Review Article

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Intervention and Evaluation of Mobile Technologies for Patients Safety in Nursing: A Scoping Review

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ABSTRACT

Background: Patient safety is a global concern because health professionals have an ethical responsibility to protect patient safety within the context of health care. **Objectives:** The purpose of this research was to fill in the gaps in the outcome evaluation of mobile application technologies by conducting a systematic analysis of existing mobile application interventions for enhancing patient safety culture among healthcare providers, particularly nurses. **Methods:** The protocol for this study was based on the 27-item Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) extension for scoping reviews. Combining the keywords "mobile app," "patient safety," and "nurse or nursing" addressed three fundamental issues. PubMed (MEDLINE), Scopus, and CINAHL (Cumulative Index to Nursing and Allied Health Literature) were searched through to find relevant articles. The papers published between January 2008 and April 31, 2023, were identified. **Results:** Following the full-text review, five papers were selected for this scoping review. One study was conducted in Indonesia, while others were conducted in Taiwan, the United States, Argentina, and Brazil. These mobile application interventions were delivered using technology platforms such as smartphones. The majority was used for education purposes, check lists, and reporting incidents to improve patient safety. The included study found that the application was effective, adequate, and useful to be used to improve patient safety. **Conclusion:** The use of mobile application technologies will improve their patient safety culture. Patient safety culture among nurses might be greatly enhanced by implementing mobile technologies.

Keywords: Mobile Technologies; Patients Safety; Nursing; Scoping Review

INTRODUCTION

This Patient safety is a global concern because health professionals have an ethical responsibility to protect patient safety within the context of health care (Royal College of Nursing, 2010). In healthcare, patient safety refers to the absence of avoidable injury (Johnson, 2022). The use of best practices that can result in optimal patient outcomes and the reduction and mitigation of dangerous measures are key components of patient safety (Doran *et al.*, 2010). Medication errors, misunderstandings during handoffs, a lack of trained personnel, and an unfamiliarity with new technologies are all examples of potential dangers that nurses must guard against to keep their patients safe (Sherwood, 2015). Monitoring and supervision are two ways in which registered nurses can ensure patient safety. Therefore, they should focus on the individual needs of each patient, collaborate in multidisciplinary teams, employ evidence-based procedures, enhance patient safety and quality, and satisfy the demands of modern medicine. It is imperative that nurses acquire patient safety skills during their educational and professional careers.

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In addition to revolutionizing information and communication technology, the rise of mobile technology is reshaping the health care system by equipping both patients and doctors with a plethora of useful resources for keeping tabs on their health and organizing their medical records (Free *et al.*, 2013). The use of mobile devices has been shown to benefit nurses in the field, including both RNs and nursing students (Hudson *et al.*, 2011). It has been shown that when nurses in medical and rehabilitation settings use mobile devices equipped with a preference-based care planning support system, their work and answers are more in line with patients' actual preferences. Access to clinical information resources via a mobile device has helped four different types of registered nurses (RNs) (acute care, home care, long-term care, and correctional facilities) improve their knowledge and practice (Patel *et al.*, 2016). Research has shown that using a mobile decision support system equipped with a barcode scanner to gain an understanding of a patient's prescription regimen as well as for patient identification can improve the security of blood transfusions (Johansson *et al.*, 2010). According to Johansson *et al*. (2012), the mobile device is believed to improve patient safety and quality of care, as nurses do not have to abandon their patients to look up information. As a result, the nurses' encounter with the patient is more comprehensive. However, research focused on app construction rather than app efficacy and clinical benefits. There is no systematic review of existing literature on mobile applications and their effectiveness and benefits for improving patient safety culture among nurses.

The purpose of this research was to fill in the gaps in the outcome evaluation of mobile application technologies by conducting a systematic analysis of existing mobile application interventions for enhancing patient safety culture among healthcare providers, particularly nurses. The goals of this research were to (1) synthesize, through a systematic literature review, the categories of interventions and their main functions of mobile applications for improving patient safety culture among nursing students, (2) analyze how these mobile application interventions are assessed, and (3) pinpoint areas where further research is needed in the assessment of mobile application technologies for improving patient safety culture among nurses.

METHODOLOGY

Study Design

The five-step methodological framework for scoping reviews proposed by Arksey and O'Malley (2005) was used in this investigation. These steps were as follows: (1) defining the research question; (2) identifying relevant studies; (3) selecting the best studies; (4) data extraction; and (5) assembling and reporting the findings. The protocol for this study was based on the 27-item Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) extension for scoping reviews (Tricco *et al.*, 2018).

Defining the Research Questions

Mobile applications were used as an intervention with a population of nurses. Questions for further investigation were formulated after an initial review of the relevant literature and then revised through team discussions. The study posed the following questions: (1) Which mobile applications exist to promote a culture of patient safety, and (2) how are these mobile applications evaluated?

Identifying Relevant Studies

Relevant articles that addressed the study's questions were found using a methodical search strategy. Combining the keywords "mobile app," "patient safety," and "nurse or nursing" addressed three fundamental issues. PubMed (MEDLINE), Scopus, and CINAHL (Cumulative Index to Nursing and Allied Health Literature) were searched through to find relevant articles. The papers published between January 2008 and April 31, 2023, were identified, and the authors then examined databases for citation information.

Selecting Relevant Papers for the Review

Box 1 shows the inclusion and exclusion criteria. The RefWorks citation management system was fed with papers acquired from the various databases. Two researchers read the titles and abstracts of all the papers and deleted those that were duplicates. They evaluated each document and decided whether or not to include it. When two reviewers could not come to a consensus on whether or not an article should be included (i.e., it was marked as "unsure" or placed in multiple categories), a full-text review was performed to determine whether or not to include the article. Researchers evaluated their individual test results and discussed any discrepancies to reach a unanimous decision. Only papers that passed the title and abstract review were read in their entirety.

Box 1. Inclusion And Exclusion Criteria

The following were used as inclusion criteria:

- The use of mobile application interventions in the nursing and healthcare fields has improved patient safety.
- Articles published between January 2010 and April 30, 2023
- Documents must be written in English.

The following conditions qualified as exclusion criteria:

- e-consultation or v-conferencing-based mobile app interventions
- Study protocols
- Publications in languages other than English
- Review articles

Data Extraction

The study team worked together to make the data chart and choose the variables to extract. The paper's general description includes the first author and year, study design, location, and patient population; intervention-specific information includes intervention and mobile app purpose, main functions, delivery method, data collected, outcomes measured, and findings. Table 1 provides a summary of the information gathered from the full-text analysis of all eligible papers.

Data Collection

Descriptive characteristics of research were used to generate a general description of the reviewed papers. After reviewing the graphical data in parallel, the research team conducted a thematic content analysis of interventions and associated outcomes for each study. In order to decipher the information, codes were first created and used. Color-coded quotations were then used to demarcate the various sections of the resulting charts. In addition, an Excel table was created to further organize the code summary for thematic content analysis. To compare the included research and identify the core themes, this table was sorted by codes and density to find recurring patterns that were addressed by the included papers. The study's goals were established, and the research findings were summed up in accordance with the objectives.

RESULTS

Selection of Included Papers

A total of 771 published publications were obtained from the databases. There were 123 duplicates among

the 771 papers found. Based on the screening findings of titles and abstracts, 124 of the remaining 513 papers were selected for a full-text review. Following the full-text review, five papers were selected for this scoping review (Table 1).

Characteristics of the Included Studies

Among the five reported studies, one was conducted using a quasi-experimental design (Nurhasanah *et al.*, 2022); Lin *et al*. (2022) conducted an implementation study; Jhonson *et al*. (2021) conducted a cohort study; Alvares *et al*. (2018) conducted a content validation study; and Navas *et al.* (2015) conducted research and development. One study was conducted in Indonesia, while others were conducted in Taiwan, the United States, Argentina, and Brazil. The general characteristics of these studies are presented in Table 1.

Table 1: General Characteristics of The Included Studies

First Author (Year)	Study Design	Study Location	Cohort	Study Purpose/ Objectives	Main Applications	Tools/ Approach	Results
Nurhasanah *et al*. (2022)	quasi-experimental	Indonesian	Nurse	determine the effectiveness of Procalysis Mobile in improving the patient safety culture at a hospital	Provide education regarding patient safety	-	Effective
Lin *et al*, (2022)	Implementation study	Taiwan	Health professional	Applying mobile application to improve patient safety during hemodialysis.	patient safety during hemodialysis	-	Effective
Jhonson *et al*., (2021)	Cohort study	USA	Health professional	evaluate a user - friendly mobile application that allowed for real - time simple and anonymous reporting of adverse event	reporting complications	complications were then categorized as either major or minor to evaluate the changes more accurately in reporting	Improved
Alvares *et al*., (2018)	Content validation study	Brazil	Nurses who worked at undergraduate nursing program at different Brazilian Universities	to design a mobile-based learning application to teach surgical instruments comprehensively and compare students' learning and satisfaction in both mobile -based learning and flashcards methods	Surgical safety checklist	sociodemographic data 20 closed-ended questions), related content, language, illustrations, layout and motivation.	Adequate
Navas *et al*., (2015)	Research and development	Argentina	Nurse	To develop the mobile system developed and its inclusion in a safe medication process.	Nursing Kardex	ensuring the five Rights of the medication administration process (patient, medication, dose, route and schedule).	Useful

Mobile Interventions

These mobile application interventions were delivered using technology platforms such as smartphones. The mobile application interventions have the main functions of improving the patient safety culture at a hospital, improving patient safety during hemodialysis, allowing for real-time simple and anonymous

reporting of adverse events, and teaching surgical instruments comprehensively and comparing students' learning. The majority was used for education purposes, check lists, and reporting incidents to improve patient safety. The included study found that the application was effective, adequate, and useful to be used to improve patient safety.

DISCUSSION

This scoping review compiled the research on the role of mobile application technologies in enhancing nurses' commitment to patient safety, detailing the various interventions that have been tried, the outcomes they yielded, and the gaps in the evaluation of these technologies' effects that need to be filled in by future studies.

Advantages

The rapid development of mobile technology has made it possible for health care practitioners to collect and share data in real time from patient self-monitoring devices through a remote monitoring system. This opens up possibilities for analyzing the data and responding quickly to alarms given by patients. Five to ten studies were included in this analysis, and their primary purpose was to evaluate the efficacy of mobile application interventions in enhancing patient safety culture in hospitals, enhancing patient safety during hemodialysis, facilitating real-time, simple, and anonymous reporting of adverse events, and educating medical students on surgical instruments in depth while allowing for comparisons in their knowledge acquisition. This means that the new technologies are not being widely adopted in the healthcare sector just yet. According to Rogers, there are five types of consumers involved in the diffusion of new innovations: the pioneers, the early majority, the late majority, and the laggards. The healthcare industry has been sluggish to adopt new technology due to its heavy investment in aging but effective communication infrastructure. Therefore, new technologies have not expanded beyond their initial adopters and creators (Rogers, 1962; Putzer *et al.*, 2012). However, health professionals are increasingly taking matters into their own hands and using personal mobile phones to connect with colleagues in hospitals where pagers remain the primary way of communication. Conversations can take place in a variety of ways, including over the phone (Khanna *et al.*, 2015; Johnston *et al.,* 2019), by text message (SMS), and increasingly through messaging services like WhatsApp (WhatsApp Inc, Mountain View, CA, USA).

Drawbacks

The HTA-CM introduces nine domains for evaluating the results of health technologies as part of its multidisciplinary assessment, which includes "health problem and current use of the technology; description and technical characteristics of technology; safety; clinical effectiveness; costs, economic evaluation; ethical analysis; organizational aspects; social aspects; and legal aspects" (Lampe *et al.*, 2009). Clinical effectiveness, partial costs, and economic evaluation were among the metrics studied to determine the value of mHealth therapies. There was a lack of evidence on safety, organizational, sociocultural, ethical, and legal aspects, even though the outcome evaluation was multifaceted with respect to the general characteristics and intervention specific of mobile technologies.

The adoption of mobile technologies in health care raises serious concerns about patient safety. Patient safety is of utmost importance in the medical field. It is important to consider the impact and risks of employing a mobile technology solution on patient safety before implementing it in a care setting. It is also important to think about the technical safety of evaluating assessment in terms of its validity and reliability. Improvements to health care delivery can only be achieved by adhering to the highest standards of privacy, security, cooperation, data sharing, traceability, and transparency. It's possible for patients and doctors to experience unanticipated downtime due to technical issues with data transmission, infrastructure, connectivity, bandwidth, resolution, and frame rate (Lew *et al.,* 2018).

Different health application has been described by different authors (Pangaribuan *et al.,* 2023; Anggraini *et al.*, 2023; Chakraborty *et al.*, 2023; Amalia *et al.*, 2021; Hayatiningrum *et al.*, 2023). The study was not restricted to onlywho used mobile apps on purpose. It is important to note that none of the mobile technologies reviewed here were intended towards healthcare professionals in order to improve patient safety culture; rather, all of the research included in this review focused on patients as the primary users. The evaluation of the use of

mHealth technology and the introduction of this new service is heavily influenced by the question of how this new service will fit within the current organizational framework (Lew *et al.*, 2018). This can have far-reaching effects on an organization's structure, processes, culture, workflow, and personnel management, and interoperability between information systems, as well as its allocation of resources (Lew *et al.*, 2018).

Implications

This scoping analysis indicated a lack of evidence or a gap in assessing the influence of mHealth solutions on enhancing patient safety culture among healthcare providers, particularly nurses. Importantly, the economic benefit of mHealth technology is an important component in managing this patient population. A future study could incorporate more data collection to allow for intent-to-treat efficacy and cost-benefit analyses. Due to the scarcity of RCTs on the subject, this review provides a critical baseline from which future studies with higher sample sizes in a range of patient population analyses are warranted (Pham *et al.*, 2016). Furthermore, this evaluation could help to drive a co-design approach and the development of a holistic service model that uses mHealth technology to improve nurse-patient safety culture.

One of the limitations of this study design was publication bias; for example, non-English papers were omitted. As a result, relevant investigations initiated in non-English-speaking native nations were not included in this evaluation. The majority of the included research was done in wealthy nations, which may result in limited worldwide generalizability. Regional disparities, clinical and social practices, and health-care systems and policies may not be generalizable to other locations.

CONCLUSION

The use of mobile application technologies to improve patient safety culture. Patient safety culture among nurses might be greatly enhanced by implementing mobile technologies; however, so far, mobile technologies have not been extensively adopted and integrated into everyday practice. This analysis revealed the need for a more thorough assessment of mHealth technologies in patient care, one that considers not just the health and well-being of the patient but also their social and cultural context and the professional, ethical, and legal constraints under which the care provider works. Despite the widespread use of mHealth solutions, the long-term effects and cost-effectiveness of these tools have not been thoroughly evaluated because of a lack of evidence in the literature. As more rigorous studies are conducted in this field, cost-benefit analysis will become a standard procedure to aid in the decision-making process for establishing a sustainable business model and gaining support from organizations for mHealth applications.

Conflict of Interest

The authors declare that they have no competing interests.

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REFERENCES

Alvarez, A. G., Dal Sasso, G. T. M., & Iyengar, M. S. (2018). Mobile persuasive technology for the teaching and learning in surgical safety: content validation. *Nurse Education Today, 71*, 129-134. https://doi.org/10.1016/j.nedt.2018.09.030

Amalia, N., Rustam, M. Z. A., Rosarini, A., Wijayanti, D. R., & Riestiyowati, M. A. (2021). The Implementation of Electronic Medical Record (EMR) in the DEVELOPMENT Health Care System in Indonesia. *International Journal of Advancement in Life Sciences Research, 4*(3), 8-12. https://doi.org/10.31632/ijalsr.2021.v04i03.002

Anggraini, N. A., Said, F. M., Umar, N. S., Ambarika, R., & Poddar, S. (2023). Impact of Detak Mobile Application in Early Detection of Acute Coronary Syndrome in the Covid-19 Pandemic in Blitar Regency Indonesia. *JK Practitioner, 28*. https://efaidnbmnnnibpcajpcglclefindmkaj/https://jkpractitioner.com/pdfs/

2023/A7_Dr%20Novita.pdf

Arksey, H., & O'Malley, L. (2005). Scoping studies: towards a methodological framework. *International Journal of Social Research Methodology, 8*(1), 19-32. https://doi.org/10.1080/1364557032000119616

Chakraborty, B., Trivedi, K., Kiran, K. A., Chatterjee, P., Kujur, M., & Sarkar, B. (2023). Impact of Using Mobile Applications on the Psychological Wellbeing of Nurses to Reduce Job Stress and Burnout: Systematic Review & Meta-Analysis. *The Malaysian Journal of Nursing (MJN), 15*(2), 143-153. https://doi.org/10.31674/mjn.2023.v15i02.016

Doran, D. M., Haynes, R. B., Kushniruk, A., Straus, S., Grimshaw, J., Hall, L. M., ... & Jedras, D. (2010). Supporting evidence-based practice for nurses through information technologies. *Worldviews on Evidence-Based Nursing, 7*(1), 4-15. https://doi.org/10.1111/j.1741-6787.2009.00179.x

Free, C., Phillips, G., Watson, L., Galli, L., Felix, L., Edwards, P., ... & Haines, A. (2013). The effectiveness of mobile-health technologies to improve health care service delivery processes: a systematic review and meta-analysis. *PLoS Medicine, 10*(1), e1001363. https://doi.org/10.1371/journal.pmed.1001363

Hayatiningrum, R. I. Z., Cahyati, Y., & Februanti, S. (2023). The Effect of Health Education Through Animated Video Media and Leaflets About Breastfeeding Techniques on the Level of Knowledge and Skills of Breastfeeding Mothers. *International Journal of Advancement in Life Sciences Research, 6*(3), 38-46. https://doi.org/10.31632/ijalsr.2023.v06i03.004

Hudson, K., & Buell, V. (2011). Empowering a safer practice: PDAs are integral tools for nursing and health care. *Journal of Nursing Management, 19*(3), 400-406.https://doi.org/10.1111/j.1365-2834.2011.01251.x

Johansson, P. E., Petersson, G. I., & Nilsson, G. C. (2013). Nursing students' experience of using a personal digital assistant (PDA) in clinical practice—an intervention study. *Nurse Education Today, 33*(10), 1246-1251. https://doi.org/10.1016/j.nedt.2012.08.019

Johansson, P., Petersson, G., Saveman, B. I., & Nilsson, G. (2014). Using advanced mobile devices in nursing practice–the views of nurses and nursing students. *Health Informatics Journal, 20*(3), 220-231. https://doi.org/10.1177/1460458213491512

Johnson, C. R., Noorzad, A., Pujari, A., Paiement, G., & Lin, C. (2021). There is an App for That: Mobile Technology Improves Complication Reporting and Resident Perception of Their Role in Patient Safety. *JBJS Open Access, 6*(1). https://doi.org/10.2106%2FJBJS.OA.20.00077

Johnston, M. J., King, D., Arora, S., Behar, N., Athanasiou, T., Sevdalis, N., & Darzi, A. (2015). Smartphones let surgeons know WhatsApp: an analysis of communication in emergency surgical teams. *The American Journal of Surgery, 209*(1), 45-51. https://doi.org/10.1016/j.amjsurg.2014.08.030

Khanna, V., Sambandam, S. N., Gul, A., & Mounasamy, V. (2015). "WhatsApp" ening in orthopedic care: a concise report from a 300-bedded tertiary care teaching center. *European Journal of Orthopaedic Surgery & Traumatology, 25*, 821-826. https://doi.org/10.1007/s00590-015-1600-y

Lampe, K., Mäkelä, M., Garrido, M. V., Anttila, H., Autti-Rämö, I., Hicks, N. J., ... & Kristensen, F. B. (2009). The HTA core model: a novel method for producing and reporting health technology assessments. *International Journal of Technology Assessment in Health Care, 25*(S2), 9-20. https://doi.org/10.1017/S0266462309990638

Lew, S. Q. (2018, November). Telehealth in Peritoneal Dialysis: Review of Patient Management. *In Advances in Peritoneal dialysis*. Conference on Peritoneal Dialysis (Vol. 34, No. 2018, pp. 32-37). https://europepmc.org/article/med/30480534

Lin, C. H., Ho, T. F., Chen, H. F., Chang, H. Y., & Chien, J. H. (2022). Applying Healthcare Failure Mode and Effect Analysis and the Development of a Real-Time Mobile Application for Modified Early Warning Score

Notification to Improve Patient Safety During Hemodialysis. *Journal of Patient Safety, 18*(5), 475. https://doi.org/10.1097%2FPTS.0000000000000977

Navas, H., Ares, F., Strumia, G., Dourado, E., & Alvarez, M. (2015). Using mobile devices to improve the safety of medication administration processes. *Studies in Health Technology and Informatics, 216*, 903-903. https://europepmc.org/article/med/26262205

Nurhasanah, N., Yunus, R., Heryani, N., & Saputri, W. I. (2022). The Effectiveness of Procalysis Mobile to Patient Safety Culture Improvement. *Journal EduHealth, 13*(01), 372-377. https://ejournal.seaninstitute.or.id/index.php/healt/article/view/505

Pangaribuan, I. K., Said, F. M., Rahim, S. B. A., Hassan, H. C., & Poddar, S. (2023). Stunting Care Application (SCATION) and Its Effect in Early Detection of Stunting in Toddlers in Langkat District. *JK Practitioner, 28*. https://efaidnbmnnnibpcajpcglclefindmkaj/https://jkpractitioner.com/pdfs/2023/A8_Dr%20Ingka.pdf

Patel, B., Johnston, M., Cookson, N., King, D., Arora, S., & Darzi, A. (2016). Interprofessional communication of clinicians using a mobile phone app: a randomized crossover trial using simulated patients. *Journal of Medical Internet Research, 18*(4), e79. https://doi.org/10.2196/jmir.4854

Pham, Q., Wiljer, D., & Cafazzo, J. A. (2016). Beyond the randomized controlled trial: a review of alternatives in mHealth clinical trial methods. *JMIR mHealth and uHealth, 4*(3), e5720. https://doi.org/10.2196/mhealth.5720

Putzer, G. J., & Park, Y. (2012). Are physicians likely to adopt emerging mobile technologies? Attitudes and innovation factors affecting smartphone use in the Southeastern United States. Perspectives in Health Information Management/AHIMA, *American Health Information Management Association, 9*(Spring). https://www.semanticscholar.org/paper/Are-physicians-likely-to-adopt-emerging-mobile-and-Putzer-Park/d9da8efcb488a758e7808e32c6ded28c2c2cbb68

Rogers, E. M., Singhal, A., & Quinlan, M. M. (2014). Diffusion of innovations. In *An Integrated Approach to Communication Theory and Research* (pp. 432-448). Routledge. https://www.taylorfrancis.com/chapters/edit/10.4324/9780203887011-36/diffusion-innovations-everett-rogers-arvind-singhal-margaret-quinlan

Sherwood, G. (2015). Perspectives: Nurses' expanding role in developing safety culture: quality and safety education for nurses–Competencies in action. *Journal of Research in Nursing, 20*(8), 734-740. https://doi.org/10.1177/1744987115621142

Stang, A., Thomson, D., Hartling, L., Shulhan, J., Nuspl, M., & Ali, S. (2018). Safe care for pediatric patients: a scoping review across multiple health care settings. *Clinical Pediatrics, 57*(1), 62-75. https://doi.org/10.1177/0009922817691820

Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K. K., Colquhoun, H., Levac, D., ... & Straus, S. E. (2018). PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Annals of Internal Medicine, 169*(7), 467-473. https://doi.org/10.7326/M18-0850