



EFFECTIVENESS OF ELECTRONIC MEDICAL RECORDS ON PATIENT SAFETY

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ABSTRACT

This study evaluates the effectiveness of using Electronic Medical Records (EMR) by nurses in relation to service quality and patient safety. Based on the analysis of 10 journals, the results show that the implementation of EMR significantly increases patient satisfaction, reduces medication errors, and improves nurse work efficiency. The study also identifies challenges such as user resistance and technological infrastructure limitations. Overall, EMR has proven effective in enhancing healthcare service quality and patient safety, although further efforts are needed to address implementation barrier. This literature review research aims to find out how the effectiveness of electronic medical records affects patient safety and satisfaction. There were 10 journals used in the literature review. Journal searches were carried out through 3 databases, namely Google Scholar, ProQuest, Emerald Insight, selecting journals using protocol guidelines (PRISMA) starting from identification, screening, eligibility. Literature analysis shows that there is a relationship between Quality, patient safety (IPSG), efficiency, technology and the level of patient satisfaction.

Keywords: effectiveness; electronic medical record (EMR); patient safety

How to cite (in APA style)

Sinaga, N. C., & Sumartini, B. (2025). Effectiveness of Electronic Medical Records on Patient Safety. *Indonesian Journal of Global Health Research*, 7(1), 1095-1104. <https://doi.org/10.37287/ijghr.v7i1.5778>.

INTRODUCTION

In the era of digital transformation, healthcare institutions are required to continuously evolve and integrate technological advancements to enhance service quality and efficiency. One of the key challenges in nursing care is the time-intensive nature of documentation, especially when the patient-to-nurse ratio is disproportionate. Nurses must not only document and execute all clinical interventions but also ensure patient safety and comfort while managing multiple responsibilities. Traditional paper-based medical record systems can be inefficient and prone to errors, necessitating the adoption of digital solutions. Electronic Medical Records (EMR) have emerged as a critical innovation in healthcare, addressing these challenges by streamlining documentation, improving data accuracy, and enhancing patient care coordination. The implementation of EMR has been widely adopted in various healthcare facilities, including Diagram Heart Hospital, to increase nursing efficiency, optimize service quality, and positively impact patient satisfaction and safety. Several studies support the benefits of EMR adoption in clinical settings. For instance, Wali et al. (2020) reported that EMR implementation can reduce documentation time by up to 30%, allowing nurses to dedicate more time to direct patient care. Additionally, Naamneh & Bodas, (2024) found that EMR usage reduces medication administration errors by 25%, significantly improving patient safety.

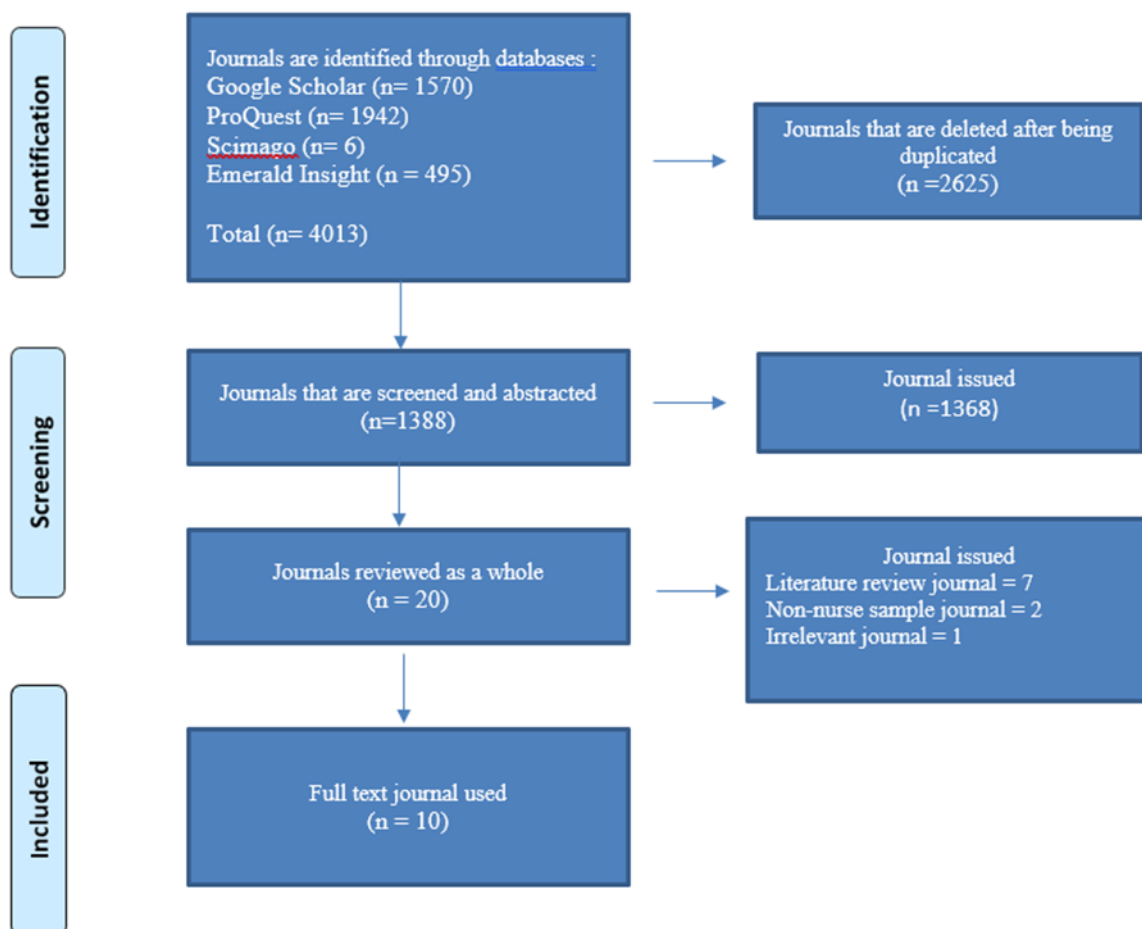
This literature review aims to evaluate the effectiveness of EMR in relation to patient safety and satisfaction. Specifically, it seeks to analyze the impact of EMR on nursing efficiency, particularly in reducing documentation workload, assess the role of EMR in enhancing patient safety by minimizing medication errors and improving care coordination, and identify challenges associated with EMR implementation, including healthcare staff resistance,

technological infrastructure limitations, and data security concerns. Given the growing reliance on digital healthcare solutions, understanding the factors that influence EMR adoption is crucial for optimizing its implementation in clinical practice. Further research is necessary to develop strategies that enhance EMR utilization, ensuring its effectiveness in improving service quality and patient outcomes..

METHOD

This research method is a literature review study. The database used as a literature source consist of Google Scholar, Crossref ProQuest, Emerald Insight. The keywords used for the Indonesian search are “Electronic medical Record”, “Perawat”, “Kualitas Pelayanan”, “Keselamatan Pasien”, while the search keywords in English are “Electronic medical Record”, “Nurse”, “Quality of Service”, “Patient Safety”. Last 10 years ((2015-2024). These journals were selected using PRISMA guidelines (Page et al, 2021). Immediately after a journal search was carried out on the database, a total; of 4013 articles were obtained. Then the researchers carried out the first stage of selection by eliminating 2625journals that were the same. Next, the second selection was with the abstract title and title and in the final process 10 journals were obtained which included in the review.

The following is a PRISMA flow chart for the article screening process used in literature review (Chart 1).



Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

RESULT

Based on the result of journal searches from online databases, 10 journals from within and outside the country were found that met the inclusion criteria, which were selected and further evaluated because the topic was appropriate, namely the effectiveness of patient satisfaction level. This collection of journals is qualitative, descriptive quantitative research with a cross sectional approach. The data obtained comes from studies conducted in various countries.

Table 1.
Literature Search Results

Research, Year Publication	Journal Name	Instruments/ Methods	Research Results
<i>Douma et al., (2024)</i> https://doi.org/10.1080/19932820.2024.2421625	“Impact of Implementing Electronic Nursing Records on Quality and Safety Indicators in Care”. This study uses a longitudinal approach to evaluate the impact of Electronic Nursing Records (ENR) implementation on quality and safety of care indicators (QSCI).	Data were collected using an audit format adapted to record results before ENR implementation, one month after implementation, and six months after implementation.	This study demonstrated that ENR implementation had a positive impact on several aspects of quality of care, particularly in vital sign traceability and infusion administration. However, it was found that paper-based documentation was superior in handover traceability between teams.
<i>(Wali et al., 2020)</i> https://doi.org/10.1186/s12875-020-1099-0	“Patient satisfaction with the implementation of electronic medical records in the western region, saudi arabia 2018” This research is a descriptive study that aims to evaluate patient satisfaction with the implementation of electronic medical records (EMR) in the western region of Saudi Arabia.	Data were collected through a structured questionnaire designed to assess the level of patient satisfaction regarding the use of EMRs in healthcare. Data is analyzed statistically to determine the level of patient satisfaction and identify factors that influence it. Patients receiving healthcare services at facilities that have implemented EMR in the western region of Saudi Arabia. The specific sample size was not stated in the abstract; More detailed information is likely available in the full text of the article. Inclusion criteria were patients who had interacted with the EMR system and were willing to participate in a satisfaction survey.	This study aimed to explore patient satisfaction with EMR compared with PMR in five Primary Health Care Centers in the Western Region of Saudi Arabia. The results showed that overall patient satisfaction was 3.708 out of 5. Patient satisfaction with EMR was statistically significantly higher compared to PMR (3.7241 vs. 3.6919, $p < 0.001$). Some factors that increase patient satisfaction include increased doctor attention during clinical consultations (82.3%), better explanations regarding tests and treatments (85.8%), more time the doctor spends with the patient during the consultation (80.4%), and increased active listening skills by the doctor (77.3%). Additionally, patients felt more confident to ask health-related questions during clinical consultations (84.0%).
<i>Trout et al., 2022)</i> https://doi.org/10.3390/ijerph191912525	“The Impact of Meaningful Use and Electronic Health Records on Hospitals Patient Safety” This research is an observational study that aims to determine the impact of using Electronic Health Records (EHR) and participation in the Meaningful Use (MU) program on Patient Safety Indicators	Patient hospitalization data were taken from the 2013 Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID) for four states in the United States: Florida, Nebraska, New York, and Washington. Patient safety was measured using PSIs developed by the Agency for Healthcare Research and Quality (AHRQ). Multivariate regression analysis was performed using generalized linear model methods to evaluate the impact of EHR use and participation in MU on PSIs.	This study aims to determine the impact of EHRs and participation in the MU program on PSIs in hospitals. Multivariate regression analysis was performed using generalized linear model methods to assess the impact of EHRs use on PSIs. The results showed that full implementation of EHRs without participation in MU had a positive impact on three PSIs, while hospitals participating in MU showed a positive impact on two PSIs. However, participation in MU or full implementation of EHRs was not a primary determinant of PSI-90 composite scores, suggesting that hospitals may not see significant differences in patient safety with use of

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	(PSIs).	Sample Quantity: The study includes data from hospitals in the four states mentioned above. Inpatient data from these hospitals were used in the analysis.	EHR systems when switching to a performance-based payment model.
Ibrahim et al., (2022) DOI: 10.1097/MD.0000000029627	“The role of electronic medical records in improving health care quality A quasi experimental study”	This research is a meta-analysis which aims to evaluate the impact of implementing electronic medical records (EMR) on hospital administration services. Meta-analysis is carried out by collecting and analyzing data from various relevant studies to obtain stronger conclusions regarding the effectiveness of EMR in improving hospital administration efficiency. The population analyzed in this meta-analysis were Diploma 3 graduates of Medical Records and Health Information (RMIK). The studies included in this analysis involved individuals who had those educational backgrounds, which are relevant to the implementation and use of EMRs in the context of hospital administration.	This study aims to compare the level of patient satisfaction between clinics that use EMR and clinics that still use paper-based medical records. Patient satisfaction was assessed using the validated Short Form Patient Satisfaction Questionnaire, which consists of 7 subscales
Naamneh & Bodas, (2024) DOI: 10.1186/s12912-024-01936-7	The effect of electronic medical records on medication errors, workload, and medical information availability among qualified nurses in Israel– a cross sectional study	This research is a cross-sectional study that aims to evaluate the perceptions of trained nurses regarding the impact of electronic medical records (EMR) systems on patient safety, especially regarding medication administration errors, workload, and availability of medical information. Respondents were asked to rate their experiences in two time periods: before and after EMR implementation. Additionally, open-ended questions were included for further qualitative analysis. Quantitative data were analyzed to compare nurses' perceptions between the periods before and after EMR implementation. Qualitative analysis was conducted on open-ended question responses to gain in-depth insights. Population: Trained nurses working in hospitals in Israel. The total sample, 591 nurses participated in this research. Participants were recruited through a private social media group aimed at nurses in Israel.	This study aimed to assess the impact of EMR implementation on medication administration errors, workload, and availability of medical information among registered nurses in Israel. Results show that nurses feel EMR reduces medication administration errors and workload, but may increase documentation time and slightly reduce the availability of medical information
(Delvita et al., 2024) https://journal.ik	“Analysis of Plans for Transitioning Manual Medical Records to Electronic Medical	This article uses a qualitative approach, using in-depth interviews and document analysis as te primary methods of data	This study aims to analyze the transition plan from manual medical records to EMR at Permata Hati Palangka Raya Hospital. The analysis results highlight key factors

Research, Year Publication	Journal Name	Instruments/ Methods	Research Results
ojs.uin-suka.ac.id/index.php/covalue/article/view/4716/3766	Records to Improve Patient Safety at Permata Hati Hospital Palangka Raya”	collection. The sample consisted of key informants from Permata Hati Palangka Raya Hospital, including hospital managers, doctors and administrative staff. These participants were selected to provide insight into the challenges and strategies associated with transitioning from manual to electronic medical records (EMR) to improve patient safety.	influencing implementation, such as user resistance, technology infrastructure limitations, security and privacy concerns, and integration challenges with existing systems. Recommended steps include identification of comprehensive training needs, investment in technology infrastructure updates, thorough evaluation of existing systems, and a comprehensive approach to addressing user resistance. Thus, it is hoped that the transition to EMR can improve patient safety and the efficiency of medical services at Permata Hati Palangka Raya Hospital
(Agustiany et al., 2024) DOI: https://doi.org/10.15562/ism.v15i3.2158	“Effectiveness of electronic medical record quality in an effort to increase productivity and patient safety management: Qualitative study at Mutiara Putri Mother and Child Hospital (RSIA), Bandar Lampung”	This research uses a qualitative approach with descriptive methods to explore and understand the meaning of social problems related to the use of electronic medical records (RME). Data was collected through in-depth interviews with medical and non-medical personnel, including registration staff, medical records, nurses and doctors. Data analysis was carried out inductively to identify the main themes that emerged from the data collected. The research sample consisted of medical and non-medical personnel at RSIA Mutiara Putri, Bandar Lampung. Respondents included registration personnel, medical records staff, nurses, and physicians involved in the use of RME. Sample selection was carried out purposively to ensure the information obtained was relevant to the research objectives.	This study aims to explore and understand the impact of using RME on productivity and patient safety management at RSIA Mutiara Putri. The research results show that the application of RME increases efficiency, accuracy and patient safety through an integrated approach to aspects of people, money, methods, machines and materials. Recommendations provided include the importance of ongoing training, regular cost analysis, and improvements to RME-related infrastructure
Palojoki et al., (2021) doi: 10.2196/30470	Classification of Electronic Health Record-Related Patient Safety Incidents: Development and Validation Study(Palojoki et al., 2021)	This research uses a classification development and validation approach. A multiprofessional research team developed a classification based on the Finnish Technology-Induced Error Risk Assessment Scale and related literature. This classification was then validated by analyzing 428 RME-related incidents reported during the 6 months following implementation of the new RME system. Analysis was carried out qualitatively to assess the characteristics and application of classification in incident reporting. The sample consisted of 428 patient safety incident reports related to RME, collected during the 6 months following implementation of the new RME system at the hospital. This report	During the implementation period, the number of RME-related patient safety incidents increased fivefold compared with the pre-implementation period, indicating patient safety challenges during this phase. The developed classification demonstrated an inter-rater agreement rate of 97.7% during blinded review, demonstrating its reliability in categorizing RME-related patient safety incidents. Of the 427 incidents classified, interface issues accounted for 22.5% (96 reports), usability issues 17.1% (73 reports), documentation issues 14.1% (60 reports), and clinical workflow issues 7.7% (33 reports). Additionally, 20.8% (89 reports) were related to medication problems, while downtime problems were rare (8 reports).

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Jabour, A. M. (2020) DOI: https://doi.org/10.2196/16502	The Impact of Electronic Health Records on the Duration of Patients' Visits: Time and Motion Study (Jabour, 2020)	<p>is used to validate the developed classification.</p> <p>This research is an observational time and motion study conducted at four PHCs. Two PHCs used EHR systems and the other two used paper-based systems. Each group consists of one PHC in the metropolitan area and one in the rural area. Data analysis was carried out using descriptive statistics and comparisons between groups.</p> <p>This study does not mention the specific sample size in the available sources. However, this study involved observing the duration of time patients spent at various stages of the visit at four different PHCs.</p>	<p>This study result :</p> <ol style="list-style-type: none"> No significant differences were found in the time patients spent in reception areas (P=0.26) and waiting areas (P=0.57) between PHCs using EHRs and those using paper-based systems. There was no significant difference in consultation time (P=0.08) and time in pharmacy (P=0.28) between the two types of systems. There was a significant difference (P<0.001) in the duration of time spent on all tasks between PHCs located in metropolitan and rural areas. Observations after 1 and 2 years of EHR implementation showed a decrease in enrollment time from 5.5 minutes (SD 3.5) to 0.9 minutes (SD 0.5), which can be attributed to the introduction of the web-based ordering system. <p>Overall, this study suggests that EHR use does not significantly affect the length of time patients spend at various stages of their visit. However, PHC location factors and the introduction of web-based booking systems have had a greater impact on the time efficiency of patient visits.</p>
Kietsa, G., et al (2021) DOI: https://doi.org/10.21203/rs.3.rs-1005135/v1	Effect of Electronic Health Records on Patient Satisfaction and Waiting Time at Selected Hospitals, in Addis Ababa (Kitesa et al., 2021)	<p>This research was an institutional-based comparative cross-sectional study conducted in two hospitals in Addis Ababa. The sample size was calculated using the multiple population proportion formula, with a total of 184 participants. Data analysis was carried out using Epidata V3.1 software for data entry and SPSS V25 for statistical analysis. Bivariable and multivariable logistic regression analysis was used to assess the relationship between dependent and independent variables.</p> <p>The total sample size was 184 participants, divided between the two hospitals studied</p>	<p>The results show that</p> <p>Waiting Time: The average waiting time at Yekatit 12 Hospital Medical College was 60.2 ± 48.2 minutes, compared to 82 ± 56.8 minutes at Menelik II Referral Hospital.</p> <p>Patient Satisfaction: 83.1% of patients at Yekatit 12 Hospital Medical College reported being satisfied with the services, compared to 31.8% at Menelik II Referral Hospital.</p> <p>Significant Factors Influencing Patient Satisfaction:</p> <ol style="list-style-type: none"> Eye contact Clear communication Accessibility of services Explanation of medical procedures Patient involvement in clinical decision-making Active listening to patient opinions and questions <p>Conclusion: The implementation of EHR at Yekatit 12 Hospital Medical College contributed to higher patient satisfaction and reduced waiting time compared to Menelik II Referral Hospital, which had not implemented EHR. Therefore, it is recommended that the Federal Ministry of Health and Regional Health Bureaus implement EHR across all healthcare facilities to enhance service quality.</p>

DISCUSSION

This literature review has examined 10 original studies on the benefits of Electronic Medical Records (EMR) for patient safety, encompassing research from countries such as Israel, Ethiopia, Saudi Arabia, and Germany. These studies consistently demonstrate that EMR implementation enhances patient safety by reducing medication errors and improving the accuracy of medical records. For instance, a study in Saudi Arabia highlighted that widespread EMR adoption positively influences healthcare delivery and patient safety (AlSadrah, 2020). In Indonesia, the adoption of EMR systems is not yet universal, primarily due to the substantial costs associated with implementation. While larger hospitals with sufficient budgets can manage these expenses, many smaller facilities face financial constraints. Despite these challenges, the Indonesian government has mandated that all healthcare facilities transition to EMR systems by 2023, recognizing the significant benefits for both healthcare staff and patient safety (Tilaar & Sewu, 2023). Several studies conducted in Indonesia have focused on assessing the impact of EMR on service quality and patient safety. These studies have found that EMR implementation leads to increased patient satisfaction, a reduction in medication administration errors, and improved efficiency among nursing staff. For example, research indicates that EMR systems enhance the review of medical records and medication management, contributing to better patient outcomes (Jaber et al., 2021).

International studies corroborate these findings, emphasizing that EMR systems improve service quality by facilitating faster access to patient information and enhancing coordination among medical teams. In Ethiopia, research has shown that EMR adoption improves the quality of healthcare services and patient safety (Tegegne et al., 2023). Similarly, studies have demonstrated that EMR systems reduce medication errors and enhance the traceability of vital signs and infusion administration, thereby minimizing the risk of medical data recording errors (Naamneh & Bodas, 2024). However, the implementation of EMR systems is not without challenges. Common obstacles include user resistance, limitations in technological infrastructure, and concerns regarding data security. In Indonesia, specific challenges encompass regulatory compliance, patient data protection, and the validity of medical records (Rusdian Ikawati & Haris, 2024). Additionally, inadequate training and a lack of ongoing technical support hinder effective EMR utilization. Addressing these issues is crucial to ensure the successful adoption and optimization of EMR systems in healthcare settings. In conclusion, while EMR implementation offers substantial benefits in enhancing service quality and patient safety, overcoming financial, infrastructural, and educational barriers is essential for widespread and effective adoption. Collaborative efforts between government entities, healthcare institutions, and technology providers are necessary to address these challenges and fully realize the potential of EMR systems in improving patient care.

CONCLUSION

Based on a review of 10 journals from various countries, including Israel, Ethiopia, Saudi Arabia, Germany, and Indonesia, the implementation of Electronic Medical Records (EMR) has been shown to have a positive impact on healthcare quality and patient safety. Research findings indicate that EMR significantly enhances patient satisfaction, reduces medication errors, improves nursing efficiency, and accelerates access to and traceability of medical information. The key benefits include improved patient safety by reducing medication errors, enhancing the accuracy of medical documentation, improving the traceability of vital signs and infusion administration, and facilitating better coordination among medical teams. EMR also increases patient satisfaction by improving doctor-patient communication, ensuring transparency in medical procedures, and enhancing consultation efficiency, with patients reporting higher satisfaction compared to paper-based medical records. In terms of service

efficiency and workload management, EMR simplifies medical documentation and speeds up access to patient information, although some studies noted that the transition from manual to digital systems may initially increase documentation time. However, the implementation of EMR faces several challenges, including user resistance from healthcare staff unfamiliar with digital systems, limited technological infrastructure, especially in hospitals with budget constraints, and concerns over data security. Despite these challenges, the Indonesian government has mandated EMR implementation in all hospitals starting in 2023, recognizing its substantial benefits for patient safety, satisfaction, and healthcare service efficiency. Further efforts are needed to address barriers such as healthcare staff training, technological infrastructure improvements, and data security policies to ensure the successful and universal adoption of EMR.

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