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Smartphone As Basic Paraphernalia Of Nursing Students Clinical Exposure: A Scoping Review

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ABSTRACT

Introduction: Smartphones have become integral to nursing students' clinical practice, providing instant access to critical resources, aiding in clinical decision-making, and supporting skill development. However, their use in clinical settings raises concerns about professionalism, the reliability of accessed information, and the consistency of their impact on enhancing clinical skills.

Objectives: This scoping review aims to explore the role of smartphones in clinical practice among nursing students, highlighting both the benefits and challenges associated with their use.

Methods: A comprehensive scoping review was conducted to examine the literature on the use of smartphones in nursing education, specifically focusing on their impact on clinical practice. The review included studies published between 2010 and 2023, sourced from databases such as Google Scholar, PubMed, ProQuest, ScienceDirect, and Sage Journals. A total of 17,374 articles were initially identified, with 11 studies meeting the inclusion criteria after thorough screening and selection. These studies were analyzed to assess the benefits and challenges of smartphone use in clinical settings, as well as their implications for nursing education.

Results: The findings of the review underscore the significant role of smartphones in enhancing nursing students' clinical education. Smartphones were found to be effective in improving knowledge acquisition, fostering critical thinking, and enhancing specific clinical skills such as urinary catheterization and problem-solving abilities. However, challenges such as concerns over professionalism, inconsistent Wi-Fi connectivity, and the reliability of information accessed through smartphones were also identified. The review highlighted the need for clear guidelines and protocols to support the effective and professional use of smartphones in clinical practice.

Conclusions: Smartphones hold great promise for advancing nursing education by enhancing clinical skills, supporting decision-making, and providing real-time access to educational resources. However, their effective integration into clinical practice requires careful consideration of contextual factors, including technological infrastructure, faculty training, and the development of clear guidelines for professional use.

Keywords: Smart Phones; Nursing Informatics; Student Nurses, Clinical Competence.

Introduction

The integration of smartphones into healthcare education has become increasingly prevalent, particularly among nursing students, where these devices have evolved into essential tools during clinical practice [7,16]. In the past decade, smartphones have transitioned from being mere communication devices to becoming
indispensable paraphernalia for nursing students, providing them with instant access to a vast array of resources necessary for effective clinical exposure. This shift reflects broader trends in mobile technology adoption within healthcare, where real-time access to information is critical for safe and informed patient care [1, 25].

Smartphones serve as a gateway to a wealth of clinical resources, including drug databases, diagnostic tools, clinical guidelines, and evidence-based practice resources, all of which are crucial for nursing students who must make informed decisions in fast-paced clinical environments [1, 7]. These devices also enable nursing students to access up-to-date medical literature, educational videos, and interactive learning modules, thereby bridging the gap between theoretical knowledge and practical application [1, 7]. The immediate availability of such resources has made smartphones a basic necessity in clinical settings, allowing students to verify information, cross-check procedures, and ensure the accuracy of their clinical interventions in real-time [4, 23].

Moreover, smartphones facilitate seamless communication between nursing students, their peers, educators, and clinical staff, fostering a collaborative learning environment that is essential in healthcare settings [7, 25]. This capability enhances the overall learning experience by enabling quick consultations and discussions, thereby improving the quality of care provided by students. The use of smartphones for clinical documentation and record-keeping also supports the development of essential skills in electronic health record (EHR) management, further preparing students for the technological demands of modern healthcare environments (10).

Despite their widespread use and the numerous benefits they offer, the integration of smartphones into clinical practice is not without controversy (21). Concerns have been raised about the potential for smartphones to distract students from patient care, as well as issues related to the privacy and security of patient information accessed or stored on these devices (4). Also, there is considerable variability in the digital literacy levels among nursing students, which can affect the effective use of smartphones in clinical settings. Some students may struggle to navigate complex applications or may use their devices inappropriately, leading to potential errors or breaches of professional conduct (17).

The debate surrounding smartphone use in clinical education also touches on the broader issue of professionalism. While smartphones provide valuable tools for learning and decision-making, their visible presence in clinical settings can be perceived as unprofessional by patients and healthcare staff, particularly if their use is not directly related to patient care (17). This perception can undermine the trust between patients and healthcare providers, which is fundamental to effective care delivery. As such, it is crucial that nursing students are educated not only in the technical use of smartphones but also in the ethical and professional considerations surrounding their use in clinical environments.

Given these complexities, it is imperative that nursing education programs carefully consider how smartphones are integrated into clinical practice. This involves developing clear guidelines and best practices for smartphone use, ensuring that students are equipped with the necessary digital literacy skills, and fostering an understanding of the ethical implications of mobile technology in healthcare. Additionally, further research is needed to explore the long-term impact of smartphone use on clinical skill development and patient outcomes, particularly in light of the ongoing evolution of mobile technology in healthcare (4; 7; 25).

This scoping review aims to systematically explore the role of smartphones as basic paraphernalia in the clinical exposure of nursing students. By mapping the existing literature, the review seeks to identify how smartphones are being utilized in clinical practice, the benefits and challenges associated with their use, and the implications for nursing education. Understanding these dynamics is essential in enhancing the clinical learning experience without

compromising professionalism or patient care.

Objectives

This scoping review aims to provide a comprehensive understanding of the role smartphones play in clinical practice among nursing students, focusing on the multifaceted ways in which these devices are integrated into their learning experiences. By reviewing current literature, the study seeks to highlight both the benefits and challenges associated with smartphone use, offering insights into how these tools impact clinical learning, patient care, and professional development within nursing education.

Methods

Research Design

This scoping review was conducted to systematically explore and map the role of smartphones as essential tools in the clinical exposure of nursing students. A scoping review is designed to provide a broad overview of the existing literature on a particular topic, identifying key concepts, gaps in research, and the range of evidence available (20). The purpose of this review was to examine how smartphones are integrated into nursing students' clinical practice, highlight the benefits and challenges of their use, and assess the implications for nursing education.

Search Methods

A comprehensive search strategy was developed to identify relevant studies published in peer-reviewed journals. The search was conducted across multiple electronic databases, including Google Scholar (17,900 results), PubMed (7 results), ProQuest (1,519 results), ScienceDirect (622 results), and Sage Journals (2,514 results), to ensure broad coverage of nursing, healthcare, and educational literature. The search terms included combinations of keywords such as "smartphone," "mobile devices," "nursing students," "clinical exposure," "clinical practice," and "scoping review." Boolean operators (AND, OR) were used to refine the search and ensure all relevant literature was captured. The search was limited to studies published in English from 2010 to 2023 to reflect the recent advancements in smartphone technology and its integration into healthcare education.

Inclusion and Exclusion Criteria

The inclusion criteria were set to select studies that specifically addressed the use of smartphones or mobile devices by nursing students during clinical exposure. Studies were included if they (1) examined the role of smartphones in enhancing clinical skills or decision-making, (2) explored the benefits or challenges associated with smartphone use in clinical settings, or (3) discussed the educational outcomes related to smartphone integration in nursing education. Exclusion criteria included studies that focused on non-nursing disciplines, articles not available in English, studies published before 2010, and those that discussed mobile technology in a non-clinical educational context.

Screening Articles

The initial search yielded a large number of articles, which were screened in two stages. First, titles and abstracts were reviewed to identify potentially relevant studies. Articles that clearly did not meet the inclusion criteria were excluded at this stage. In the second stage, full-text articles of the remaining studies were retrieved and assessed for eligibility based on the predefined inclusion and exclusion criteria. Any discrepancies in the screening process were resolved through discussion among the reviewers.

Data Extraction

Data extraction was carried out using a standardized form developed for this review. Key information was extracted from each selected study, including the study title, authors, publication year, study design, sample size, setting, objectives, key findings, and conclusions. The data extraction form also included fields for noting any methodological limitations or biases identified in the studies. This systematic extraction process ensured that all relevant data were consistently and comprehensively captured for analysis.

Quality Assessment of Selected Articles

The quality of the selected studies was assessed using the Mixed Methods Appraisal Tool (MMAT), which is suitable

for evaluating the methodological quality of studies with diverse designs, including qualitative, quantitative, and mixed-methods studies (8). Each study was evaluated based on criteria such as the clarity of the research questions, appropriateness of the methodology, quality of data collection and analysis, and the validity of the findings. Studies were scored, and those with significant methodological flaws were noted in the analysis but were not excluded, as the scoping review aimed to provide a broad overview of the literature.

Risk of Bias

The risk of bias in the selected studies was assessed using the Cochrane Collaboration's Risk of Bias tool for quantitative studies (Table 1) and the Critical -

Table 1. Risk of Bias Assessment Tool

Author/s (year)	Selection Bias	Performance Bias	Detection Bias	Reporting Bias	Over-all Bias
Y. Chuang, F. Lai, Chia-Chi Chang, Hsu-Tien Wan (2018)	Low Risk	Low Risk	Unclear	Low Risk	Low
Mohadeseh Motamed-Jahromi, F. Eshghi, F. Dadgar, E. Nejadsadeghi, Z. Meshkani, Tayebeh Jalali, S. Dehghani (2022)	Low Risk	Low Risk	Unclear	Low Risk	Low
Hyejung Lee, H. Min, Su-mi Oh, Kaka Shim (2018)	Low Risk	Low Risk	Unclear	Low Risk	Low
Mohadeseh Motamed-Jahromi, F. Eshghi, F. Dadgar, E. Nejadsadeghi, Z. Meshkani, Tayebeh Jalali, S. Dehghani (2022)	Low Risk	Low Risk	Unclear	Low Risk	Low
Toktam Masoumian Hosseini, S. Ahmady, Samuel Edelbring (2022)	Low Risk	Low Risk	Unclear	Low Risk	Low
V. Chandran, A. Balakrishnan, M. Rashid, Girish Pai Kulyadi, Sohil Khan, E. Devi, Sreedharan Nair, G. Thunga (2022)	Low Risk	Low Risk	Unclear	Low Risk	Low

Table 2. Critical Appraisal Skills Programme (CASP) Assessment

Author/s (year)	CRA	AM	RD	RS	DC	Ref.	EC	DA	CF	Overall Quality
S. O'Connor, T. Andrews (2018)	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	High
Khraim, Fadi, Sandra Small, Daphne Crane Mde, Claudine Morgan (2015)	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	High
L. Hsu, Hsiu-Chuan Hsiang, Yi-Hua Tseng, Siang-Yun Huang, Suh-Ing Hsieh (2015)	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	High
Ruth A. Wittmann-Price, L. Kennedy, C. Godwin (2012)	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	High
Vanesa Gutiérrez-Puertas, L. Gutiérrez-Puertas, G. Aguilera-Manrique, M. Rodríguez-García, V. V. Márquez-Hernández (2021)	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	High

Notes: CRA = Clear Research Aim; AM = Appropriate Methodology; RD = Research Design; RS = Recruitment Strategy; DC = Data Collection; Ref = Reflexivity; EC = Ethical Considerations; DA = Data Analysis; CF = Clear Findings

Appraisal Skills Programme (CASP) checklist for qualitative studies (Table 2). Each study was evaluated for potential sources of bias, including selection bias, performance bias, detection bias, and reporting bias. The assessment helped to identify the limitations of the studies and provided context for interpreting the results (13; 24). The results in Table 1 indicated that all six studies consistently exhibited a "Low Risk" for selection, performance, and reporting biases. Then in Table 2, all five qualitative studies demonstrated high overall quality. Specifically, each study excelled in areas such as having a clear research aim, appropriate methodology, ethical considerations, and clear findings.

Data Analysis

The quality of the selected studies was assessed using the Mixed Methods Appraisal Tool (MMAT), which is suitable for evaluating the methodological quality of studies with diverse designs, including qualitative,
quantitative, and mixed-methods studies. Each study was evaluated based on criteria such as the clarity of the research questions, appropriateness of the methodology, quality of data collection and analysis, and the validity of the findings. Studies were scored, and those with significant methodological flaws were noted in the analysis but were not excluded, as the scoping review aimed to provide a broad overview of the literature.

Results

Characteristics of the Selected Studies

In total, 11 studies were included in the review process after a thorough screening and selection procedure (Figure 1). Initially, the search identified 17,374 articles from various databases, including Google Scholar, PubMed, ProQuest, ScienceDirect, and Sage Journals. After applying limiters such as year of publication, article type, subject area, and language,

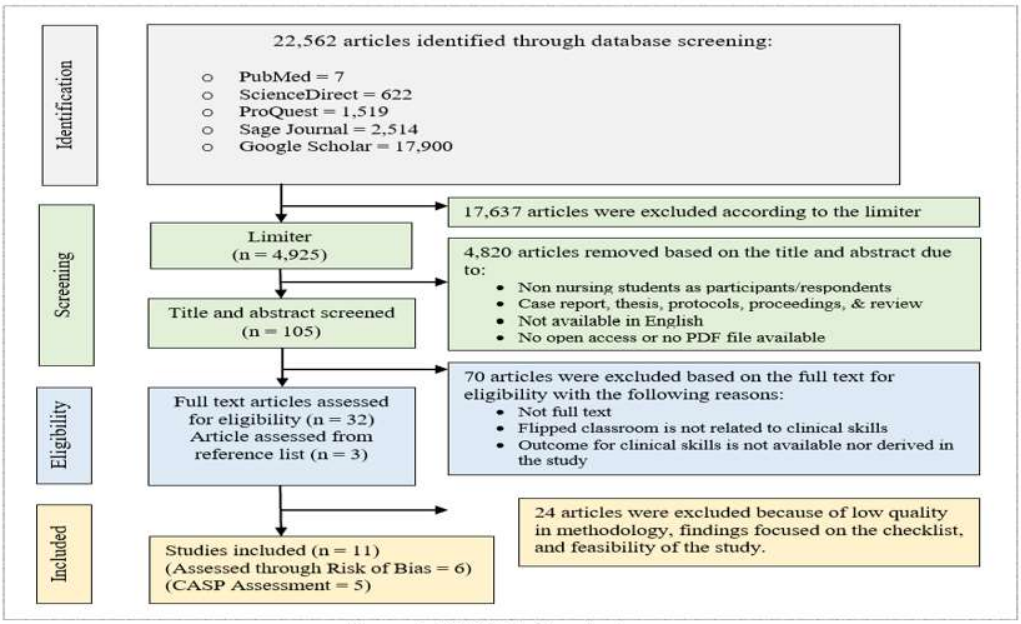

Figure 1. PRISMA flowchart

16,721 articles were excluded. The remaining 653 articles were further filtered based on titles and abstracts, resulting in 38 articles that were closely reviewed. Of these, 25 articles were removed during the full-text review due to not meeting the inclusion criteria, such as relevance to the research question and methodological quality.

The reviewed studies were conducted in diverse geographical locations, with representation from countries such as the United States, Canada, Taiwan, Iran, and Spain. Of the 11 studies, the majority were conducted in academic settings, such as universities and nursing schools, while a few were set in clinical environments. The methodologies employed in these studies varied, including randomized controlled trials (RCTs), quasi-experimental designs, and qualitative approaches like phenomenological studies and thematic analysis. Six of the studies employed quantitative methodologies, including experimental and quasi-experimental designs, to assess the impact of smartphone applications on nursing students' clinical skills and problem-solving abilities. Five studies utilized qualitative methodologies to explore nursing students' perceptions and experiences with using smartphones in clinical education. These studies

provided rich insights into the benefits and challenges of integrating mobile technology into nursing practice.

Use of Smartphone in the Clinical Practice of Nursing Students

The use of smartphones in clinical education has been shown to primarily support access to educational resources, skill development, and clinical decision-making. O'Connor and Andrews (2018) and Hsu et al. (2018) demonstrated that smartphones enhance knowledge acquisition, confidence, and critical thinking, particularly through applications that provide instructional videos and realistic clinical scenarios. However, these studies also identified significant barriers, such as negative staff attitudes and technical issues like poor connectivity, which can limit the full potential of smartphones in clinical settings (3; 9; 16).

Experimental studies, including those by Chuang et al. (2018) and Motamed-Jahromi et al. (2022), found that smartphone-based interventions could significantly improve specific clinical skills and problem-solving abilities

among nursing students (3; 15). Despite these benefits, Gutiérrez-Puertas et al. (2021) reported that nursing students often found smartphones challenging to use in clinical environments due to perceptions of unprofessionalism and difficulties in mastering the devices effectively.

Furthermore, systematic reviews and meta-analyses have provided broader insights, confirming that while smartphones and mobile applications enhance knowledge and learning motivation, their impact on clinical skills remains inconsistent and warrants further investigation (2; 11). Additionally, the review highlighted concerns regarding inappropriate smartphone use, which could potentially interfere with patient communication and safety (7).

Benefits and Challenges in the Use of Smartphone in the Clinical Practice

Benefits of Smartphone Use

The integration of smartphones in clinical practice offers several significant benefits for nursing students, as highlighted by multiple studies. One of the primary advantages is the enhanced access to educational resources, which supports knowledge acquisition and skill development. For instance, O'Connor and Andrews (2018) found that smartphones and mobile applications improved nursing students' access to educational materials, leading to increased knowledge, confidence, and reduced anxiety during clinical practice. Similarly, Hsu et al. (2018) reported that using a smartphone app in a physical assessment course provided realistic clinical scenarios that promoted critical thinking and reflection, thus aiding in skill development.

In addition to educational benefits, smartphones have been shown to facilitate the acquisition of specific clinical skills. Chuang et al. (2018) demonstrated that the delivery of skill demonstration videos via smartphones significantly improved students' knowledge and competencies in urinary catheterization. Moreover, Motamed-Jahromi et al. (2022) found that team-based training through smartphone applications significantly enhanced nursing students' clinical skills and problem-solving abilities, with the benefits sustained over a 12-week follow-up period.

Smartphones also contribute to improving clinical decision-making among nursing students. Gutiérrez-Puertas et al. (2021) noted that nursing students perceive smartphones as valuable tools for supporting clinical decision-making and improving patient care. Also, a study showed that virtual patient simulations delivered via smartphones significantly enhanced students' clinical decision-making skills, shifting them from analytical to more intuitive approaches (1).

Challenges of Smartphone Use

Despite these benefits, the integration of smartphones into clinical practice also presents several challenges. A recurring issue is the perceived unprofessionalism of smartphone use in clinical settings. A study found that the majority of nursing students did not find the provided smartphones useful for their clinical experience, citing concerns about appearing unprofessional, difficulties in using the devices, and insufficient time to learn the applications effectively (21).

Another significant challenge is the variability in the quality of information accessed via smartphones. Gutiérrez-Puertas et al. (2021) highlighted concerns about the reliability of information accessed through smartphones, which could potentially compromise patient safety and communication. Furthermore, negative attitudes from nursing staff and technical issues, such as poor Wi-Fi connectivity, were identified as barriers to the effective use of smartphones in clinical practice (16).

The inconsistent impact of smartphones on skill development is another challenge identified in the review. While some studies, such as those by Chandran et al. (2022), showed that mobile applications enhance knowledge acquisition, the effect on clinical skills was less clear. This inconsistency underscores the need for further research to optimize the integration of smartphones in nursing education, ensuring that they effectively contribute to both knowledge and skill development.

Implications for Nursing Education

The integration of smartphones in clinical practice has several important implications for nursing education, as revealed by the studies included in this scoping review. These implications relate to curriculum development, teaching

strategies, and the preparation of nursing students for clinical practice.

The use of smartphones in clinical practice suggests that nursing curricula need to evolve to incorporate mobile technology as a core component of educational programs. Several studies, including those by O'Connor and Andrews (2018), highlighted that mobile applications and smartphones provide nursing students with enhanced access to educational resources, which supports their learning in real-time clinical settings. As a result, there is a growing need for nursing education programs to integrate these technologies into the curriculum formally. This integration should focus on equipping students with the skills to effectively utilize mobile technology to enhance their learning and clinical practice.

The findings indicate that nursing faculty need to adopt new teaching strategies that leverage mobile technology to maximize its educational benefits. For instance, the study by Chuang et al. (2018) demonstrated the effectiveness of using smartphones to deliver skill demonstration videos, which suggests that educators should incorporate similar technology-based teaching tools into their instructional methods. Additionally, Hsu et al. (2018) showed that smartphone applications could facilitate critical thinking and reflection, which are essential skills in nursing. Consequently, faculty development programs should be designed to train educators on how to effectively use and integrate mobile technologies into their teaching practices.

Moreover, the use of smartphones in clinical settings has significant implications for the development of students' clinical skills and decision-making abilities. As shown in the study by Motamed-Jahromi et al. (2022), smartphone-based interventions, such as team-based training programs, can significantly enhance students' clinical skills and problem-solving abilities. This finding implies that nursing education programs should incorporate smartphone-based training modules to improve these competencies among students. Furthermore, the study by Hosseini et al. (2022) emphasized the importance of virtual patient simulations delivered via smartphones in enhancing clinical decision-making skills, suggesting that nursing programs should include similar simulation-based learning experiences.

Finally, the growing reliance on smartphones and other mobile technologies in healthcare settings underscores the importance of preparing nursing students for a technology-driven healthcare environment. As noted in the study by Chandran et al. (2022), while mobile applications have been shown to enhance knowledge acquisition, the impact on skill development remains inconsistent. This inconsistency suggests that nursing education programs need to continuously assess and update their technological integration strategies to ensure that students are adequately prepared for the demands of modern healthcare environments, where technology plays an increasingly central role.

Discussion

The findings of this scoping review highlight the transformative role of smartphones in enhancing clinical education for nursing students, emphasizing both the benefits and challenges associated with their integration into clinical practice. The reviewed studies consistently demonstrate that smartphones are vital tools for facilitating access to educational resources, developing clinical skills, and supporting decision-making processes (9; 16; 18). These devices have been shown to significantly improve knowledge acquisition and foster critical thinking, particularly when integrated with applications that simulate realistic clinical scenarios, aligning with the broader literature that recognizes the educational potential of mobile technology in healthcare settings (12; 23).

One of the critical strengths of smartphone use, as demonstrated in studies by Chuang et al. (2018) and Motamed-Jahromi et al. (2022), lies in their ability to enhance specific clinical skills through mobile-based interventions. These studies provide compelling evidence that smartphones can significantly improve competencies in areas such as urinary catheterization and problem-solving abilities among nursing students. This aligns with findings from other research that shows how mobile technology, particularly through interactive and multimedia content, can enhance practical skills and facilitate the application of theoretical knowledge in clinical settings (5; 6). The sustained benefits observed over follow-up periods in these studies further reinforce the potential of smartphones as effective educational tools in clinical training, echoing similar conclusions from studies on e-learning and simulation-based education (2; 10).

However, the review also identified substantial barriers to the widespread adoption of smartphones in clinical settings. Concerns regarding the professionalism of smartphone use, as highlighted by Ramjan et al. (2021), reflect the ongoing challenges nursing students face in balancing the utility of these devices with the perceptions of staff and peers. This finding is consistent with other studies that have documented skepticism among healthcare professionals regarding the appropriateness of smartphone use in clinical environments, where concerns about distraction and unprofessional behavior are prevalent (1). Additionally, issues such as inconsistent Wi-Fi connectivity and the reliability of information accessed via smartphones pose significant obstacles that must be addressed to maximize the benefits of mobile technology in clinical education (7; 16). These challenges underscore the need for robust technological infrastructure and institutional support to ensure that the integration of smartphones is both effective and sustainable (14; 19).

Despite these challenges, the positive impact of smartphones on student motivation and engagement in learning is well-documented (2; 11). The potential of smartphones to serve as accessible and flexible learning tools aligns with broader educational trends towards technology-enhanced learning, where mobile devices are increasingly seen as integral to modern educational practices (2; 5). However, the inconsistent effects on clinical skills development noted across studies suggest that further research is needed to optimize the integration of smartphones into nursing curricula. This is supported by the literature, which calls for a more understanding of how different educational technologies can be tailored to meet the specific needs of nursing students, thereby enhancing both theoretical knowledge and practical skills (25).

Generally, while smartphones hold great promise for enhancing the clinical education of nursing students, their effective integration requires careful consideration of contextual factors, including technological infrastructure, faculty training, and the development of clear guidelines for professional use in clinical settings. Addressing these challenges will be crucial in harnessing the full potential of smartphones to improve nursing education and, ultimately, patient care. As the healthcare landscape continues to evolve, it is imperative that educational institutions and clinical settings collaborate to create environments that support the effective use of mobile technology, ensuring that future nurses are well-equipped to meet the demands of a technology-driven healthcare system (1; 7).

CONCLUSION

The integration of smartphones into nursing education offers significant potential for enhancing clinical skills, supporting decision-making, and providing nursing students with immediate access to critical educational resources. The findings of this scoping review underscore the benefits of smartphone use in clinical practice, particularly in terms of knowledge acquisition, skill development, and fostering critical thinking. However, these advantages are accompanied by challenges, including concerns about the professionalism of smartphone use in clinical settings and the variability in the quality of information accessed through these devices.

While the evidence suggests that smartphones can be powerful educational tools, their effectiveness is influenced by factors such as technological infrastructure, the attitudes of healthcare staff, and the availability of clear guidelines for appropriate use. To fully realize the potential of smartphones in nursing education, it is essential to address these barriers through targeted research, faculty training, and the development of best practices that ensure smartphones enhance, rather than hinder, the clinical learning experience.

In conclusion, while smartphones hold great promise for advancing nursing education, their integration into clinical practice must be carefully managed to balance the benefits with the challenges. By doing so, nursing education programs can better prepare students for the evolving demands of healthcare, ultimately leading to improved patient care and outcomes.

Implications and Limitations

The scoping review suggests that integrating smartphones into nursing education can greatly enhance learning outcomes by providing students with immediate access to essential resources and decision-making tools. Educational

institutions should formalize the use of smartphones within their curricula and train educators on effective mobile technology usage. In clinical practice, establishing clear guidelines for smartphone use is crucial to maintain professionalism and ensure these devices contribute positively to patient care. Policy development should focus on creating standardized protocols for smartphone use, addressing issues like data security and ethical considerations to maximize the benefits while minimizing risks.

The review's limitations include the diverse geographical settings of the included studies, which may affect the generalizability of the findings. Additionally, the reliance on studies with varying methodologies could introduce inconsistencies in the interpretation of results. The focus on English-language literature may have excluded relevant studies in other languages, potentially limiting the scope of the review. Further research is needed to explore the long-term impacts of smartphone use on clinical skills and professionalism, with more rigorous designs and broader participant experiences across different contexts.

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