health Rev

Source: Prepared by the authors (2026).

Discussion

The analysis of scientific production showed significant growth in the development of mobile applications aimed at patient safety between 2021 and 2025. A predominance of methodological, technological development, and technology-prospecting studies was observed, indicating that the literature focuses mainly on the creation, validation, and initial evaluation of these tools, while studies aimed at evaluating their clinical effectiveness remain limited.[2,3,4,5,8]

The applications identified presented different care purposes, including support for drug therapy, surgical safety, prevention of health care-associated infection, education on sepsis, cardioactive drugs, and hospital shift handover. Applications aimed at supporting drug therapy showed potential to strengthen care safety, particularly by favoring the standardization of practices, reducing the occurrence of medication errors, and supporting the decision-making of nursing professionals during the care of adults and older adults.[8]

In the perioperative context, mobile applications showed potential to standardize safe care for surgical patients, foster communication among professionals, and support clinical decisions grounded in care protocols.[15] The incorporation of digital technologies was also observed in critical and specialized settings. In critical care units, the development of applications aimed at supporting the use of cardioactive drugs highlights the expanding use of mobile technologies as clinical decision-support tools, reducing uncertainty during care and favoring greater safety in the administration of high-alert medications.[1] Educational applications aimed at the early recognition of sepsis expand access to knowledge and favor the timely identification of clinical signs, contributing to earlier and potentially safer interventions.[4]

Technology-prospecting studies reinforced the expansion of digital tools aimed at patient safety. Scientific production also shows growth in the development of applications aimed at patient safety education, demonstrating that these technologies favor continuing education, the dissemination of care protocols, and the strengthening of a safety culture in health services.[5] In investigating applications on intravenous therapy and the prevention of catheter-associated bloodstream infection, the authors highlighted the potential of these technologies in preventing adverse events related to invasive devices.[13,14,15]

The literature reviews included also pointed to important benefits related to the use of mobile applications in health care. In a narrative review, the authors observed that technological innovations over the last decade have contributed to greater traceability of care actions, optimized communication among teams, and strengthened the safety culture.[13,14,15] In an integrative review on prehospital care, the authors emphasized that mobile applications favor speed, rapid access to information, and support for decision-making in critical situations.[10]

Regarding the patient safety themes addressed in the applications surveyed, a predominance of the themes of drug therapy, safe surgery, and prevention of health care-associated infections was evident.

Table II. Characteristics of the applications identified according to safety theme, target audience, and operating system.

Author (Year)	Type of Study	Safety Theme Addressed	Target Audience	Operating System
Borges et al. (2024)	Experimental development	Safety in the preparation and administration of cardioactive drugs	Intensive care nurses	Android, iOS, and Web
Mendes et al. (2024)	Technology prospecting (review)	Education on hospitalized patient safety	Professionals, patients, and companions	iOS, Android, and Web
Silva et al. (2024)	Scoping review	International patient safety goals (medication, surgery, communication)	Patients, students, and health professionals	iOS and Android
Pereira et al. (2024)	Integrative review	Patient safety in prehospital care (PHC)	Multidisciplinary team and lay public	Android and iOS
Dematte et al. (2024)	Methodological (technological production)	Effective communication during shift handover	Nurses in inpatient units	iOS, Android, and Windows
Mendes et al. (2025)	Technological study (Serious Game)	Pediatric patient safety	Companions of pediatric patients	iOS and Android
Ximenes et al. (2023)	Integrative review	Health education on patient safety	Surgical, elderly, and hospitalized patients	Various (as reviewed)
Limeira et al. (2023)	Methodological	Early identification and prevention of sepsis	General population (laypersons)	Android
Silva et al. (2023)	Technology prospecting	Intravenous therapy and catheter-associated infection prevention	Professionals, students, and patients	Android and iOS
Saggioro et al. (2022)	Methodological (prototyping)	Support and safety in wound treatment	Physicians and nurses	Mobile (iOS not specified)
Rezende et al. (2024)	Clinical trial protocol	Safety in antibiotic therapy (decision support)	Attending physicians	iOS and Android
Muniz et al. (2025)	Methodological	Prevention of medication therapy errors	Nurses caring for adults and older adults	Android and iOS
Silva et al. (2025)	Narrative review	Impact of technologies on reducing errors and improving safety	Patients, family members, and professionals	Mobile and wearables
Silva et al. (2024)	Methodological	Guidance and safety for surgical patients	Surgical patients	Android
Pacenko et al. (2023)	Scoping review	Assessment of patient safety culture	Managers and health professionals	Android
Ferreira et al. (2024)	Technology prospecting	Elderly patient safety in the surgical environment	Older adults and their caregivers	iOS, Android, and Web

Source: Prepared by the authors (2026).

The distribution of the themes addressed by the applications, according to the analysis of scientific production in the field, shows the following percentages: medication error prevention, 62.9%; safe surgery, 14.8%; effective communication, 11.1%; correct patient identification, 7.4%; and fall prevention and multiple goals, 3.7%. The applications identified presented different purposes, with emphasis on support for medication safety, health education, infection prevention, communication among professionals, shift handover, surgical patient care, wound care, sepsis management, and pediatric safety.

The theme of medication error prevention (medication safety) is widely predominant in the literature and in software development. Medication-related errors are among the most frequent preventable adverse events in health services, justifying the development of technologies aimed at supporting drug therapy.[8]

Despite the advances identified, a scarcity of robust experimental studies capable of evaluating the clinical effectiveness of these technologies in reducing adverse events and improving care outcomes was observed. Among the studies included, only one randomized controlled trial protocol was identified, showing that there is still an important gap in the production of high-level evidence on the impact of these technologies on clinical outcomes and patient safety indicators.[11] Scoping reviews show that there is a growing diversity of applications aimed at patient safety; however, limitations remain related to scientific validation, usability assessment, integration with health services, and implementation in clinical practice.[9,14]

Taken together, the studies analyzed indicate that mobile applications represent promising tools for strengthening patient safety through continuing education, support for clinical decision-making, standardization of care processes, and improved communication among professionals. However, the consolidation of these technologies in clinical practice depends on studies with greater methodological rigor, capable of demonstrating their impact on care indicators, adverse events, and quality of care.[2,4,11,13]

Conclusion

It is concluded that scientific production on mobile applications aimed at patient safety grew between 2021 and 2025, evidencing growing interest in the development of digital technologies applied to health care. Methodological, technological development, and technology-prospecting studies predominated, showing that the literature still focuses on the construction and validation stages of these tools.

The applications identified cover different dimensions of patient safety, with emphasis on the prevention of medication errors, surgical care, health education, prevention of health care-associated infections, communication among professionals, and support for clinical decision-making, with strong participation by nursing both in the development and use of these technologies.

However, the small number of experimental studies highlights the need for research with greater methodological rigor capable of evaluating the clinical effectiveness, usability, and impact of applications on quality and care safety indicators.

The findings of this bibliometric review contribute to broadening the understanding of current trends in scientific production, identifying knowledge gaps, and supporting the development of digital technologies that are safer, more effective, and better aligned with the needs of health services.

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Conflicts of Interest

The authors declare no conflicts of interest.

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Autor correspondente:
Ana Caroline Batista da Silva de Oliveira.
Travassão São Cristovão, Bairro São Pio X n86, CEP 68702110, (91) 986281252
kanabatista@gmail.com