

Implementation of E-Health Innovations in Primary Health Care Services in Sukabumi Regency

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ABSTRACT

Digital transformation in the health sector places Electronic Medical Records (EMR) as an important component in strengthening integrated primary health care services. This study aims to analyze the conditions of EMR implementation, its effectiveness in supporting the integration of primary health care services, and to formulate follow-up strategies in Community Health Centers (Puskesmas) in the Sukabumi Regency. The study uses a qualitative approach with a literature review and case study design. Data were collected through semi-structured in-depth interviews with key stakeholders at Puskesmas and documentation studies of policies and official reports related to EMR. Data analysis was conducted descriptively and analytically using the Input-Process-Output-Outcome (IPOO) framework. The results showed that the implementation of EMR at Puskesmas in the Sukabumi Regency has been running and supports the integration of primary health services, but it is not yet optimal. The use of EMR is still partial and not yet fully integrated between service units. Limitations in digital infrastructure, human resource competencies, and system instability are the main obstacles at the input and process stages. In terms of output, EMR has increased the speed and accuracy of medical records, with an average data delivery rate to the SATUSEHAT platform of 74.13%, indicating sufficient integration effectiveness. However, the use of EMR data for health analysis and evidence-based decision-making is still limited. This study recommends strengthening human resource capacity, digital infrastructure, standardizing SOPs, integrating with SATUSEHAT, and promoting cross-sectoral synergy among local governments.

INTRODUCTION

The digital transformation triggered by the Industrial Revolution 4.0 era has brought fundamental changes to public service systems, including the health sector. Advances in information and communication technology have driven a paradigm shift in healthcare services from conventional models to more integrated, data-driven, and patient-oriented systems. E-health innovation is seen as a strategic instrument in strengthening the primary health care system because it can improve service efficiency, expand access, and support continuity of patient care through the use of digital technology (Shifa, 2021; ThinkWell, 2025).

In the Indonesian context, Community Health Centers (Puskesmas) play a strategic role as the spearhead of primary health care and as the frontline for the implementation of national health policies. However, the challenges faced by Puskesmas are very complex and structural in nature. Indonesia's geographical condition as an archipelagic country, the uneven distribution of health workers between regions, limited facilities and infrastructure, and the increasing double burden of communicable and non-communicable diseases require an innovative approach to maintain the sustainability and quality of primary health services (WHO, 2020; Shifa, 2021). In this situation, the digitization of health services has become an urgent necessity, not just an additional innovation.

Classic problems still faced by Puskesmas include long service queues, a referral system that is not yet optimally integrated, limited monitoring of patients with chronic diseases, and administrative inefficiencies due to the use of manual medical records or systems that are not yet standardized. Various studies show that fragmented health information systems have an impact on low data quality, service delays, and limitations in evidence-based decision-making at the primary care level (Budiyanthi et al., 2023; Rosyari, 2025). Therefore, strengthening health information governance through the implementation of Electronic Medical Records (EMR) has become a priority in the national health system transformation agenda.

The COVID-19 pandemic has been an important momentum that has accelerated the adoption of e-health in Indonesia. Restrictions on community mobility have encouraged the use of telemedicine, online consultation services, and electronic medical records as solutions to maintain continuity of health services. Various studies have noted that the use of digital technology during the pandemic has improved access to health services, especially for vulnerable groups and communities in areas with limited physical access to health facilities (Fakih, 2022; ThinkWell, 2025). However, this accelerated adoption has also revealed various weaknesses in the system, particularly regarding infrastructure readiness, the digital competence of health workers, and data integration between platforms.

In response to these challenges, the Indonesian government, through the Ministry of Health, is promoting the nationwide implementation of Electronic Medical Records with the issuance of Minister of Health Regulation No. 24 of 2022 concerning Medical Records. This policy emphasizes the obligation of healthcare facilities to implement standardized EMRs that are integrated with the

national SATUSEHAT platform. EMR is expected to become the foundation for health data interoperability that supports integrated primary health services, improved clinical quality, operational efficiency, and a strengthened referral system (Indonesian Ministry of Health, 2022; Budiyanthi et al., 2023).

However, the implementation of EMR at the Puskesmas level still faces various multidimensional obstacles. In terms of input, limitations in digital infrastructure, such as unstable internet networks, limited server capacity, and uneven availability of hardware and software, remain major obstacles. In addition, the capacity of human resources, both health workers and cadres, in utilizing digital technology also shows significant variation between regions (Nurdinillah, 2024). This condition has resulted in a low level of optimal EMR utilization in supporting primary health services.

At the implementation stage, the challenges are not only technical but also organizational and cultural. Work culture adaptation, resistance to change, limited continuing education, and weak change management are factors that affect the effectiveness of EMR implementation in Puskesmas. In addition, interoperability between systems, including integration with the BPJS Kesehatan system and other health service applications, is still not optimal, thereby hampering the flow of integrated primary health services (Ma'rifatulloh, 2024; Quality Evaluation on the Implementation of EMR, 2023).

In terms of output, the implementation of EMR in Puskesmas has not yet fully produced complete, accurate, and optimally usable health data. Issues such as missing data, limited application features, and the lack of integration of all service units—such as laboratories, emergency units, POND, auxiliary Puskesmas, and community-based service networks—have resulted in the quality of health information produced not being optimal in supporting clinical and managerial decision-making (Rosyari, 2025; Nurdinillah, 2024).

This condition also impacts the outcome or impact of EMR implementation on the quality of primary health services. Although EMR has the potential to improve service efficiency, patient satisfaction, and continuity of care, these benefits have not been felt evenly by the community. Public access to digital health services is still limited, especially for non-BPJS Kesehatan participants, so digital transformation risks widening the gap in access to health services if it is not managed inclusively (ThinkWell, 2025).

At the regional level, including Sukabumi Regency, the challenges of implementing e-health are increasingly complex. Sukabumi Regency has a large geographical area with a diverse distribution of community health centers (Puskesmas), auxiliary community health centers (Puskesmas Pembantu), and integrated health service posts (posyandu). The Sukabumi Regency Health Profile data shows significant variations in digital infrastructure readiness and resource capacity between Puskesmas, which has an impact on the level of EMR utilization and primary health service integration (Sukabumi Regency Health Office, 2024). Additionally, the involvement of cadres and the community in the use of digital health services is still limited due to low digital literacy and minimal socialization of the EMR system at the community level.

Previous studies have proven the benefits of e-health and EMR in improving the quality and efficiency of primary health services, both nationally and internationally (Shifa, 2021; Budiyaniti et al., 2023). However, most studies still focus on policy aspects or partial implementation and have not comprehensively examined the relationship between input readiness, implementation process dynamics, system output quality, and their impact on primary health services. In addition, empirical studies that specifically evaluate the implementation of EMR at the Puskesmas level in districts with heterogeneous geographical and social characteristics, such as Sukabumi District, are still limited.

LITERATURE REVIEW

Electronic Medical Records (EMR) are a fundamental element in the digital transformation of modern healthcare systems. Conceptually, EMR is defined as a system for recording patient health information in digital format that replaces paper-based medical records, with the aim of improving the quality of clinical documentation, service efficiency, and continuity of patient care (Shifa, 2021). EMR is designed as a structured system that enables the integrated storage, management, and exchange of health data between service units and health facilities, thereby supporting data-driven clinical and managerial decision-making (Budiyaniti et al., 2023).

In Indonesia, the implementation of EMR has a strong legal basis through the Regulation of the Minister of Health of the Republic of Indonesia Number 24 of 2022 concerning Medical Records. This regulation emphasizes that EMR is a digital medical document that contains patient identity, clinical examination results, diagnoses, medical actions, nursing services, prescriptions, and referral and treatment histories. This regulation emphasizes that EMR is not merely a digitization of conventional medical records, but rather a health information system that must meet the principles of data security, information integrity, and interoperability between systems (Ministry of Health of the Republic of Indonesia, 2022). Thus, EMR becomes the main foundation in efforts to strengthen integrated primary health services.

Various studies show that the implementation of EMR contributes significantly to improving the effectiveness of health services. Fakih (2022) notes that the use of digital medical records can speed up administrative processes, reduce patient waiting times, and improve service flow efficiency, especially in primary health care facilities. In addition, EMR plays a role in improving the accuracy of medical data by reducing manual recording errors and data duplication, which have been major problems in paper-based medical record systems (Nurdinillah, 2024).

From a clinical perspective, EHRs support continuity of care by providing rapid and accurate access to patient health histories for medical personnel across service units. Access to complete and organized clinical information enables healthcare professionals to conduct comprehensive analyses of patient conditions and determine more appropriate treatment plans, especially in the management of chronic diseases and tiered referral services (Budiyaniti et al., 2023). A systematic study conducted by Shifa (2021)

also shows that e-health systems, including EMR, have a positive contribution to improving the quality of clinical decision-making and patient safety, when supported by a reliable system and competent human resources.

The implementation of EMR in Indonesia cannot be separated from the national health digital transformation agenda. The government, through the Ministry of Health, encourages the interoperability of health data across facilities by developing the SATUSEHAT national platform, which adopts international data exchange standards such as HL7-FHIR. The main objective of developing this platform is to build a national health information ecosystem that is integrated, secure, and can be used for population health analysis and evidence-based policy formulation (Budiyanti et al., 2023). However, a number of studies confirm that the success of this integration is highly dependent on the readiness of the EMR system at the primary health care facility level (Ma'rifatulloh, 2024).

Community health centers (Puskesmas) as primary health facilities have a strategic role in the national health system because they provide integrated promotive, preventive, curative, and rehabilitative services. In addition to providing individual services, Puskesmas are also responsible for managing public health data in their working areas, making the quality of the recording and reporting system a key factor in supporting health program planning and evaluation (Sukabumi District Health Office, 2024). In this context, EMR serves as an important instrument to ensure that all primary health care processes are documented in a standardized, consistent, and continuously accessible manner.

Although it has been mandated nationally, the implementation of EHR in Indonesia is still in a transitional phase. Juliansyah (2022) shows that most community health centers are still in the early stages of EHR adoption, with varying levels of system utilization between regions. These variations are influenced by various factors, including the readiness of technological infrastructure, human resource capacity, budget support, and local government policies.

The literature shows that the main challenges to the implementation of EMR at the national level include limitations in technological infrastructure, such as unstable internet networks, an insufficient number of computers and servers, and power supply disruptions in some areas. These conditions have a direct impact on the smooth operation of the EMR system and the quality of services provided to patients (Quality Evaluation on the Implementation of EMR, 2023). In addition, the inconsistency of EMR applications used between health facilities complicates the process of real-time data integration and exchange.

Another challenge that is widely discussed in the literature is the limited competence of human resources. Nurdinillah (2024) emphasizes that the low digital literacy of health workers and the lack of continuing education are significant obstacles to the optimal use of EMR. During the transition period, the process of inputting data into the EMR system is often considered

to add to the workload and prolong the duration of service, thereby causing resistance from some health workers (Ma'rifatulloh, 2024).

Apart from technical and human resource factors, organizational and change management aspects also influence the success of EMR implementation. Several studies note that the lack of strong leadership, weak coordination across service units, and the absence of clear standard operating procedures result in inconsistent data quality that is difficult to analyze in aggregate (Juliansyah, 2022). Resistance to changing from manual medical records to EMRs also remains a challenge, especially in health facilities with long-established work cultures.

Nevertheless, empirical evidence shows that EMR provides significant benefits when implemented in a planned manner and supported by adequate infrastructure and policies. EMR has been proven to improve administrative efficiency, reduce long-term operational costs, and strengthen health program reporting and monitoring systems (Budiyanti et al., 2023; ThinkWell, 2025). Standardized digital data also facilitates the collection of aggregate data for epidemiological surveillance and health facility performance evaluation.

The effectiveness of EHR in health services is generally measured through indicators of service speed, patient information integration, data accuracy and completeness, ease of reporting, and user satisfaction levels, both for health workers and patients (Nurdinillah, 2024). The literature emphasizes that this effectiveness is not only determined by the quality of technology, but also by policy support, organizational leadership, and the involvement of all stakeholders in the implementation process (ThinkWell, 2025).

In the context of Puskesmas, the strategies for strengthening the implementation of EMR recommended in the literature include improving information technology infrastructure, developing human resource competencies, integrating cross-sector systems, and standardizing data and operational procedures. Local government policy support, especially in terms of budgeting, monitoring, and evaluation of EMR implementation, is also seen as a key factor in ensuring the sustainability of the digital transformation of primary health services (Juliansyah, 2022; Ma'rifatulloh, 2024).

Based on this literature review, it can be concluded that EMR has great potential to improve the quality and effectiveness of primary health services in Puskesmas. However, its successful implementation is highly dependent on technical readiness, human resource capacity, organizational governance, and cross-sector policy support. Therefore, research evaluating the implementation and effectiveness of EMR at the Puskesmas level, particularly in the regional context, is important to provide empirical contributions to strengthening health digital transformation policies in Indonesia.

This study uses the Input-Process-Output-Outcome (IPOO) framework to analyze the implementation of Electronic Medical Records (EMR) in primary health care at Community Health Centers (Puskesmas). The IPOO model was chosen because it is able to explain the systematic relationship between initial resources, implementation mechanisms,

intermediate results, and the final impact of a policy or public service innovation, particularly in the context of digital health transformation.

At the input stage, the implementation of EMR is influenced by the availability of supporting resources, including information technology infrastructure, hardware and software, internet networks, and human resource readiness. In addition, policy and regulatory factors, such as the mandatory implementation of EMR and national interoperability standards, are institutional inputs that determine the direction and scope of implementation. Uneven input quality has the potential to cause gaps in the utilization of EMR between Puskesmas and impact the overall effectiveness of the system.

The process stage represents the operational mechanisms of EMR implementation in primary health care. This process includes the adaptation of service workflows, patient data entry and management, system integration between service units, and organizational change management. The success of the process is largely determined by the level of digital competence of health workers, the commitment of Puskesmas management, and ongoing technical support and assistance. At this stage, there is also interaction between the EMR system and work culture, which can lead to resistance or acceptance of digital innovation.

The output stage describes the direct results of the EMR implementation process, which are reflected in the availability of complete, accurate, and integrated electronic medical records. Outputs also include increased speed of administrative services, ease of access to patient information by health workers, and the availability of service data ready for use in health program reporting and monitoring. Optimal output is a key prerequisite for generating the expected impact in the next stage.

The outcome stage represents the impact of EHR implementation on the overall quality of primary health services. The expected outcomes include improved service effectiveness, operational efficiency of community health centers, continuity of patient services, increased satisfaction of health workers and the community, and strengthening of data-driven decision-making systems. In the medium and long term, these outcomes are expected to contribute to improving the quality of primary health services and strengthening the regional health system in a sustainable manner.

This IPOO framework emphasizes that the effectiveness of EMR implementation is not only determined by the availability of technology, but by the dynamic relationship between adequate inputs, adaptive implementation processes, quality system outputs, and measurable service outcomes. Thus, the evaluation of EMR implementation in Puskesmas needs to be conducted holistically and systematically in order to produce targeted policy recommendations.

Figure 1. Conceptual framework of EMR implementation in primary health care based on the Input-Process-Output-Outcome (IPOO) model with governance, leadership, and digital readiness as moderating/mediating factors.

INPUT • IT infrastructure (network, hardware, software) • Human resources (digital competence, training) • Policy and financial support	MODERATING / MEDIATING FACTORS • Governance (policy enforcement, inter-sector coordination) • Leadership (managerial commitment, vision, decision-making) • Digital Readiness (organizational readiness, digital culture, user acceptance) These factors influence the strength of relationships between IPOO components.
↓	
PROCESS • EMR data entry and management • Integration across service units • Change management and technical support	
↓	
OUTPUT • Accurate and integrated EMR data • Improved administrative efficiency • Data availability for reporting	
↓	
OUTCOME • Effectiveness of primary health care services • Operational efficiency • Clinical decision-making quality • Patient and provider satisfaction	

METHODOLOGY

This study uses a qualitative approach with a literature review and case study design to analyze the implementation of Electronic Medical Records (EMR) in primary health care at Community Health Centers in the Sukabumi Regency. A qualitative approach was chosen because it allows for in-depth exploration of the implementation process, organizational dynamics, and the experiences and perceptions of stakeholders that cannot be comprehensively explained through a quantitative approach (Creswell & Poth, 2018; Shifa, 2021).

A literature review was used to examine concepts, policies, and empirical findings related to EMR and digital health transformation, which foEMRd the basis for developing a conceptual framework based on Input-Process-Output-Outcome (IPOO) (Budiyanti et al., 2023). Case studies were conducted to explore the contextual implementation practices of EMR at the Puskesmas level, taking into account organizational characteristics, resources, and the regional policy environment (Yin, 2018).

The research data consisted of primary and secondary data. Primary data were obtained through semi-structured in-depth interviews with

informants directly involved in the implementation and utilization of EMR, including Puskesmas leaders, administrative managers, program coordinators, health workers, technical officers, and patients as service users. Secondary data were collected through a documentation study of regulations and official documents related to EMR and primary health care, which served to strengthen policy context analysis and data triangulation (Indonesian Ministry of Health, 2022; Budiyaniti et al., 2023).

Table Characteristics of Research Informants

No	Informant Category	Position/Role	Sampling Technique	Number of Informants	Inclusion Criteria	Role in EMR Implementation
1	Key Informant	Head of Primary Health Center	Purposive sampling	1 per PHC	Currently in position ≥ 1 year	Policy decision-making and strategic direction of EMR implementation
2	Key Informant	Head of Administration / Administrative Officer	Purposive sampling	1 per PHC	Responsible for administrative management and reporting	Administrative management and EMR data integration
3	Key Informant	Program Coordinator (e.g., MCH, Disease Control)	Purposive sampling	1-2 per PHC	Managing primary health care programs	Utilization of EMR for program planning and monitoring
4	Technical Informant	IT Officer / EMR System Administrator	Purposive sampling	1 per PHC	Managing EMR system and network	Technical operation, system maintenance, and troubleshooting
5	Main Informant	Physician	Quota sampling	± 5 per PHC	Actively using EMR in clinical services	Clinical data entry and decision-making
6	Main Informant	Nurse	Quota sampling	± 5 per PHC	Directly involved in patient care	Nursing documentation and EMR utilization
7	Main Informant	Midwife	Quota sampling	± 3 per PHC	Providing maternal and child health services	EMR use in maternal and child health services
8	Supporting Informant	Registration / Front Desk Officer	Quota sampling	± 2 per PHC	Managing patient registration	Initial patient data entry and administrative services
9	User Informant	Patients	Accidental sampling	± 150	Received EMR-based services	Perceptions of service quality and accessibility

Informants were selected using non-probability sampling. Purposive sampling was used to determine key informants who had a strategic role in decision-making and EMR management. Quota sampling was applied to health workers to ensure representation of EMR user professions, while accidental sampling was used to recruit patients to capture user perceptions of the quality and efficiency of EMR-based primary health services (Yin, 2018; Nurdinillah, 2024).

Data analysis was conducted using descriptive-analytical qualitative methods based on the IPOO framework, through the stages of data reduction, data presentation, and conclusion drawing. The analysis focused on identifying the input, process, output, and outcome factors of EMR implementation. Data validity was maintained through source and method triangulation, by comparing interview results between informants and confronting primary data with policy documents and official reports (Miles et al., 2019; Creswell & Poth, 2018).

DISCUSSION

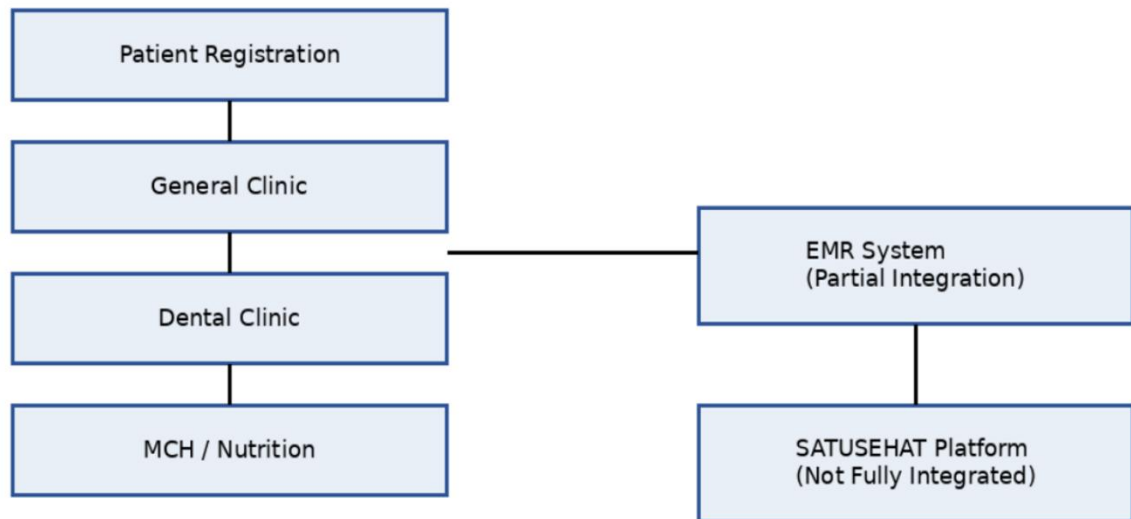
1. Conditions for the Implementation of Electronic Medical Records (EMR) in the Integration of Primary Health Services

The results of the study show that the implementation of Electronic Medical Records (EMR) in Community Health Centers (Puskesmas) in the Sukabumi Regency has been running and contributing to the integration of primary health services, but has not yet reached an optimal level. These findings confirm that EMR is still functioning partially, with varying levels of utilization between service units such as registration, general clinics, dental clinics, maternal and child health, nutrition, and pharmacy. This condition has resulted in patient data flow not being fully integrated end-to-end, thereby limiting the continuity of clinical information. These findings are in line with previous studies which stated that in the early stages of digital transformation, EMR systems in primary health facilities tend to be used inconsistently due to differences in the readiness of service units and supporting resources.

From the input perspective of the IPOO framework, technological infrastructure limitations are a major factor affecting EMR conditions in Puskesmas. Unstable internet access, insufficient numbers of computers in some clinics, and limited IT personnel have a direct impact on data input delays and service disruptions. These findings reinforce the argument in the literature that the successful implementation of EMR is highly dependent on the readiness of digital infrastructure and adequate technical support, especially in primary health care facilities with a high service load.

Nevertheless, from the user's perspective, health workers acknowledge that EMR has provided tangible benefits, particularly in displaying patient visit histories, increasing the speed of recording, and improving the accuracy of medical documentation. This indicates that functionally, EHR has supported the goal of primary health integration, but its effectiveness is still limited by technical constraints, human resource competencies, and uneven system utilization across service units.

Figure 2. Partial Integration of Electronic Medical Records in Primary Health Care



As shown in Figure 2, the implementation of electronic medical records in primary health care facilities is still partial, with varying levels of utilization between service units. This fragmented data flow limits the continuity of comprehensive clinical information and explains why the implementation of EMR, although functional, has not yet achieved an optimal level of integration.

2. The Effectiveness of Primary Health Integration Services on the Utilization of EMR

The effectiveness of primary health care integration through EMR can be analyzed through indicators of service speed, data accuracy, inter-unit integration, and data utilization for decision making. The findings show that EMR can accelerate the recording process and facilitate access to patient medical records in most clinics. This is consistent with the literature, which states that the digitization of medical records can reduce administrative time and improve the efficiency of service flows in primary health facilities.

In terms of output, the use of EMR has been shown to improve data accuracy by minimizing manual recording errors, loss of archives, and data duplication. Data on maternal and child health, non-communicable diseases, and outpatient services have become easier to trace and analyze. However, the effectiveness of integration has not been fully optimized because not all service units utilize EMR consistently. Delays in data input due to long patient queues, uneven adaptation of technology among health workers, and the lack of integration of pharmacy, laboratory, and several polyclinic systems are the main obstacles.

Supporting quantitative findings in the form of EMR data delivery to the SATUSEHAT platform show an average of 74.13% during the monitoring period in September 2025. This achievement indicates that data integration has been running quite well, but fluctuations between weeks—especially a significant decline in the third week—indicate that there is still system

instability and dependence on daily operational conditions. Analytically, this achievement places the effectiveness of EMR integration in the “fairly effective” category, in line with previous study findings stating that national integration requires consistency in data input and system stability at the service facility level.

In addition, although several EMR feature indicators have been connected to SATUSEHAT, there are still service units that have not been optimally bridged. This can be seen from the limitations of the real-time reporting feature and the use of the family health dashboard. As a result, EMR data has not been fully utilized as a basis for family health analysis, early disease detection, and evidence-based intervention planning at the Puskesmas level. These findings reinforce the argument that the digitization of medical records does not automatically result in data-driven decision making without adequate analytical and data management capabilities.

Figure 3. Effectiveness of Primary Health Care Integration through EMR Utilization

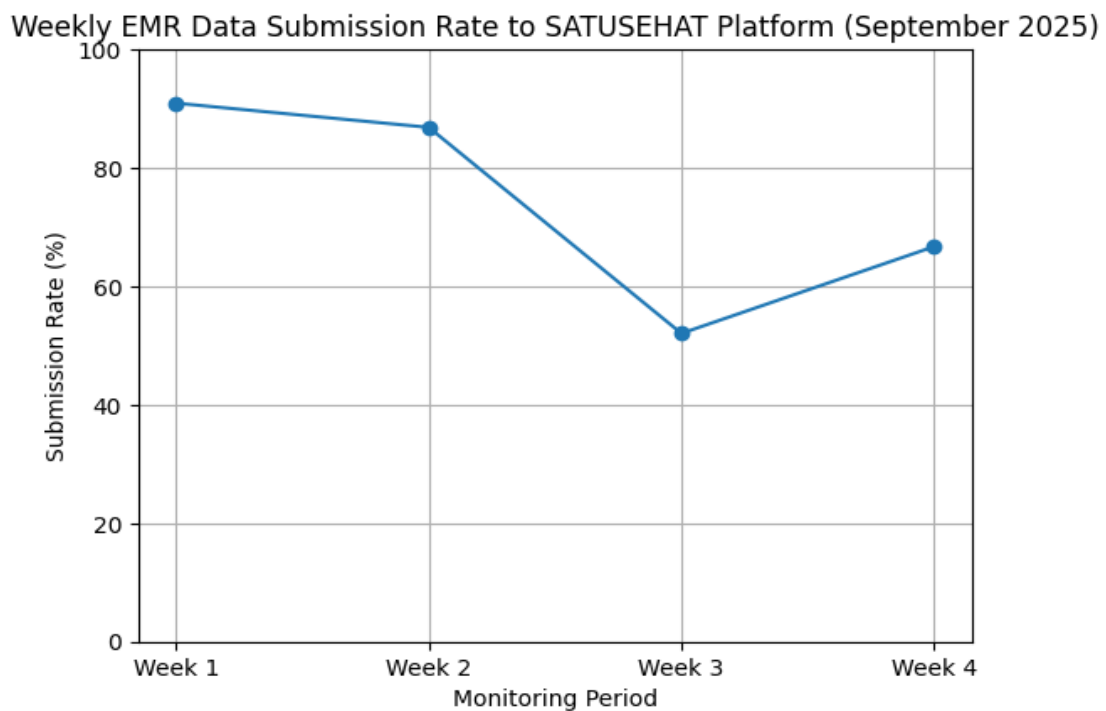


Figure 3 illustrates the effectiveness of primary health care integration through the use of EMR, as assessed in terms of service speed, data accuracy, inter-unit service integration, and the level of interoperability with the national SATUSEHAT platform..

3. Puskesmas Follow-up Strategy and Cross-Sector Support of Local Government

Based on the research findings, strengthening the implementation of EMR requires an integrated follow-up strategy between Puskesmas and local governments. At the Puskesmas level, the main strategy focuses on

strengthening processes within the IPOO framework. Regular and ongoing training related to the use of EMR, feature updates, and digital data management is an urgent need to improve the competence of health workers. In addition, the addition of computer equipment and improvement of internet network quality in all service units are necessary to ensure consistency of data input and smooth service flow.

The uniform application of EMR standard operating procedures (SOPs) in all clinics is also an important factor in improving data quality and consistency. Clear SOPs related to filling times, input standards, and EMR usage flow will reduce variations in practice between service units. Furthermore, optimizing the use of EMR data for health program planning, case mapping, and disease trend analysis needs to be encouraged so that EMR functions not only as a recording tool but also as a data-driven decision-making instrument. Internal monitoring and evaluation through periodic digital data audits are important mechanisms for maintaining the quality of system output.

At the local government level, cross-sector support is a determinant of the sustainability of EMR implementation. The integration of the Puskesmas EMR with the national SATUSEHAT platform needs to be continuously strengthened so that health data is more standardized and interoperable. The provision of a special budget for the digitization of Puskesmas, including the procurement of hardware, increased internet bandwidth, and system maintenance, is a key prerequisite for improving input readiness. In addition, regular technical assistance from regional IT teams is needed to overcome operational obstacles and ensure system stability.

The development of regional regulations related to EMR standards, data security, and digital health information governance is also a strategic necessity. Cross-sector cooperation between the Health Office, the Communication and Information Office, and the Regional Development Planning Agency (Bappeda) needs to be strengthened so that health digitization is integrated into the regional development roadmap. This synergy will strengthen medium- and long-term outcomes in the form of increased effectiveness of primary health services, operational efficiency of community health centers, and strengthening of a sustainable regional health system.

Figure X. Integrated Follow-up Strategy for EMR Implementation in Primary Health Care

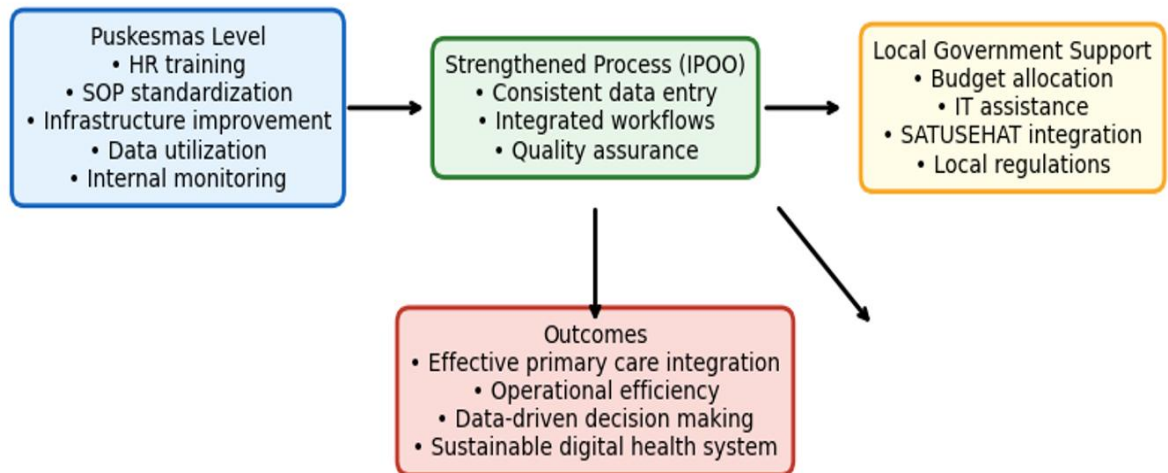


Figure 4 presents an integrated follow-up strategy to strengthen the implementation of EMR in primary health care through internal strengthening of community health centers, process improvement, and cross-sectoral support from local governments to achieve sustainable digital transformation in health care.

4. Theoretical and Practical Implications

Theoretically, the findings of this study reinforce the relevance of the IPOO framework in analyzing the implementation of EMR in primary health care, by demonstrating the dynamic relationship between input, process, output, and outcome. Practically, this study provides an empirical picture of the conditions of EMR implementation at the regional level as well as concrete strategies that can be adopted by community health centers and local governments to improve the effectiveness of digital-based primary health care integration.

CONCLUSION

This study concludes that the implementation of Electronic Medical Records (EMR) in Community Health Centers in the Sukabumi Regency has supported the integration of primary health services, but its effectiveness is still limited. EMR has improved the speed and accuracy of medical records, but its utilization has not been optimal due to limitations in infrastructure, human resource competencies, and uneven integration between service units. Based on the IPOO framework, the main obstacles lie in the input and process aspects, which have an impact on the quality of primary health care services' output and outcome. Overall, the effectiveness of primary health care service integration through EMR is in the “moderately effective” category. Community health centers need to strengthen human resource capacity through training and assistance in using EMR. Local governments need to support digital infrastructure, standardize SOPs, and strengthen the integration of EMR with the

SATUSEHAT platform. In addition, cross-sector synergy needs to be improved so that the digital transformation of health care is sustainable and data-driven.

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