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ELECTRONIC HEALTH RECORDS AND NURSING PRACTICE: A SYSTEMATIC REVIEW OF UNINTENDED CONSEQUENCES, WORKFLOW CHALLENGES, DOCUMENTATION BURDEN, AND PATIENT SAFETY

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Abstract

Background: Electronic health records (EHRs) were introduced to improve documentation, communication, and patient safety. However, unintended consequences have emerged, particularly for nurses who rely on these systems in daily practice. This systematic review aimed to explore nurses' experiences with the unintended consequences of EHR use in acute care settings. **Methods:** A comprehensive search of PubMed and CINAHL databases was conducted for studies published between 2009 and 2024, supplemented by manual reference screening. Studies focusing on registered nurses and unintended consequences of EHR use were included. Following PRISMA guidelines, 101 articles were identified, 29 underwent full-text screening, and 7 met the eligibility criteria. Data on study design, setting, aims, and reported consequences were extracted and synthesized narratively. **Results:** Seven studies

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were included, predominantly qualitative in design, with one mixed-methods study. Across settings in the United States, Sweden, and Iran, nurses reported multiple unintended consequences. These included workflow disruptions, increased documentation burden, usability challenges, redundant or duplicate data entry, communication barriers, and insufficient training during implementation. Such issues were found to contribute to cognitive overload, inefficiencies, and potential risks to patient safety. **Conclusion:** While EHRs offer potential benefits for nursing documentation and care coordination, this review demonstrates that their implementation often generates significant unintended consequences. Addressing these challenges requires aligning EHR design with clinical workflows, providing adequate training, and ensuring nurses' involvement in system development. Greater awareness and proactive planning may help minimize negative effects and optimize the role of EHRs in supporting high-quality, safe patient care.

Keywords: Electronic Health Record, Unintended Consequences, Nurses, Documentation, Patient Safety, Workflow.

INTRODUCTION

Over the past decades, electronic health records (EHRs) become a cornerstone of modern healthcare, replacing paper-based systems with the promise of improving efficiency, accuracy, and continuity of care. For nurses in particular, EHRs were expected to simplify documentation, support clinical decision-making, and reduce redundant tasks. However, as adoption has grown, it has become clear that the technology also brings new challenges. Reports of unintended consequences—ranging from workflow interruptions and communication barriers to increased cognitive workload—suggest that the benefits of EHRs are not always fully realized in practice.

Understanding these consequences from the perspective of nurses is essential to ensure that digital systems enhance, rather than hinder, patient care (Kataria & Ravindran, 2020; Baughman, 2024; Tajirian et al., 2020).

Workflow isn't going smoothly because different EHR software systems aren't compatible with one another. The EHR's shortcomings are now being addressed via artificial intelligence. New information gathered from EHR use in the real world is offering helpful inputs that could improve the system. This assessment offers a critical evaluation of the EHR's current state and problems as well as an outline of the major technologies being used to improve the system's efficiency and lessen the administrative load on healthcare workers (Kataria & Ravindran, 2020; Tajirian et al., 2020).

EHR can provides healthcare workers including nurses with data gathering and integration capabilities. Nurse Information Systems possess the capability to enhance patient history and care planning procedures, as well as boost the accuracy, accessibility, and completeness of nursing documentation. Additionally, it offers a way to reduce redundant documentation and help ensure that legal documentation requirements are more precisely followed (Ammenwerth et al., 2011). A recent systematic evaluation, however, did not find any proof that nursing record systems had a quantifiable effect on nurse practice or patient outcomes. Relatively little is known about the barriers experienced by nurses when using EHR in hospitals because there are few studies on this topic. The body of research on EHRs is more extensive. The systems arrange clinical information about patients in a chronological order. These consist of pharmaceutical

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administration systems as well as order entry and results reporting systems for lab, pharmacy, and radiology settings. Despite being the last users of EHRs, nurses are not well understood in terms of their experiences or if they believe that EHRs are related to patient safety and high-quality treatment (Kutney, 2011). This review's objective is to look at published works that discuss nurses' experiences with unexpected outcomes related to EHR.

METHOD

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A comprehensive search was performed in **PubMed** and **CINAHL** databases for studies published between 2009 and 2024. The primary search terms included *nurse* and *unintended consequences*, and these were combined with additional keywords such as *work-arounds*, *barriers to electronic health record*, *consequences*, *unintended outcomes*, and *electronic medical record*. To ensure completeness, reference lists of relevant studies were also manually screened, yielding three additional records.

In total, 101 articles were identified, of which 71 remained after duplicate removal. Title and abstract screening excluded 42 irrelevant studies, leaving 29 full texts for detailed assessment. Following the exclusion of reviews, editorials, and studies not primarily focused on registered nurses in acute care, 7 studies met the eligibility criteria and were included in the final synthesis. A PRISMA flow diagram (Figure 1) illustrates the selection process.

Data extraction was performed independently by all authors using a predesigned form. Extracted information included study characteristics (year, country, setting, sample size, and design), methodological details, study aims, and reported unintended consequences of EHR use. Given the heterogeneity of study designs, a narrative synthesis approach was employed. The methodological quality of included studies was assessed qualitatively, with particular attention to sampling, data collection methods, and relevance to nursing practice.

RESULT

A total of seven studies met the inclusion criteria for this review. Six employed qualitative designs, while one used a mixed-methods approach. The studies were conducted across diverse healthcare settings, primarily involving nurses providing direct patient care in acute care units. Sample sizes ranged from small exploratory groups to large cross-sectional surveys, reflecting variability in scope and methodological rigor.

Despite differences in design, common themes emerged across the studies. Nurses frequently reported unintended consequences of EHR use, including workflow disruptions, communication challenges, increased cognitive load, and documentation inefficiencies. Qualitative approaches such as interviews, focus groups, and content analysis were most commonly employed to capture nurses’ experiences, while

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quantitative surveys provided broader perspectives on acceptance and usability. Together, these studies highlight that although EHR systems are designed to support care delivery, their design and implementation often introduce new barriers that affect both nurses' work processes and perceptions of patient safety.

Schoville et al., (2009) looked at the workarounds and artifacts that nurses employed when switching from paper order entry to EHR. The study looked at how nurses used artifacts to adjust to their changes in workflow as a result of CPOE adoption, enabling adjustments to be made by addressing these specific themes and resolving unintended consequences. In order to find workarounds, information was gathered via email asking clinical leaders to list any workarounds and artifacts they had seen; they also conducted conducting open-ended follow-up interviews with leaders.

Carrington and Effken (2011) investigated how well nurses thought the EHR communicated a clinical event or an abrupt and unplanned change in a patient's clinical status. They conducted 37 interviews with nurses, including receiving nurses (who continued to care for the patient after a shift change) and documenting nurses (who provided care during the change in status). Five categories emerged from the transcript analysis and content analysis: usability, legibility, communication, work-around, and collaboration.

In specifically, the usage of the optional free-text comments as part of a local EHR that has been in use since 2005 was one of the workarounds utilized by nurses that Collins et al. (2021) analyzed using a mixed-methods approach. In this instance, clinical events were not connected to nursing flow sheet data by the EHR design. A nurse workaround to establish such relationship was the use of free-text comments.

When using the EHR as part of routine practice in a general ward context, nurses' views of patient safety were investigated by Stevenson and Nilsson, (2012). The EHR system was used by twenty-one nurses for whom focus group interviews were performed after a year. Through content analysis, the category "documentation in everyday practice" was identified. This category included three aspects: patient overview, drug module management, and vital sign documentation. Nurses said that redundant and duplicate EHR data caused confusion and increased their mental burden while trying to locate the information they required.

The influence of a Nursing Information System (NIS) and the ensuing health care outcomes connected with NISs were evaluated in 2014 by Sockolow et al. (24). Nurses may plan and make informed decisions about patient care by using evidence-based guidelines through the NIS program, which is part of the EHR. Twelve nurses who were chosen at random for interviews. They were required to "think aloud" in order to respond to questions concerning the EHR while they were recording a patient's fall during the scenario-based testing portion of the interview. To evaluate the interview transcripts for the simulation, content analysis was employed. The advantages and disadvantages of NIS usability were determined through thematic analysis. They expressed dissatisfaction with the frequent disruptions they encountered when documenting at the patient's

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bedside, their inability to offer feedback on the NIS design, and the inadequate flowsheet design, which made it more difficult for them to create a clear clinical picture of the patient's condition. Poor usability, the need to duplicate patient information, delays in between orders, physician evaluation of the NISs documentation, missing data, the requirement for duplicate documentation, and insufficient training during implementation were among the design elements that could have an impact on patient safety. When adopting NIS on their unit, the authors advised nurse administrators to push for better training and implementation assistance.

The findings of the study by Sharifian et al. (2014) showed that effort expectancy, performance expectancy, social influence, and conducive factors all predicted the nurses' behavioral intention to use hospital information systems.

Schoville et al. (2009) aimed to identify the workarounds and artifacts used by nurses after the adoption of computerized provider order entry (CPOE). The study revealed 40 workarounds and 18 artifacts, most of which were employed to improve patient care coordination. These adaptations addressed issues such as workflow timing, communication challenges, care delays, provider incoordination, and learning curve difficulties, including unnecessary training and manual double-checking.

Carrington and Effken (2011) investigated how nurses communicate during clinical incidents compared to what is documented in the EHR. The nurses highlighted obstacles related to the system’s design and expressed a strong desire to be involved in hospital-level decisions regarding EHR usage, as the system often failed to capture essential details of their communication.

Stevenson and Nilsson (2011) explored nurses’ perceptions of using EHRs in acute care and their impact on patient safety. Nurses described difficulties navigating the complex design, duplication of documentation, and delays in retrieving critical information. They reported confusion caused by multiple documentation locations, medication logging errors, and unclear records of drug changes, all of which posed risks to patient safety.

Collins et al. (2012) examined the use of free-text comments in EHRs. Nurses valued this function for its legal protection, simplicity, and ability to capture time-stamped details that enhanced patient safety. However, the reliance on free-text notes also suggested that the structured EHR design was insufficient for documenting clinical events comprehensively.

Sockolow et al. (2014) assessed the usability of a Nursing Information System (NIS) within EHRs. Nurses reported challenges such as duplicate documentation, delays in order processing, confusing admission questions, and poor system usability. They also emphasized insufficient training and limited opportunities for feedback, which hindered their ability to document effectively and affected patient safety. Sharifian et al. (2014) studied factors influencing nurses’ acceptance of hospital information systems. Findings showed that performance expectations, effort requirements, social influence, and available support shaped nurses’ intentions to use the EHR. Barriers such as poor hardware/software design and inadequate training were identified, but many could be reduced with comprehensive support and system improvements.

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Samadbeik et al. (2017) evaluated how nurses process data within Nursing Information Systems. The study found that many nurses underutilized both digital and paper-based tools, particularly for processing discharge information. Less experienced nurses tended to rely more heavily on computer tools. The most common issues identified were poor readability of patient information and repetitive, time-consuming documentation practices.

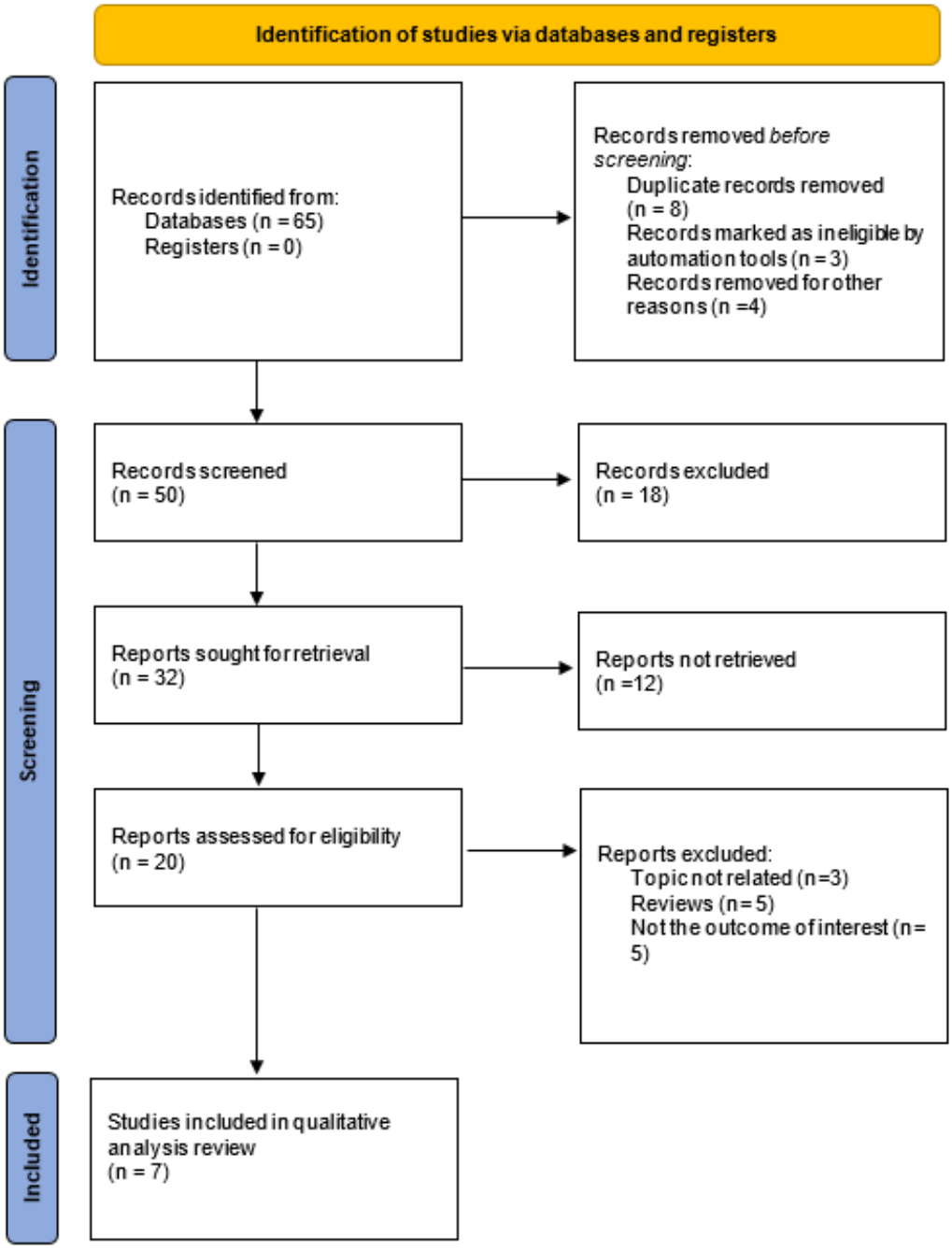

Fig 1: PRISMA consort chart of studies selected

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Table 1: characteristics of the included studies

Citation	Method	Sample size	Study setting	Country
Carrington & Effken, 2011	Interviews with registered nurses who are documenting and receiving care for patients following a clinical occurrence.	37	Medical-surgical unit	USA
Schoville et al., 2009	Observation, sources of data, interviews and emails.	12	Two large hospitals employing1000 RNs.	USA
Stevenson & Nilsson, 2011	Nurses were split up and subjected to unstructured interviews in groups before thematic analysis was carried out.	21	Acute care unit	Sweden
Sockolow et al., 2014	qualitative, using observation and a think-aloud approach	12	Two hospitals with a total of 1060 beds	USA
Sharifian et al., 2014	The adoption and usage of EHR by nurses was investigated using a descriptive-analytical research approach. A cross-sectional survey of nurses was used to gather data.	303	One teaching hospital	Iran
Collins et al., 2012	Hybrid approach. content analysis of RN interviews regarding free-text records pertaining to cardiac arrest.	5 nurses and data from 201 patients	One unit from a large medical center	USA
Samadbeik et al., 2017	Cross sectional study	71	5 teaching hospitals	Iran

DISCUSSION

This review synthesized evidence from seven studies exploring the unintended consequences nurses experience when using electronic health records (EHRs). Across diverse settings, the findings consistently demonstrated that while EHRs were designed to improve efficiency and support patient care, their implementation often generated new challenges for nursing practice.

Commonly reported issues included increased documentation burden, workflow disruptions, usability limitations, and barriers to effective communication. These consequences not only affected nurses' daily tasks but also raised concerns regarding patient safety and quality of care. Collectively, the evidence highlights the need to view EHRs not only as technical systems but also as sociotechnical tools whose success depends on alignment with clinical workflow, adequate training, and meaningful nurse involvement in their design and optimization.

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The findings of this study indicate that nurses deal with shifting work processes, uneven information accessibility, and mismatched flow sheet designs. Furthermore, it doesn't seem that EHRs change the way other medical professionals choose not to review the patient data recorded in nurse documentation. The authors suggest some key tactics to reduce the impact of EHRs unintentional consequences, to foresee modifications to the workflow, obstacles, and workarounds. Nurse administrators can advocate for nursing while decreasing the number of known EHRs unintentional consequences by being informed and participating in the implementation process, according to one recommended strategy.

For example, nurse leaders should examine the present workflow and promote education for the projected future workflow post implementation with the entire nursing team during the construction process. In order for nurses to offer feedback while learning the system, they should assist the educational process during system testing. The "super user" model, in which nurses from all care areas become the unit "expert" on system use, is another one that nurse administrators can encourage.

A recent cross-sectional survey conducted by Kinnunen et al. (2023), involving 3610 nurses that are employed in Finland, to describe nurses' perceptions of their informatics competencies regarding EHR usage, their result indicate that nurses are extremely skilled users of EHR. However, nurses are facing challenges due to the skill requirements brought about by the fast-rising digitalization.

The competency categories of "ethics and data protection" and "digital environment" were clearly scored highest and lowest, respectively, out of the three that were studied. This alludes to pertinent nursing curriculum material on ethical guidelines and data security and protection principles in day-to-day patient care when utilizing digital services (Silén et al., 2020). This finding indicates that nurses are highly competent in ethical matters, which is significant since digitalization is shifting the nature of the patient-nurse relationship from in-person to virtual.

As a result, nurses must determine the patient's needs for care from a distance, provide instruction and guidance in accordance with those needs, and evaluate the patient's progress. The preservation of patient autonomy, privacy, confidentiality, and integrity should all be upheld in digital health care procedures (Dhingra & Dabas, 2020; Konttila et al., 2018; Hübner et al., 2018).

CONCLUSION

The results showed that many of the unexpected consequences—workflow time, communication, a learning curve during deployment, system issues, patient safety, nurse satisfaction, interruptions in documentation, efficiency and functionality—that have been documented in studies that have concentrated on the EHR were also disclosed. Raising awareness and preparing for the unanticipated might be the last mile of prevention needed to ensure the long-term success of EHR deployment and, ultimately, enhance patient safety.

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Abbreviations

1) COPE, computerized provider order entry
2) EHR, electronic health record
3) NIS, Nursing Information System
4) RN, registered nurse
5) WA, work-around

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