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Analysis of Performance-Related Factors Associated with the Completeness of Electronic Medical Record Entry Among Healthcare Workers

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Abstract

The performance and satisfaction of healthcare workers are critical determinants of the completeness of Electronic Medical Records (EMR). However, in 2024, Sengayam Regional General Hospital achieved only 50% of the targeted 100% EMR completeness rate, indicating challenges related to staff understanding and a suboptimal quality assurance system. This study aimed to examine factors associated with EMR completion performance among healthcare workers at Sengayam Regional General Hospital. This observational analytical study employed a cross-sectional design. The study population consisted of 165 healthcare workers, of whom 116 were selected as samples using purposive sampling techniques. Data were collected using a structured questionnaire. EMR completion performance served as the dependent variable, while age, education level, knowledge, and domicile were treated as independent variables. Bivariate analysis was conducted using the chi-square test, followed by multivariate analysis using multiple logistic regression. The findings demonstrated significant associations between EMR completion performance and age (p = 0.028), education (p = 0.000), and knowledge (p = 0.002). No significant association was found between domicile and EMR completion performance (p = 0.140). Among all variables examined, knowledge exhibited the strongest association with EMR completion performance (Exp(B) = 15.995). EMR completion performance among healthcare workers was significantly associated with age, education, and knowledge, whereas domicile showed no significant relationship. Knowledge emerged as the most influential factor affecting the completeness of Electronic Medical Record entry.

Introduction

Digital transformation in the health sector has become a central policy agenda in many countries, including Indonesia, as part of broader efforts to improve service quality, efficiency, and patient safety. One of the most significant manifestations of this transformation is the implementation of Electronic Medical Records (EMR), which replaces paper-based documentation with integrated digital systems that store, manage, and transmit patient health information. EMR systems are expected to enhance continuity of care, reduce clinical errors, support evidence-based decision-making, and strengthen health system accountability. However, the realization of these benefits depends not only on the availability of technology and regulatory mandates but also on how effectively EMR systems are used by health professionals in daily clinical practice (Juliansyah et al., 2024; Ștefan et al., 2024;

Mudiyanselage et al., 2024; Mwogosi & Kibusi, 2025; Wahyuningsih et al., 2025; Mwogosi, 2025).

In Indonesia, the implementation of EMR is no longer optional. It is a mandatory policy regulated under the Minister of Health Regulation No. 24 of 2022, which requires all health facilities to adopt electronic medical records as part of national health system modernization. This regulatory framework is further reinforced by the Minister of Health Circular Letter No. H.02.01/MENKES/1030/2023, which explicitly stipulates administrative sanctions for non-compliant facilities, including warnings, restrictions on service operations, and even revocation of accreditation. Through this policy, the Ministry of Health aims to standardize medical documentation, improve data accuracy, ensure interoperability across health services, and support national health information governance (Indonesian Ministry of Health, 2023; Reegu et al., 2023; Mamuye et al., 2022; Holmgren et al., 2023; Kwon et al., 2024; Mekonnen & Chanyalew, 2024). From a policy perspective, EMR is positioned not merely as a technological upgrade but as a critical instrument for improving the quality and safety of healthcare delivery.

Despite the strong regulatory push, the implementation of EMR in many health facilities remains uneven. A recurring issue identified in both national reports and empirical studies is the suboptimal performance of EMR usage, particularly in terms of the completeness of medical record documentation. Completeness of EMR refers to the extent to which all required components such as patient identification, authentication by health professionals, clinical notes, diagnostic results, treatment records, and mandatory reports are accurately and consistently filled in accordance with established standards. Incomplete EMRs compromise the continuity of care, weaken legal protection for both patients and providers, and increase the risk of clinical errors due to missing or inaccurate information (Mulyana et al., 2025; Vukmir, 2024; Adeyemi et al., 2024; Dhaja et al., 2025; Adapa, 2025). Consequently, completeness of EMR documentation is widely recognized as a key indicator of EMR performance and an essential prerequisite for achieving the intended benefits of digital health systems.

A growing body of literature suggests that the performance of EMR implementation is strongly influenced by human factors, particularly the characteristics, attitudes, and competencies of health workers as end users of the system. While technological infrastructure and system design are important, they are insufficient on their own to guarantee effective EMR utilization. Health workers must be willing and able to integrate EMR use into their clinical workflows, often under conditions of high workload and time pressure (Provenzano et al., 2024; Asgari et al., 2024; Zhang et al., 2022). Studies have shown that personal factors such as age, level of education, knowledge of information systems, and socio-demographic background can shape how health workers perceive, adopt, and consistently use EMR systems (Aliyah, 2023; Ayuni et al., 2024; Marzuki, 2024; Mutmainah et al., 2024).

From a theoretical standpoint, these findings align with Gibson's performance theory, which conceptualizes performance as the outcome of interactions among individual factors, psychological factors, and organizational context. Individual factors include demographic characteristics, educational background, and technical skills; psychological factors encompass attitudes, motivation, and perceptions; while organizational factors relate to leadership, supervision, and work environment. In the context of EMR implementation, individual characteristics such as age and education may influence cognitive adaptability to new technologies, while knowledge reflects the extent of training and understanding necessary to operate EMR systems correctly (Derecho et al., 2024; Webb et al., 2025; Mwogosi & Kibusi, 2025). Place of residence, often overlooked in health informatics studies, may also shape performance indirectly through disparities in access to digital exposure, infrastructure, and prior experience with information technology. Together, these factors can significantly affect health workers' discipline, accuracy, and consistency in completing electronic medical records.

Empirically, these challenges are evident at Sengayam Regional General Hospital. In 2024, the rate of complete EMR documentation at this hospital reached only 50%, far below the national quality standard of 100%. This gap highlights a critical disconnect between regulatory expectations, institutional quality targets, and actual implementation practices at the facility level. Preliminary observations and internal evaluations indicate several contributing issues, including limited understanding of EMR procedures among health workers, difficulties in adapting to digital documentation workflows, suboptimal integration between EMR modules, and weak supervision and feedback mechanisms related to medical record quality (Olakotan et al., 2025). These challenges suggest that the problem is not merely technical but deeply rooted in human performance and organizational management.

The persistence of incomplete EMR documentation at Sengayam Regional General Hospital raises important analytical questions. If EMR implementation is legally mandated and supported by institutional policies, why does performance remain low? Which characteristics of health workers are most strongly associated with EMR completion performance? And to what extent do individual factors explain the observed implementation gap? Addressing these questions is crucial not only for improving EMR performance at the hospital level but also for informing broader strategies to strengthen digital health governance in regional health systems.

Based on this context, the present study seeks to analyze the factors associated with the performance of health workers in completing electronic medical records at Sengayam Regional General Hospital. Specifically, this study focuses on four key individual factors—age, level of education, knowledge of EMR, and place of residence—to identify which factors have the strongest relationship with EMR completion performance. By grounding the analysis in performance theory and empirical evidence, this study aims to contribute to a more nuanced understanding of the human dimensions of EMR implementation. The findings are expected to provide practical insights for hospital management and policymakers in designing targeted interventions, such as training programs, supervision models, and incentive mechanisms, to improve EMR performance and ensure that the promise of digital health transformation is realized in everyday clinical practice.

Methods

This study employed a cross-sectional research design and was conducted at Sengayam Regional General Hospital during October–November 2025. The study population comprised all health workers involved in the use of Electronic Medical Records (EMR), totaling 165 individuals. Using proportional sampling, a sample of 116 respondents was selected to represent the study population. This design was chosen to capture a snapshot of the relationship between individual characteristics and EMR performance at a specific point in time.

The independent variables examined in this study were age, level of education, knowledge of EMR, and place of residence (domicile). The dependent variable was the performance of health workers in completing electronic medical records, operationalized through indicators of completeness and accuracy of EMR documentation. Data collection instruments included informed consent forms and structured questionnaires developed to measure each study variable. The questionnaire items were designed to reflect both demographic characteristics and EMR-related knowledge and performance.

Primary data were obtained through self-administered questionnaires completed by the respondents, while secondary data were collected through interviews with hospital management and review of relevant institutional documents related to EMR implementation. Data analysis was conducted in three stages: univariate analysis to describe the characteristics of respondents, bivariate analysis to examine associations between independent variables and performance, and multivariate analysis to identify the most influential factors affecting health worker performance in completing EMR.

Result and Discussion

Frequency Distribution of Respondent Characteristics

Table 1. Frequency Distribution of Respondent Characteristics

No	Age	Frequency	Percentage
1	< 40 years	80	69
2	≥ 40 years old	36	31.0
Total		116	100.0
No	**Education**	**Frequency**	**Percentage**
1	Diploma	56	48.3
2	Bachelor	60	51.7
Total		116	100.0
No	**Knowledge**	**Frequency**	**Percentage**
1	Less	43	37.1
2	Good	73	62.9
Total		116	100.0
No	**Residence**	**Frequency**	**Percentage**
1	Far	42	36.2
2	Near	74	63.8
Total		116	100.0
No.	**RME Filling Performance**	**Frequency**	**Percentage**
1	Less	41	35.3
2	Good	75	64.7
Total		116	100

The findings show that most respondents were within the productive age group (under 40 years), held at least a bachelor's degree, and resided in close proximity to the hospital. These demographic and educational characteristics suggest a workforce that is relatively adaptive to technological change and organizational demands. Younger health workers are generally more familiar with digital systems, while higher educational attainment is associated with stronger cognitive skills and greater capacity to understand standardized documentation requirements. Living near the workplace may further reduce fatigue and time-related stress, allowing health workers to allocate adequate attention to administrative responsibilities such as electronic medical record (EMR) completion.

Importantly, these structural characteristics are reinforced by a generally good level of EMR-related knowledge among respondents, which appears to translate into better performance in completing EMRs. This pattern indicates that performance is not solely shaped by individual background factors, but also by the extent to which health workers understand EMR procedures and their clinical relevance. Consistent with performance theory, knowledge functions as a mediating factor that enables demographic advantages to be converted into effective work behavior. Therefore, the predominance of good EMR completion performance at Sengayam Regional General Hospital reflects an interaction between favorable individual characteristics and adequate knowledge, rather than the presence of demographic factors alone.

Relationship between Age and RME Completion Performance among Health Workers at Sengayam Regional General Hospital

Table 2. Relationship between age and RME filling performance among health workers at Sengayam Regional General Hospital

Age	RME Completion Performance	Total	P Value	OR

	Poor		Good					
	N	%	N	%	N	%		
< 40 years	34	42.5	46	57.5	80	100.0	0.028	3.062
≥ 40 years	7	19.4	29	80.6	36	100.0		
Total	41	35.3	75	64.7	116	100		

The bivariate analysis indicates a statistically meaningful relationship between age and Electronic Medical Record (EMR) completion performance among health workers at Sengayam Regional General Hospital. The results show that health workers aged over 40 years were 3.062 times more likely to demonstrate good EMR filling performance compared to those under 40 years of age. This finding suggests that age is an important individual factor influencing compliance and accuracy in electronic medical documentation.

This pattern may reflect greater professional experience, higher levels of work discipline, and stronger awareness of clinical and legal responsibilities among older health workers. Although younger staff are often assumed to be more technologically adept, the results indicate that experience and habitual adherence to documentation standards may play a more decisive role in EMR completeness. These findings underscore the need to balance technological training for younger health workers with efforts to maintain and transfer best documentation practices from more experienced personnel.

Relationship between Education and RME Completion Performance among Healthcare Workers at Sengayam Regional General Hospital

Table 3. Relationship between education and RME filling performance among healthcare workers at Sengayam Regional General Hospital

Education	RME Completion Performance				Total		P Value	OR
	Poor		Good					
	N	%	N	%	N	%		
Diploma	31	55.4	25	44.6	56	100.0	0.000	6,200
Bachelor	10	16.7	50	83.3	60	100.0		
Total	41	35.3	75	64.7	116	100		

The bivariate analysis demonstrates a significant association between level of education and Electronic Medical Record (EMR) completion performance among health workers at Sengayam Regional General Hospital. The findings indicate that health workers holding a bachelor's degree were 6.200 times more likely to exhibit good EMR filling performance compared to those with a diploma-level education. This result highlights education as a strong individual determinant of EMR performance.

Higher educational attainment may enhance analytical skills, comprehension of clinical documentation standards, and adherence to institutional procedures, all of which are essential for accurate and complete EMR completion. Health workers with a bachelor's degree are also more likely to have received formal exposure to health information systems and evidence-based practice during their education. This finding suggests that improving EMR performance may require not only technical training but also educational strategies that strengthen conceptual understanding of medical documentation and its implications for service quality and patient safety.

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Relationship between Knowledge and RME Completion Performance among Health Workers at Sengayam Regional General Hospital

Table 4. Relationship between knowledge and RME completion performance among healthcare workers at Sengayam Regional General Hospital

Knowledge	RME Completion Performance				Total		P Value	OR
	Poor		Good					
	N	%	N	%	N	%		
Less	29	67.4	14	32.6	43	100.0	0.000	10.530
Good	12	16.4	61	83.6	73	100.0		
Total	41	35.3	75	64.7	116	100.0		

The bivariate analysis reveals a strong association between knowledge level and Electronic Medical Record (EMR) completion performance among health workers at Sengayam Regional General Hospital. The results indicate that health workers with good EMR-related knowledge were 10.530 times more likely to demonstrate good EMR filling performance compared to those with poor knowledge. This finding identifies knowledge as the most influential individual factor in EMR performance at the bivariate level.

This strong effect underscores the critical role of cognitive understanding in the effective use of electronic medical record systems. Adequate knowledge enables health workers to navigate EMR features correctly, understand documentation standards, and appreciate the clinical and legal consequences of incomplete records. Consistent with performance and technology acceptance theories, this result suggests that knowledge acts as a key enabling factor that translates policy mandates and system availability into effective practice. Therefore, strengthening EMR-related knowledge through continuous training and supervision is essential for improving documentation performance and ensuring high-quality health services.

Relationship between Domicile and RME Completion Performance among Health Workers at Sengayam Regional General Hospital

Table 5. Relationship between domicile and RME filling performance among health workers at Sengayam Regional General Hospital

Residence	RME Completion Performance				Total		P Value	OR
	Less		Good					
	N	%	N	%	N	%		
Far	19	45.2	23	54.8	42	100.0	0.140	1,953
Near	22	29.7	52	70.3	74	100.0		
Total	41	35.3	75	64.7	116	100		

The bivariate analysis using the chi-square test showed a p-value of 0.140 ($p > 0.05$), indicating that the null hypothesis was accepted. This result demonstrates that there is no statistically significant relationship between domicile and Electronic Medical Record (EMR) completion performance among health workers at Sengayam Regional General Hospital.

This finding suggests that proximity of residence to the workplace does not substantially influence the quality of EMR documentation. Regardless of whether health workers live near or farther from the hospital, their performance in completing EMRs appears to be shaped more strongly by professional competencies and knowledge rather than geographical factors. Consequently, interventions aimed at improving EMR performance should prioritize capacity building, training, and supervision rather than focusing on residential or logistical considerations.

Relationship between Domicile Variable and RME Completion Performance among Health Workers at Sengayam Regional General Hospital

Table 6. Results of Multiple Logistic Regression Analysis

No	Variable	B	Wald	Sig	Exp (B)	95% CI
1	Age	2,166	8,604	0.003	8,720	2,052 – 37,066
2	Education	2,467	15,084	0	11,782	3,393 – 40,908
3	Knowledge	2,772	20,652	0	15,995	4,839 – 52,875
4	Residence	0.600	1,195	0.274	1.822	0.621 – 5.346

Multiple logistic regression analysis shows that age, education, and knowledge of health workers have a significant relationship with RME completion performance at Sengayam Regional General Hospital. Health workers aged over 40 years are 8.720 times more likely to complete RME well compared to those under 40 years of age. Health workers with a bachelor's degree are 11.782 times more likely to perform well than those with a diploma. Health workers with good knowledge are 15.995 times more likely to perform well than those with poor knowledge. However, domicile has no significant relationship with RME filling performance, although there is a small effect showing that professionalism in the workplace is more important than geographical factors.

The Relationship Between Age and RME Completion Performance Among Healthcare Workers at Sengayam Regional General Hospital

Based on the frequency distribution, the majority of respondents were under 40 years old (80 people), indicating that health workers at Sengayam Regional General Hospital have high potential to adapt to digital technology. Statistics show a significant relationship between age and electronic medical record (EMR) completion performance with a p-value of 0.028. However, crosstabs analysis shows that respondents aged ≥ 40 years have better performance than those aged < 40 years. This indicates that although younger health workers are more tech-savvy, the experience and discipline of the senior age group contribute positively to complete EMR completion.

An odds ratio (OR) value of 3.062 indicates that senior health workers are 3.1 times more likely to complete EMRs well. This is because they are more responsible for the legality of medical documents and are better at adapting to hospital SOPs. According to Gibson's theory, age is an individual variable that reflects a person's ability and skill ( ). This study reflects that older individuals have greater accuracy and awareness of legal consequences.

Gibson also explained that age affects perception and motivation at work. Younger workers are more dynamic, while older workers are more consistent in following procedures even though they have to work harder to learn new software. This study supports previous studies that show a relationship between age and RME completion rates. The RME training program was successful for young health workers, but senior workers still viewed it as an administrative burden. Compliance was influenced by age, experience, social norms, and views on risk (Rini et al., 2023; Syarifuddin et al., 2021; Rice et al., 2022; Baekgaard & Madsen, 2024).

The Relationship Between Education Variables and RME Completion Performance Among Healthcare Workers at Sengayam Regional General Hospital

Based on data analysis at Sengayam Regional General Hospital, the distribution of healthcare workers' educational levels is almost balanced, with bachelor's degree graduates slightly dominating over diploma graduates. Health workers with bachelor's degrees showed better performance in medical documentation, especially in filling out Electronic Medical Records (EMR). The results show that formal education has a significant effect on the discipline and

quality of digital patient data entry, with a p-value of 0.000, which is far below the standard of 0.05. Higher education is an important factor related to EMR completion performance.

An odds ratio (OR) value of 6.200 indicates that healthcare workers with lower education are 6.2 times more likely to show incomplete EMR performance compared to those with higher education. Gibson's theory (1984) states that individual performance is influenced by background variables, abilities, and skills, with education level as the main component. Higher education is considered to provide a stronger theoretical foundation for problem solving and decision making.

Education also shapes abilities and skills, as well as improving accuracy and understanding of complex systems. Education is a predictor of superior performance at Sengayam Regional General Hospital, as health workers have undergone intensive academic socialization related to professionalism. This study is in line with findings that education is related to the use of RME (Fatmala et al., 2022; Syarifuddin et al., 2021).

The Relationship between Knowledge Variables and RME Completion Performance among Healthcare Workers at Sengayam Regional General Hospital

Based on statistical tests, the p-value for the knowledge variable is 0.000, indicating a significant relationship between healthcare workers' knowledge and their performance in completing RME data at Sengayam Regional General Hospital. With an odds ratio (OR) of 10.530, healthcare workers with insufficient knowledge have a 10.5 times higher risk of not completing RME compared to those with good knowledge.

The data shows that RME completion performance is related to education, where a lack of understanding of patient confidentiality and the usefulness of data results in poor performance. Knowledge is not only about technical skills but also awareness of the importance of data. According to Gibson's Performance Theory (1984), good knowledge helps health workers respond to digital systems correctly. Knowledge is the basis for determining work outcomes, and a lack of knowledge can hinder clinical decisions.

The relationship between knowledge and RME completion behavior. Knowledge is considered important in shaping actions. Without knowledge, actions will not last long. This knowledge can be evaluated through interviews related to the measured material (Wongso et al., 2024; Schützenhofer et al., 2022; Mohzana et al., 2024).

The Relationship between the Domicile Variable and RME Completion Performance among Healthcare Workers at Sengayam Regional General Hospital

The statistical test results show a p-value of 0.140, which is greater than 0.05, concluding that there is no significant relationship between domicile and RME completion performance among healthcare workers at RSUD Sengayam. An OR value of 1.953 indicates that healthcare workers who live far away are nearly twice as likely to have poorer RME completion performance compared to those who live nearby. However, because the p-value is not significant, domicile is not a major factor in the quality of medical record completion. Merwe's theory (2008) states that living far away can increase physical fatigue, decrease concentration, and reduce work motivation. Although there are indicators of fatigue, internal factors such as ability and motivation as well as organizational factors play a role in overcoming these obstacles.

Relationship Between Dominant Variables and RME Completion Performance Among Healthcare Workers at Sengayam Regional General Hospital

The modeling results show that knowledge is the most important factor influencing RME completion performance. Healthcare workers who have good knowledge of RME are nearly 16 times more likely to complete RME properly than those with less knowledge. At Sengyam

Regional General Hospital, knowledge is necessary because the RME system is a new technology that must be understood before use. This knowledge includes operational procedures, important clinical data, and the legal aspects of digital documentation.

Education also influences knowledge. Healthcare workers with higher education tend to more easily understand and absorb information about RME. However, education alone is not enough; specific knowledge about the hospital system is needed to improve performance. Age is related to knowledge through experience, where younger people may be more tech-savvy, and older people have better procedural knowledge. Without training, age does not guarantee good RME completion. al variables do not significantly influence knowledge and performance, indicating that knowledge about RME is universal and independent of place of residence. Performance in completing RME is determined by understanding of the system and the professional background of healthcare workers.

Conclusion

There is a relationship between age, education, and knowledge with the completeness of Electronic Medical Records among health workers at the Sengayam Regional General Hospital. However, there is no relationship between domicile and the completeness of the records. Knowledge is the most dominant factor influencing the completeness of Electronic Medical Records by health workers.

Suggestion

The management of Sengayam Regional General Hospital involves senior staff in providing guidance on the accuracy and legality of documents, while younger staff assist with the technical aspects of the digital system. The hospital conducts regular training that emphasizes data completeness for legal and service quality purposes. The quality control system is tightened so that health workers are consistent in filling in data. Management also considers rest facilities for health workers who live far away. Senior health workers are active in information technology training, while young workers need to increase their awareness of the legal consequences of medical documents. Future researchers are advised to explore other factors and use qualitative methods to understand the performance of young health workers

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