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Optimization of Electronic Medical Records: Challenges, Benefits, and Strategies for More Efficient Healthcare Services

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ABSTRACT

The implementation of Electronic Medical Records (EMR) is a strategic initiative to enhance efficiency and quality in healthcare services by improving patient information management and enabling integrated service delivery. This study aimed to explore the understanding, benefits, challenges, and implementation strategies of EMR in healthcare facilities. Using a qualitative approach, in-depth interviews were conducted with nurses, doctors, and system administrators from December 2024 to February 2025. The findings indicate that EMR facilitates accurate documentation, supports coordination between units, and offers features such as automatic notifications to reduce documentation errors. However, challenges remain, including limited system integration, technical slowdowns, downtime, and insufficient user training and regulatory support. Strengthening technology infrastructure, providing continuous training, establishing supportive policies, and involving users in feature development are essential strategies to optimize EMR use. An integrated and sustainable approach is expected to improve the efficiency and quality of healthcare services.

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1. INTRODUCTION

The global adoption of Electronic Medical Records (EMR) has been consistently shown to enhance healthcare efficiency, improve the accuracy of medical data recording, and strengthen coordination among healthcare professionals. Studies have demonstrated that digitizing medical records transforms clinical operations by enabling faster access to standardized patient data, streamlining workflows, and reducing dependence on paper-based systems. This not only improves decision-making but also contributes to safer and more effective care delivery (Pereira, 2024). In Indonesia, this digital transformation is formalized by national regulations, such as the Ministry of Health Regulation No. 24 of 2022, which mandates the implementation of EMR across all healthcare facilities as part of the national digital health agenda. Supporting this policy direction, a study conducted at Wangaya Regional Hospital found that EMR significantly improves data access and supports data-driven clinical decisions, thereby enhancing staff performance and service quality (Dewi et al., 2022).

Moreover, EMR systems foster better patient care coordination by facilitating seamless information sharing between care teams, reducing prescription and transcription errors, and improving the continuity of care (Otayf et al., 2024). A recent comprehensive review further confirms that EMR improves patient outcomes by providing timely access to critical medical data, supporting evidence-based decision-making, and enhancing

adherence to clinical guidelines (Adeniyi et al., 2024). Taken together, the evidence affirms that EMR implementation is a strategic and impactful advancement in modern healthcare systems worldwide.

Although numerous studies have explored the benefits and challenges of Electronic Medical Records (EMR), there remains a noticeable gap in the literature regarding effective implementation strategies—especially in the Indonesian context. Much of the existing research tends to emphasize the technical and legal dimensions, such as data security and policy compliance, as reflected in studies examining the impact of national regulations like Minister of Health Regulation No. 24 of 2022 (Novianti and Bakhtiar, 2024). However, the socio-cultural and organizational dimensions of EMR adoption remain underexplored.

Research in primary healthcare settings has shown that while technical deployment of EMR systems can be achieved, significant barriers persist related to human resources, infrastructure, and change management—factors that are inherently socio-organizational (Purwanto; et al., 2019). For example, EMR implementation processes in Indonesian clinics often overlook the complexity of institutional culture and staff engagement, instead relying on top-down directives without accounting for local adaptation strategies.

Recent literature also acknowledges this gap, suggesting that while policy compliance is progressing, the absence of context-aware strategies—such as those informed by socio-technical models—limits successful EMR integration (Mayasafira and Almansoob, 2024). Despite the known effectiveness of socio-technical frameworks in balancing human, organizational, and technological factors in health informatics, these approaches remain largely absent in Indonesian EMR research. Consequently, the local literature continues to focus on infrastructure readiness and legal concerns, with insufficient exploration of the complex interplay between user behavior, organizational change, and technology.

To address persistent gaps in the literature on Electronic Medical Records (EMR) by Hossain et al., (2025), this study employs a qualitative approach grounded in the socio-technical model to examine the challenges, benefits, and strategies for EMR implementation within Indonesian healthcare settings. While many previous studies have explored EMR from technical or legal perspectives, there has been limited focus on how technology interacts with human, organizational, and contextual dynamics—especially in developing countries like Indonesia. The socio-technical model is particularly relevant in this context, as it considers both technical components (such as system design and infrastructure) and social aspects (such as user readiness, communication, and institutional culture), making it well-suited to guide effective and sustainable EMR implementation.

Recent empirical evidence reinforces the importance of integrating these dimensions. For instance, Purwanto et al. (2019) describe the successful adoption of EMR in primary health centers in Yogyakarta, where inclusive planning, leadership engagement, and continuous evaluation were essential for overcoming human resource and technical challenges. Similarly, Nathan and Rostiaty (2024) emphasize that the effectiveness of EMR implementation depends not only on digital infrastructure but also on user adaptability, training, and policy alignment—highlighting the need for a socio-technical lens to guide planning and evaluation. Widyawan et al. (2020) also show that user-centered system development approaches—such as the agile-based Scrum method—can enhance EMR usability and responsiveness when implementation is based on actual user needs and workflows.

xxx Based on this understanding, this study aims to generate relevant and applicable recommendations in the context of EMR implementation in Indonesia by analyzing how social, organizational, and technical elements interact with each other in practice. The results are expected to support a sustainable and locally appropriate healthcare digital transformation strategy. Specifically, this research focuses on identifying the main challenges faced by healthcare workers in EMR implementation, finding the enabling factors that enable effective implementation, and formulating strategic recommendations that integrate socio-technical principles into the Indonesian healthcare system.

2. RESEARCH METHOD

This study employed a qualitative descriptive design, which is suitable for exploring participants' experiences and perspectives in a straightforward and comprehensive manner. The primary data collection method was in-depth, semi-structured interviews, conducted with six purposively selected key informants involved in the implementation and use of electronic medical records (EMR) in hospital settings.

Participants included two ambulatory care nurses, two inpatient ward nurses, one head of nursing care, and one attending physician. These individuals were selected based on their direct experience with the EMR system and their ability to provide rich, relevant information about the topic under investigation.

The interviews focused on four main areas: understanding of the EMR system, perceived benefits, barriers encountered, and expectations for future development. All interviews were audio-recorded, transcribed verbatim, and analyzed using thematic analysis based on Braun and Clarke's six-phase framework. This approach enabled the identification of recurrent patterns and meaningful themes across the data.

Ethical approval was obtained from the Health Research Ethics Committee of Universitas Muhammadiyah Purwokerto (Approval No. KEPK/UMP/207/IV/2025). All participants gave written informed

consent, and the study was conducted in accordance with recognized ethical standards for research involving human subjects.

3. RESULT AND DISCUSSION

The main findings obtained from interviews regarding the understanding, benefits, technical challenges, system evaluation, regulations, and user expectations of the EMR. Based on interviews with various informants, several themes emerged that reflect their experiences and perspectives on the use of this system in the hospital. The analysis of these interview results reveals both the strengths and challenges of the system, as well as suggestions for improvements, which can serve as a foundation for further development of the system.

Theme 1. Understanding and Use of the System

The EMR is understood by the informants as a replacement for the manual system that provides ease in managing patient data. Informant 1 explained:

"*EMR is an electronic medical record used as a replacement for manual medical records*" (Informant 1).

Reflects a fundamental understanding of EMR as a digital solution that substitutes traditional paper-based documentation in hospitals. This perception highlights the participant's recognition of EMR as a core component of digital transformation in healthcare administration. It implies that EMR is not just a technological upgrade, but a deliberate move toward a more efficient, structured, and accessible system for managing patient information.

By referring to EMR as a replacement for manual records, the informant acknowledges the shift from handwritten, physical documentation—which is often prone to errors, delays, and inefficiencies—toward a more reliable electronic system. This transition is seen as a means to streamline medical data management, improve workflow, and support better decision-making in clinical settings. Overall, the statement illustrates how frontline users perceive EMR as a vital innovation that redefines how medical records are maintained and utilized within healthcare institutions.

This system allows for more organized and efficient data access in supporting the healthcare service process. However, the understanding and usage of it vary among the hospital units. Informant 2 highlighted the limitations in integration between units. She said:

"*All departments have access to EMR through user ID and password, but not all units can connect with each other to share data*" (Informant 2).

Reveals a critical insight into the limitations of the current EMR system implementation within the hospital. While it acknowledges that each department or unit has been granted access to the EMR system through secure login credentials, it also highlights a significant gap in system integration—namely, the inability of different departments to effectively communicate and share patient data across units.

This indicates that although the infrastructure for digital access exists, the lack of interconnectivity between departments hampers the full potential of EMR in supporting coordinated and seamless care. The informant's statement suggests that data silos still exist within the digital system, preventing the efficient exchange of patient information between clinical units. As a result, healthcare providers may face delays or obstacles in accessing complete patient records, which can impact the quality, continuity, and efficiency of care. This underscores the need for a more integrated EMR system that not only provides individual access but also ensures interoperability across all departments within the hospital.

Electronic Medical Records (EMRs) represent a digital transformation tool replacing manual systems to enhance efficiency in managing patient data is strongly supported by recent scholarly research. EMRs are widely recognized for improving structured data management, enhancing documentation accuracy, and facilitating inter-unit coordination within hospitals. This transformation not only modernizes administrative processes but also strengthens clinical decision-making and patient outcomes.

Research conducted by Kurniawan and Arini (2024) in an Indonesian hospital found that EMRs significantly enhanced the accuracy and relevance of medical data, which in turn increased healthcare worker satisfaction and improved patient service quality. Similarly, a study by Patience Onuogu (2023) in Nigerian hospitals confirmed that EMR implementation led to quicker access to patient records, reduced duplication of tests, and minimized the risk of losing patient files, highlighting its ability to centralize data and streamline operations.

However, just as noted in the interviews, the implementation of EMR systems is not without challenges. Issues such as infrastructure limitations, inconsistent inter-unit integration, insufficient training, and user resistance remain significant obstacles. A 2023 study from Tanzania identified that while EMRs brought improved service efficiency and resource management, their success heavily depended on factors like ease of use, training, and leadership involvement. The lack of sufficient funding and IT resources were noted as critical barriers to optimal implementation (Nuwas et al., 2023).

Moreover, understanding and usage of EMRs can vary across departments, which is a challenge to consistent service quality. Studies have emphasized the importance of system integration and interdepartmental connectivity to ensure the full benefits of EMRs are realized (Ariyanti et al., 2023). Without seamless data sharing across hospital units, the utility of EMRs can be significantly compromised.

The EMR system stands as a pivotal innovation in hospital digitalization, offering tangible improvements in efficiency, data accuracy, and healthcare coordination. Yet, its full potential can only be realized through strategic implementation, ongoing user training, and robust infrastructure support—points that are consistently echoed across recent empirical studies.

Theme 2. Benefits of the System

The main benefits of implementing EMR lies in the efficiency and accuracy of patient data management. In addition, this system also reduces the risk of document loss and supports coordination between service units. Informant 4 said:

"*The benefits are many, for example, patient data is more organized, easily accessible at any time, and it facilitates coordination between service units*" (Informant 4).

Informant 4 conveys a positive perception of the EMR system's impact on hospital operations. It reflects the informant's appreciation for how EMR contributes to better data management by organizing patient information in a structured and systematic way. The mention of easy access "at any time" suggests that EMR improves the availability of information, allowing healthcare professionals to retrieve necessary data quickly, regardless of time or location within the hospital.

Furthermore, the informant highlights that EMR supports coordination among service units, indicating that the system plays a role in enhancing communication and collaboration between departments. This implies that with EMR, different units can work more efficiently together, reducing delays and improving the continuity of patient care. Overall, the statement emphasizes the practical advantages of EMR in creating a more integrated, responsive, and efficient healthcare delivery system.

This system is equipped with automatic features such as alerts that ensure data completeness before being saved. This feature supports healthcare workers in improving documentation accuracy. Informant 5 emphasized that:

"*There is an automatic alert feature to help healthcare workers ensure that all data is fully completed before being saved*" (Informant 5).

This statement highlights the role of EMR in supporting data accuracy and completeness. This remark indicates that the system is equipped with built-in mechanisms—specifically, automated alerts—that serve as reminders or prompts for healthcare workers during the documentation process. These alerts are designed to notify users if certain required fields or information have not been filled out, preventing incomplete records from being saved.

This feature is seen as a valuable safeguard that helps maintain the integrity of patient data and ensures that critical information is not overlooked. It also reduces the likelihood of human error by prompting users to review their inputs before finalizing entries. From the informant's perspective, this function contributes to improving the quality of documentation and ultimately supports safer and more reliable clinical decision-making.

One of the primary benefits of EMRs, as noted by Informant 4, is their ability to prevent the loss of medical documents. Unlike traditional paper-based systems, EMRs offer constant digital access to patient records and support coordination across departments. This is echoed in a study by Pilares et al. (2022), which emphasizes that EMRs improve data security through controlled user access and automated backup systems, significantly reducing the risk of data loss and ensuring continuity of care even during technical or administrative disruptions.

However, as highlighted by Informant 2, challenges in interdepartmental data sharing remain. Although user access may be well-managed through individual logins, the lack of system interoperability between units can hinder the seamless exchange of patient information. This issue is consistent with findings from De Benedictis et al. (2020), who found that the absence of technical integration between hospital departments often limits data flow and adversely affects the efficiency of clinical decision-making.

Additionally, EMRs contribute significantly to time efficiency and the accuracy of medical documentation. Demonstrated that the digital format streamlines data entry processes and reduces the risk of manual errors, ultimately enhancing the quality and speed of healthcare services provided to patients (Dewi et al., 2022).

EMRs offer robust solutions to long-standing issues in medical record management, particularly by safeguarding against data loss and improving operational efficiency. Nonetheless, these benefits can only be fully realized if hospitals address existing interoperability challenges and invest in system-wide integration strategies.

Theme 3. Technical and Operational Constraints

The implementation of EMR is faced with a number of technical and operational constraints. Informant 3 and Informant 4 also highlighted similar challenges and underscored the technical issues as follows:

"*The slow system often becomes a challenge, especially when inputting detailed data*" (Informant 3).

"*If the system is down from the central office, the staff can only wait for repairs*" (Informant 4).

Informant 3 and Informant 4 highlight two critical technical challenges faced by healthcare staff in using the EMR system. Informant 3 points out that the system's slow performance can become a major obstacle, particularly when staff are required to input detailed or complex patient data. This suggests that lagging system speed disrupts workflow, delays documentation, and can potentially compromise the efficiency and accuracy of healthcare services.

Informant 4 adds to this by explaining that when the system experiences downtime—particularly when the issue originates from the central office—staff are left unable to proceed with their work and must wait for the system to be repaired. This indicates a dependence on centralized control and limited local contingency options, making the hospital vulnerable to service interruptions. Together, these statements reflect the operational difficulties that arise from system instability and highlight the need for improved infrastructure, responsiveness, and backup solutions to ensure the EMR system can support uninterrupted healthcare delivery.

Another constraint is the limited training provided to the staff. This indicates the need for a more comprehensive training program to support healthcare workers' adaptation to the new system. Informant 2 said:

"*There is no specific SOP for the use of the application in the medical records unit, and the training only consists of basic assistance*" (Informant 2).

The statement by Informant 2, "There is no specific SOP for the use of the application in the medical records unit, and the training only consists of basic assistance," reveals a significant gap in the operational implementation of the EMR system. It indicates that within the medical records unit, there are no established Standard Operating Procedures (SOPs) to guide staff in the proper and consistent use of the application. This lack of structured guidance can lead to confusion, inconsistent practices, and potential errors in how the system is used.

Additionally, the informant notes that the training provided to staff is limited to basic assistance, suggesting that users may not receive comprehensive or in-depth instruction on the system's features and functions. This minimal training likely hinders staff from fully utilizing the system's capabilities, reducing its effectiveness in supporting medical documentation and administrative workflows. Overall, the statement reflects the need for more formalized protocols and robust training programs to ensure consistent, efficient, and confident use of the EMR system among healthcare personnel.

The statement that technical constraints—such as system slowness and downtime—pose major challenges in EMR implementation is strongly supported by recent scientific literature. Informants 3 and 4 emphasized how system performance issues disrupt workflow and delay data entry. This is reinforced by a qualitative study by Subu et al., which found that hardware limitations, unstable infrastructure, and insufficient technical support are common barriers to successful EMR adoption in hospitals. Participants in that study highlighted how system downtimes significantly hindered operational continuity, requiring immediate and responsive IT support to restore functionality (Subu et al., 2024).

Additionally, the lack of comprehensive training was noted by Informant 2 as a persistent obstacle. This observation aligns with the findings of Nuwas et al. (2023), who reported that many hospital staff received little to no formal EMR training, which limited their ability to fully engage with and benefit from the system. Their research emphasized that continuous, structured training programs are essential to overcoming resistance and improving system utilization across departments.

Further supporting this, Putri and Sutrisno (2024) found that system quality and user satisfaction were strongly influenced by regular system maintenance and user education. Their study concluded that both factors—technical reliability and sufficient training—are critical to ensure effective and sustainable use of EMRs in hospital settings.

Recent research confirms that system instability, inadequate IT support, and insufficient staff training are persistent challenges in EMR implementation, validating the concerns expressed by the informants.

Theme 4. System Evaluation and Data Completeness

Data completeness has become a significant issue in the implementation of EMR. This deficiency not only affects the quality of service but also impacts administrative processes such as BPJS claims. As Informant 1 observed:

"*Diagnosis and anamnesis are often incomplete, resulting in an empty summary*" (Informant 1).

The statement by Informant 1, "Diagnosis and anamnesis are often incomplete, resulting in an empty summary," reflects a concern about the quality and completeness of medical documentation within the EMR system. It suggests that healthcare professionals sometimes fail to fully record essential clinical information—such as patient history (anamnesis) and diagnosis—which are crucial for creating an accurate and comprehensive medical summary.

This incomplete input leads to summaries that lack critical patient details, reducing the usefulness of the medical record for ongoing treatment, clinical decision-making, or referrals. The remark points to possible issues in user behavior, workflow pressures, or limitations in the EMR interface that may discourage or hinder thorough documentation. It underscores the importance of improving both system design and user training to ensure that all vital clinical data are consistently and accurately recorded.

To handle this challenge, the automatic feature in the system provides notifications that help ensure data completeness. Informant 6 explained:

"*Usually in the form of a pop-up notification or a highlight on the unfilled sections to ensure important data is not missed*" (Informant 6).

The statement by Informant 6, "Usually in the form of a pop-up notification or a highlight on the unfilled sections to ensure important data is not missed," describes a built-in feature of the EMR system designed to enhance data completeness and reduce human error. According to the informant, the system uses visual cues—such as pop-up alerts or highlighted fields—to draw the user's attention to sections that have not yet been filled out.

This mechanism acts as a safeguard, prompting healthcare workers to review and complete all necessary information before finalizing or saving a patient record. It reflects the system's role in supporting clinical documentation by helping ensure that no essential data is overlooked, which is critical for maintaining the accuracy and reliability of medical records. This feature not only improves documentation quality but also supports patient safety by minimizing the risk of missing important clinical information.

The statement that data completeness is one of the primary challenges in EMR implementation is well-supported by current research. Informant 1's concern about incomplete diagnosis and anamnesis reflects a broader issue observed in hospitals, where essential clinical information is often missing, directly affecting administrative tasks such as BPJS claims. This concern is validated by Wurster et al. (2023), who found that EMR implementation can both improve and compromise data completeness depending on how the system is used and how well users are trained to document consistently. Their study revealed that while EMRs improved the average completeness of some documentation fields, certain key clinical items like diagnosis were still less consistently recorded.

Furthermore, the importance of periodic evaluation and regular supervision, as noted in the original statement, is emphasized in studies like the one by Subu et al. (2024), which underlines that continuous leadership involvement and performance monitoring are key factors in identifying usage problems and improving the overall success of EMR adoption.

In support of Informant 6's suggestion that EMRs should allow data entry from portable devices and be more user-friendly, recent studies highlight the role of system design in ensuring usability and adoption. The perceived relevance and accuracy of the EMR system significantly influenced user satisfaction, while incomplete data entry—though still a concern—could be mitigated with user-centered design improvements (Kurniawan and Arini, 2024; Nurfaiza and Purwito, 2022).

Moreover, the value of automated system features—such as pop-up reminders or highlighted incomplete fields—to enhance data completeness has been emphasized by Wurster et al. (2023), who reported that such features are instrumental in improving documentation accuracy and administrative efficiency.

Finally, research by De Benedictis et al. (2020) also supports the idea that user-centered design is essential for successful EMR implementation. Their findings show that EMR adoption is more effective when the system is developed with direct input from users and when organizational norms and peer support encourage engagement with the technology.

Theme 5. Regulations and SOP

The existence of regulations and Standard Operating Procedures (SOP) serves as an important foundation in the implementation of EMR. Informant 3 said:

"*Written regulations regarding the implementation of EMR are available and serve as a guide that can be used by all healthcare service personnel*" (Informant 3).

This statement reflects a structured and standardized approach to EMR usage within the hospital. It suggests that formal documentation—such as policies, procedures, or standard operating protocols—has been developed and disseminated to guide healthcare professionals in the proper use of the electronic medical record system.

This written guidance is intended to ensure that all staff members, regardless of their role or department, have access to clear instructions on how to operate the EMR system effectively and consistently. By providing a common reference point, these regulations help promote uniformity in practice, reduce variability in data entry, and support compliance with institutional and legal standards. The informant's remark highlights the importance of regulatory frameworks in facilitating the smooth and responsible implementation of digital health systems in clinical environments.

This SOP includes standard steps to ensure the completeness and accuracy of patient data entry. However, not all units have adequate regulatory support. This deficiency can affect employee commitment in optimizing the use of the system.

"*The absence of written regulations from management is the main obstacle in the implementation of EMR*" (Informant 1).

This statement emphasizes a critical gap in organizational support for the electronic medical record system. It suggests that the lack of formal, documented policies or guidelines from hospital leadership has created uncertainty and inconsistency in how the EMR is used by staff. Without clear written regulations, healthcare workers may be unsure of the correct procedures, responsibilities, or standards for using the system, leading to fragmented practices and reduced efficiency.

This absence of direction from management not only hinders effective system adoption but may also contribute to resistance, errors, or underutilization of the EMR's full capabilities. The statement underscores that successful implementation of digital health systems requires not only technical infrastructure but also strong administrative commitment, including clear and accessible written protocols that guide everyday practice.

Regulations and Standard Operating Procedures (SOPs) play an important role in the successful implementation of Electronic Medical Records (EMR) is strongly supported by recent studies in the Indonesian healthcare context.

Research by Sandhe et al. (2025) revealed that although Indonesia's Ministry of Health has issued mandates for EMR implementation Regulation No. 24 of 2022, many hospitals continue to face significant challenges due to unclear internal policies, insufficient technical training, and inadequate infrastructure. These gaps often result in inconsistent system usage across departments and reduced commitment among healthcare staff.

Similarly, Sugiarto et al. (2024)emphasized that while regulatory frameworks exist at the national level, the lack of concrete, operational SOPs at the facility level undermines effective system adoption. Their study showed that without standardized procedures, EMR usage tends to vary among users, leading to poor data quality and reduced efficiency in service delivery.

Supporting this, Wurster et al. (2023) found that consistently implemented SOPs significantly improve the completeness and quality of medical documentation. Their findings suggest that having clear, written procedures leads to more accurate data entry and helps streamline administrative processes across departments.

Additionally, a study by Juliansyah et al. (2023) examined EMR implementation in Indonesian clinics and emphasized that adherence to standardized procedures, aligned with government regulations, supports better service quality and ensures that EMR systems function in accordance with national standards. This highlights the critical role of regulatory consistency in maximizing EMR benefits for both clinical care and administrative efficiency.

In summary, the existence and enforcement of strong regulations and SOPs are essential not only for guiding consistent EMR use but also for ensuring the long-term success and impact of digital transformation in healthcare settings.

Theme 6. User Expectations

Expectations for future development are also an important focus. This hope reflects the need for continuous innovation in supporting more effective healthcare services. Informant 6 said:

"*I hope this system becomes more user-friendly, has faster access, and can be accessed through portable devices to facilitate data entry in the field*" (Informant 6).

Informant 6 expresses a clear expectation for improvements in the usability and flexibility of the EMR system. The informant is highlighting three specific areas of concern: ease of use, speed, and mobility. By wishing for a more user-friendly interface, the informant is pointing to the need for a system that is intuitive and simple to navigate, reducing the learning curve and minimizing errors during use.

The desire for faster access indicates that delays or slow system performance may currently be interfering with efficient workflow, especially during time-sensitive medical tasks. Additionally, the request for portability—such as access through tablets or smartphones—reflects the practical need for healthcare staff to input or retrieve patient data while working in various locations, including in the field or at the patient's bedside. This statement underscores the importance of designing EMR systems that are responsive, accessible across devices, and aligned with the dynamic work environments of healthcare professionals.

The system users actively contribute to the development of features that better meet operational needs. User involvement demonstrates the importance of active participation in system development. Informant 2 provided a concrete example in their statement:

"*The addition of a warning feature for patient referrals that are about to expire is a suggestion from the direct users*" (Informant 2).

Informant 2 highlights a specific user-driven recommendation aimed at improving the functionality of the EMR system. This remark indicates that healthcare workers who use the system regularly have identified a

practical need for a notification or alert feature that can warn them when a patient referral is approaching its expiration date.

Such a feature would serve as a proactive reminder, helping staff manage patient referrals more effectively and avoid administrative delays or disruptions in care continuity. The statement also reflects the importance of incorporating feedback from frontline users into system development, ensuring that the EMR aligns with real-world workflows and supports timely, accurate patient management. Ultimately, it underscores the value of user-centered design in creating digital tools that truly meet the needs of healthcare providers.

The statement that automated features—such as reminder notifications—support data completeness and improve medical documentation accuracy is strongly supported by recent empirical research. Informant 5 noted the usefulness of such features in helping ensure that no critical data is missed before a record is saved. This aligns with the findings from Leisman et al. (2024), who conducted a clinical trial demonstrating that real-time EMR alerts significantly improved adherence to clinical documentation guidelines. Specifically, automated reminder pages sent to healthcare providers increased compliance with sepsis care bundles, highlighting how such systems can enhance both accuracy and timeliness in clinical documentation.

In addition, Informant 2's suggestion for an alert feature to flag near-expired patient referrals reflects the active role users can play in shaping system functionality. This viewpoint is echoed by Wurster et al., (2023), who emphasized the benefit of user-centered system development. Their study found that involving users in the feedback and design process of EMR platforms led to enhancements that were more aligned with real operational needs and significantly improved the quality of documentation and workflow.

These findings support the idea that automated reminders not only assist in ensuring data completeness and patient safety but also that the continuous input from users is vital for tailoring features that address the dynamic and practical demands of clinical environments. Incorporating these features and embracing a user-driven development model significantly increases the EMR system's effectiveness and relevance in practice.

4. CONCLUSION

The implementation of Electronic Medical Records (EMR) holds substantial potential for improving the efficiency, accuracy, and coordination of healthcare services. As a core component of healthcare digitalization, EMRs offer numerous benefits, including better patient data management, reduced documentation errors, and enhanced clinical decision-making. However, the findings of this study reveal that these advantages are often constrained by persistent technical, organizational, and human-related challenges. Issues such as limited interoperability between units, slow system performance, lack of infrastructure, insufficient user training, and the absence of clearly defined Standard Operating Procedures (SOPs) continue to hinder optimal EMR utilization in many healthcare facilities in Indonesia.

More importantly, the study highlights that successful EMR implementation cannot rely solely on technological readiness. A socio-technical perspective is essential to understanding the complex interplay between the system and its users within real-world organizational contexts. Active involvement of healthcare workers in system development, tailored training programs, responsive policy frameworks, and continuous evaluation are critical components for fostering sustainable and effective EMR use.

This study contributes to closing the gap in EMR implementation literature by offering context-specific insights into the Indonesian healthcare system and proposing holistic strategies that combine technical and social interventions. Going forward, healthcare institutions and policymakers must adopt integrated and participatory approaches that prioritize not only digital infrastructure but also the readiness, capacity, and engagement of human resources. By doing so, EMR systems can truly fulfill their promise of enhancing the quality, continuity, and equity of healthcare services across diverse settings.

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