The use of Electronic Medical Record (EMR) in hospitals during the COVID-19 pandemic in Indonesia: a systematic literature review

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Abstract

Purpose: Electronic medical records (EMR) are information technology-based systems that store and manage patient medical data. EMR are beneficial for improving healthcare services' efficiency, effectiveness, and security. The COVID-19 pandemic has driven the adoption of EMR, but there are still challenges, such as the surge in patient numbers and problems with EMR filling. This study aimed to investigate the use of EMR in hospitals during the COVID-19 pandemic in Indonesia. **Method:** This study was a systematic literature review using the PRISMA diagram. Article search was conducted based on the PICO model eligibility criteria. The articles used were retrieved from 3 databases: Google Scholar, ResearchGate, and Cerdika. The researcher limited the publication year of the journals to 2020-2021, when the COVID-19 pandemic was ongoing, and added the keyword "COVID-19" to the journals published in 2022-2023. **Results:** The results of the study showed that the COVID-19 pandemic has had a significant impact and the need for the implementation of EMR due to its various benefits, such as improving the efficiency and effectiveness of healthcare services, facilitating access to patient health information, increasing collaboration among healthcare workers, accelerating the process of clinical decision-making, and improving the security and accuracy of health data. However, implementing EMR during the COVID-19 pandemic has only sometimes been smooth. Some challenges include suboptimal infrastructure, untrained human resources, and inadequate policies. **Conclusion:** To overcome these challenges, efforts from various parties, including the government, hospitals, and healthcare workers, are needed.

Keywords: COVID-19; electronic medical record; EMR; hospital; Indonesia

INTRODUCTION

Healthcare services are a fundamental necessity for the community, crucial in achieving public health well-being. The government continues its efforts to enhance healthcare facilities, including building new hospitals. Hospitals play a crucial role in providing quality healthcare services to the public [1]. In the increasingly competitive environment today, hospitals are expected to deliver high-quality healthcare services customized to the needs and desires of patients. Good service quality is the key to the survival of an institution. Therefore, hospitals must consistently improve the quality of their services to compete with other healthcare service providers, including enhancing the quality of electronic medical records (EMR) as one of the hospital's functions [2].

Complete and accurate medical records are crucial documents that serve various purposes, such as providing proper medical services, protecting patients from treatment errors, and enhancing the quality of healthcare services [3]. As per the Minister of Health Regulation Number 269 of 2008 concerning Medical Records, these records are defined as documents containing patients' medical information, including their identities, health histories, physical examination results, diagnostic test findings, treatment plans, and progress notes [4].

Medical records are essential for providing healthcare teams with the necessary health data required to care for patients. The quality of medical record services is determined by how complete, accurate, and speedy they are in providing the required information. A medical record is considered complete when a physician has thoroughly filled it out within 24 hours of the completion of service or a patient is declared ready for discharge. It should contain details such as the patient's identity, medical history, treatment plans, care implementation, follow-up, and a summary of the treatment outcomes [5]. Medical records also need to be returned and archived accordingly to ensure appropriate data processing. Failing to do so will impact on the medical records assembly process, preparation of disease coding and actions, storage processes, insurance claims, and post-discharge care [6].

The hospital industry worldwide has adopted a technology called EMR that helps in making medical records efficient and effective [7]. EMR involves the use of information technology to collect, store, process, and access patient medical data in a hospital via a database management system that integrates various medical data sources. Although EMR development in Indonesia is not yet optimal, the Minister of Health Regulation Number 269 of 2008 has recognized EMR as legal evidence, which is expected to boost its progress in Indonesia [8].

The use of Electronic Medical Records (EMR) has increased due to both awareness of disruption and the COVID-19 pandemic [9]. Many hospitals in Indonesia have adopted EMR to deal with the challenges brought about by the pandemic, such as an increased number of patients and issues arising during treatment [7]. The surge in patient numbers during the pandemic has led to problems with filling in medical records [10] However, EMR have played a crucial role in tracking and analyzing patient data, both for general patients and COVID-19 patients, thus aiding healthcare professionals in providing telemedicine services and managing the pandemic more effectively. Overall, EMR can be a powerful tool to enhance healthcare services during the COVID-19 pandemic era, enabling healthcare professionals to deliver more precise, secure, and efficient services.

To examine the usage of EMR in hospitals during the COVID-19 pandemic in Indonesia, this literature systematic review has been conducted. Although a literature review has been previously conducted on the implementation of EMR in healthcare institutions in Indonesia [11], there has been no exploration specifically addressing the use of EMR in hospitals during the COVID-19 pandemic in Indonesia.

METHODS

This study involved a thorough literature systematic analysis, or a literature systematic review, of the usage of EMR in hospitals during the COVID-19 pandemic. The researchers carefully investigated, evaluated, and interpreted each article used to address this phenomenon. To find relevant articles, the researchers used a combination of Indonesian keywords, including EMR and hospitals, with the conjunction "AND." To narrow the search, the researcher limited the publication years of journals to 2020-2021, corresponding to the period of the COVID-19 pandemic. Additionally, the keyword "COVID-19" was included for journals published in 2022-2023.

The articles that are part of this research review the usage of Electronic Medical Records (EMR) in Indonesia during the COVID-19 pandemic. The research focuses on both qualitative and quantitative aspects and should not be in the form of a literature systematic or literature review. The articles considered for the study must be written in either Indonesian or English and have been published between 2020 and 2023.

To obtain relevant articles, the eligibility criteria of the PICO Model was used. Various sources were used to

gather data, including Google Scholar, ResearchGate, and Cerdika. To narrow down the scope of the study, the researcher employed the PICO method (Population/Problem, Intervention, Comparison, Outcomes) and the PRIMA diagram flow.

The PICO framework applied in this research is as follows:

- P (Population/Problem): EMR
- I (Intervention): Benefits of implementing EMR in Indonesia during the COVID-19 pandemic
- C (Comparison): Not applicable (-)

- O (Outcomes): Benefits of implementing EMR in Indonesia during the COVID-19 pandemic.

Using the PRISMA process, a total of 304 scientific articles discussing EMR during the COVID-19 pandemic were identified. However, after removing 86 duplicate articles and investigating further, only 218 articles were left. Out of these 218 articles, 132 were unusable due to mismatched titles, inaccessibility, or incompleteness. This left only 79 articles for screening eligibility based on research methods and focus. Finally, seven journals were selected for further examination in this study (**Figure 1**).

The following is a selection of articles using the PRIMA diagram flow:
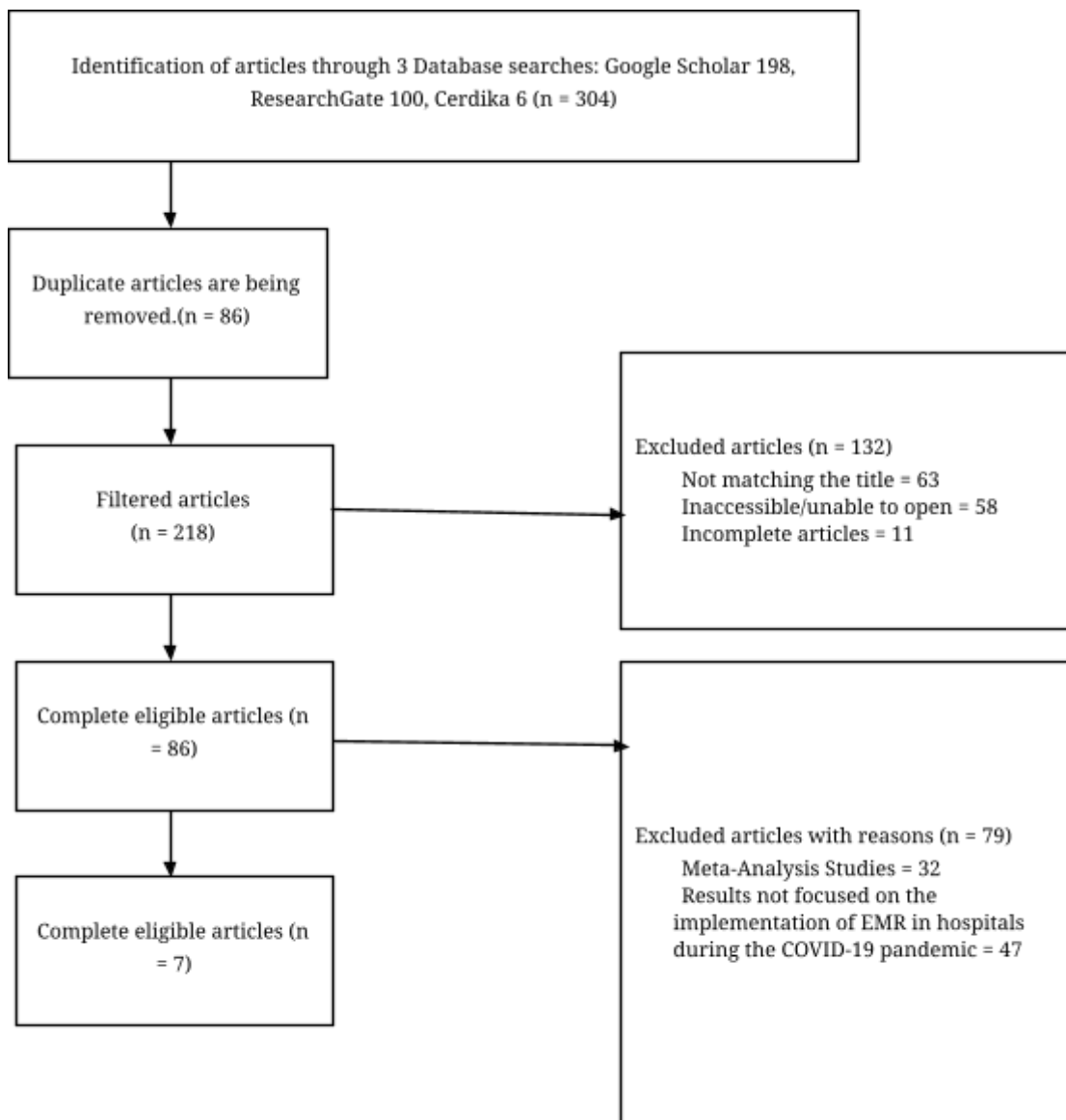

Figure 1. PRISMA method of search and article selection

RESULTS

The results of the literature systematic review conducted on seven articles are as follows:

Table 1. Results of the literature systematic review conducted

Author	Title	Research Method/Purpose	Results
Widyastuti, et al. (2020) [12]	Evaluation of Electronic Medical Record Systems in Primasatya Husada Citra Surabaya Hospital	Qualitative / Evaluate EMR using the HOT-Fit Mode evaluation method	The study results show successful EMR implementation with socialization, training, inaccurate data presentation, and lack of computer facilities.
Dhamar & Rahayu (2020) [13]	Nurses' Experience in Using Electronic Medical Records at Panti Rini Hospital, Yogyakarta	Qualitative / Obtain an overview of nurses' experiences in using EMR.	The use of EMR offers convenience and efficiency, but obstacles hinder their use. Nurses have expectations for EMR use.
Erawantini & Wibowo (2020) [14]	Implementation of Electronic Medical Records with Clinical Decision Support System	Parallel Implementation and user satisfaction evaluation with the End User Computing Satisfaction method / Implement the EMR application in educational clinics and evaluate user satisfaction with the implemented EMR application.	The research suggests that educational clinics can successfully implement the EMR application. The EMR application, along with clinical decision support, can help in determining blood pressure, risk of Diabetes Mellitus and stroke, drug content interactions with allergy history, and also provide abnormal warnings for laboratory and radiology examination results.
Wirajaya & Dewi (2020) [8]	Analysis of the Readiness of Dharma Kerti Tabanan Hospital in Implementing Electronic Medical Records	Cross-Sectional / Analyze the readiness of Dharma Kerti Tabanan Hospital to implement EMR	Dharma Kerti Tabanan Hospital is deemed equipped to implement EMR. In terms of organizational culture, the hospital scored 68.57%, indicating a satisfactory level of preparedness. As for governance and human resources, the hospital scored 71.43% and 57.14%, respectively. The infrastructure score was 58.57%. However, there are still some qualitative shortcomings, such as lack of training, standard operating procedures (SOPs), lack of a special team formed by the leader, and inadequate IT resources.
Muhlizardy & Meisari (2022) [3]	Analysis of the Completeness of Electronic Medical Record Files in COVID-19 Patients at the Hospital	Descriptive Quantitative / Determine the completeness of filling out EMR for COVID-19 patients in PKU Muhammadiyah Gamping Hospital.	The research findings indicate that EMR files are incomplete. Diagnostic support results are the most complete indicator (100%), followed by nursing actions (98.9%) and pain assessment (93.5%).
Pratami et al. (2020) [7]	Analysis of the Incompleteness of Filling Electronic Medical Records in Hospitals During the COVID-19 Period	Descriptive Qualitative / Identify the causes of incomplete filling of EMR in hospitals during COVID-19.	The study highlights the reasons behind incomplete EMR filling, including staffing, facility support, and policy drivers.
Sidjabat et al. (2022) [15]	Mechanism of Electronic System Management and Reporting of COVID-19 Vaccine Data at Gatoel Mojokerto Hospital in 2022	Qualitative / Understand the mechanism of electronic system management and reporting of COVID-19 vaccine data at Gatoel Mojokerto Hospital in 2022	The management and reporting of COVID-19 vaccine data at Gatoel Mojokerto Hospital involves the integration of three systems. The SIMRS system generates daily vaccination reports for the Director of Gatoel Mojokerto Hospital, and is the primary care system for BPJS vaccine claims and vaccine procurement. Additionally, the Gayatri system is used in Mojokerto City for monitoring vaccine program achievements to the Mojokerto City Health Office. The information system for managing and reporting vaccine data at Gatoel Mojokerto Hospital follows a decentralized model.

DISCUSSION

The phenomenon of EMR implementation during the COVID-19 pandemic

The COVID-19 pandemic has had a significant impact on healthcare systems worldwide, including in Indonesia. One of the most noticeable effects is the increased need for Electronic Medical Records (EMR). The pandemic has accelerated the need to optimize medical records so that patient information during the COVID-19 period can facilitate coordination among medical professionals and enable prompt patient care based on the patient's requirements [7]. The use of EMR during the pandemic has revolutionized healthcare service delivery and provided a powerful tool for monitoring and controlling the spread of the virus. This phenomenon illustrates the crucial role of technology in supporting healthcare during emergencies like a pandemic. As a result, the COVID-19 pandemic has put strong demands on hospitals to adapt to the use of EMR.

Supporting factors for the implementation of EMR

Hospitals need to have several key elements in place to implement the use of EMR successfully [8]. These are organizational culture readiness, leadership readiness, human resources readiness, and infrastructure readiness. Human resources, facilities, and policies significantly influence the success of EMR implementation [7]. Supporting factors in using EMR include the availability of facilities and infrastructure, human resources (HR) with high motivation to learn, hospital management policies, and IT staff [13].

From each of these findings, it can be concluded that the readiness that hospitals need to have to implement EMR consists of four factors: organizational culture, hospital management policy-making, human resources (HR), and infrastructure.

Organizational culture drives the transition from manual medical records to EMR, aiming to create a more effective and efficient working system [8]. Leaders play a crucial role in EMR implementation, serving as policy-makers, including innovation development strategies, seizing opportunities, negotiation, and consistent decision implementation. Therefore, leader support is vital to ensure the success of EMR implementation [7,8,13]. The human resources in an organization should be well-documented and proposed to the personnel department in the hospital. The ability of staff or employees to operate a computer is one crucial component that supports the development and acceleration of EMR implementation [7,8,13]. Infrastructure readiness for EMR implementation includes IT infrastructure, IT management, and financial or budgetary aspects. One common obstacle encountered in EMR development is the limited budget to provide hospital IT infrastructure. The more readiness the hospital possesses in the aspects mentioned above, the greater its potential to adapt to using EMR when the COVID-19 pandemic strikes suddenly [7,8,13].

Hospitals that have this readiness can then implement EMR using some steps. First, preparing hardware and network infrastructure. The registration area is equipped with computers installed with EMR applications and printers. Patient examination rooms, pharmacies, laboratories, and radiology departments also have computers. EMR is integrated from the registration area to other departments. The network or LAN has been prepared. Second, training users on EMR usage. All users receive training on using EMR to ensure they become familiar with and proficient in utilizing EMR. Third, implementing EMR with clinical decision support. EMR implementation takes place over 2 months while the old paper medical record system is still in use. Lastly, evaluating the use of the EMR application using the end-user computing satisfaction method. Evaluated aspects include content, accuracy, format, ease of use, and timelines [14].

Benefits of implementing EMR during the COVID-19 pandemic

With the use of EMR during the COVID-19 pandemic, it is expected to continue providing the best service to patients during this challenging time [3]. The benefits of implementing EMR in hospitals during the ongoing COVID-19 pandemic are improved efficiency & effectiveness of health services, facilitated patient health information access, enhanced collaboration among healthcare professionals, accelerated clinical decision-making process, and enhanced health data security and accuracy.

One of the perceived impacts of implementing EMR is its ability to assist hospitals in enhancing the efficiency and effectiveness of health services, especially in facing the COVID-19 pandemic [3]. EMR can provide timely patient service, reducing waiting times [8]. The existence of EMR can facilitate the tasks of healthcare professionals. Besides benefiting the staff, EMR is also advantageous for management in optimizing resources and time, accelerating service and data presentation, enhancing data accuracy, and facilitating data integration [12]. Therefore, this allows medical personnel to respond to COVID-19 cases more efficiently and provide more timely care.

EMR can assist hospitals in facilitating access to patient health information. This can be achieved by

storing all patient health information in one integrated system. Consequently, healthcare professionals can easily access the required patient health information without searching for printed medical records [8]. EMR system will facilitate the implementation of patient condition reporting during the COVID-19 pandemic and present it in a short time, allowing system users to focus on analyzing reports [15]. This allows medical consultations and patient monitoring without the need for physical meetings, reducing the risk of the spread of COVID-19 virus.

EMR can assist hospitals in enhancing collaboration among healthcare professionals. Healthcare professionals can work together more effectively to provide the best healthcare services for patients [3]. In addition to benefiting the staff, this EMR system is also advantageous for management in improving data accuracy and facilitating data integration [13]. For nurses, EMR can make it easier for them to connect with multiple departments effortlessly [8]. Better collaboration among healthcare team members, including doctors, nurses, and specialists, allows the hospital to continue providing optimal services amid the COVID-19 pandemic, where patient information available in the EMR facilitates better care coordination.

The ease of obtaining patient data from EMR, such as blood pressure data, risk of Diabetes Mellitus, risk of stroke, drug content interactions with allergy history, and abnormal alerts regarding laboratory and radiology examination results, greatly facilitates and accelerates the decision-making process for the hospital [14]. Other studies also stated that with the presence of EMR, hospitals could create an integrated recapitulation with the Primary Care vaccination system, thus supporting decision-making for hospital management, as the system can provide quick, accurate, and accountable information [15].

One of the advantages of EMR is its ability to reduce human errors and integrate patient data, thereby generating vaccination program reports that align with the needs [15]. For medical personnel, EMR serves as the foundation or guide for planning and analyzing a disease, planning treatment, and providing medical care and interventions for patients [8]. Therefore, EMR can assist hospitals in enhancing the security and accuracy of patient health data.

In addition to its use in healthcare services, EMR in hospitals during the COVID-19 pandemic also has several benefits. EMR can be utilized to gather data and information related to COVID-19. This data and information can be used to support research and development related to COVID-19, such as epidemiological studies and clinical examinations. EMR can help hospitals enhance the security and accuracy of COVID-19 patient health data. This can be achieved by implementing stringent security systems, training healthcare personnel in the use of EMR, and ensuring the completeness and accuracy of patient health data. EMR can also be utilized to support the implementation of health policies related to COVID-19, such as mobility restrictions and contact tracing.

Obstacles to implementing EMR during the COVID-19 pandemic

The implementation of EMR during the COVID-19 pandemic does not always run smoothly; quite often, various challenges are encountered that affect the optimal implementation of EMR. A few obstacles encountered in implementing EMR during the COVID-19 pandemic are suboptimal infrastructure, untrained human resources, ineffective and inefficient EMR system, and regulations and budgeting that have yet to facilitate overall implementation.

One of the hindering factors in using EMR is the internet network, which is sometimes slow, computers facing occasional issues, an insufficient number of computers, and the absence of a system for nursing care documentation [13]. Phenomena in the field also reveal inaccuracies in data presentation, and there is still a lack of computer facilities [12].

The lack of a common understanding among medical and IT personnel regarding the display of EMR is a challenge. Therefore, the hospital needs to formulate policies and facilitate IT staff and medical personnel to find the proper interface for the EMR used and prepare an appropriate system to facilitate the documentation needs of EMR [13]. This is due to the absence of a strategy to accelerate the implementation of EMR, a lack of training related to the implementation of EMR, and the absence of specific budgetary allocations for medical record management [8].

The hospital faces challenges completing EMR data, such as diagnostic support results, nursing interventions, care plans, education provision, and medication administration records. Even from the entire EMR data conducted on COVID-19 patients, it is stated that the records are incomplete. The high level of busyness and workload is known to be one of the factors causing the incompleteness of ERM entries. When a large number of patients arrive, doctors and nurses often prioritize direct examinations without filling out the EMR first. After the examination, doctors or patients sometimes forget to complete the medical record. A tight schedule further exacerbates the doctor's busyness; sometimes, they have to move practice locations, leading to forgetfulness in filling out

patient medical record data. Meanwhile, nurses are also busy preparing equipment and sterilization procedures to prevent the spread of COVID-19, contributing to the incompleteness of medical record entries [3,8].

Encountered challenges include many hospitals lacking a clear picture of the EMR system that will be implemented, the absence of Standard Operating Procedures (SOPs) related to this matter, the non-existence of a specialized team to expedite the implementation of EMR, and the absence of a strategy to accelerate the adoption of electronic medical records, as well as the lack of specific budgeting or financial provisions for the organization of medical records [8].

Some recommendations identified from the challenges encountered in implementing EMR in hospitals during the COVID-19 pandemic are beneficial to implement in the future. The government needs to support hospitals in developing EMR systems, both in terms of funding and regulations. This support is necessary to ensure that the EMR systems developed by hospitals meet established quality standards [7,8,14,15]. Hospitals must invest in developing EMR systems, including hardware, software, and human resources. This investment is necessary to ensure that the EMR systems used by hospitals can meet the needs of healthcare services [3,12,13,15]. Hospitals should provide training to healthcare professionals in the use of EMR. This training is necessary to ensure healthcare professionals can use EMR effectively and efficiently [3,13].

The research relied solely on the systematic literature review method due to a lack of articles utilizing a quantitative approach, which limited the depth of analysis.

CONCLUSION

The COVID-19 pandemic has significantly impacted healthcare systems worldwide, including in Indonesia. Based on the research presented, the demand for EMR in hospitals has increased. EMR provides several benefits, such as improving the efficiency and effectiveness of healthcare services, facilitating access to patient health information, enhancing collaboration among healthcare professionals, accelerating clinical decision-making processes, and improving the security and accuracy of health data. Additionally, EMR can be used to gather data and information related to COVID-19, enhance the security and accuracy of COVID-19 patient health data, and support the implementation of health policies related to COVID-19.

However, implementing EMR during the COVID-19 pandemic has not always been smooth due to several challenges, including suboptimal infrastructure, untrained human resources, and policies that do not support them. The government, hospitals, and healthcare professionals must work together to overcome these obstacles.

To enhance the implementation of EMR during the COVID-19 pandemic, the government should provide support in the form of policies and budget allocation for implementing EMR. Hospitals need to establish adequate infrastructure and train their personnel to use EMR. Healthcare professionals should enhance their understanding and skills in utilizing EMR. With these efforts, it is hoped that implementing EMR during the COVID-19 pandemic can proceed more smoothly and provide maximum benefits for both hospitals and patients.

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