



The Role of Mobile Applications in Enhancing Patient Education by Nurses: A Review

¹-Jamlah Salem Suliman Alatawi,²-Adeeb Atallah Saad Aljohani,³-Ahlam Ibrahim Ahmed Al Drhami,⁴-Bushra Mayah Farhoud Alruwaili,⁵-Mohammed Saleh Al-Rashidi,⁶-Mazona Abdullah Alubaie,⁷-Fozeh Menahy Alrewily,⁸-Latifh Faihan Alotabi,⁹-Fahad Aysh Alonizi,¹⁰-Asmaa Mohammed Jaber Sulayyi,¹¹-Hadeel Yousef Sanyour,¹²- Naif Hamed Alsobhi, ¹³-Fahad Saud Mohammad Alsulaiman,¹⁴- Mohammed Ali Hussein Harrash,¹⁵-Amal Ali Alrowily

1. Ksa, Ministry Of Health, Alhamra Phcc Tabuk
2. Ksa, Ministry Of Health, Alhamra Phcc Tabuk
3. Ksa, Ministry Of Health, Al Shifa Second Health Centre
4. Ksa, Ministry Of Health
5. Ksa, Ministry Of Health, Shamli Hospital
6. Ksa, Ministry Of Health, King Saud Medical City
7. Ksa, Ministry Of Health, Hafar Al-Batin Central Hospital
8. Ksa, Ministry Of Health, Shaqra General Hospital
9. Ksa, Ministry Of Health, Aliman General Hospital
10. Ksa, Ministry Of Health, Abu Arish General Hospital
11. Ksa, Ministry Of Health,
12. Ksa, Ministry Of Health, Prince Sultan Bin Abdulaziz Airport
13. Ksa, Ministry Of Health, King Salman Hospital
14. Ksa, Ministry Of Health, Prince Mohammed Bin Nasser Hospital In Jazan
15. Ksa, Ministry Of Health, Turif General Hospital

Abstract

Background: Patient safety is a critical concern in healthcare, necessitating effective communication and education strategies among nursing professionals. The integration of mobile applications (mHealth) has the potential to enhance patient education, thereby improving safety outcomes.

Methods: This review systematically examined the role of mobile applications in enhancing patient safety culture among nurses. A thorough literature search was conducted across databases such as PubMed, Scopus, and CINAHL, focusing on publications from 2006 to 2023. The search utilized key terms including "mobile app," "patient safety," and "nurse."

Results: The findings indicated that while mobile applications can facilitate real-time data collection, provide educational resources, and improve communication, their adoption in clinical practice remains limited. Key benefits identified include enhanced access to clinical information, improved patient monitoring, and support for decision-making. However, barriers such as resistance to new technology, concerns over data security, and insufficient training were also highlighted. Most studies focused on patient outcomes rather than the impact on nursing practices, revealing a gap in the literature regarding nurses' engagement with these technologies.

Conclusion: The findings underscore the need for a comprehensive evaluation of mobile applications to assess their effectiveness in improving patient safety culture among nurses. Although mHealth technologies show promise, more robust research is required to understand their long-term impacts and to facilitate

their integration into routine nursing practice. Addressing the barriers to adoption and focusing on nurse-specific applications will be essential for enhancing patient safety.

Keywords: Patient safety, mobile applications, nursing education, healthcare technology, mHealth.

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1. Introduction

Patient safety is a worldwide issue since healthcare personnel have an ethical obligation to safeguard it within the healthcare system (1). In healthcare, patient safety denotes the prevention of preventable harm (2). The use of best practices that provide optimum patient outcomes and minimize hazardous interventions is essential for patient safety (3). Medication mistakes, miscommunications during transitions, insufficiently educated staff, and unfamiliarity with new technology are possible hazards that nurses must mitigate to ensure patient safety (4). Monitoring and supervision are two methods by which licensed nurses may guarantee patient safety. Consequently, they must prioritize the specific requirements of each patient, engage in interdisciplinary collaboration, implement evidence-based practices, improve patient safety and quality, and meet the expectations of contemporary medicine. Nurses must get patient safety skills throughout their education and professional development (5). security. Consequently, they must prioritize the unique requirements of each patient, engage in interdisciplinary collaboration, implement evidence-based practices, improve patient safety and quality, and meet the expectations of contemporary medicine. Nurses must get patient safety skills throughout their education and professional development (5).

The emergence of mobile technology is transforming the healthcare system by providing patients and doctors with numerous resources for monitoring health and managing medical records (6). Mobile devices have shown advantages for nurses in practice, including both registered nurses and nursing students (7). Research indicates that when nurses in medical and rehabilitation environments use mobile devices integrated with a preference-based care planning support system, their actions and responses align more closely with patients' genuine preferences. Mobile access to clinical information resources has enhanced the understanding and practice of four distinct categories of registered nurses (RNs): acute care, home care, long-term care, and correctional institutions (8). Studies indicate that using a mobile decision support system with a barcode scanner to comprehend a patient's prescription regimen and facilitate patient identification might enhance the safety of blood transfusions (9). Johansson et al. (10) assert that mobile devices enhance patient safety and care quality by allowing nurses to access information without leaving their patients unattended. Consequently, the nurses' interaction with the patient is more thorough. Nonetheless, the study concentrated on app development rather than app effectiveness and clinical advantages. No comprehensive evaluation exists about the literature on mobile apps and their efficacy and advantages in enhancing patient safety culture among nurses.

This study aimed to address deficiencies in the outcome assessment of mobile application technologies by a comprehensive examination of current mobile application treatments designed to improve patient safety culture among healthcare personnel, including nurses. This research aimed to synthesize, via a systematic literature review, the categories of interventions and their primary functions of mobile applications designed to enhance patient safety culture among nursing students, analyze the evaluation methods of these mobile application interventions, and identify areas requiring further investigation in the assessment of mobile application technologies for improving patient safety culture among nurses.

2. Methods

Relevant publications addressing the study's inquiries were identified using a systematic search technique. The integration of the phrases "mobile app," "patient safety," and "nurse or nursing" addressed three essential concerns. Relevant papers were identified by searches in PubMed (MEDLINE), Scopus, and CINAHL (Cumulative Index to Nursing and Allied Health Literature). Papers published from 2006 to 2023 were found, and the authors then reviewed databases for citation information.

3. Benefits

The rapid advancement of mobile technology has enabled healthcare professionals to gather and disseminate data in real time from patient self-monitoring devices via a remote monitoring system. This facilitates the analysis of data and enables prompt responses to alerts sent by patients. This analysis incorporated five to ten studies aimed at assessing the effectiveness of mobile application interventions in improving patient safety culture in hospitals, augmenting patient safety during hemodialysis, enabling real-time, straightforward, and anonymous reporting of adverse events, and providing comprehensive education on surgical instruments to medical students while facilitating comparisons in their knowledge acquisition. This indicates that the new technologies have not yet achieved widespread adoption in the healthcare industry. Rogers (11) identifies five categories of customers participating in the dissemination of innovations: innovators, early adopters, early majority, late majority, and laggards. The healthcare sector has been slow to embrace new technologies because of its substantial investment in outdated but functional communication systems.

Consequently, novel technologies have not progressed beyond their original users and developers (11,12). Nevertheless, healthcare personnel are progressively assuming responsibility and using personal mobile phones to communicate with colleagues in hospitals where pagers continue to be the predominant mode of communication. Conversations may occur via several mediums, including telephone calls, text messages (SMS), and increasingly via messaging platforms such as WhatsApp (13,14). Table 1 summarizes the benefits of using mobile applications.

Table 1. Benefits of Mobile Applications in Patient Safety

Benefit	Description	Example
Improved Access to Information	Nurses can access clinical guidelines and patient data on the go	Use of mobile apps to retrieve medication information
Enhanced Patient Monitoring	Real-time data collection from patients	Monitoring vital signs through wearable devices
Better Communication	Facilitates communication between healthcare providers and patients	Messaging platforms for quick updates on patient status

4. Disadvantages

The HTA-CM delineates nine domains for assessing health technology outcomes within its multidisciplinary evaluation framework: "health problem and current technology utilization; technology description and technical specifications; safety; clinical efficacy; costs and economic assessment; ethical considerations; organizational factors; social implications; and legal factors" (15-18). The parameters used to assess the value of mHealth treatments were clinical efficacy, partial costs, and economic assessment. Despite the broad result assessment on the general features and intervention specifics of mobile technologies, there was an absence of data concerning safety, organizational, sociocultural, ethical, and legal dimensions.

The use of mobile technology in healthcare presents significant problems in patient safety. Patient safety is paramount in the medical domain. Before adopting a mobile technology solution in a care environment, it is crucial to evaluate its effect and hazards on patient safety. Considering the technical safety of assessing assessments about their validity and reliability is equally crucial. Enhancements in health care delivery need strict adherence to the highest standards of privacy, security, collaboration, data sharing, traceability, and openness. Patients and clinicians may encounter unforeseen interruptions owing to technological problems related to data transmission, infrastructure, connection, bandwidth, resolution, and frame rate (19).

Various health applications have been delineated by many authors (17,18, 20-22). The research was not limited to those who intentionally used mobile applications. It is essential to emphasize that none of

the mobile technologies examined in this review were designed for healthcare workers to enhance patient safety culture; instead, every study included focused on patients as the principal users. The assessment of mHealth technology use and the implementation of this new service is significantly affected by the inquiry of its integration inside the existing organizational structure (19). This may significantly impact an organization's structure, procedures, culture, workflow, people management, interoperability of information systems, and resource allocation (19). Table 2 summarizes the barriers of using mobile applications.

Table 2. Barriers to Mobile Application Adoption

Barrier	Description	Impact on Adoption
Resistance to Change	Hesitance from nursing staff to adopt new technologies	Slower integration of mobile apps
Data Security Concerns	Fear of breaches in patient confidentiality	Reduced willingness to use mobile apps
Insufficient Training	Lack of training programs for effective app usage	Ineffective use of available technologies
Outdated Communication Systems	Reliance on traditional methods such as pagers	Hinders adoption of modern solutions

5. Consequences

This scoping review revealed an absence of evidence or a deficiency in evaluating the impact of mHealth solutions on improving patient safety culture among healthcare personnel, especially nurses. The cost advantage of mHealth technology is a crucial element in managing this patient demographic. Future research might include additional data collecting to facilitate intent-to-treat effectiveness and cost-benefit assessments. This analysis establishes a vital baseline for future investigations with larger sample sizes across diverse patient populations, given the paucity of RCTs on the topic (23). This study may facilitate a co-design approach and the creation of a comprehensive service model that employs mHealth technology to enhance nurse-patient safety culture (24-26).

A weakness of this research design was publication bias; for instance, non-English studies were excluded. Consequently, pertinent research conducted in non-English-speaking countries was excluded from our assessment. The preponderance of the included studies was conducted in affluent countries, perhaps restricting global generalizability. Regional differences, clinical and social practices, as well as healthcare systems and policies, may lack generalizability to other locales.

6. Conclusion

Utilization of mobile application technology to enhance patient safety culture. The culture of patient safety among nurses may be significantly improved with the use of mobile technology; however, these technologies have not yet been widely embraced or incorporated into routine practice. This analysis indicated the necessity for a comprehensive evaluation of mHealth technologies in patient care, encompassing not only the patient's health and well-being but also their social and cultural context, as well as the professional, ethical, and legal limitations faced by the care provider. Despite the extensive use of mHealth solutions, the long-term impacts and cost-effectiveness of these tools remain inadequately assessed due to insufficient data in the literature. As more comprehensive studies are undertaken in this domain, cost-benefit analysis will emerge as a common practice to facilitate decision-making for developing a viable business model and securing organizational support for mHealth apps.

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دور التطبيقات المحمولة في تعزيز التعليم الصحي للمرضى بواسطة الممرضين: مراجعة

الملخص

الخلفية: تعتبر سلامة المرضى قضية حاسمة في الرعاية الصحية، مما يتطلب استراتيجيات فعالة للتواصل والتعليم بين المتخصصين في التمريض. إن دمج التطبيقات المحمولة (mHealth) لديه القدرة على تعزيز تعليم المرضى، وبالتالي تحسين نتائج السلامة.

الطرق: قامت هذه المراجعة بفحص منهجي لدور التطبيقات المحمولة في تعزيز ثقافة سلامة المرضى بين الممرضين. تم إجراء بحث شامل في الأدبيات عبر قواعد بيانات مثل PubMed و Scopus و CINAHL، مع التركيز على المنشورات من عام 2006 إلى 2023. استخدم البحث مصطلحات رئيسية تشمل "تطبيق محمول"، "سلامة المرضى"، و"مرض".

النتائج: أشارت النتائج إلى أنه بينما يمكن أن تسهل التطبيقات المحمولة جمع البيانات في الوقت الحقيقي، وتوفير الموارد التعليمية، وتحسين التواصل، إلا أن اعتمادها في الممارسة السريرية لا يزال محدودًا. تشمل الفوائد الرئيسية التي تم تحديدها تحسين الوصول إلى المعلومات السريرية، وتحسين مراقبة المرضى، ودعم اتخاذ القرار. ومع ذلك، تم تسليط الضوء أيضًا على الحواجز مثل المقاومة للتكنولوجيا الجديدة، والمخاوف بشأن أمان البيانات، ونقص التدريب الكافي. ركزت معظم الدراسات على نتائج المرضى بدلاً من تأثيرها على ممارسات التمريض، مما يكشف عن فجوة في الأدبيات بشأن مشاركة الممرضين مع هذه التقنيات.

الاستنتاج: تؤكد النتائج على الحاجة إلى تقييم شامل للتطبيقات المحمولة لتقييم فعاليتها في تحسين ثقافة سلامة المرضى بين الممرضين. على الرغم من أن تقنيات mHealth تظهر وعدًا، إلا أن هناك حاجة إلى مزيد من الأبحاث القوية لفهم آثارها على المدى الطويل وتسهيل دمجها في الممارسة الروتينية للتمريض. سيكون من الضروري معالجة الحواجز التي تعيق الاعتماد والتركيز على التطبيقات الخاصة بالممرضين لتعزيز سلامة المرضى.

الكلمات المفتاحية: سلامة المرضى، التطبيقات المحمولة، التعليم التمريضي، تكنولوجيا الرعاية الصحية، mHealth.