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Review Article

Nurses' Perception towards Electronic Medical Records System: An Integrative Review of Barriers and Facilitators

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Abstract

Background: Electronic medical records (EMRs) can minimize mistakes, enhance the comprehensiveness, legibility, and overall comprehension of medical records. However, nurses' limited familiarity with advanced technology lowers their confidence in utilizing EMRs. We aimed to collect and synthesize the most credible evidence on nurses' perception of EMRs, along with the barriers and facilitators that influence their acceptance.

Methods: Searching for relevant studies was carried out across three electronic databases, namely PubMed, Scopus and ProQuest in Dec 2023. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) was followed in this study report. The selected studies were then analyzed narratively and organized thematically for presentation.

Results: Out of the 4,382 articles identified through comprehensive database searches, only 19 met the criteria for inclusion and reviewed. Through the synthesis of findings, two primary themes emerged, including nurses' perceptions and experiences with EMRs and facilitators & barriers for nurses' in utilizing EMRs.

Conclusion: Nurses' perspectives are shaped by their computer skills, confidence in their abilities, and training. Despite obstacles such as nurse stress, EMRs present advantages such as enhanced patient care and decreased errors. Augmenting computer competency, delivering training, and guaranteeing support are essential for effective EMRs integration, leading to enhanced healthcare provision and better patient results.

Keywords: Barriers; Electronic medical records; Facilitators; Nurses; Perception

Introduction

The integration of information technology in healthcare is crucial for reducing malpractice occurrences and enhancing patient safety. Technology can significantly decrease medical errors (1), improve patient safety (2), and improve patient care process (3). A previous systematic review found that interventions for improving electronic medical records (EMRs) implementation, could lead to a fivefold increase in the proper use of EMRs functions, such as clinical decision support systems and customized referral templates (4). Furthermore, another systematic review revealed that similar interventions could improve the EMRs functions, such as referrals, electronic

communication, reminders, clinical decision support systems, and workflow management support functions (5).

Nurses are key users of EMRs due to their integral involvement in patient care and documentation (6). Nurses' acceptance and willingness to use EMRs significantly impact the success of EMRs implementation (7). Nurses generally perceive EMRs positively, finding them useful in their jobs (8,9). However, challenges such as usability concerns, system design complexities, and time-consuming tasks exist, affecting nurses' satisfaction and efficiency in using EMRs (10).

Challenges in adopting EMRs persist, particularly in low-income countries (LICs), due to issues such as inadequate infrastructure, lack of management commitment, absence of standards and interoperability, insufficient support, limited experience, and subpar EMR systems (11). Developing countries face difficulties in supporting clinical decision-making and public health using computerized patient healthcare information systems, necessitating novel EMRs architectures tailored to all social classes and socioeconomic statuses (12). Successful EMRs implementation requires factors like financial resources, system usability, efficiency, and effective leadership to overcome barriers and ensure project success (13).

The limited exposure of nurses to sophisticated technology reduces their comfort level in utilizing EMRs. This lack of confidence among nurses in using EMRs can impede the efficiency and effectiveness of nursing documentation. Consequently, evaluating nurses' perceptions of EMRs usage is essential, as it seeks to examine nurses' perspectives on EMRs within hospital information systems. Therefore, this study aimed to collect and synthesize the most credible evidence on nurses' perception of EMRs, along with the barriers and facilitators that influence their acceptance. By addressing this gap, the review seeks to offer actionable insights for improving EMRs systems and implementation strategies, ultimately enhancing their efficacy and acceptance among nurses.

Methods

Study design

This research employed an integrative review, a methodological approach considered appropriate for the thorough synthesis of findings across different study designs (14), in accordance with the framework outlined by Whittemore and Knafl (15).

Eligibility criteria

To be included in the review, studies had to meet the predetermined criteria outlined in Table 1.

Table 1: Eligibility criteria

	Inclusion criteria	Exclusion criteria
Participants	Studies that include individuals employed as nurses in hospital settings	Studies involving healthcare workers other than nurses
Phenomena of interest and context	Studies where an EMRs was implemented in hospital or clinical setting	Studies that discussed the EMRs implementation, but do not describe the nurse's perception in the study outcome
Type of study	Observational studies, experiments, ethnographic research, grounded theory, and phenomenological studies	Literature review, opinion, protocol and other non-research article

Search strategy

In Dec 2023, exploration was carried out on three electronic databases, namely MEDLINE (via PubMed), Scopus, and ProQuest. Customized approaches to searching were formulated for each database, integrating their distinct terms for

indexing, such as Medical Subject Headings (MeSH), in conjunction with Boolean operators. The search criteria covered fundamental concepts of the analysis, comprising: i) nurses; ii) perception; and iii) barriers & facilitators. Furthermore, manual search was executed in a bidirectional manner, including forward and backward citation searching to guarantee a thorough scope of pertinent articles. There were no restrictions applied to the search timeframe. The search strategy description depicted in Table 2. Additionally, the detailed search strategy was appended in the supplementary file 1 (Not published).

Search screening

The investigation adhered to the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 when evaluating pertinent articles (16). Upon the deduplication, three investigators (FM, DII and BD) undertook the evaluation of titles and abstracts. Any inconsistencies were addressed through deliberation involving a fourth investigator (IMMYS). Following this, the full texts of the articles were individually examined by all investigators in accordance with pre-established inclusion and exclusion criteria. The results of the search are depicted in a PRISMA flowchart (Fig. 1).

Data extraction

Data were systematically documented and gathered using a customized data extraction template. The data extraction instrument was unanimously selected by all members of the research team and covered categories such as author, year, country, study design, and results. The primary investigator conducted the data extraction process, and the extracted data were subsequently examined and discussed by all research team members to ensure alignment with the research question. The compiled data was amalgamated utilizing a narrative methodology.

Table 2: Search strategy

	Search strategy	Preliminary searches	Piloting of the study selection process	Formal screening results against eligibility criteria
PubMed	((Nurses [MeSH Terms]) AND (Electronic Health Records[MeSH Terms])) AND ((((((Perception[MeSH Terms]) AND "electronic health records"[MeSH Terms] AND ("perception"[MeSH Terms]	163	60	10
Scopus	(nurse*) AND ("Health Record, Electronic") AND (attitudes) OR TITLE-ABS-KEY (sentiment) OR TITLE-ABS-KEY (sentiments) OR TITLE-ABS-KEY (opinions)	2,091	64	19
ProQuest	abstract(Nurse) OR abstract(Personnel, Nursing) OR abstract(Registered Nurse) AND abstract(Health Record, Electronic) AND abstract(Facilitator*) OR abstract(Attitudes)	2,128	59	12

Quality appraisal

The quality and rigor of the examined articles were evaluated using the tools provided by the Joanna Briggs Institute, which were selected based on the research methodology employed (17). Three researchers (FM, IDI and BD) independently assessed each article according to the pertinent criteria of the respective tool, with any

inconsistencies being resolved by a fourth researcher (IMMYS). No articles were excluded based on the quality evaluation as all of the included studies is in moderate level.

Data synthesis and analysis

For the purpose of data synthesis and analysis, adherence to the methodology proposed by previous study (15) was followed. This approach involved continuously reviewing and interpreting findings from relevant literature, with regular discussions among the research team to ensure consistency and accuracy. Our systematic examination process started with immersing ourselves in the data, followed by synthesis, identifying differences, exploring recurring patterns, and evaluating these patterns. This process led to a unified agreement within the research team on defining and categorizing the identified themes. Ultimately, the articles were classified into two main themes based on the review's primary objectives.

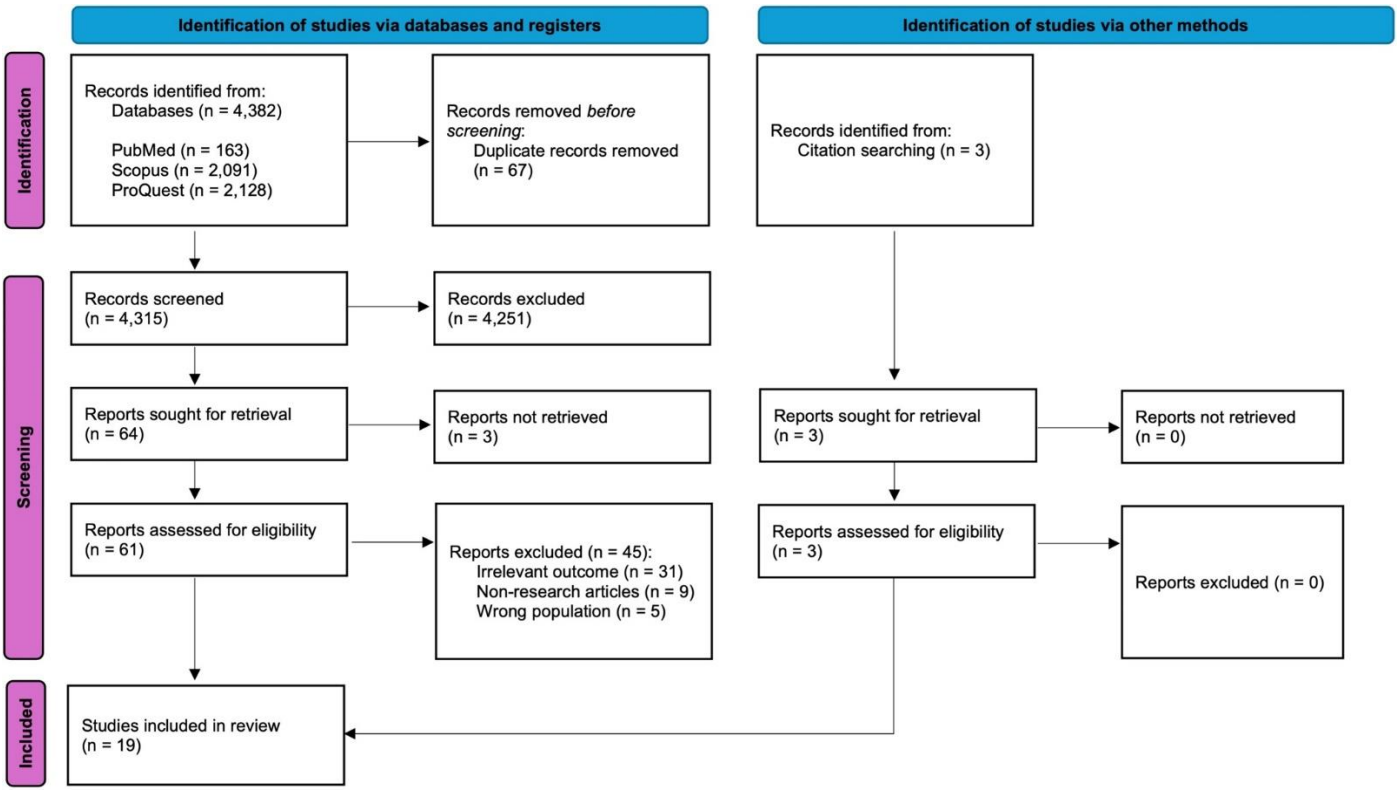

Fig. 1: PRISMA Flow Diagram

Results

Study characteristics

Out of 4,382 articles found in thorough database searches, only 16 matched the criteria for inclusion. Furthermore, 3 additional articles were found through searching references, making 19 articles reviewed. Among these, 4 were from Australia, 3 from the USA, and 2 each from China, South Korea, and Malaysia. Additionally, there was 1 article each from Canada, Ethiopia, Jordan, Kenya, South Africa, the UAE, and Palestine (Fig. 2). Furthermore, the details of each study, including author, year of publication, country of study origin, study design, study findings, and quality assessment outcomes, are presented in Table 3.

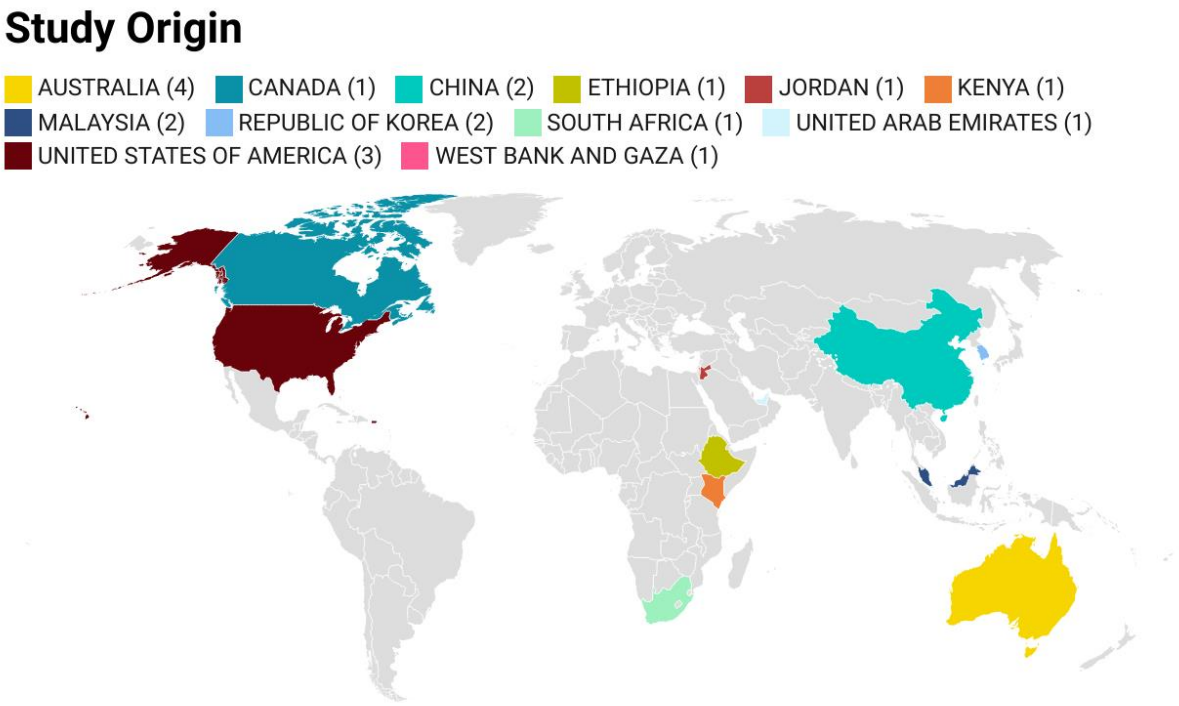

Fig. 2: Distribution of study origin country. This map was produced using free service of data visualization tool (https://www.datawrapper.de)

Table 3: Study characteristics (Quality Assessment was moderate for all cases)

Authors and Year of Publication	Citation	Country of Study Origin	Methods	Findings
Zaman et al. (2021)	(18)	The USA	A cross-sectional study	"Nurses' training in electronic documentation systems affects their perceptions, with computer skills and self-efficacy mediating ease of use and usefulness."
Hu et al. (2023)	(19)	China	A text mining and machine learning techniques	"Utilizing EMRs in nursing practice within regular clinical settings can forecast occurrences of aggression in psychiatric wards."
Cheligeer et al. (2024)	(20)	Canada	A retrospective Cohort Study	"The EMRs algorithm developed offers an automated and precise approach to identify fall risks in inpatient populations, leveraging multidisciplinary progress records and a pre-trained Bidirectional Encoder Representation from Transformers (BERT) language model."
Aljaafreh (2020)	(21)	Jordan	A survey method	"The satisfaction of end-users with computer systems is notably and positively affected by the quality of information, system performance, and personal effectiveness, thereby amplifying and optimizing the advantages of Electronic Health Records (EHR)."
Shaharul et al. (2023)	(22)	Malaysia	A cross-sectional study	"Implementing EMRs systems can reduce burnout among healthcare workers, with low prevalence of burnout symptoms found in this study, emphasizing the need for continuous support and resources for successful integration."
Wynter et al. (2022)	(23)	Australia	A qualitative study	"Nurses' and midwives' experiences of the EMRs were complex and mixed, and they perceived benefits of using an EMRs relatively soon

Table 3: Continued …

				after implementation in terms of their workflow and patient care but also experienced some negative effects on workflow, patient care and their own well-being."
Almarzouqi et al. (2022)	(24)	The UAE	A cross-sectional study	"The study's data proved that the intention of using an EMRs system was the most influential and predictor of the actual use of the system and it was found that TAM construct was directly influenced by anxiety, innovativeness, self-efficacy, and trust."
Shan et al. (2023)	(25)	China	A prospective observational study	"Workflow interruptions in EHR tasks lead to elevated mental workload for nurses, affecting task performance. Strategies to reduce interruptions and enhance system usability can mitigate these negative outcomes."
Lee (2022)	(26)	South Korea	A cross-sectional study	"The effect of the system quality, information quality, and service quality of EMRs on nurses' perceived usefulness and ease of use of the EMRs was examined from the perspective of nurses."
Jedwab, et al. (2022)	(27)	Australia	A qualitative study	"Nurses are vital in successfully implementing EMRs systems, with their perceptions and experiences impacting the effectiveness of these systems in enhancing patient care."
Bingham et al. (2021)	(28)	Australia	A longitudinal time and motion study	"The study proposes that introducing a complete EMRs system in healthcare departments can help nurses spend more time with patients. Moreover, it allows nurses to use their time more efficiently for other tasks."
Chirchir et al. (2021)	(29)	Kenya	A cross-sectional study	"Healthcare organizations should select champions for EHR system projects, preferably experienced nurses, to lead the implementation effectively."
Jedwab et al. (2022)	(30)	Australia	A pre and post cross-sectional study	"The study revealed that nurses had lower engagement, higher burnout, and less career satisfaction post-EMRs adoption. Data from a nurse subset confirmed these changes in mental health after implementation."
Ngusie et al. (2022)	(31)	Ethiopia	A cross-sectional study	"The authors examined healthcare providers' readiness for EHR adoption and associated factors in southwestern Ethiopia, and found that younger-aged groups were more ready for such technology which in turn implied; the older one needs more concern."
Horwood et al. (2023)	(32)	South Africa	A longitudinal mixed-methods study	"Primary health care nurses in rural Africa faced challenges with e-health technologies due to poor computer skills, heavy workloads, technical support issues, and lack of alignment with existing clinic programs."
Neirat et al. (2023)	(33)	Palestine	A mixed-methods study	"The benefits of using EMRs include promoting a patient safety culture and reducing medication errors. Challenges include lack of knowledge and skills, insufficient time to use EMRs, and computer limitations."
Zheng & Jiang (2022)	(34)	The USA	A cross-sectional study	"Three supporting factors for EHR (access to digital devices, access to the internet, and perceived usefulness of EHR) are positively associated with EHR usage."
Cho et al. (2021)	(35)	South Korea	A descriptive correlative study	"Levels of user resistance, resistance to change, perceived usefulness, perceived ease of use, perceived value, peer opinions, self-efficacy for change, and organizational support for change are significantly associated with user resistance, both directly and indirectly."
Seeburger et al. (2023)	(36)	The USA	A Qualitative study	"Nursing viewpoints on the significance of EHR behavior flags differ. Flags remind nurses to interact carefully with patients or use safety skills. Nurses doubt the flags' effectiveness in preventing violence and worry about bias impacting patient care."

Thematic finding

Theme 1. Nurses' perceptions and experiences in using EMRs

The results of this integrative review identify that overall computer skills, self-efficacy, and training influence nurses' perceptions of the functions and ease of use of EMRs (18). One perceived function by nurses in psychiatric wards is that EMRs usage can predict patient aggressive incidents (19). Similarly, the findings of a Retrospective Cohort Study suggest that EMRs algorithms provide automated and accurate methods for detecting fall risks in inpatients (20). Furthermore, Lee (2022) investigated the impact of EMRs quality on nurses' perceptions and found that system quality and information quality significantly affected the perception of EMRs usefulness and ease of use (26). Furthermore, studies in Australia have found that EMRs facilitate easier access to real-time patient data, enhance communication with patients, and reduce medication errors; however, negative effects of EMRs can lead to nurse and midwife frustration, stress, and fatigue (23). The implementation of EMRs enables nurses to spend more time with patients per episode of direct care and utilize their time for other activities more effectively (28), while also promoting a patient safety culture and reducing medication errors (33).

Theme 2. Facilitators and barriers for nurses' in using EMRs

Facilitators

Nurses' supportive factors in using EMRs are significantly influenced by information quality, system quality, and self-efficacy, thereby enhancing and maximizing the benefits of the system (21). Three supportive factors for EMRs (access to digital devices, internet access, and perceived usefulness of EMRs) are positively associated with EMRs usage. Perceived health status is a constant negative predictor of EMRs use. Nurse-patient communication is positively related to the frequency of EMsR usage (34). User resistance behavior, resistance to change, perceived usefulness, perceived ease of use, perceived value, peer opinions, self-efficacy for change, and organizational support for change are significantly related to user resistance, both directly and indirectly (35). A study in the UAE states that intention to use EMRs systems predicts system usage. Anxiety, innovativeness, self-efficacy, belief, and behavioral intention related to EMRs have also been positively proven to influence system usage (24). Nurse motivation in EMRs usage is a dominant supportive factor besides social influence and reinforcement (27). Additionally, this study identifies that younger age groups are more prepared for EMRs technology, while older groups require more attention. Increasing computer literacy, building confidence to enhance nurses' self-efficacy towards EMRs, addressing computer availability issues in healthcare facilities, fostering positive attitudes, EMRs awareness campaigns, and recognizing system usefulness are steps to enhance EMRs readiness (31). A paradigm shift is needed to equip all healthcare sectors with EMRs systems to improve healthcare services. Technical support and sustainable financial resources are crucial to ensure smooth transition and integration (22).

Barriers

Nurses' barriers to using EMRs are related to emotions and environmental context and resources (27). The implementation of EMRs during the SARS-CoV-2 pandemic is associated with negative changes in nurse well-being, intention to stay, fatigue, work engagement, and satisfaction (30). This is supported by the findings that there is a relationship between multitasking, task switching, and task time. Task time, task difficulty, and the usefulness of EMRs systems directly impact nurses' mental workload (25). Another barrier to EMRs usage is a lack of computer skills that make simple tasks difficult. Technical support is available but time-consuming to access. Heavy workloads and the perception that EMRs take longer and disrupt work are also challenges. Lack of alignment between EMRs recording requirements and other clinical programs increases administrative workload (32). These findings are reinforced by the study results indicating that lack of knowledge and skills, insufficient time to use

EMRs, and computer limitations are constraints and challenges to EMRs implementation (33).

Discussion

This study finding showed that EMR implementation among nurses is heavily influenced by their computer skills, confidence, and training. EMRs are crucial for predicting patient aggression and identifying fall risks, and they improve access to data, communication, and reduce medication errors. However, they can also cause dissatisfaction and stress. EMRs enable nurses to focus more on patient care, enhancing safety. Key facilitators for EMR use include high-quality information, reliable systems, and self-efficacy, while barriers involve emotional and environmental issues. Younger nurses are generally more prepared, and enhancing computer literacy, along with providing technical support and financial resources, is vital for successful EMR implementation.

Nurses' perceptions and experiences with EMRs are influenced by various factors such as their proficiency in computer usage, self-belief, and training. Previous study (37) emphasize the importance of considering nurses' attitudes and personal use of information technology (IT) devices in relation to EMRs adoption, highlighting the significance of nurses' proficiency in computer usage and their individual beliefs in shaping their interactions with EMRs. Additionally, another previous study (38) explores nurses' perceptions and confidence in using EMRs systems, indicating the relevance of self-belief in influencing nurses' views on EMRs.

Furthermore, another study (39) investigates nurses' views on EMRs systems in terms of use, quality, and user satisfaction, providing insights into the factors that impact nurses' encounters with EMRs. Similarly, previous study (40) highlights how nurses perceive EMRs as reducing workload, improving documentation quality, and enhancing patient care, indicating the multifaceted nature of nurses' experiences with EMRs. In addition to proficiency and self-belief, training also plays a crucial role in shaping nurses' interactions with EMRs. A previous study (41) discusses the implementation of an EMRs system in previously computer-naïve primary care centers, emphasizing the significance of training in facilitating the integration of EMRs into nursing practice, underscoring the impact of training on nurses' proficiency in utilizing EMRs effectively.

EMRs offer benefits like improved access to patient data and communication, and reduced medication errors. However, challenges such as nurse dissatisfaction and stress arise during EMRs implementation (8,42). Nurses play a crucial role in successful EMRs adoption due to their involvement in patient care and being the largest healthcare workforce (43). Studies emphasize the importance of addressing usability concerns identified by clinicians to realize the benefits of EMRs. Nurses' acceptance of EMRs is influenced by factors like perceived usefulness and ease of use, highlighting the significance of their willingness to use EMRs in clinical practice (7,42).

The implementation of EMRs has been shown to have a positive impact on nurse time allocation and patient safety. EMRs can lead to more efficient documentation processes, reducing the time spent on paperwork and administrative tasks by nurses (44). This allows nurses to reallocate this time to direct patient care activities, ultimately improving patient safety (39). Furthermore, EMRs have the potential to improve nursing care in hospital settings, leading to better nurse-sensitive patient outcomes (45). Additionally, the effectiveness of EMRs in long-term care facilities has been demonstrated, showing a reduction in the number of steps required to complete daily work processes, allowing nurses to dedicate more time to direct care of the facility's residents and contributing to improved quality care (46).

Previous study also showed factors that support EMRs utilization include teamwork support, perceived usefulness, ease of use, performance expectancy, and preventive health behaviors (47). These factors contribute to greater acceptance and use of EMRs by healthcare professionals and patients. On the other hand, barriers to EMRs utilization encompass data management issues, lack of awareness of EMRs functionality, limited

resource availability, and emotional factors like lack of readiness and confidence in using EMRs (48). Overcoming these obstacles requires addressing usability concerns, providing adequate training, and fostering a supportive organizational culture that values the mature use of EMRs by primary care physicians and nurses.

This integrative review finding also shoes younger nurses tend to show higher readiness for EMRs technology, as age significantly influences technical readiness among hospital nurses (49). Additionally, first-year nursing students generally exhibit average "techno-readiness," indicating a positive attitude towards computer use in nursing (50). Efforts to enhance computer literacy are crucial, as some students may require additional support to work effectively in technology-rich healthcare environments (51). Moreover, undergraduate nursing students perceive their informatics competency as somewhat competent, with only 40.84% considering themselves competent, highlighting the need for improved preparation in digital health technologies (52). Therefore, focusing on enhancing computer literacy can further improve the preparedness of nurses, especially younger ones, for utilizing EMRs technology effectively in clinical practice.

When comparing this study findings to the broader literature, the barriers and facilitators identified in our review are not unique but are shared across different healthcare settings and regions. For instance, several studies (53) emphasize the importance of addressing usability and training issues to improve EMRs adoption, similar to this study findings. Emotional and environmental factors such as stress and frustration are significant barriers, especially during EMRs implementation. This finding is consistent with studies which reported increased burnout and lower job satisfaction among healthcare due to EMRs adoption (54). Similarly, several previous studies found that resistance to change and anxiety were significant barriers to EMRs use (55).

Study implication

The study's findings suggest practical steps for nursing practice, EMR implementation, and policy-making. For nursing practice, there is a need for ongoing training programs to enhance nurses' computer skills and confidence in using EMRs, along with accessible technical support to improve user experience. In EMR implementation, prioritizing user-friendly design and gradual rollouts can help address usability concerns and reduce disruption. Continuous feedback from nurses should be integrated to refine the systems. For policy-making, allocating sufficient funds for EMR infrastructure, training, and technical support is crucial, with a focus on ensuring system interoperability and supporting low-income and rural areas to overcome implementation challenges. These measures can facilitate the effective adoption of EMRs, ultimately enhancing healthcare delivery and patient outcomes.

Conclusion

This study identifies key factors for successful EMR adoption in nursing, including the need for comprehensive training, user-friendly system design, and strong technical support. It recommends gradual system rollouts and continuous feedback to improve usability and functionality. Policymakers should focus on providing adequate funding for EMR infrastructure and support, especially in underserved areas. Future research should explore nurses' specific training needs, assess the long-term effects of EMRs on patient outcomes, and address usability and interoperability challenges. Studies should also investigate the unique barriers in low-income and rural settings and the impact of EMRs on healthcare workers' well-being. These efforts are crucial for enhancing EMR systems and improving healthcare delivery.

Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of interest

The authors declare that there is no conflict of interests.

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