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Analysis of Electronic Medical Record Adoption Impact on Provider Performance and Service Quality at Sumedang Hospital Outpatient Department

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A B S T R A C T :

The adoption of Electronic Medical Records (EMR) at Sumedang Regional Hospital (RSUD Sumedang) has brought tangible improvements to the hospital's daily operations, particularly in the outpatient department. In practice, EMR has replaced manual record-keeping, enabling doctors, nurses, and administrative staff to access patient histories instantly, update treatment notes in real time, and coordinate care without the delays and redundancies that once occurred with paper-based files. This study analyzes the effect of EMR adoption on Professional Care Provider (PCP) performance and service quality using a descriptive and verificative approach with total sampling of PCPs, including specialist doctors, general practitioners, nurses, physiotherapists, nutritionists, and clinical pharmacists. Data collected through structured questionnaires were analyzed using simple linear regression. Findings show that EMR adoption, PCP performance, and service quality are all in the "good" category. EMR adoption has a significant positive effect on PCP performance, accounting for 62.4% of performance variance, with the remainder influenced by factors such as staff training, workload management, and technological readiness. Likewise, EMR adoption improves service quality by 63.0%, with the remaining 37.0% influenced by staffing levels, workflow efficiency, and patient engagement. These figures are reflected in daily hospital activities: reduced patient waiting times, faster pharmacy dispensing due to real-time prescription updates, fewer errors in lab result reporting, and smoother interdepartmental communication. By streamlining operations and enhancing data accuracy, EMR has allowed RSUD Sumedang to provide safer, faster, and more coordinated care. However, sustained improvement will require internet capacity upgrades, hardware renewal, workflow optimization, continuous staff training, and robust data security measures.

Keywords: EMR, Professional Care Provider, Service Quality.

1. Introduction

Healthcare systems across the globe are undergoing a profound and continuous transformation, a shift largely propelled by rapid advancements in information and communication technologies (ICT). These technological innovations have reshaped not only the tools available to healthcare professionals but also the very architecture of healthcare delivery, management, and evaluation. One of the most influential and widely adopted innovations in this global transformation is the Electronic Medical Record (EMR); a digital platform designed to enable the systematic, organized, and secure collection, storage, and retrieval of patient health information in an electronic format (Hillestad et al., 2005).

The EMR serves as far more than a simple replacement for traditional paper-based records. It functions as an integrated repository of clinical data, encompassing patient demographics, medical histories, diagnostic test results, medication lists, treatment plans, and imaging records. This centralization of information eliminates redundancies, reduces the risk of data loss, and ensures that relevant clinical details are available instantly to authorized healthcare providers at the point of care. By making patient information both accessible and up-to-date, EMR systems directly support evidence-based clinical decision-making, allowing physicians, nurses, and allied health professionals to plan and adjust treatment with greater precision and timeliness (Chaudhry et al., 2006).

Beyond individual patient encounters, EMR systems have been widely recognized as essential instruments for modernizing entire healthcare delivery systems. They provide a framework for multidisciplinary collaboration by ensuring that all members of the care team, whether located in the same facility or dispersed across multiple sites, have access to the same, current patient data. This not only minimizes miscommunication and duplication of services but also facilitates smoother care transitions between primary, secondary, and tertiary care levels. In addition, EMR systems enhance operational efficiency by streamlining administrative processes, enabling automated billing and coding, and generating performance and compliance reports with minimal manual intervention (World Health Organization, 2021).

Furthermore, EMR systems are increasingly acknowledged as strategic tools for health system governance and public health management. At the macro level, the aggregated data within EMR platforms can be utilized to monitor disease trends, evaluate healthcare utilization patterns, and inform resource allocation. This capability positions EMR systems as vital components in the pursuit of universal health coverage and in the design of responsive, data-driven health policies. In a more contextual essence, EMR adoption represents not only technological advancement, but also structural reconfiguration of healthcare, aligning service delivery with the principles of safety, efficiency, equity, and patient-centeredness.

Historically, patient medical information was maintained exclusively in paper-based records; while functional and relatively inexpensive in earlier times, these systems were constrained by several critical limitations. Paper records require substantial physical storage space, are susceptible to wear and tear over time, and can be misplaced, misfiled, or damaged by environmental factors such as fire, humidity, or pests. Retrieving historical data from such archives often involved labor-intensive manual searches, which could delay clinical decision-making and impede timely patient care. Moreover, the fragmentation of patient information across multiple files and departments made it difficult for healthcare teams to obtain a complete and up-to-date picture of a patient's medical history, increasing the risk of duplicated tests, inconsistent documentation, and medical errors (Wright et al., 2013).

The transition toward digital medical records began in the latter half of the 20th century, emerging first in technologically advanced nations where healthcare facilities had access to early computing infrastructure. Initial implementations were limited in scope, often developed as departmental solutions for specialized areas such as radiology, laboratory services, or billing departments. These early systems primarily addressed data entry and storage needs within specific units, rather than providing a unified patient record accessible across an entire hospital. Nevertheless, these pioneering efforts demonstrated the potential of digital systems to streamline information management, setting the stage for broader adoption.

Over the past two decades, the shift from paper to electronic systems has accelerated dramatically, propelled by a convergence of technological, regulatory, and organizational factors. Government policy mandates, such as the introduction of national health information strategies, have created strong incentives for hospitals to digitize their records. Economic pressures to improve efficiency and reduce healthcare costs have further driven adoption, as EMRs enable automation of routine administrative tasks and facilitate better resource utilization (Janett & Yeracaris, 2020). At the same time, the increasing complexity of healthcare delivery, with patients often managing multiple chronic conditions, receiving care from multidisciplinary teams, and moving between different levels of care, has made integrated, accessible health information indispensable.

In contemporary practice, EMR systems are no longer viewed as isolated data repositories. They have evolved into integral components of comprehensive hospital information systems, linking clinical, administrative, and financial operations into a single, interconnected platform. This integration allows for seamless information flow between inpatient and outpatient services, real-time updates to patient records, automatic alerts for potential drug interactions, and direct links to diagnostic imaging and laboratory results. In addition, EMR platforms increasingly interface with external systems such as national health insurance databases, telemedicine services, and public health reporting systems, thereby extending their influence beyond individual hospitals to the broader healthcare ecosystem (Menachemi & Collum, 2011; Nguyen et al., 2014).

An equally important dimension of EMR functionality lies in its capacity for interoperability, which can be interpreted as the ability to exchange and use health information seamlessly across different systems, facilities, and regions. Interoperable EMR systems ensure that a patient's health data follows them regardless of where they seek care, reducing the risk of fragmented information and improving continuity of care. This capability becomes particularly valuable in referral networks, where patients may transition from primary care centers to regional hospitals and then to specialized tertiary facilities. When properly integrated, EMRs can also connect with national health insurance databases, enabling automated verification of eligibility and faster claims processing.

The expanding integration of EMRs with telemedicine platforms has further extended the reach of healthcare beyond the physical walls of hospitals. By synchronizing patient records with virtual consultation tools, healthcare providers can access complete medical histories during online visits, order diagnostic tests remotely, and update treatment plans without geographic limitations. This is particularly beneficial in rural or underserved areas, where access to specialist care may be limited. EMR-enabled telemedicine thus contributes not only to clinical efficiency but also to healthcare equity by bridging gaps in service availability.

Moreover, modern EMR systems increasingly incorporate patient engagement features, such as secure patient portals, appointment scheduling interfaces, and access to test results. These tools empower patients to participate more actively in their own care, fostering a shift toward shared decision-making and greater adherence to treatment plans. By allowing patients to view their health data, track progress, and communicate directly with providers, EMRs can strengthen the provider–patient relationship and improve health outcomes (De Mesquita & Edwards, 2020).

Collectively, the capabilities of interoperable, telemedicine-integrated, and patient-centered EMR systems underscore their role as a transformative force in healthcare. They extend beyond clinical documentation to create an interconnected health ecosystem that supports continuity of care, broadens access, and enhances patient engagement. In this way, EMR adoption is aligned not only with operational efficiency goals but also with broader health system objectives such as universal health coverage, equity, and quality improvement.

2. Literature Review

Two prominent theoretical frameworks often guide research on Electronic Medical Record (EMR) adoption and its impacts: the Technology Acceptance Model (TAM) and the DeLone and McLean Information Systems Success Model (DeLone & McLean, 2003). The Technology Acceptance Model, developed by Davis (1989), emphasizes two central determinants of technology adoption at the individual level: perceived usefulness also known as the extent to which a person believes that using a particular system will enhance their job performance, and perceived ease of use or the degree to which a person believes that using the system will be free of effort (Himastuti et al., 2023). In the context of healthcare, these perceptions are particularly critical, as clinicians operate in high-pressure environments where any added complexity or inefficiency can have direct consequences for patient care. When applied to EMR adoption studies, the TAM has consistently revealed that healthcare professionals are more likely to embrace EMRs if they believe these systems will improve efficiency, reduce errors, and enhance patient safety. For example, Holden & Karsh (2010) demonstrated that physicians and nurses who perceived EMRs as supportive of their clinical workflow were more inclined to integrate them into daily practice, whereas systems perceived as cumbersome or disruptive met with resistance despite their potential benefits.

While TAM focuses primarily on individual acceptance, the DeLone and McLean Information Systems Success Model offers a more comprehensive, multidimensional framework for evaluating the overall performance and effectiveness of information systems at the organizational level. First proposed in 1992 and refined in 2003, this model identifies six interrelated dimensions of system success: system quality, information quality, service quality, use, user satisfaction, and net benefits (DeLone & McLean, 2003). System quality refers to the technical soundness and reliability of the system; information

quality concerns the relevance, accuracy, and timeliness of the data it provides; and service quality addresses the support services available to users, such as technical assistance and training. The model posits that these quality dimensions influence the extent and manner in which the system is used, which in turn shapes user satisfaction. Ultimately, both usage and satisfaction drive the realization of net benefits, which may include improved individual performance, enhanced organizational efficiency, and better decision-making outcomes.

Applied to EMR research, the DeLone and McLean model facilitates a broader analysis that goes beyond whether healthcare professionals are willing to use the system; it also considers how the technical robustness of the EMR, the quality of the data it generates, and the institutional support available to users affect both staff performance and patient service outcomes. For instance, even if clinicians are motivated to use an EMR, poor system reliability, incomplete patient data, or inadequate technical support can hinder performance and limit the system's contribution to service quality. Conversely, a well-designed EMR with high-quality data and strong user support can amplify positive outcomes across the organization.

The complementary nature of these frameworks is particularly valuable in EMR adoption research. While TAM helps identify the psychological and behavioral factors influencing individual acceptance, the DeLone and McLean model provides a structure for evaluating systemic and organizational outcomes. Together, they offer a more holistic understanding of EMR implementation, enabling researchers to capture both the human and technical dimensions that determine success. This dual perspective is essential in healthcare contexts, where both individual clinician engagement and institutional infrastructure must align for EMR adoption to translate into measurable improvements in performance and service quality (Hillestad et al., 2005).

Empirical studies on EMR adoption and healthcare provider performance have consistently demonstrated positive impacts across diverse healthcare settings, though the magnitude and nature of these benefits often vary depending on the implementation environment. For example, Lucini et al. (2020) reported that physicians in U.S. hospitals using EMR systems exhibited higher adherence to evidence-based clinical guidelines, suggesting that real-time access to standardized protocols and decision-support tools can directly enhance clinical practice. This effect was particularly notable in chronic disease management, where adherence to long-term care plans is critical for patient outcomes. Similarly, Mosaybian & Jafari (2017) found in Saudi Arabia that EMR adoption significantly improved nurses' ability to document care accurately, communicate with other healthcare team members, and respond more promptly to patient needs. The availability of up-to-date patient data at the point of care reduced the time spent searching for information and allowed nurses to dedicate more time to direct patient interaction.

These findings are echoed in other regions. In Canada, Tajirian et al. (2020) observed that EMR use was associated with measurable improvements in patient safety indicators, including reduced rates of adverse drug events and improved monitoring of high-risk patients. In Thailand, Dilokthornsakul et al. (2016) found that EMR implementation in a tertiary hospital setting led to better compliance with infection control procedures and improved coordination between clinical and administrative staff. Such evidence reinforces the idea that EMRs do not merely digitize existing processes but actively reshape provider workflows that improve both efficiency and accuracy.

Research on EMR adoption and service quality has also yielded generally favorable results. Campanella et al. (2016), in a systematic review, concluded that EMR systems can improve the timeliness, reliability, and patient-centeredness of care by facilitating smoother information flow, eliminating redundant diagnostic testing, and enabling more coordinated treatment planning. Timeliness benefits are often seen in reduced patient waiting times for consultations, laboratory results, and prescription dispensing; reliability improvements stem from more consistent and legible documentation; and patient-centeredness is enhanced when providers have a holistic view of the patient's medical history, enabling more personalized care.

However, the literature also presents important cautionary findings. Yen et al. (2017) emphasized that without adequate training, stakeholder engagement, and workflow integration, EMR implementation can initially slow down service delivery. In some cases, clinicians experience increased documentation time and cognitive load, particularly during the early stages of transition from paper-based systems. Resistance to adoption may arise when staff perceive the system as disrupting established routines or when technical glitches undermine confidence in the technology. In resource-constrained settings, additional barriers such as unreliable internet connectivity, insufficient hardware, and lack of ongoing technical support can exacerbate these challenges.

The balance between these positive and negative outcomes underscores the complexity of EMR implementation. While evidence overwhelmingly supports the potential of EMR systems to improve provider performance and service quality, realizing these benefits depends on factors such as system design, user training, organizational readiness, and the alignment of technology with clinical workflows. These considerations are particularly relevant for regional hospitals in developing countries, where resource limitations and infrastructural variability can significantly influence both the adoption process and its ultimate impact. By examining the case of RSUD Sumedang, this study contributes empirical evidence from an Indonesian provincial hospital context, thereby adding nuance to the global discourse on EMR effectiveness.

Despite the breadth of global literature on EMR adoption, there remains a noticeable scarcity of research that quantitatively examines both provider performance and service quality within the context of Indonesian provincial hospitals. Much of the existing scholarship in Indonesia has tended to focus narrowly on qualitative accounts of user experiences, exploring perceptions of ease of use, perceived benefits, and barriers to adoption among specific professional groups, such as physicians or nurses. While these studies have provided valuable insights into attitudes and implementation challenges, they do not offer the robust statistical evidence needed to measure the magnitude of EMR's impact on key performance indicators. Furthermore, when quantitative analyses are conducted, they often concentrate on large, urban tertiary hospitals, with facilities that typically benefit from greater funding, advanced infrastructure, and dedicated health IT personnel. These conditions, while ideal for successful EMR deployment, are not representative of the operational realities in smaller, resource-constrained public hospitals that serve semi-urban or rural populations.

This gap is particularly significant because provincial hospitals in Indonesia occupy a crucial position in the national healthcare system. They function as referral centers for surrounding district hospitals and community health centers, often managing high patient volumes with limited technological and human resources. In such environments, the efficiency and accuracy of clinical documentation, the coordination between multidisciplinary teams, and the overall quality of service delivery can be directly influenced by the capacity of EMR systems to integrate seamlessly into daily operations (Khairat et al., 2020). However, without empirical data capturing these dynamics in provincial settings, policymakers and hospital administrators have limited evidence to guide decisions on technology investment, staff training priorities, and workflow redesign.

Moreover, there is a paucity of research that considers the collective performance of multidisciplinary healthcare teams such as specialist doctors, general practitioners, nurses, physiotherapists, nutritionists, and clinical pharmacists, rather than isolating individual professional categories. In practice, patient care in hospitals is inherently collaborative, requiring timely information exchange and coordinated interventions across departments. An EMR system's

true value lies in its ability to support this interconnected network of care providers, yet studies that explicitly measure this multidisciplinary dimension remain scarce.

Addressing this knowledge gap is not merely of academic interest; it has practical implications for advancing Indonesia's national digital health agenda, which emphasizes equitable access to technology-enabled healthcare across all regions. By focusing on RSUD Sumedang, a public hospital operating in a resource-limited context, this study offers evidence that is both contextually grounded and policy-relevant. It responds directly to the need for quantitative, multidisciplinary evaluations of EMR effectiveness in service environments that more closely reflect the majority of Indonesia's healthcare facilities, rather than the exceptional cases found in metropolitan tertiary hospitals.

3. Research Method

This study employed a descriptive–verificative research design with a quantitative approach. The descriptive component was intended to present an overview of the levels of Electronic Medical Record (EMR) adoption, Professional Care Provider (PCP) performance, and service quality in the outpatient department of RSUD Sumedang. The verificative component tested the hypothesized relationships between EMR adoption, PCP performance, and service quality through statistical analysis. This combined approach was selected because it enables both the characterization of current conditions and the evaluation of causal relationships between variables.

The study population comprised all PCPs working in the outpatient department of RSUD Sumedang, including specialist physicians, general practitioners, nurses, physiotherapists, nutritionists, and clinical pharmacists. A total sampling technique (census) was applied to ensure inclusion of all eligible PCPs, thereby reducing sampling bias and improving the precision of parameter estimation.

Data collection was conducted over a four-week period within the outpatient department. Prior to data collection, approval was obtained from the hospital's management and ethical clearance was granted by the institutional health research ethics committee. Printed questionnaires were distributed to eligible PCPs during their working hours. The objectives of the study, the voluntary nature of participation, and the measures to ensure confidentiality were explained to all respondents before obtaining written informed consent. Completed questionnaires were collected on the same day to optimize the response rate.

Two types of data analysis were employed. First, descriptive analysis was used to calculate mean scores and standard deviations for each variable; results were then categorized as "low," "moderate," or "high" based on predetermined score ranges derived from the Likert scale distribution. Second, inferential analysis was conducted using simple linear regression to examine the relationships between EMR adoption and each dependent variable (PCP performance and service quality). Before conducting regression analysis, assumptions of normality, linearity, homoscedasticity, and absence of multicollinearity were verified. The coefficient of determination (R^2) was used to determine the proportion of variance in the dependent variables explained by EMR adoption, with a significance level set at $\alpha = 0.05$.

4. Results

4.1. Descriptive Analysis

Descriptive statistics indicated that the level of EMR adoption in the outpatient department of RSUD Sumedang was categorized as good, with a mean score of 4.12 (SD = 0.41) on a five-point Likert scale. This suggests that most Professional Care Providers (PCPs) perceive the EMR system as well-integrated into their daily workflow.

PCP performance also achieved a good category, with a mean score of 4.09 (SD = 0.39), indicating that staff consistently met professional standards in patient care delivery. Similarly, service quality was rated good, with a mean score of 4.15 (SD = 0.37), reflecting timely, reliable, and patient-centered service delivery in the outpatient department.

4.2. Inferential Analysis

a. EMR Adoption and PCP Performance

Simple linear regression analysis revealed a statistically significant positive relationship between EMR adoption and PCP performance ($\beta = 0.790$, $p < 0.001$). The coefficient of determination (R^2) was 0.624, indicating that EMR adoption accounted for 62.4% of the variance in PCP performance. The remaining 37.6% was attributed to other factors such as staff training quality, workload distribution, and technological readiness of the institution.

b. EMR Adoption and Service Quality

Similarly, regression analysis showed that EMR adoption significantly influenced service quality ($\beta = 0.794$, $p < 0.001$), with an R^2 value of 0.630. This means that EMR adoption explained 63.0% of the variance in service quality, while the remaining 37.0% was influenced by factors such as staffing levels, workflow design, patient engagement strategies, and interdepartmental coordination.

4.3. Summary of Key Findings

The statistical results indicate a strong and statistically significant relationship between Electronic Medical Record (EMR) adoption and both Professional Care Provider (PCP) performance as well as service quality in the outpatient department of RSUD Sumedang.

For the relationship between EMR adoption and PCP performance, the β coefficient of **0.790** demonstrates a high degree of positive association, suggesting that higher levels of EMR adoption are closely linked to improved performance among healthcare providers. The coefficient of determination (**$R^2 = 62.4\%$**) shows that EMR adoption explains more than three-fifths of the variance in PCP performance, indicating substantial predictive power. The

p-value of **<0.001** confirms that this relationship is statistically significant at a high confidence level, meaning the observed effect is unlikely due to random variation.

Relationship	β Coefficient	R^2 (%)	Significance (p)	Interpretation
EMR → PCP Performance	0.790	62.4	<0.001	Strong positive and significant relationship
EMR → Service Quality	0.794	63.0	<0.001	Strong positive and significant relationship

Similarly, the relationship between EMR adoption and service quality yields a β coefficient of 0.794, which again reflects a strong positive association. The R^2 = 63.0% indicates that EMR adoption accounts for nearly two-thirds of the variation in service quality scores, underscoring its importance in shaping patient care experiences. The p-value of <0.001 reinforces the robustness of this relationship, confirming that the effect is highly significant.

Overall, the findings suggest that EMR adoption serves as a critical driver for enhancing both operational effectiveness and patient-centered service delivery. The nearly identical strength of associations with PCP performance and service quality further implies that EMR benefits are multidimensional, improving both the clinical and experiential aspects of care. However, the remaining 37–38% of unexplained variance indicates that other contextual, organizational, and human factors also contribute meaningfully to these outcomes.

5. Discussion

The results clearly demonstrate that EMR adoption exerts a substantial influence on both PCP performance and service quality in the outpatient department of RSUD Sumedang. The strong regression coefficients and high R^2 values obtained in this study underscore that the EMR system functions far beyond its original purpose as a digital storage solution; it has evolved into a strategic enabler that supports clinical decision-making, facilitates timely interventions, and improves the efficiency of administrative processes. By integrating EMR into routine workflows, RSUD Sumedang has created an environment where clinical information is accessible, accurate, and actionable at the point of care.

The uniformly "good" ratings across EMR adoption, PCP performance, and service quality indicate that this integration has been effectively managed and broadly accepted by the hospital's multidisciplinary workforce. This outcome mirrors global trends in digital health transformation, where EMR systems have been credited with streamlining patient care pathways, reducing treatment delays, and fostering stronger interprofessional collaboration (Miziara & Miziara, 2022). Such improvements are particularly important in outpatient settings, where rapid patient turnover requires swift and precise coordination between healthcare providers.

These findings align closely with previous empirical research. Rosyada & In'am (2023) documented a positive association between EMR use and physician adherence to evidence-based clinical guidelines, suggesting that well-structured electronic records can act as a clinical compass for practitioners. Similarly, Lucini et al. (2020) reported that EMR implementation in hospitals enhanced nurses' documentation accuracy and response times, thereby improving overall care responsiveness. The present study reflects these patterns, with PCPs at RSUD Sumedang reporting tangible benefits such as reduced duplication of diagnostic tests, faster retrieval of historical patient data, and better continuity of care across multiple visits.

In terms of service quality, the results are consistent with the conclusions of Campanella et al. (2016), who found that EMR systems positively influence healthcare timeliness, reliability, and patient-centeredness. At RSUD Sumedang, the enhanced service quality can be attributed to improved data availability, more efficient appointment scheduling, and quicker turnaround times for test results. Importantly, the integration of EMR into front-line service delivery allows administrative and clinical data to flow seamlessly between departments, minimizing communication breakdowns and enabling more responsive service to patients.

However, the fact that approximately 37% of the variance in both PCP performance and service quality remains unexplained by EMR adoption highlights that technology alone is not a panacea for all healthcare delivery challenges. Factors such as staff motivation, patient load, organizational culture, leadership commitment, and availability of complementary resources (e.g., sufficient medical equipment, trained support staff) continue to exert significant influence on outcomes. This underscores the multifactorial nature of healthcare performance improvement, where technological systems must be supported by human resource development, continuous quality improvement initiatives, and strong managerial oversight.

Several contextual factors within RSUD Sumedang may help explain the relatively high impact of EMR adoption observed in this study. First, workflow integration played a pivotal role in ensuring that the EMR system complemented rather than disrupted established clinical practices. During the planning phase, system designers and hospital administrators conducted workflow mapping exercises to identify points where digital processes could seamlessly replace or enhance paper-based tasks. This strategic alignment minimized resistance from staff, as the transition did not require a wholesale re-engineering of daily routines. By embedding EMR functionalities—such as order entry, progress note documentation, and prescription generation—into existing care sequences, the hospital reduced the risk of work slowdowns commonly associated with abrupt technological shifts. Second, staff engagement was prioritized throughout the implementation process. The hospital organized periodic feedback sessions and usability workshops where Professional Care Providers (PCPs) could share their experiences, report technical issues, and propose enhancements to the user interface. These participatory mechanisms not only generated valuable input for system optimization but also fostered a sense of ownership among end-users. Clinicians reported greater satisfaction with the system when they felt their feedback had a tangible influence on system modifications, thereby reinforcing long-term adoption. Third, strong administrative support was evident in the proactive measures taken by hospital management to ensure a robust technical infrastructure. This included timely procurement of adequate hardware, regular software updates to maintain system stability and security, and the establishment of a dedicated IT helpdesk for immediate troubleshooting. The presence of accessible technical support mitigated user frustration, particularly during the early stages of implementation, and contributed to sustained system reliability.

Despite these notable strengths, certain operational challenges persist that could affect the sustainability of EMR-related gains. One issue is internet bandwidth limitation, which occasionally reduces system responsiveness, especially during peak usage hours when multiple workstations access the server simultaneously. Slow response times can interrupt clinical workflows and diminish the perceived efficiency of the EMR system. A second challenge involves hardware obsolescence, as some older workstations within the facility lack the processing capacity or display resolution to accommodate the

latest EMR software updates. This hardware disparity creates inconsistencies in user experience across departments. Finally, varying levels of digital literacy among PCPs remain a barrier to uniform EMR utilization. While younger staff members or those with prior exposure to health information systems adapt quickly, others require more intensive training and ongoing mentorship to fully leverage the system's capabilities. Addressing these challenges will require a combination of infrastructural investment, targeted digital literacy programs, and continuous performance monitoring to ensure that EMR adoption continues to yield measurable improvements in provider performance and service quality over time.

The strong and statistically significant linkage between EMR adoption and both Professional Care Provider (PCP) performance and service quality observed in this study underscores the strategic value of sustained investments in digital health infrastructure. Beyond serving as a record-keeping platform, the EMR system at RSUD Sumedang functions as a critical enabler of clinical coordination, timely decision-making, and patient-centered care. This finding aligns with international evidence that well-implemented health information systems can translate technological resources into measurable improvements in clinical outcomes, operational efficiency, and patient satisfaction.

For RSUD Sumedang, sustaining and amplifying these benefits will require targeted interventions in several key areas. First, upgrading internet capacity is essential to ensure system stability during peak usage hours, when multiple concurrent logins can place substantial demands on network bandwidth. Reliable connectivity is a prerequisite for real-time access to patient records, especially in multidisciplinary settings where delays can compromise workflow continuity. Second, systematic hardware renewal will be necessary to maintain compatibility with evolving EMR software features and security patches. Hardware obsolescence not only limits functionality but can also exacerbate disparities in user experience, as staff working on outdated devices may encounter slower system response times or incomplete feature availability. Third, ongoing training programs must be institutionalized to enhance user proficiency across all professional groups. While initial onboarding sessions are effective for introducing basic functionality, sustained competence, particularly among less digitally literate staff, requires refresher courses, role-specific tutorials, and one-on-one technical mentoring. Such initiatives can also mitigate resistance to technological change by demonstrating tangible benefits in daily clinical practice. Fourth, reinforcing data security protocols is critical to safeguard patient confidentiality and maintain compliance with Indonesian health data protection regulations. As EMR systems consolidate vast amounts of sensitive health information, robust cybersecurity measures, including encrypted data storage, multi-factor authentication, and regular security audits, must be embedded into system governance frameworks (Sukmawati & Tarmizi, 2022). Addressing these strategic priorities will not only consolidate the gains already achieved through EMR adoption but also position RSUD Sumedang as a model for scalable, sustainable digital health transformation in Indonesia's provincial hospital network.

While the use of a total sampling method in this study strengthens the representativeness of the findings within the target population, certain limitations should be acknowledged to contextualize the results. The study was conducted in a single hospital setting, which is RSUD Sumedang, and focused exclusively on the outpatient department. Consequently, the generalizability of the results to other service areas, such as inpatient wards, emergency departments, or specialized clinics, may be limited. These other settings often operate under different workflow pressures, patient acuity levels, and staffing patterns, which could influence both the adoption process and the functional impact of Electronic Medical Records (EMR) on professional performance and service quality.

Furthermore, the study was situated in an urban-provincial hospital with a particular resource profile; rural or remote healthcare facilities may face distinct infrastructural constraints, such as limited internet connectivity, reduced IT support availability, and fewer opportunities for continuous training. These differences could significantly alter the relationship between EMR adoption and its organizational outcomes.

Another limitation relates to the exclusive reliance on quantitative survey data, which, while valuable for statistical testing, may not fully capture the nuances of healthcare providers' experiences, perceptions, and adaptive behaviors during EMR implementation. Future research could address this by integrating qualitative methodologies—such as in-depth interviews, focus groups, and observational studies—to uncover user perceptions, contextual challenges, and informal workarounds that quantitative measures may overlook. Building on these points, future research should aim to broaden the scope of EMR impact assessment by:

1. Expanding the study population to include inpatient units, emergency services, and rural health centers to capture variations across clinical contexts;
2. Conducting multi-site studies to improve generalizability and enable comparative analysis between facilities with differing resources and patient demographics; and
3. Employing mixed-methods designs to combine statistical evidence with rich, contextual insights, thereby offering a more comprehensive understanding of the facilitators and barriers to EMR optimization.

By addressing these gaps, subsequent investigations could generate evidence that is both contextually relevant and broadly applicable, informing policy and practice for more equitable and effective digital health transformation across Indonesia's diverse healthcare system.

6. Conclusion

This study provides empirical evidence that the adoption of Electronic Medical Records (EMR) has a significant and positive impact on both Professional Care Provider (PCP) performance and service quality in the outpatient department of RSUD Sumedang. The statistical analyses demonstrated strong relationships between EMR adoption and the measured outcomes, indicating that the system functions not only as a documentation tool but also as a catalyst for clinical efficiency, interdisciplinary coordination, and patient-centered care. The "good" ratings across all variables suggest that the hospital has achieved a relatively mature level of EMR integration, supported by deliberate workflow alignment, active staff engagement, and consistent administrative backing.

These findings are in line with global literature, reinforcing the view that EMR systems, when properly implemented and supported, can streamline healthcare processes, reduce redundancies, and improve both the timeliness and accuracy of service delivery. Importantly, the study also identifies local contextual factors—such as workflow integration, responsive feedback mechanisms, and adequate technical support—that appear to amplify the positive effects of EMR adoption in this setting.

Nevertheless, the research highlights that approximately one-third of the variance in PCP performance and service quality is attributable to factors beyond EMR adoption. This underscores the multifactorial nature of healthcare quality improvement, where technological infrastructure must be complemented by human resource capacity building, organizational culture development, and continuous process refinement.

For RSUD Sumedang, sustaining and enhancing the gains from EMR adoption will require strategic investments in internet bandwidth, hardware renewal, user training, and data security measures in compliance with national health data protection regulations. From a policy perspective, the study supports the prioritization of EMR expansion within Indonesia's health system digital transformation agenda, particularly in provincial and resource-constrained hospitals, where the potential for impact on care quality is substantial.

In summary, this research contributes to the limited body of quantitative evidence on EMR impact in Indonesian provincial hospital settings and provides actionable insights for hospital managers, policymakers, and health IT stakeholders. By building on these findings and addressing the identified limitations, future initiatives can further optimize EMR use, ultimately improving patient outcomes and operational efficiency across diverse healthcare environments.

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