

The Impact of Electronic Medical Record Implementation on the Effectiveness of Healthcare Services at Karang Sari Public Health Center

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Abstract. Community health centers (Puskesmas), as primary-level healthcare facilities, bear a significant responsibility in providing essential medical services. The ongoing digital transformation, particularly through the implementation of integrated Electronic Medical Record (EMR) systems such as SIMPUS, aims to enhance service delivery. This study seeks to evaluate the impact of EMR implementation on service effectiveness at Karang Sari Community Health Center. A quantitative method with a descriptive approach was employed. The population consisted of all patients, with a random sample of 20 respondents selected. Data were collected through questionnaires, observation, literature review, and interviews, and analyzed using SPSS version 25. Validity and reliability tests indicated that the research instrument was both appropriate and consistent ($r_{\text{calculated}} > r_{\text{table}}$; Cronbach's $\alpha = 0.930$). Correlation analysis showed a very strong relationship between EMR implementation and service effectiveness, with a correlation coefficient of $r = 0.994$ ($p < 0.01$). Regression analysis revealed that EMR implementation could potentially increase service effectiveness by a coefficient of 1.226, with the independent variable contributing 98.9% to the variation in service effectiveness ($R^2 = 0.989$). Despite the proven effectiveness and highly significant impact of EMR systems at Karang Sari Community Health Center, several technical challenges were identified, including network instability, automatic credential storage issues, and the absence of electronic signature features. Recommendations include enhancing data security, improving network infrastructure, and incorporating digital signature functionality to ensure data availability, confidentiality, and integrity. These improvements are expected to further optimize EMR implementation and improve the quality of healthcare services at the Puskesmas.

Keywords: *Implementation, Electronic Medical Records, Service Effectiveness*

Introduction

According to the Regulation of the Minister of Health No. 43 of 2019, a Puskesmas (community health center) is a primary-level healthcare facility responsible for delivering essential health services to both individuals and communities in a comprehensive manner. Puskesmas play a crucial role in ensuring optimal healthcare services and hold the authority and responsibility to safeguard the health of the population within their jurisdiction. In conducting its operational activities, one of the key professional personnel required is a medical record officer (Tigrid & Hidayati, 2021).

To improve the quality of healthcare services, Puskesmas require various forms of support, including the proper management of medical records. The digitalization of patient registration processes facilitates the recording of medical information, examination results, and treatment plans within healthcare facilities (Siregar, 2024). These efforts aim to promote health, prevent illness, provide treatment, and enhance public well-being, particularly for communities in need of essential healthcare services offered by Puskesmas.

Healthcare technology transformation in Indonesia has been reflected in the development and adoption of digital systems and biotechnology, notably through the use of Electronic Medical Records (EMRs). EMRs play a critical role in today's healthcare delivery systems, containing key patient information such as identification, medical history, examination results, and records of clinical actions or treatments (Regulation of the Minister of Health No. 24 of 2022). The implementation of EMRs has already been adopted by several hospitals and community health centers across Indonesia (Wati, 2024).

The implementation of EMRs involves several core activities, including patient registration, data distribution, clinical documentation, data processing, insurance claims documentation, data storage, quality assurance, and the transfer of medical records. It is vital for service providers to uphold data security principles—ensuring the confidentiality, integrity, and availability of information. EMRs offer broad benefits, not only for healthcare professionals and patients but also in strengthening the overall healthcare system (Wati, 2024).

SIMPUS is an application specifically developed for use in Puskesmas, designed to align with the center's operational capacities and needs. It functions as a

management information system that supports administrative processes and helps achieve operational targets (Putra et al., 2020). The system includes features for patient registration, medical record documentation, treatment services, and billing processes (Pusparani, 2023).

Service effectiveness refers to the extent to which an organization can carry out its duties, programs, or mission in line with set objectives. In the healthcare context, effectiveness is linked to how successfully services preserve, improve, and restore health while also preventing and treating diseases—delivered in a timely manner and with positive impact on individuals, families, communities, and society (Zubaidah & Tua, 2021). To assess healthcare service effectiveness, this study employed interviews and questionnaires, using three indicators from Hamrana et al. (2022): timeliness, delivery method, and accuracy.

The development of the e-Puskesmas system plays a strategic role in enhancing service quality by facilitating data access and enabling online reporting to the local Health Office in a more efficient manner (Sari, 2024). At Puskesmas Karang Sari, the implementation of e-Puskesmas is generally running well, although several issues such as network instability and system errors persist. To ensure optimal system performance, complete and accurate data entry from the beginning is crucial. While the system has been deployed across all outpatient units, occasional network issues hinder the immediate accessibility of patient records at service points, disrupting smooth service delivery.

Puskesmas Karang Sari has adopted an EMR system as part of its digital health services. However, implementation challenges remain, including limited staff understanding, unreliable internet connectivity, and mismatches between SIMPUS features and service requirements. Additionally, fragmented service workflows contribute to delays in healthcare delivery. Therefore, an evaluation is needed to measure the effectiveness of EMR implementation. This study aims to assess “The Effect of Electronic Medical Record Implementation on Service Effectiveness at Karang Sari Community Health Center.

Methodology

3.1. Research Design

This study applied a quantitative research method with a descriptive approach, aiming to examine the effect of Electronic Medical Record (EMR) implementation on service effectiveness at Karang Sari Community Health Center (Puskesmas). The research process was guided by the systematic procedures of scientific inquiry as described by Sugiyono (2022).

3.2. Population and Sampling Technique

The population of this study consisted of all patients receiving health services at Puskesmas Karangsari. Based on Handayani (2020), a population includes all elements—individuals, events, or objects—that share common characteristics relevant to the study. Although saturated sampling could be used to represent the population fully (Sugiyono, 2020), this study employed random sampling, selecting 20 patients randomly to participate by completing the questionnaire.

3.3. Data Collection Methods

Data were collected using a combination of techniques:

- Questionnaires, distributed to randomly selected patients,
- Direct observations of the health service process at Puskesmas Karangsari,
- Literature review (library research) involving relevant journals, books, and government regulations,
- Interviews with patients to gather qualitative insights complementing the quantitative data.

3.4. Research Instruments and Validity Testing

The research instrument was tested for validity to ensure it accurately measured the intended variables. An instrument is considered valid if the correlation coefficient ($r_{\text{calculated}}$) exceeds the r_{table} value. In this study, all items met this criterion.

3.5. Reliability Testing

Reliability testing was conducted using Cronbach's Alpha. A coefficient (α) of 0.930 was obtained, indicating a high level of internal consistency, which suggests that the instrument used was reliable.

3.6. Data Analysis Techniques

Data were processed and analyzed using SPSS version 25, employing the following statistical tests:

- Validity Test: To evaluate whether the items accurately reflect the intended variables.
- Reliability Test: To assess the consistency of the measurement instrument.
- Simple Linear Regression Analysis: To assess the impact of the independent variable (EMR implementation) on the dependent variable (service effectiveness).

- Coefficient of Determination (R^2): To measure the proportion of variance in the dependent variable explained by the independent variable.

Results and Discussion

Data Analysis Results

The following are the results of data analysis obtained through processing using SPSS version 25.

Validity Test Results

The validity test aims to evaluate the extent to which each question in the questionnaire accurately measures the concept or construct intended in the study.

Table 1. Validity Test Results for Variables X and Y

	Item-Total Statistics			
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
X01	22.25	11.145	.830	.921
X02	22.50	9.947	.753	.923
X03	22.50	8.684	.890	.905
Y01	22.25	11.145	.830	.921
Y02	22.50	9.947	.753	.923
Y03	22.50	8.684	.890	.905

Thus, with degrees of freedom (df) = $N - 2$, the result is $df = 20 - 2 = 18$. Based on this, the critical value of r_{table} for $df = 18$ is 0.378. It can be concluded that all six statements used as research instruments are valid, as each item has an r_{table}

greater than the r_{tabel} value. The detailed r_{tabel} values can be found in the Item-Total Statistics table. Based on the Aspect of Duties or Functions.

Table 2. Reliability Test Results for Variables X and Y

tabel r:

18	0.3783	0.4438	0.5155	0.5614	0.6788
19	0.3687	0.4329	0.5034	0.5487	0.6652
20	0.3598	0.4227	0.4921	0.5368	0.6524

The results of the reliability test using SPSS version 25 showed a Cronbach's Alpha value of 0.930, with a total of 6 questionnaire items (N of Items = 6). According to Priyatno (2013, p. 30), a questionnaire is considered reliable if the Cronbach's Alpha value exceeds the threshold of 0.60. Based on this result, it can be concluded that the responses for each item in the questionnaire are reliable (consistent), as the obtained Cronbach's Alpha value of $0.930 > 0.60$.

Table 3. Correlation Test Results Between Variable X and Variable Y

		Correlations	
		Efektivitas Pelayanan	Rekam Medis Elektronik
Efektivitas Pelayanan	Pearson Correlation	1	.994**
	Sig. (2-tailed)		.000
	N	20	20
Rekam Medis Elektronik	Pearson Correlation	.994**	1
	Sig. (2-tailed)	.000	
	N	20	20

**. Correlation is significant at the 0.01 level (2-tailed).

The dependent variable (X: Electronic Medical Records) and the independent variable (Y: Service Effectiveness) have a correlation coefficient value of 0.994, which falls within the range of 0.80–1.000. According to Sugiyono (2013, p. 213), this indicates a very strong degree of relationship based on the interpretation of the correlation coefficient. In this study, the significance level was set at $\leq 5\%$ (0.05) prior to conducting the statistical test, as suggested by McCall (1975). The result of the Pearson Product Moment correlation test shows a significance value (p-value) of 0.00, which is less than 0.05, indicating that the relationship between the dependent and independent variables is statistically significant.

Simple Linear Regression Test Results

The simple linear regression test was used to determine the effect of the independent variable (X) on the dependent variable (Y).

Table 4. Simple Linear Regression Test Results of Variable X on Variable Y

Model	Coefficients ^a				
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	1.606	.414		3.879	.001
Rekam Medis Elektronik	1.226	.031	.994	40.194	.000

a. Dependent Variable: Efektivitas Pelayanan

Simple Linear Regression Analysis

The results of the simple linear regression test show a constant value of 1.606 and a regression coefficient for variable X of 1.226, resulting in the following regression equation:

$$Y = 1.606 + 1.226X$$

This equation indicates that for every 1% increase in the value of X (EMR implementation), the value of Y (service effectiveness) increases by 1.226 units. Since the regression coefficient is positive, it can be concluded that there is a positive relationship between the independent and dependent variables.

Hypothesis Testing

Hypothesis testing aims to verify the truth of the research assumptions, particularly to determine whether there is a significant effect or relationship between the independent variable (X) and the dependent variable (Y).

Table 5. Hypothesis Test Results for Variable X on Variable Y

Model	Coefficients ^a				
	Unstandardized Coefficients		Standardized Coefficients		Sig.
	B	Std. Error	Beta	t	
1 (Constant)	1.606	.414		3.879	.001
Rekam Medis Elektronik	1.226	.031	.994	40.194	.000

a. Dependent Variable: Efektivitas Pelayanan

It was found that the T_{hitung} value was 40.194, with a significance level (α) of 10% (0.1) using a two-tailed test and degrees of freedom (df) = $N - 2 = 20 - 2 = 18$. Based on the statistical table, the critical t_{table} value at $df = 18$ is 1.734. The research hypothesis (H_1) is accepted and the null hypothesis (H_0) is rejected if

$$T_{hitung} > T_{tabel}$$

Based on the results above, it can be concluded that the research hypothesis (H_1)—stating that variable X affects variable Y—is accepted, and the alternative (null)

hypothesis (H_0) is rejected, because T_{hitung} (40.194) > T_{tabel} (1.734).

tabel t:

18	0.68836	1.33039	1.73406	2.10092	2.55238	2.87844	3.61048
19	0.68762	1.32773	1.72913	2.09302	2.53948	2.86093	3.57940
20	0.68695	1.32534	1.72472	2.08596	2.52798	2.84534	3.55181

Coefficient of Determination (R^2) Test Results

The coefficient of determination test was conducted to determine the extent to which the independent variable (X) is able to explain the variation in the dependent variable (Y).

Table 6. Coefficient of Determination (R^2) Test Results for Variable X on Variable Y

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.994 ^a	.989	.988	.250

a. Predictors: (Constant), Rekam Medis Elektronik

Coefficient of Determination Analysis

Based on the results processed using SPSS version 25, the coefficient of determination (R^2) shown in the R Square column is 0.989 or 98.9%. This means that variable X (Electronic Medical Records implementation) has a 98.9% influence on variable Y (service effectiveness), while the remaining 1.1% is influenced by other factors or variables not examined in this study.

Confidentiality Indicator

Confidentiality refers to the protection of data and information from threats that may originate from either internal or external sources. Its purpose is to ensure that the information and data contained within electronic medical records remain secure and are not misused in their access, use, or dissemination (Ministry of Health Regulation No. 24 of 2022).

Below is the login interface of the E-Puskesmas system used at Puskesmas Karangsari:

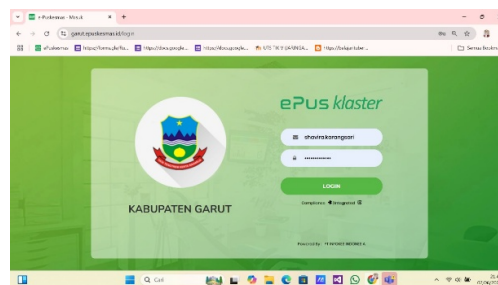


Figure 1. Login Interface of the E-Puskesmas System at Puskesmas Karangsari

Confidentiality Aspect in Electronic Medical Records

The purpose of confidentiality in electronic medical records (EMRs) is to protect patients' health information from unauthorized access or use. By implementing robust security measures—such as data encryption, role-based access control, and audit trails—sensitive data such as medical history, laboratory results, and personal details

can be safeguarded. These efforts not only maintain patient privacy and the reliability of medical data but also prevent potential misuse of information and ensure compliance with applicable legal and regulatory standards.

On the main page of the E-Puskesmas system at Puskesmas Karangsari, access to EMRs is restricted to authorized users with valid usernames and passwords, thereby preventing unauthorized parties from retrieving the data. According to interviews with staff, data security and confidentiality are well maintained due to features such as automatic logout. However, they acknowledged that some users activate auto-fill account login, which increases the risk of unauthorized access to electronic medical records.

Integrity Indicator

Integrity refers to efforts to ensure that the information and data contained in EMRs remain accurate and can only be modified by authorized personnel (Ministry of Health Regulation No. 24 of 2022).

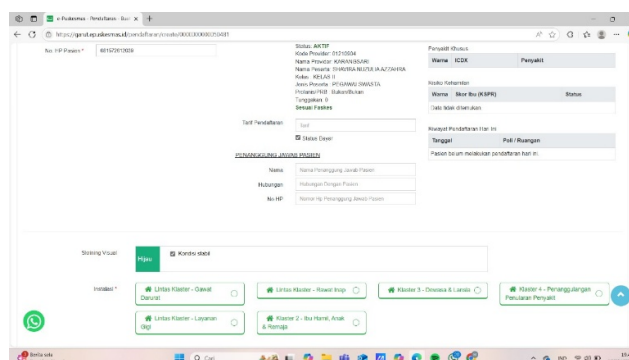


Figure 2. Integrity Display of the E-Puskesmas System at Puskesmas Karangsari

Integrity in Electronic Medical Records

Integrity in electronic medical records encompasses the authenticity, completeness, and security of data, ensuring it is resistant to unauthorized alterations or manipulations, and remains accurate and reliable. At Puskesmas Karangsari, the E-Puskesmas system functions as an integrated platform composed of various modules, including Registration, Medical Services, Emergency Cluster, Dental Services Cluster, Inpatient Services Cluster, Adult and Elderly Cluster, Maternal, Child, and Adolescent Health Cluster, Communicable Disease Control Cluster, and Reporting.

This modular integration demonstrates a strong internal system cohesion that supports data integrity and facilitates the seamless exchange of medical information across service functions within a unified platform.

Availability

Availability refers to the assurance that individuals who have been granted access rights by the authorized healthcare provider can reliably access and utilize the data and information stored within the system (Ministry of Health Regulation No. 24 of 2022).

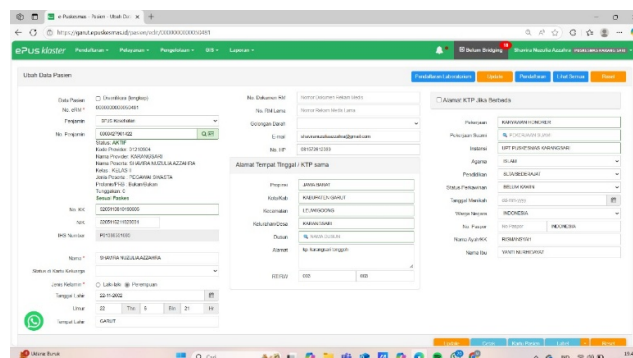


Figure 3. Availability Display of the E-Puskesmas System at Puskesmas Karang Sari

Availability Aspect

The availability aspect in the E-Puskesmas system refers to the system's ability to store and access data effectively and efficiently. The availability of electronic medical records is crucial as it enables doctors and healthcare staff to quickly and accurately access patient information, thereby supporting appropriate clinical decision-making. The electronic medical record system used at Puskesmas Karang Sari is web-based, allowing data to be accessed at any time with speed and accuracy. However, a notable limitation is the absence of electronic signature features for both doctors and patients, as the required facilities to support digital signing are not yet available.

Timeliness Indicator

Timeliness refers to the extent to which services at Puskesmas Karang Sari are delivered according to scheduled times and predetermined durations, such as patient registration, medical consultations, and prescription delivery. However, in practice, several obstacles are encountered—for example, high patient waiting times due to the absence of an online queuing system, frequent accumulation of queues, and the lack of a Standard Operating Procedure (SOP) regulating maximum service duration. These factors lead to a gap between the ideal service time and actual performance in the field.

Service Delivery Indicator

The service delivery aspect includes the clarity of information provided to patients, courtesy in interactions, and the understandability of service procedures. However, based on observation and patient feedback, several issues were noted, such as prolonged waiting times causing discomfort and inconsistency in communication among staff members. As a result, patients often experience confusion regarding the registration flow, consultation, and prescription pickup processes.

Accuracy Indicator

The accuracy indicator in this study reflects the researcher's diligence and attentiveness in managing data—ranging from questionnaires and observational results to interview transcripts. This is critical to ensure that all data entries are accurate and free from errors that may distort findings. At Puskesmas Karangsari, several challenges have been identified, including incomplete questionnaire forms, observational notes mixed with subjective opinions, and inconsistent recording of patient conditions, especially when data collection locations or times shift. These issues have the potential to reduce the overall quality and reliability of the collected data.

Conclusion

Overall, the implementation of Electronic Medical Records (EMRs) at Puskesmas Karangsari is supported by the SIMPUS-based e-Puskesmas system, which is structured through modules for registration, medical services, data management, GIS, and reporting. This structure has enhanced the effectiveness and integrity of service data. While data security—particularly confidentiality—is reasonably maintained through username/password login and automatic logout features, risks still arise due to the use of auto-fill credential storage.

The system's internal integration helps preserve data integrity, although network limitations occasionally disrupt real-time data availability, and the lack of electronic signatures remains a concern. Based on statistical analysis using SPSS version 25—including validity, reliability, correlation, regression, and coefficient of determination tests—it was found that EMR implementation has a very strong positive impact on service effectiveness ($r = 0.994$; $R^2 = 98.9\%$).

Thus, although the system is operating fairly optimally, technical improvements are still needed—such as enhancing credential security, adding digital signature features, and upgrading infrastructure—to fully optimize the performance of EMR-based healthcare services at Puskesmas Karangsari.

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