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ORIGINAL

The Influence of Electronic Health Records on Nursing Practice within Hospital Settings

Influencia de la historia clínica electrónica en la práctica de enfermería en el ámbito hospitalario

Asha Kademane[1], Peekesh Kumar[2], Bulbul Chaudhary[3]

[1]Department of Life Sciences, School of Sciences, JAIN (Deemed-to-be University). Karnataka, India.
[2]College of Nursing, Teerthanker Mahaveer University. Moradabad, Uttar Pradesh, India.
[3]ISDI - School of Design & Innovation, ATLAS SkillTech University. Mumbai, India.

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ABSTRACT

Usability issues with electronic health records (EHRs) represent a growing threat to the health of nurses and patients, despite the fact that few studies have examined these correlations in depth. The purpose of this study was to investigate how the use of electronic health records has affected nursing practice in hospital settings. EHR adoption and care quality have yet to be extensively studied. The American Hospital Association (AHA) data, state patient discharges, and a survey of nurses were all used to conduct cross-sectional studies. The sample includes 1 281 848 surgical patients, 12 004 nurses, and 343 hospitals. Logistic regression models were used for uncontrolled, randomized studies examining the correlation between EHR usability and outcomes. Using logistic regression models, we analyzed the relationship between nurse-assessed quality of care outcomes and the use of even the most fundamental electronic health record systems. Nurses who worked in facilities equipped with even the most basic EHRs reported significantly fewer incidences than their colleagues at hospitals without EHRs; they had worse results in patient security and other quality measures. Implementing even a minimal EHR could improve the quality of nursing care, facilitate more effective care coordination, and boost patient safety.

Keywords: Electronic Health Records (EHR); Nursing Practice; Hospital; American Hospital Association (AHA); Patient Safety.

RESUMEN

Los problemas de usabilidad de las historias clínicas electrónicas (HCE) representan una amenaza creciente para la salud de enfermeras y pacientes, a pesar de que pocos estudios han examinado estas correlaciones en profundidad. El objetivo de este estudio era investigar cómo ha afectado el uso de las historias clínicas electrónicas a la práctica de la enfermería en el ámbito hospitalario. La adopción de la HCE y la calidad asistencial aún no se han estudiado en profundidad. Se utilizaron datos de la Asociación Americana de Hospitales (AHA), altas estatales de pacientes y una encuesta a enfermeras para realizar estudios transversales. La muestra incluye 1 281 848 pacientes quirúrgicos, 12 004 enfermeras y 343 hospitales. Se utilizaron modelos de regresión logística para los estudios aleatorizados no controlados que examinaban la correlación entre la usabilidad de la HCE y los resultados. Mediante modelos de regresión logística, se analizó la relación entre los resultados de calidad de la atención evaluados por las enfermeras y el uso de los sistemas de historia clínica electrónica más básicos. Las enfermeras que trabajaban en centros equipados incluso con las HCE más básicas declararon un número significativamente menor de incidencias que sus colegas de hospitales sin HCE; obtuvieron peores resultados en seguridad del paciente y otras medidas de calidad.

Implantar incluso una HCE mínima podría mejorar la calidad de los cuidados de enfermería, facilitar una coordinación asistencial más eficaz y aumentar la seguridad de los pacientes.

Palabras clave: Historia Clínica Electrónica (HCE); Práctica de Enfermería; Hospital; Asociación Americana de Hospitales (AHA); Seguridad del Paciente.

INTRODUCCIÓN

More efficient and cost-effective patient transport methods are being developed as the nursing field evolves. The uniformity and logic of production that penetrates contemporary hospital cultures, along with technological and medical advancements, have contributed to a more complicated healthcare environment in recent decades. Therefore, nurses must address not only the needs of patients and their families but also those of other medical professionals and the hospital's administration. The sets nursing apart from other professions are its emphasis on the whole person, which includes an ethical need to protect the privacy and autonomy of patients. This means that moral and ethical concerns permeate all aspects of nursing. Every day, nurses face moral dilemmas in the course of their employment, and these dilemmas range from life and death to the mundane.[1]

Because of the various ways they ensure safe and high-quality healthcare delivery, EHRs have become the most common type of E-health software, including the automation of tasks like documentation, medication administration, practice management, and communication. EHRs are databases that store and manage patients' medical records, including their demographic information, medical history, and imaging and laboratory test results, in digital formats. The rate of EHR adoption is affected by several factors, including the quality of the information system and service, the costs of the application, the users' expectations of confidentiality and privacy, and the application's usability. Efficiency, availability, satisfaction, and confidentiality are hallmarks of high-quality electronic medical records. A system must be readily available and simple to operate to be efficient. The validity and functionality of EHRs constitute their availability. While confidentiality refers to how well personal information about customers and patients is kept secure, fulfillment describes how the system may complete healthy orders.[2]

Trends in the modern workplace, such as the widespread adoption of information and communication technology (ICT), the need to continually acquire new skills, and the need to do so within a constrained time frame, place a premium on the quality of the workforce. Organizational processes and routines are re-engineered due to digitalization, compelling and obligating workers to acquire new knowledge and adapt to novel circumstances. The medical field is not immune to the effects of digitization. New knowledge and abilities are required in the healthcare industry for companies and individuals to keep up with technological advancements and shifts. Competency in IT or training in new IT will only fix IT problems if the underlying technology is up to snuff.[3] Figure 1 depicts the general framework of EHR.

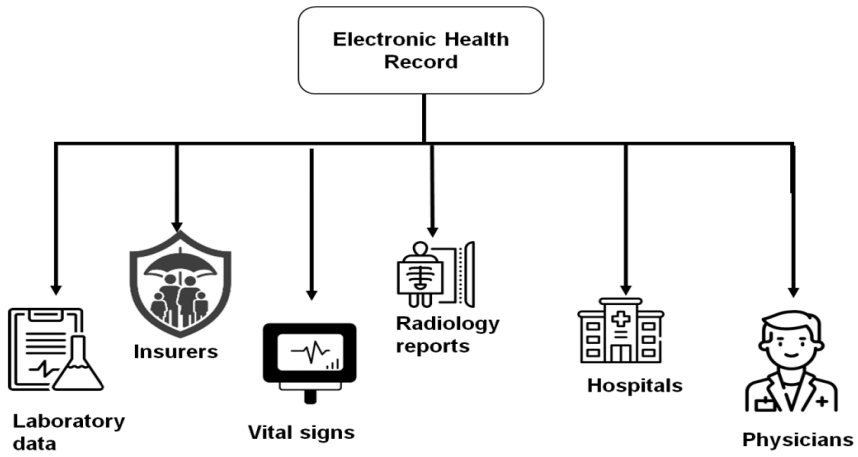

Figure 1. The general framework of EHR

All members of the healthcare team who add information to the electronic health record are subject to its dictates, but its effects on nurses specifically. There are several benefits to establishing clear roles for everyone on the healthcare team. Patients, doctors, and the healthcare system take precedence over nurses and nursing, which can lead to the former needing to be addressed. This results in nursing becoming invisible and erased, highlighting the need to address nurses' specific issues and recognize their unique body of knowledge. Nurses frequently give up their rights as care providers and submit to patronizing behavior from patients and their families to provide adequate care. This makes it harder to uncover the underlying patterns and dynamics that

shape nursing work and dilutes nurses' unique disciplinary power/knowledge.[4]

Enaizan et al.[5] suggested a paradigm for decision support analysis of the factors that affect user acceptance and use of EMR, including those related to individual, security, and privacy concerns. The framework is based on a multi-criteria approach that Malaysian healthcare experts took as a frame of reference. Shao et al.[6] analyzed the ability and representativeness of the Chang Gung Research Database (CGRD) to support the secondary use of electronic medical records (EMR) data for clinical research with more precise predictions. Sieja et al.[7] analyzed a unique clinic-focused Sprint method (an intensive team-based intervention) to boost EHR effectiveness. With an emphasis on primary care databases from Europe and a national database for veterans from the United States, they outline the characteristics of electronic health record databases and their function in pharmacoepidemiologic research.[8] Hossain et al.[9] proposed that extend the Unified Theory of Acceptance and Use of Technology (UTAUT) to include Personal Innovativeness in Information Technology and Resistance to Change to uncover the crucial factors influencing physicians' adoption of EHR in Bangladesh's healthcare system. White et al.[10] explored the connection between burnout among registered nurses (RNs), discontent with their jobs, and missing care in nursing homes. The maintenance of COVID-19 with physiotherapy in an acute hospital environment is suggested in this study.[11] It is designed to be used by physiotherapists and other key players in the acute care setting who are working with adult patients who have COVID-19 that is either confirmed or suspected. Schroeder et al.[12] examined the perspective of a registered nurse caring for COVID-19 patients at an urban university hospital in the early phases of the global outbreak. Lotfi et al.[13] evaluated patient satisfaction with nursing care in the burn wards for men and women and nurse-patient communication. Using 22 malnutrition screening measures that have recently been approved for use with older persons, Leij-Halfwerk et al.[14] analyzed the incidence of protein-energy malnutrition risk in older Europeans living in various healthcare settings. Andrews et al.[15] analyzed nurses' experiences of self-care and self-compassion were investigated, as well as how those experiences may link to compassionate caregiving for patients. As a result, we proposed that electronic health records may impact nursing practice in hospital settings.

The remaining sections of this research are as follows: Methodology is introduced in Part 2; the result of the study is in Part 3; the discussion is found in Part 4; the conclusion is in Part 5.

METHODS

Design of the Study

We desired to analyze hospitals that provided a representative sample of EHR adoption. To extrapolate clinical outcomes for all non-federal institutions, we honed in on four large states "(California, Florida, New Jersey, and Pennsylvania)." The research was a cross-sectional review of secondary data from 2015 and 2016. Among these sources were:

- The Annual Hospital Survey conducted by the AHA.
- The information system of the “AHA Healthcare Information Technology (IT)."
- Patient discharge summaries were acquired from state organizations.
- The nurse assessment “RN4CAST-US”.

An analysis covered all of the hospitals that were identified in each of all four data sources. Using a standard hospital identity, databases were connected for the examination. The "Institutional Review Board at the University of Pennsylvania" endorsed the research.[16]

Sampling and Data Collection Methods

Data on the sample hospitals, such as their sizes, may be found in the AHA's Annual Survey of Hospitals, percentage of faculty physicians, and ability to provide cutting-edge medical care. The AHA IT Database contained variables that revealed the extent to which individual hospitals used their EHR systems.

This research relied on summaries of patient discharges provided by the health departments of the four participating states: New Jersey's Division of Aging and Adult Services, “New Jersey's Office of Statewide Health Planning and Development," “Florida's Agency for Health Care Administration," and “Pennsylvania's Health Care Cost Containment Council." Demographic data, primary and secondary diagnosis, coding for medical procedures and treatments, in-hospital mortality, and subsequent hospital stays were also included in the patient discharge data set. Patients in the sample ranged in age from 18 to 99, and they had all undergone procedures in general, orthopedic, and vascular surgery between January 1, 2015, and December 31, 2016. Risk adjustment strategies have been vetted, and these procedures are routinely performed in hospitals. Therefore, they were selected for the study.

The “RN4CAST-US nurse” survey was administered to a representative sample of RNs in “California, New Jersey, Pennsylvania, and Florida” drawn from active licensee lists maintained by state nursing boards. About 231,000 RNs had surveys addressed to their homes, followed by postcard reminders. The poll asked about patient workload, demographics, job results, and EHR usability. The construction of hospital-level measures was made possible by linking AHA and patient discharge data with the primary employer information provided

by nurses. A detailed follow-up survey of non-respondents, conducted after the initial poll received a 26 % response rate, yielded an 87 % response rate. It is more crucial to know how many nurses responded for each hospital than what percentage of nurses responded overall because nurses are the primary source of information for this study. There was an average of 35 direct care nurse respondents per facility, ranging from 10-146 overall. There are other sources wherein one can learn more about the survey approach.

Measures

Basic EHR System

The following electronic components were determined to be present in all areas of patient care during the AHA EHR Deployment assessment, the institution was considered to have a basic EHR system.

- Detailed records of each patient's vitals, problems, medications, and discharge reports.
- Diagnostic, laboratory, and imaging data.
- CPOE for medications.

In their first analysis of EHR implementation in US hospitals, Jha and colleagues utilized criteria based on data from the AHA's EHR adoption survey to define a core EHR system.

Nursing Employment Ratios

This study used nurse staffing levels as a control variable because of their positive association with patient safety and treatment quality. An anonymous survey of nurses disclosed their patient counts from the prior shift. In this study, nurse staffing was viewed as an aspect of hospitals. Hence responses were compiled at the hospital level. If a nurse cared for at least one but no more than 20 patients, they were counted in the measurement.

Nurse-Assessed Patients Security and Excellence of Service

The patient security atmosphere report conducted by the Center for Healthcare Research and Quality inspired four queries on the nurses' survey. The nurses were given statements on the importance of patient safety and the regularity with which information about patients was lost during shift changes and patient transfers. They were asked to rate their degree of agreement with each statement. The participants answered all three questions using a five-point Likert scale from strongly agrees to disapprove strongly. Nurses were polled on how well they felt patient safety was being maintained on a scale from A (outstanding) through D (good enough) to F (failed). This study used three different indicators of care quality and patient safety. Researchers asked nurses to use a 7-point Likert scale ranging from "never" to "every day" to assess the incidence of medication errors. The nurses said that reporting a prescription error more than once a month was considered standard. Using a Likert scale ranging from "excellent" to "poor," registered nurses ranked the level of treatment their patients received, and their assurance that patients were ready for discharge ranged from very confident to not at all confident. To simplify the study and allow for a more straightforward interpretation of the results, all patient outcomes, as judged by nurses, were reduced to dichotomous categories such as agree/disagree, confident/not confident, etc. In previous research, nurses' reports of adverse occurrences and the quality of care provided have been demonstrated to be accurate and trustworthy.

Structural Hospital Characteristics

The quality of care was significantly linked with three structural hospital measures from the AHA's annual survey and thus served as relevant control variables. Thirty-one hospitals were categorized as small, medium, or significant. Comparing the number of postgraduate medical residents or fellows to the total hospital beds was used to determine a hospital's status as a teaching center. A hospital's level of technological sophistication may be gauged by whether or not it performed open heart surgery and major organ transplants.

Data Analysis

To be included in the final sample, hospitals must have completed the AHA HER Adoption Survey and the AHA's yearly survey. Differences in hospitals' adoption of EHRs were analyzed using descriptive statistics. Nurses at hospitals with and without complete EHR implementation were analyzed independently; descriptive analysis and independent estimation of nurse-assessed patient outcomes were carried out. To analyze the effect of EHR adoption on results, we employed complicated logistic regression models incorporating nurse clustering within hospitals, both in the presence and absence of confounding factors. Confidence intervals and odds ratios were calculated with a 95 % level of certainty. The significance level used in analyzing the data was $P<0,5$.

RESULTS

In total, the final sample comprised 1,281,848 patients and 12,004 RNs from 343 hospitals spread across the four states. Table 1 lists the traits and results of the sample's nurses and patients. The average age of nurses

was 46,6 years old, and they had worked as nurses for over 18 years. In our selection, female nurses comprised about 90% of the nursing staff. 73.7 percent of respondents had full-time jobs. The majority of the sample's nurses—33,1 %—reported high levels of burnout or emotional tiredness. More than 20% of nurses expressed dissatisfaction with their primary position, and 12 % said they planned to quit in the upcoming year.

Table 1. Lists the traits and results of the sample's nurses and patients

Nursing features	The total value of patients
Conditions of Elixhauser	
Diabetes mellitus	Diabetes mellitus
Chronic lung disease	Chronic lung disease
Obesity	Obesity
Hypertension	Hypertension
Nursing Career Prospects	
Desire to Leaving	1,440
Extreme mental fatigue is known as burnout.	3,160
Main Occupation Disappointed	2,049
Patients' Personalities	
Male	588,641
Age, mean (SD)	61,9
Race/Ethnicity	
Other race	69,774
Deficiency Anemia	173,234
Non-Hispanic black	114,180
Non-Hispanic white	913,964
Hispanic	169,334
Unit Design	
Intensive Care	2,444
Other	5,671
Medical-Surgical	3,444
Operative technique	
Orthopedic	650,817
Vascular	172,438
Transfer from a non-hospital setting	34,476
General	458,593
Patient Data	
30-day readmission,	106,796
Inpatient mortality	10,070
Nursing features	
Female	10,819
RN working for years, mean (SD)	18,3
Full-time worker	8,731
Age, mean (SD)	46,6

Models of nurse work outcomes related to EHR usability, measured by and after adjustment, are shown in table 2. A higher burnout rate was seen among nurses who worked in hospitals with less intuitive EHR, dissatisfaction with their jobs, and even thoughts of quitting. Poor EHR usability was linked to adverse outcomes like burnout, job discontent, and job intention, even after considering nurses' familiarity with EHRs and other factors. Adopting a complete EHR was linked to a higher burnout risk, even after controlling for potentiall confounders.

Table 2. EHR usability models of nurse job outcomes before and after correction

Finding factors	Unadjusted		EHR Usage Rate Modified		Total adjustment	
	95 % confidence interval	P-value	95 % confidence interval	P-value	95% confidence interval	P-value
Burnout Accessibility of EHR						
Poorer	1,42(1,23-1,63)	<0,001	1,46 (1,25-1,70)	<0,001	1,41 (1,21-1,64)	<0,00
Moderate	1,14 (1,00-1,30)	0,05	1,16 (1,02-1,32)	0,02	1,14 (1,00-1,30)	0,06
Complete EHR	--		1,09 (0,97-1,23)	0,17	1,14 (1,01-1,28)	0,03
Job Dissatisfaction Accessibility of HER						
Poorer	1,71 (1,45-2,02)	<0,001	1,77 (1,48-2,12)	<0,001	1,61 (1,37-1,90)	<0,001
Moderate	1,32(1,12-1,55)	0,001	1,35 (1,15-1,59)	<0,001	1,24 (1,07-1,44)	0,004
Complete EHR	--		1,10 (0,96-1,26)	0,16	1,09 (0,96-1,23)	0,18
Desire to Leaving						
Accessibility of EHR Poorer	1,30 (1,10-1,55)	0,003	1,24 (1,04-1,48)	0,02	1,31 (1,09-1,58)	0,004
Moderate	1,02 (0,86-1,21)	0,80	0,98 (0,83-1,17)	0,85	1,04 (0,87-1,24)	0,66
Complete EHR	--		0,86 (0,74-0,99)	0,04	0,88 (0,76-1,01)	0,08

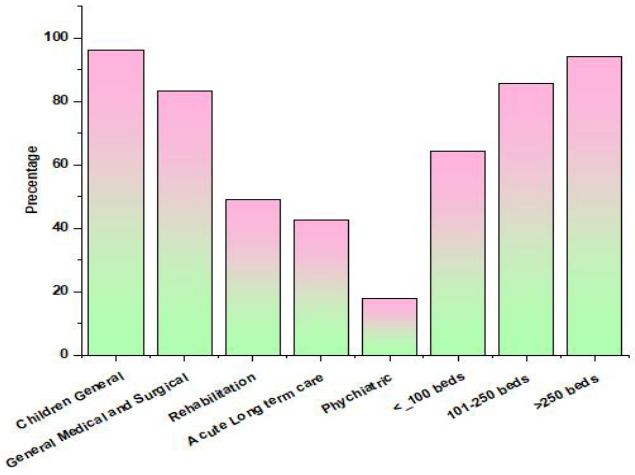

Figure 2. EHRs affect test data management and transfer in patient care

EHRs directly affect the management and transmission of laboratory information in patient care, as shown in figure 2. This is especially true for the reporting of results and the management of test orders. Institutions for children, adults, older people, people with disabilities, those in need of rehabilitation, those in need of long-term care, and those in need of mental health care all had access to a computerized system for displaying results, and all of them had a component for diagnostic test findings. Hospitals with more than 250 beds had the most significant percentage of computerized systems for displaying test results, followed by those with 101–250 beds and hospitals with fewer than 100 beds.

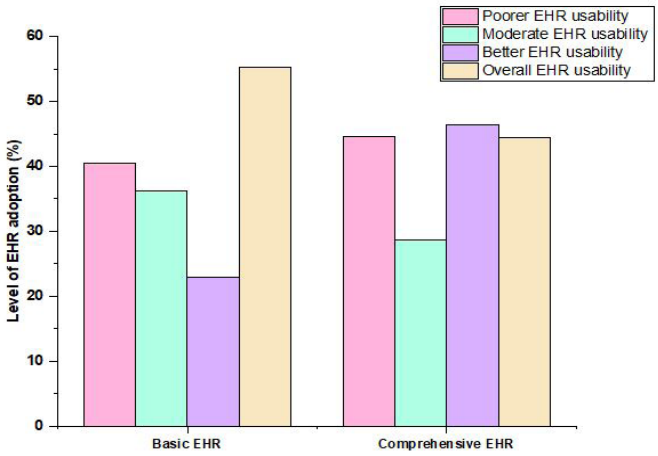

Figure 3. Hospital capabilities by EHR usability

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Figure 3 displays the overall and by EHR usability level hospital characteristics from the study. There was a statistically significant difference in usability between EHR adoption levels and academic positions. Fewer than a quarter of hospitals with minimal EHR implementation were regarded as having superior EHR usability, while almost half of those with extensive EHR implementation were similarly rated.

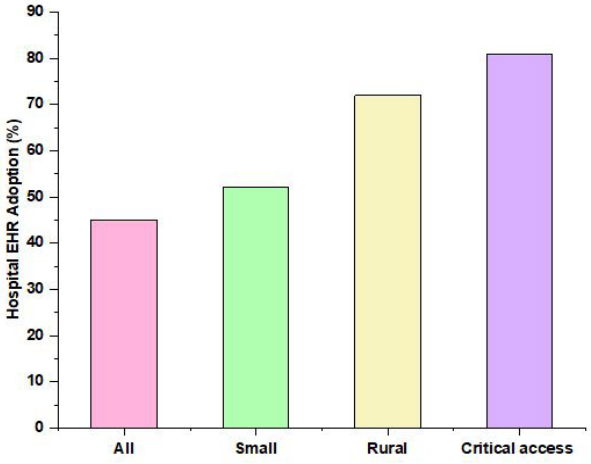

Figure 4. Hospital-level EHR system

Figure 4 displays the distribution of non-federal acute care hospitals by hospital type and the percentage of those institutions that have adopted an EHR system with at least Basic functionality. There has been a continued disparity in the adoption rates of the Basic EHR by large hospitals and those of small, rural, and critical access hospitals. Since then, acute access hospitals have adopted Basic EHRs at a rate of 18 % and at least 14 % higher than small and rural hospitals.

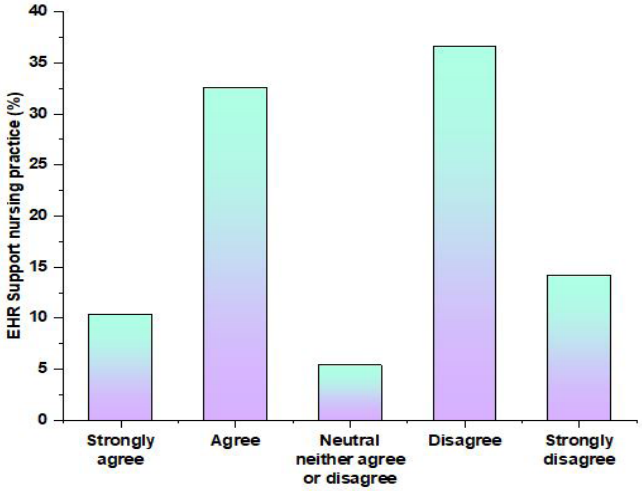

Figure 5. The nursing practice of EHR

The EHR supports the nursing process, as seen in figure 5. Mixed results on whether or not nurses believe that the EHR supports their nursing process as they use it while planning care for their patients, similar to earlier findings to the statements described above. Strongly, agree neutral neither agree or disagree, disagree and strongly disagreed analyzed in EHR support nursing practice. It is unclear from these comments whether the EHR is a productive platform that recognizes the significance of the nursing process and what this logical and organized system involves.

DISCUSSION

Some of the earliest evidence that using even a minimal EHR may improve patient continuity and safety comes from nurse reviews from a large pool of institutions. Hospitals with and without a fully functional basic EHR were compared based on nurses' evaluations of patient care quality. The sample size was limited, but we found several associations between adopting any EHR and increased quality of treatment for patients.[17] We

continued to understand how nurses felt about the efficacy and quality of nursing in hospitals, despite needing to hear their perspectives on the influence of EHR systems.[18] In hospitals with even a minimal EHR, nurses less commonly reported information being lost between the cracks during patient transfers between units or determining if a patient was ready for release. These results imply that EHRs may provide post-hospitalization healthcare practitioners with more thorough unit transfer reports and discharge summaries than verbal or written reports alone. The effectiveness and optimal utilization of the EHR depend on the involvement of nursing administrators in its acceptance and implementation.[19] While nurse staffing levels were found to affect treatment quality significantly, it is noteworthy that the inclusion of any EHR was related to better outcomes. We found no statistically significant interaction between the presence or absence of a basic EHR and nurse staffing levels, suggesting that the impact of a basic EHR is the same across hospitals with different nurse-to-patient ratios.[20] These results have implications for EHR manufacturers and hospital management because they highlight the value of nurse involvement in EHR system design, selection, deployment, and change. If nurses' opinions aren't sought out at each stage, it could harm their well-being, work satisfaction, retention, and patient outcomes. Existing organizational structures and processes may significantly affect nurses' participation in EHR-related decisions. We found in past studies that nurses' work satisfaction and patient outcomes are higher in hospitals that value nurses' input into organizational decision-making. Among hospital nurses, these characteristics are also associated with greater EHR satisfaction and participation in EHR selection or change.

CONCLUSIONS

The AHA IT database must list how long each hospital's electronic health record has been operating. This is significant because of the potential improvement in the link between patient mortality and EHR adoption. Similarly, it might take some time for EHR usability to develop and its connections to nurse jobs and patient outcomes. Poor usability of electronic health records may indicate underlying problems in the hospital that contribute to poor patient and nurse outcomes, such as insufficient financing and low clinician engagement. The large hospital sample, which reflects a variety of organizational structures and EHR adoption rates, should help ease these concerns. It was also unable to evaluate the value of EHR components in isolation. Even though registered nurses were the primary focus of the study, we recognize that other professionals, such as physicians and therapists, may have unique needs when interacting with EHR systems. Nurse should highlight the ability of EHRs to facilitate seamless transitions between care settings to boost staff adoption and buy-in. The pace of EHR adoption and, by extension, the quality of care provided to patients will be heavily impacted by the degree to which nurse managers promote and encourage the use of technology in a hospital setting.

We focused on certain data limitations we had to work with to conduct the study. With barely any hospitals having fully implemented even the most fundamental EHRs, it took time to determine the effects, and it was nearly impossible to evaluate those with more advanced systems appropriately. Nonetheless, significant connections were found within the constraints imposed. It's also possible that we should have accounted for all hospital doctors and nurses utilizing EHRs. EHRs might not be fully implemented in some hospitals. The AHA EHR adoption database does not allow users to specify which units to seek within a given facility. We could not investigate possible correlations at the unit level due to the design of our nurse survey. This study does not indicate meaningful use as defined by the rule, but it does show some early evidence of the potential outcomes of widespread EHR adoption. It was found that only hospitals achieving a particular quality criterion participated in the AHA EHR data supplement collection, a phenomenon known as response bias. The American Heart Association's nurse survey and electronic health record supplement were conducted separately. However, it could be a while before EHRs are fully implemented. Based on this, we infer that most nurses working in facilities equipped with even the most fundamental EHRs regularly used those systems at the time of the study.

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CONFLICTS OF INTEREST

None.

AUTHOR CONTRIBUTIONS

Conceptualization: Asha Kademane, Peekesh Kumar, Bulbul Chaudhary.
Methodology: Asha Kademane, Peekesh Kumar, Bulbul Chaudhary.
Drafting - original draft: Asha Kademane, Peekesh Kumar, Bulbul Chaudhary.
Writing - proofreading and editing: Asha Kademane, Peekesh Kumar, Bulbul Chaudhary.

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