



System Performance, Healthcare Workers' Behavior, and Electronic Medical Record Completeness

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Abstract

Background: Incomplete electronic medical record (EMR) documentation may compromise clinical communication, administrative processes, and data quality. Evidence from Indonesian hospitals remains limited regarding the joint association of system-related and user-behavior factors with documentation completeness. **Objective:** To examine the associations of system performance and healthcare workers' behavior with EMR completeness at Toeloengredjo Hospital, Kediri. **Methods:** This cross-sectional study included 132 of 196 inpatient healthcare workers selected through proportional random sampling. System performance, healthcare workers' behavior, and EMR completeness were assessed using the study instruments. Pearson correlation examined bivariate associations, and multiple linear regression evaluated the independent and joint associations of the two predictors with EMR completeness. **Results:** System performance was positively correlated with EMR completeness ($r = 0.434$, $p < 0.001$), as was healthcare workers' behavior ($r = 0.375$, $p < 0.001$). In the regression model, system performance (standardized $\beta = 0.240$, $p = 0.023$) and healthcare workers' behavior (standardized $\beta = 0.266$, $p = 0.012$) were independently associated with EMR completeness. The model was statistically significant, $F(2, 129) = 17.505$, $p < 0.001$, with $R^2 = 0.213$ and adjusted $R^2 = 0.201$. **Conclusion:** Higher system-performance and healthcare-worker-behavior scores were associated with greater EMR completeness. The slightly larger standardized coefficient for healthcare workers' behavior indicates a stronger adjusted association within this model, but the cross-sectional design does not establish causality.

Keywords: electronic medical records; system performance; healthcare worker behavior; documentation completeness; cross-sectional study

1. Introduction

Electronic medical records support clinical documentation, communication, service coordination, and the reuse of health data. Digital health strategies require alignment among technological, organizational, and human resources rather than isolated installation of software (World Health Organization, 2021). The contribution of an EMR depends on the quality and completeness of information entered by healthcare workers. Missing or incomplete entries can disrupt continuity of care, delay administrative verification, and limit the reliability of data used for management and evaluation (Gurupur et al., 2025; Torab-Miandoab et al., 2025). Digital infrastructure alone does not ensure complete documentation because system characteristics, user practices, workload, and organizational support shape how an EMR is used in routine care (Fennelly et al., 2020; Tsai et al., 2020).

Indonesia has accelerated EMR implementation through Ministry of Health Regulation No. 24 of 2022, which requires healthcare facilities to maintain electronic medical records (Ministry of Health of the Republic of Indonesia, 2022). Studies conducted in Indonesian health services describe continuing barriers related to infrastructure, system integration, user training, and workflow adaptation (Aisyah et al., 2025; Fatmasari & Nadjib, 2024; Juliansyah et al., 2025). These findings indicate that implementation and documentation quality are related but distinct issues. A hospital may have an operational EMR while still experiencing variation in the completeness of entries (Alfiansyah et al., 2022).

System performance and healthcare workers' behavior were selected because they represent two proximal dimensions of documentation practice. Access speed, usability, and system stability may facilitate or obstruct data entry, whereas compliance, discipline, and attitudes toward documentation may shape whether required fields are completed. UTAUT proposes that performance expectancy, effort expectancy, social influence, and facilitating conditions contribute to technology-use intention and behavior (Venkatesh et al., 2003). In the present study, UTAUT served as an interpretive framework rather than a fully tested structural model. The study variables were not presented as validated measures of all UTAUT constructs. System-performance indicators were considered conceptually related to effort expectancy and facilitating conditions, while the behavior score represented reported documentation behavior rather than behavioral intention.

At Toeloengredjo Hospital, the EMR was already in use in inpatient services, but preliminary observations indicated variation in documentation completeness. Previous studies have commonly addressed EMR readiness, adoption, or barriers, whereas fewer have examined technological and behavioral factors together in relation to completeness within a district hospital. Examining both predictors in the same regression model provides context-specific evidence on whether each retains an independent association after adjustment for the other. This study therefore examined the associations of system performance and healthcare workers' behavior with EMR completeness among inpatient healthcare workers at Toeloengredjo Hospital, Kediri.

2. Materials and Methods

2.1 Study Design and Setting

This quantitative observational study used a cross-sectional design. Data were collected at Toeloengredjo Hospital, Kediri, in April 2026. Because exposure and outcome variables were measured at the same time, the analysis estimates associations and does not determine temporal order or causal effects.

2.2 Participants and Sampling

The study population comprised 196 healthcare workers who used the EMR in inpatient services. A sample of 132 participants was selected using proportional random sampling. Proportional allocation requires the sample assigned to each stratum to be calculated as $n_h = (N_h/N) \times n$, followed by random selection from the eligible staff list within each stratum. The original manuscript did not identify the strata, the number allocated to each stratum, the randomization procedure, or the basis for the sample size; these details must be confirmed from the study protocol before resubmission.

2.4 Variabels and Measures

The independent variables were system performance and healthcare workers' behavior. System performance covered access speed, ease of use, and system stability. Healthcare workers' behavior covered compliance, discipline, and attitudes toward EMR use. The dependent variable was the EMR completeness score. The archived manuscript states that structured questionnaires were used and tested for validity and reliability, but it does not report the instrument source or development process, number of items, response scale, possible score range, item-validity results, or reliability coefficients. It also does not clarify whether EMR completeness was determined through an objective record audit, an administrative completeness checklist, or self-report. These details are necessary to evaluate measurement validity and potential common-method bias.

2.5 Statistical Analysis

Data were analyzed using SPSS. Frequencies and percentages summarized participant characteristics, while means, medians, ranges, and 95% confidence intervals summarized study scores. Pearson product-moment correlation was used to examine the bivariate association of each predictor with EMR completeness. Multiple linear regression was used to estimate the independent associations of system performance and healthcare workers' behavior with EMR completeness and to evaluate the joint model. Standardized regression coefficients were used to compare the relative magnitude of the adjusted associations. Model fit was reported using the F statistic, R^2 , and adjusted R^2 . All tests were two-sided, with $p < 0.05$ considered statistically significant. The original manuscript did not provide diagnostic results for linearity, normality and homoscedasticity of residuals, multicollinearity, or influential observations; these should be verified from the original statistical output.

3. Results

The results of a study of healthcare workers in the inpatient care unit at Toeloengredjo Hospital in Kediri, involving 132 respondents. The frequency distribution of the characteristics of the research subjects which include age, gender, highest level of education, years of experience is presented in Table 1.

Table 1. Characteristics of participants at Toeloengredjo Hospital, Kediri (n = 132)

Characteristics	n	%
Age		
< 30 years old	17	12.9
30-40 years old	73	55.3
41-50 years old	29	22.0
> 50 years old	13	9.8
Gender		
Male	87	65.9
Female	45	34.1
Highest Level of Education		
High school graduate	1	0.8
Completed a diploma program	50	37.9
Bachelor's degree	69	52.3
Master's degree	11	8.3
Doctoral Degree	1	0.8
Length of Employment		
< 1 year	6	4.5
1-5 year	23	17.4
6-10 year	39	29.5
> 10 year	64	48.5

Table 1 shows the characteristics of the study subjects based on age, gender, highest level of education, and length of service in the inpatient department at Toeloengredjo Hospital in Kediri, Kediri Regency, in April 2026. In terms of age, the majority of respondents were aged 30–40 years, totaling 73 respondents (55.3%). In terms of gender, the majority of respondents were male, totaling 87 respondents (65.9%). Regarding highest level of education, the majority of respondents held a bachelor’s degree (S1), totaling 69 respondents (52.3%). In terms of length of service, the majority of respondents had worked for more than 10 years, totaling 64 respondents (48.5%).

Table 2 Distribution of system performance, healthcare workers’ behavior, and EMR completeness scores (n = 132)

Variable	Mean	Median	Min	Max	95%(CI)	
					Lower	Upper
System performance factors	68.77	68.00	42	99	66.60	70.93
Healthcare workers' behavior	78.13	80.00	51	100	75.87	80.38
EMR Completeness	4.42	5.00	3	5	4.30	4.55

Table 2 presents the characteristics of the study variables based on system performance factors, healthcare worker behavior, and EMR completeness. The mean scores for the system performance factors (68.77), healthcare worker behavior (78.13), and EMR completeness (4.42). The median values for the system performance factor (68.00), healthcare worker behavior (80.00), and EMR completeness (5.00). The minimum values for the variables were: system performance factors (42), healthcare worker behavior (51), and EMR completeness (3). The maximum values for the variables were: system performance factors (99), healthcare worker behavior (100), and EMR completeness (5).

Table 3. Pearson correlations with EMR completeness (n = 132)

Variable	Pearson r	p-value
System performance	0.434	<0.001
Healthcare workers' behavior	0.375	<0.001

Table 3 The results of the *Pearson product-moment* test indicate a significant influence of system performance factors on the completeness of Electronic Medical Records (EMR) at Toeloengredjo Hospital in Kediri, with a p-value of 0.000 (< 0.05) and a correlation coefficient of $r = 0.434$, indicating a positive relationship of moderate strength. Furthermore, healthcare workers' behavior was also found to have a significant influence on EMR completeness, with a p-value of 0.000 (< 0.05) and a correlation coefficient of $r = 0.375$, indicating a moderate positive relationship. These findings suggest that the better the system performance and healthcare workers' behavior, the higher the level of EMR completeness.

Table 4. Multiple linear regression of EMR completeness (n = 132)

Predictor	Standardized β	p-value
System performance	0.240	0.023
Healthcare workers' behavior	0.266	0.012

Table 4 shows that the most significant result indicates a beta value of 0.266 for the healthcare worker behavior variable. Since the p-value for the healthcare worker behavior variable is $0.012 < 0.05$, it can be concluded that healthcare worker behavior has a significant effect on the completeness of the EMR.

Table 5. Coefficient of determination for the regression model (n = 132)

Model	R^2	Adjusted R^2
1	0.213	0.201

Table 5 shows the results of the analysis, which yielded an R^2 coefficient of 0.201, indicating that the combined influence of system performance and healthcare worker behavior on EMR completeness is significant. This means that system performance and healthcare worker behavior account for 20.10% of the variation in EMR completeness, while the remaining 79.90% is attributed to other variables not included in the model.

Table 6. F-test for the multiple linear regression model (n = 132)

Source	df	F	p-value
Regression	2	17.505	<0.001
Residual	129		

Table 6 shows that the F-test statistic is 17.505 at a 95% confidence level ($\alpha = 0.05$). The results in the table indicate a p-value of $0.000 < 0.05$; therefore, it can be concluded that the system performance and healthcare worker behavior factors jointly influence the completeness of the EMR.

4. Discussion

The results of the study indicate that system performance factors have a significant effect on the completeness of Electronic Medical Records (EMR), with a moderate positive correlation ($p < 0.05$; $r = 0.434$), suggesting that the better the system performance, the higher the completeness of EMR entries. System performance, which includes access speed, ease of use, stability, and data integration, has been shown to facilitate healthcare workers in recording data completely and systematically (Renggowati et al., 2026). Although the average EMR completeness score is already relatively high, the system's suboptimal quality still has the potential to limit the achievement of maximum completeness (Mamae & Mamo, 2025). System performance and healthcare workers' behavior were each positively associated with EMR completeness in the bivariate analyses and remained independently associated in the multiple regression model. The regression results are the appropriate basis for comparing the adjusted contributions of the two predictors. Healthcare workers' behavior had a slightly larger standardized coefficient than system performance, although the difference between $\beta = 0.266$ and $\beta = 0.240$ was

small and was not formally tested. The findings therefore support two related predictors of completeness rather than a strong claim that one factor dominates the other.

The association between system performance and completeness is consistent with evidence that technical reliability, usability, and workflow fit shape clinicians' interaction with electronic records. Slow access, instability, or poorly aligned interfaces can interrupt documentation and encourage delayed or partial entry, while usable systems reduce the effort required to complete routine fields (Fennelly et al., 2020; Tsai et al., 2020; Upadhyay & Hu, 2022). Studies of EMR implementation in lower-resource and hospital settings likewise identify infrastructure and system-level conditions as barriers or facilitators of use (Bekele et al., 2024; Fatmasari & Nadjib, 2024). The present cross-sectional data cannot determine whether better system performance produced more complete records or whether workers who completed records more consistently also rated the system more favorably.

Healthcare workers' behavior remained associated with completeness after adjustment for system performance. Documentation requires repeated actions within time-sensitive clinical workflows, so adherence, discipline, and attitudes toward recording may contribute to whether available fields are completed. Previous studies have linked documentation practice with knowledge, attitudes, motivation, organizational expectations, and work processes (Junaedi et al., 2024; Kasaye et al., 2022). Qualitative evidence also shows that distortions or omissions in electronic nursing records can arise from individual practices and contextual pressures rather than software characteristics alone (Wang et al., 2025). Because both behavior and completeness may have been measured through self-report, confirmation of the measurement method is required before interpreting this association as reflecting objectively audited documentation.

UTAUT provides a limited conceptual lens for these findings. System access, ease of use, and stability overlap conceptually with effort expectancy and facilitating conditions, while routine documentation behavior concerns actual use. The study did not report direct measures of performance expectancy, social influence, behavioral intention, or the UTAUT moderators. The results should therefore not be presented as a complete empirical test of UTAUT. They instead show that locally defined system and behavioral scores were associated with an EMR documentation outcome, a distinction that keeps the theoretical interpretation aligned with the constructs actually measured (Ayaz & Yanartaş, 2020; Jeyaraj et al., 2023; Venkatesh et al., 2003).

The adjusted R^2 of 0.201 indicates that most variation in EMR completeness was outside the two-predictor model. Potential contributors include workload, staffing, profession, shift patterns, supervisory feedback, mandatory fields, interface design, training exposure, leadership expectations, and unit-level documentation culture. These factors were not evaluated and should not be treated as demonstrated explanations. Future studies could combine objective record audits with validated user measures and multilevel analysis to distinguish worker, unit, and system contributions.

4.1 Practical implications

Hospital improvement efforts may reasonably address both system operation and documentation practice. Periodic review of access speed, stability, and usability can be paired with feedback on incomplete entries, clarification of documentation standards, and targeted training. These recommendations follow from the observed associations but should be evaluated prospectively before being considered effective strategies for increasing completeness.

4.2 Limitations

The cross-sectional design prevents assessment of temporal sequence and causality. The study was conducted in one hospital, which limits generalizability. The archived manuscript does not establish whether EMR completeness was objectively audited or self-reported; common-method bias is possible if all variables came from the same questionnaire. Instrument development and psychometric results were insufficiently documented. The regression model included only two predictors, did not report unstandardized coefficients or confidence intervals, and explained 20.1% of adjusted outcome variation. Residual diagnostics and multicollinearity results were not available for verification. These limitations narrow the interpretation to associations within the analyzed sample.

5. Conclusions

Higher system-performance and healthcare-worker-behavior scores were associated with greater EMR completeness among inpatient healthcare workers at Toeloengredjo Hospital. Both predictors retained independent associations in the multivariable model, and healthcare workers' behavior had a slightly larger standardized coefficient. The findings do not establish that either predictor causes changes in completeness.

Hospital managers may use the results to identify system operation and documentation practice as areas for further assessment, while prospective studies using objective record audits are needed to evaluate whether targeted improvements increase EMR completeness.

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Ethical considerations

This study was approved by the Health Research Ethics Committee of STRADA Indonesia University (No. 0623451/EC/KEPK/I/04/2026).

Conflict of Interest

There is no conflict of interest.

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