

Innovations for Successful Electronic Medical Records (EMR) Implementation in Hospitals: Inovasi untuk Keberhasilan Implementasi Rekam Medis Elektronik (EMR) di Rumah Sakit

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General Background: Electronic Medical Records (EMR) enhance healthcare efficiency, cost-effectiveness, and data accessibility. However, implementation remains uneven globally. **Specific Background:** Despite Indonesia's Ministry of Health Regulation No. 24 of 2022 mandating EMR adoption, many hospitals struggle with infrastructure, workforce limitations, and regulatory challenges. **Knowledge Gap:** While studies highlight EMR benefits, limited research addresses specific barriers in Indonesian hospitals and effective implementation strategies. **Aims:** This study identifies EMR adoption challenges and explores strategies for successful implementation in Indonesia. **Results:** Key barriers include inadequate infrastructure, unclear policies, insufficient training, and connectivity issues. Pre-implementation planning and structured training improve outcomes. **Novelty:** This study systematically analyzes Indonesia-specific EMR challenges and presents actionable solutions. **Implications:** Hospitals require better preparation, clear policies, and government support to ensure seamless EMR integration, fostering healthcare digitalization.

Highlights:

- **Regulatory Compliance:** Despite mandates, many Indonesian hospitals struggle with full EMR adoption due to infrastructure and policy gaps.
- **Key Barriers:** Limited resources, lack of training, and unstable internet hinder effective EMR implementation.
- **Strategic Solutions:** Pre-implementation planning, technical support, and structured training improve adoption success.

Keywords: Barriers, Strategy, Electronic Medical Record, Hospital

Introduction

The Indonesian government has been actively promoting digital transformation in the healthcare sector, particularly through the implementation of Electronic Medical Records (EMR) in hospitals. This initiative is reinforced by the issuance of Minister of Health Regulation (PMK) No. 24 of 2022, which mandates the adoption of EMR across all healthcare facilities [1]. The transition from conventional to electronic medical records aims to enhance service efficiency, reduce long-term operational costs, and ensure better patient safety. However, despite the regulatory push and proven benefits, many hospitals in Indonesia continue to face significant challenges in

implementing EMR systems. By the end of 2024, only 90.47% of hospitals had successfully integrated their systems with the One Sehat Platform, indicating persistent barriers to full adoption [2].

A practical gap exists in the implementation of EMR systems, as evidenced by multiple studies highlighting various obstacles, including human resource limitations, inadequate infrastructure, lack of clear policies, and inconsistent network reliability [3]. Empirical research suggests that hospitals struggle with workforce adaptation to new technologies, insufficient technical training, and inadequate financial investment for necessary hardware and software. Moreover, previous studies have primarily focused on the advantages of EMR systems rather than addressing the specific barriers to their effective implementation. The methodological gap is also evident, as many studies rely on qualitative interviews or literature reviews, lacking robust quantitative analysis that could provide a more comprehensive understanding of the challenges faced by hospitals.

Existing research on EMR adoption in Indonesian hospitals remains scarce, particularly in the context of identifying strategic solutions for overcoming implementation barriers. The limited availability of empirical studies that analyze both hospital readiness and policy effectiveness underscores the necessity for further academic investigation. This study aims to bridge these research gaps by systematically examining the obstacles faced by hospitals in adopting EMR and exploring strategies to optimize their implementation [4]. By addressing both empirical and methodological gaps, this research seeks to provide actionable recommendations for hospital management and policymakers to ensure smoother EMR integration. The findings of this study will contribute to academic discourse by offering insights into the complexities of digital healthcare transformation in Indonesia while also providing practical implications for hospital administrators to enhance their preparedness and compliance with regulatory mandates [5].

Method

This research is a literature review focused on the implementation of electronic medical records (EMR) in Indonesian hospitals. The collected articles were analyzed through a process of identification, evaluation, and interpretation to determine the best strategies for implementing EMR [6]. The study involved searching for articles using relevant keywords in both Indonesian and English. The Indonesian search terms included phrases such as "obstacles and the application of electronic medical records in hospitals in Indonesia," while the English search terms included "Challenges OR Barriers to Electronic Medical Records in Indonesian Hospitals" and "Challenges AND Adoption of Electronic Medical Records in Indonesian Hospitals."

The study included articles that discussed barriers to EMR implementation in Indonesian hospitals. The research design considered both quantitative and qualitative approaches, as well as mixed-method studies published between 2019 and 2024, in either Indonesian or English. Articles that were systematic reviews or general literature reviews were excluded. The systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines. Article searches were conducted from October 2024 to January 2025. After data collection, researchers reviewed the titles and abstracts to determine their relevance to the study objectives. The selected articles were then synthesized based on key details, including the title, author, year of publication, research method, participants, research objectives, and results [7][8].

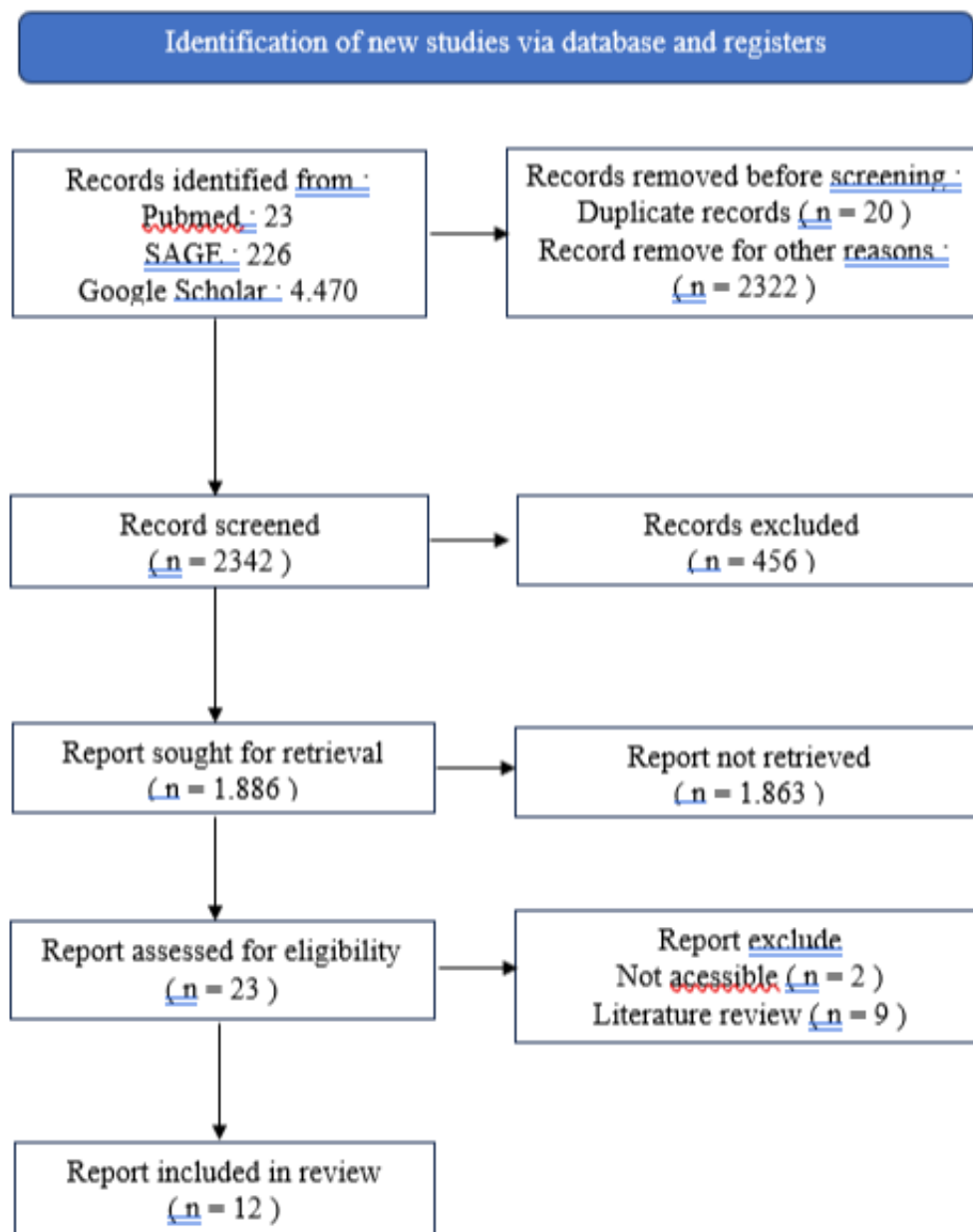


Figure 1. Results of Article Synthesis Based on Preferred Reporting Items Method For Systematic Review & Meta-Analysis

Based on the synthesis of articles using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) method, 12 articles were identified that met the inclusion criteria. These articles are considered representative of the implementation of electronic medical records (EMR) in Indonesian hospitals. The selected studies provide valuable insights into the challenges and strategies associated with EMR adoption. A detailed summary of these articles can be found in Table 1.

No	Title, Author, Year	Method	Participant	Research Objectives	Result
1	The Effect of Electronic Medical Record Implementation on The Performance of	Quantitative using questionnaires	15 medical recorders	Measuring the performance of medical recorders in using EMR	Lack of tech skills, Inadequate facilities and infrastructure, Obsolete hardware,

	Medical Record Officers [1]				Inadequate internet networks, Fewer officers, long stop if problems occur
2	Analysis of the Use of Electronic Medical Records Regarding Law Number 17 of 2023 in Indonesia [5]	Qualitative with Interviews and surveys	Medical recorders and healthcare professionals Medical recorders and healthcare professionals	Exploring the challenges in the electronic application of medical records	Lack of infrastructure including the number of computers, Reliable internet network, Shortage of skilled professionals operating EMR systems, Requires large financial investment
3	Analysis of Factors Hindering the Implementation of Electronic Medical Records at Pertamina Rantau Hospital [4]	Qualitative with Observation and interviews	All hospital elements involved in EMR	Identifying factors that hinder the implementation of electronic medical records at Pertamina Rantau Hospital	Obstacles from Man, Material, Machines, and Methods such as officer resistance, lack of knowledge, lack of hardware and software, internet constraints, and government policy support
4	Implementation of Electronic Medical Record System in Indonesia Viewed from the Perspective of Legal Certainty [6]	Interviews, observations, and Literature Studies	Medical personnel, Hospital administrators, Information technology experts, Healthcare facility managers, Health regulators	Identify readiness in the implementation of electronic medical records in Indonesia	Attention to infrastructure readiness, Data security and confidentiality, Regulatory compliance
5	Usability and satisfaction of using electronic nursing documentation, lesson-learned from new system implementation at a hospital in Indonesia [7]	Descriptive qualitative approach using Focus Group Discussion, Pre-experimental design with uncontrolled pre- and post-test	Nurses who work in wards and use the new nursing documentation system	Exploring the use and satisfaction of electronic medical records	The study recommends that hospitals provide better support in terms of training and resources, Facilitate the transition to electronic documentation systems, Emphasize management's role in supporting implementation
6	Obstacles to the Implementation of Electronic Medical Records with the HOT-Fit Method at RST Tk.II dr. Soedjono Magelang [8]	Qualitative with a cross-sectional approach	Doctors, medical records officers, coding officers, IT heads, registration officers, reporting officers, and nurses	Exploring barriers in the application of electronic medical records	Problems found: System speed, Modules and features, Information accuracy, Output quality, Data integrity, Technical constraints, Cost, Data security, Non-technical constraints, EMR efficiency, and EMR service quality
7	Obstacles to the Implementation of	Qualitative with in-depth interviews	Six informants from the hospital	Exploring barriers in the application of	Nine themes of obstacles: Officer

	Electronic Medical Records from the Perspective of Medical Recorders Using the PIECES Method [9]			electronic medical records	performance, Features and modules, Data security, Infrastructure, Officer behavior, EMR data integration, Ease of EMR use, Information accuracy, Developer/system developer response. Issues: System unpreparedness, Errors in filling data, Lack of training for officers
8	Evaluation of the Implementation of Outpatient Electronic Medical Records at X Bandung General Hospital in 2021[10]	Qualitative study	Doctors, nurses, pharmacists, medical recorders, nutritionists, IT staff, and hospital management	Explore the EMR user experience in hospitals	Obstacles: Rush hour system errors, Old SIMRS not connected to EMR, Delay in entering data, Not real-time, Rudimentary system, Lack of computer skills, Lack of hardware
9	Implementation of Electronic Medical Records: A Qualitative Study [11]	Qualitative\$ study	Doctors, nurses, pharmacists, medical recorders, nutritionists, IT staff and hospital management	E\$xplore\$ the\$ E\$RM use\$r e\$xp\$e\$rie\$nce\$ in hospitals	Obstacles: Rush hour system errors, Old SIMRS not connected to EMR, Delay in entering data, Not real-time, Rudimentary system, Lack of computer skills, Lack of hardware
10	Examine the Obstacles to EMR Implementation with the PIECES Method Based on the User's Perspective [12]	Descriptive qualitative with semi-structured in-depth interviews	Outpatient registration officer, Inpatient registration officer, Reporting officer	Identifying barriers in the implementation of electronic medical records	Seven obstacles: EMR response speed inadequate, EMR does not fully meet user needs, Concerns about reliability and accuracy of information for decision-making, Technical limitations such as technology, resources, and financing, Need for strong security measures for sensitive information protection
11	Evaluation of the Implementation of Inpatient Electronic Medical Records at Hospital X Bengkulu Utara: Systems and Users [13]	Descriptive with a qualitative approach through in-depth interviews	21 informants (Professional Caregivers, Medical Recorders, IT Experts)	Exploring the implementation of EMR in hospitalization, Identifying obstacles encountered	EMR implementation at Hospital X Bengkulu Utara not optimal, No impact on PPA compliance in filling EMR, Inpatient EMR needs more

					compact development, Needs notification and warning features, Needs integration with other hospital systems to improve compliance
12	Analysis of Electronic Medical Records in Supporting Work Effectiveness in the Medical Record Unit at Hermina Pasteur Hospital [14]	Descriptive with a qualitative approach	12 medical recorders	Analyze the application of Electronic Medical Records in supporting work effectiveness in the medical records unit	Issues at the beginning of EMR use: Patient backlog, System disturbances making it inaccessible, Data retrieval for reporting inaccurate, Many forms requiring patient and doctor signatures

Table 1. Detailed summary of these articles can be found

Result and Discussion

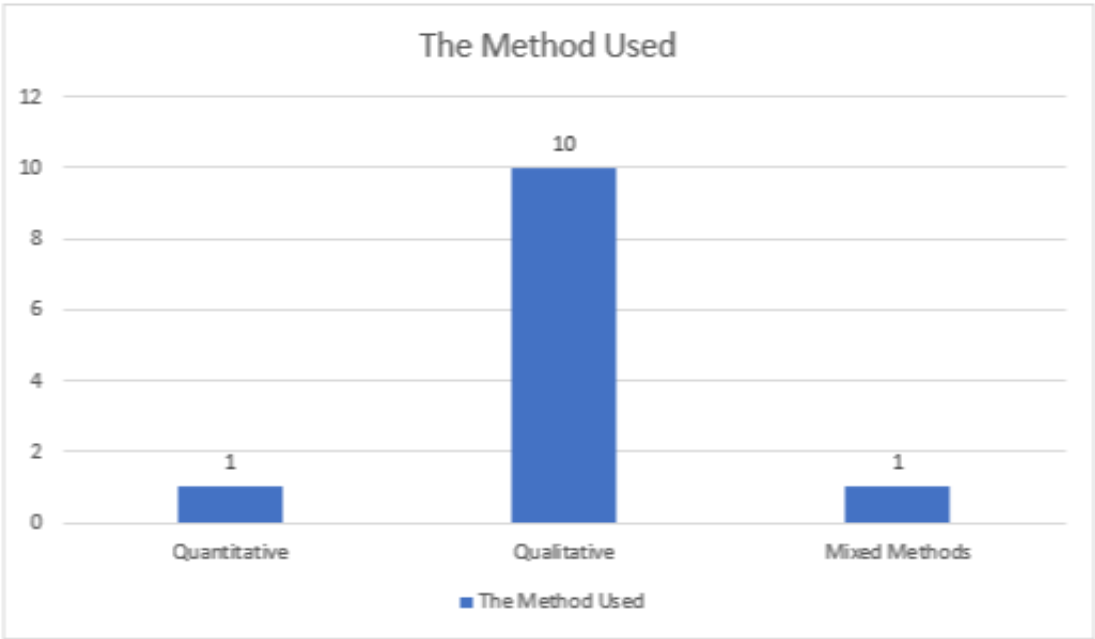


Figure 2. Methods used in research on Electronic Medical Records

From figure 2, we can see the research methods used in studies on the implementation of Electronic [14] Medical Records (EMR) in Indonesian hospitals are predominantly qualitative, with six studies employing qualitative approaches such as in-depth interviews, observations, and case studies. This highlights the need to explore the complexities of EMR adoption beyond numerical data, focusing on user experiences, institutional challenges, and contextual factors influencing implementation[15]. Additionally, four studies utilized a descriptive qualitative approach, indicating an emphasis on understanding patterns, behaviors, and responses from healthcare professionals regarding EMR usage. Only one study employed a purely quantitative method, suggesting that

while statistical analysis plays a role, it is less commonly used in assessing EMR challenges. A mixed-method approach was also found in one study, which reflects an effort to integrate both qualitative insights and quantitative validation to provide a more comprehensive evaluation.

The dominance of qualitative research suggests that EMR implementation challenges are largely human-centric, revolving around behavioral adaptation, system usability, and organizational readiness. This aligns with findings in similar healthcare technology studies, where subjective user experiences and institutional culture significantly influence adoption rates[16]. The limited use of quantitative methods may indicate that structured numerical data alone is insufficient to capture the nuanced barriers in EMR adoption. Instead, qualitative approaches help uncover deeper insights into infrastructure limitations, resistance from healthcare workers, and policy-related constraints. Future research could benefit from a greater balance between qualitative and quantitative approaches, allowing for both statistical validation and in-depth exploration of contextual issues affecting EMR success.

1. Research Participant

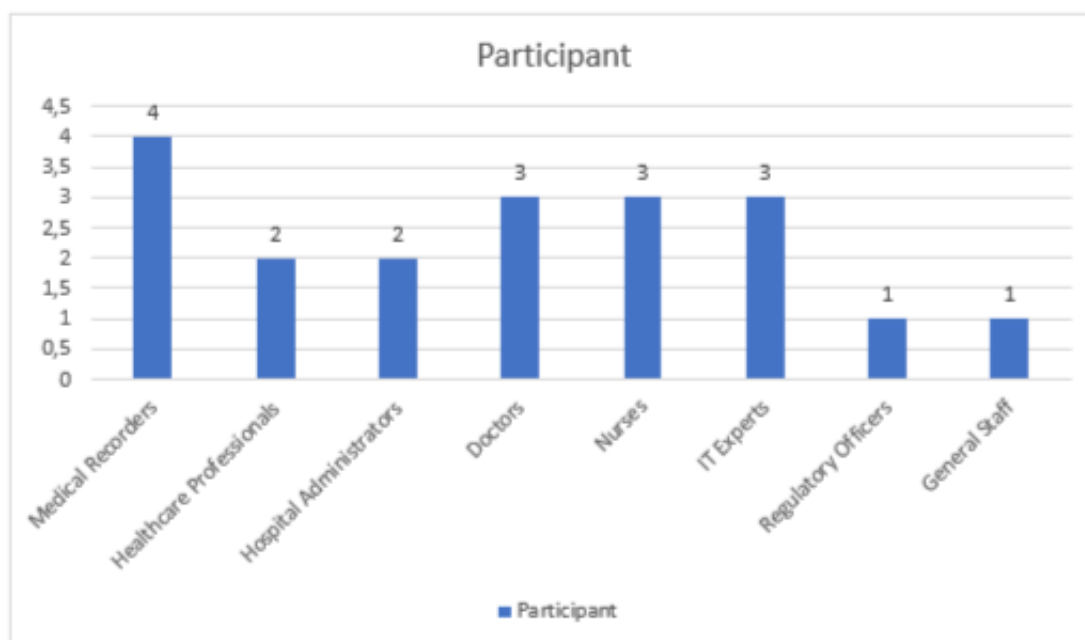


Figure 3. *Research Participant*

In figure 3, we can see the distribution of participants in studies on the implementation of Electronic Medical Records (EMR) in Indonesian hospitals highlights the involvement of various healthcare professionals, with medical record officers, doctors, and nurses being the most frequently studied groups. This indicates that EMR implementation directly affects frontline healthcare workers responsible for patient documentation and clinical decision-making. IT experts also play a significant role, reflecting the technical challenges associated with EMR adoption, such as system integration, cybersecurity, and technical support[4]. Hospital administrators and regulatory officers, though less frequently included, remain crucial stakeholders, as they influence policy decisions and resource allocation necessary for successful implementation.

The dominance of medical record officers, doctors, and nurses as study participants suggests that the main challenges in EMR adoption are related to user experience, training, and workflow adaptation. Their involvement in research emphasizes the importance of addressing usability

issues, ensuring adequate training, and improving system efficiency to minimize disruptions in patient care. On the other hand, the relatively lower participation of administrators and policymakers highlights a potential gap in studies regarding institutional and regulatory perspectives[17]. Future research should aim to include more insights from decision-makers to explore how policies, funding, and hospital management strategies can better support the widespread adoption of EMR systems.

2. Research findings



Figure 4. Research Finding

In figure 4, we can see the results from the studies on Electronic Medical Records (EMR) implementation in Indonesian hospitals reveal several recurring challenges, with inadequate infrastructure and hardware being the most frequently cited issue. Five studies highlight the lack of essential equipment such as computers, outdated hardware, and insufficient technical resources, which hinder the efficiency of EMR systems[18]. Additionally, internet connectivity issues appear in three studies, emphasizing the reliance of EMR systems on stable and fast networks, which are often unreliable in certain hospitals. System performance problems, including slow response times, frequent errors, and lack of integration with existing hospital information systems, were also significant, affecting the overall usability and effectiveness of EMR adoption.

Human resource-related barriers were another major concern, with three studies indicating a lack of technical skills and proper training among medical staff. User resistance and compliance issues were also identified, demonstrating that many healthcare professionals struggle to adapt to EMR due to insufficient training or reluctance to transition from traditional paper records. Moreover, concerns about data security and regulatory compliance were raised in three studies, highlighting the need for stronger policies to protect sensitive patient information. Financial constraints, cited in two studies, further indicate that the high costs of implementing and maintaining EMR systems remain a significant barrier. These findings suggest that a successful EMR implementation strategy must focus not only on technological improvements but also on comprehensive staff training, stable infrastructure investment, and strong regulatory frameworks.

a) Implementation of Hospital EMR in Indonesia

The adoption of Electronic Medical Records (EMR) in Indonesian hospitals has not been uniform across the country. Some hospitals began implementing EMR as early as 2016, including RSCM in Jakarta, Eka Hospital in Banten, Pondok Indah Hospital in Jakarta, RSA UGM in Yogyakarta, Panti Rapih Hospital in Yogyakarta, Margono Hospital in Central Java, Lung Hospital in Jember, and Dr. Moewardi Hospital in Central Java. According to the latest data from the Indonesian Ministry of Health, by the end of 2024, approximately 3,243 hospitals—equivalent to 90.47% of the total—had been integrated into the Satu Sehat platform[19].

b) Benefits of Electronic Medical Records

The implementation of EMR offers significant advantages for hospitals. One of the most notable benefits is improved service efficiency, provided that adequate infrastructure is in place and systems comply with Ministry of Health Regulation No. 24 of 2022. EMR also enhances the ease and speed of accessing patient health records, reducing the reliance on physical document storage while minimizing the risk of data loss. Additionally, EMR facilitates the integration of health data across different healthcare facilities, ensuring continuity of care and seamless information exchange between institutions[18][20].

c) Challenges in EMR Implementation

Despite the many benefits, hospitals still face several obstacles in adopting EMR. One of the most common challenges is the lack of adequate hardware at healthcare facilities, particularly during the initial implementation phase. Additionally, many healthcare workers struggle with digital adaptation, as some are not familiar with computerized systems and others are resistant to transitioning from traditional paper-based documentation[7].

Another significant issue is the lack of immediate technical support from IT specialists and EMR system developers, which leads to delays in resolving system-related problems. Some hospitals also report dissatisfaction with the design of EMR content, as it fails to provide a streamlined yet comprehensive alternative to traditional medical records. This issue affects healthcare professionals' compliance with proper documentation procedures [21].

Furthermore, the absence of electronic signatures for doctors and the continued requirement for physical patient signatures remain hurdles in the transition to a fully digital system. Many hospitals, particularly those in Bandung, still lack Standard Operating Procedures (SOPs) and clear written policies from management to guide EMR usage. Lastly, unstable internet connections significantly impact the speed and reliability of data synchronization, further hindering the effectiveness of EMR systems[9].

d) Recommendations for Successful EMR

To optimize the implementation of Electronic Medical Records (EMR) in hospitals, several strategic recommendations can be considered based on the identified challenges. One of the primary issues is the availability of necessary hardware. This can be addressed by carefully assessing the need for essential devices such as computers, laptops, or tablets, which will serve as the main tools for medical staff in recording and documenting patient care. Proper planning from the start is crucial to ensure that there are no delays or bottlenecks caused by a lack of equipment during documentation processes.

Another major challenge is related to human resources. Many healthcare workers struggle to adapt to new digital systems due to limited computer skills. To overcome this, hospitals should prioritize socialization, training, and mentorship programs to help staff transition smoothly to electronic record-keeping. Providing continuous guidance and clear information about the benefits of EMR can increase motivation, encourage compliance, and reduce resistance to the new system.

Technical support is also a key factor in ensuring successful EMR adoption. Since system issues can arise at any time, hospitals must have a responsive IT team and system developers who can quickly address technical problems. Delays in resolving EMR-related issues can disrupt services, impact documentation efficiency, and ultimately affect the overall quality of patient care.

Finally, strong policies and clear guidelines from hospital management are essential for effective EMR implementation. These policies should be formally documented and communicated to all staff, outlining the responsibilities and consequences of non-compliance. Additionally, hospitals should establish Standard Operating Procedures (SOPs) that provide step-by-step instructions on how to use the EMR system efficiently, making it more accessible and user-friendly for all healthcare personnel.

Conclusion

Hospitals in Indonesia are continuously working to align their electronic medical record (EMR) practices with the requirements set by Minister of Health Regulation No. 24 of 2022. While some hospitals have successfully implemented EMR systems, many still face significant challenges in the process. These challenges stem from various factors, including human resource limitations, inadequate facilities and infrastructure, lack of technical support, and unclear policies or Standard Operating Procedures (SOPs). Despite these obstacles, hospitals can learn from the experiences of other institutions that have already implemented EMR successfully. By considering the capabilities and classifications of different hospitals, healthcare facilities can use these insights as a reference to better plan and optimize their own EMR adoption. Understanding and addressing these common challenges will help create a more seamless transition towards fully digital medical records across the healthcare sector in Indonesia.

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