



## Determinant Analysis of Electronic Medical Record Completeness Based on Physician Workload: A Systematic Literature Review

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### Abstract

Electronic Health Records (EHR) are crucial tools in the transformation of clinical governance and hospital information management. Despite offering numerous benefits, EHR implementation often conflicts with physicians' heavy clinical workload, which risks reducing the level of documentation compliance and completeness. This incomplete medical data not only threatens patient safety but also hinders the insurance claims process and harms institutional operations. This study aims to systematically identify and analyze the factors determining EHR documentation completeness based on physician workload in inpatient facilities. The method used is a Systematic Literature Review (SLR) following the PRISMA 2020 framework. A comprehensive literature search was conducted using the Google Scholar database, focusing on publications from 2021 to 2026. From the initial identification to the final screening stage, 18 empirical study articles that met all inclusion criteria were extracted and analyzed thematically. The results of the literature review indicate that high operational burdens affect EHR completeness through two main determinant dimensions. First, the heavy workload during service hours triggers documentation delays, forcing physicians to perform additional administrative work outside of official duty hours (pajama time), resulting in reduced data accuracy. Second, the cognitive burden stemming from non-ergonomic EHR system interface designs leads to digital interaction fatigue (click fatigue) among medical personnel. In conclusion, excessive clinical and administrative workloads have been shown to significantly reduce the compliance rate for complete EHR documentation. Consequently, hospital management is advised to redesign system interfaces to better align with clinical workflows and provide support such as documentation assistants to optimize medical record quality without compromising physician well-being.

## Introduction

Digital transformation in the global healthcare sector has driven a massive shift from conventional paper-based medical records toward Electronic Medical Record (EMR) systems (Patel et al., 2023; Almacen & Cabaluna, 2021; Chatta et al., 2024). In Indonesia, the accelerated adoption of EMRs is strictly regulated by government policies to improve operational efficiency, health data integration, and the quality of clinical care in hospitals. EMRs not only serve as repositories for patients' clinical data but also function as legal documents, the basis for medical decision-making, and crucial indicators in assessing the quality of hospital governance (Sarifa et al., 2026). The completeness and accuracy of data

entry in the RME are absolute prerequisites for ensuring patient safety and continuity of care across healthcare professions. However, the success of this technology's implementation depends heavily on the compliance rate of its primary users (end-users) namely, medical staff and physicians in inpatient facilities (Krisdarmanto et al., 2025; Singh & Jindal, 2026; Wulansari et al., 2026).

Although EMR is designed to optimize administrative processes, operational realities on the ground show that this system often imposes an excessive documentation burden on physicians (Olakotan et al., 2025; Xu et al., 2026; Mattingly & O'neal Doctors in inpatient units often face an unbalanced dual role; they shoulder a high clinical workload while providing direct patient care, yet are simultaneously required , 2026). complete RME entries comprehensively and in real time (Levy et al., 2024; Lou et al., 2022). The friction between a heavy clinical workload and the demands of digital documentation has the potential to trigger workflow fragmentation, excessive cognitive load, and even emotional exhaustion or burnout among healthcare professionals (Moy et al., 2021).

Time constraints during hospital shifts often force physicians to postpone completing medical records, which directly correlates with high rates of incomplete inpatient clinical records (Murad et al., 2024; Selvakumar et al., 2026). This imbalance in time allocation gives rise to the phenomenon of extra work outside official duty hours, or "pajama time," during which doctors are forced to complete a backlog of medical record administration from home (Nurhayati et al., 2025; Page et al., 2021). Delays in completing medical records not only reduce the accuracy of information due to the time lag between patient examinations and documentation but also have a systemic negative impact on hospital management. Incomplete medical records have been shown to hinder specialists' commitment to their work, complicate the document verification process, and trigger the rejection or delay of health insurance claims which can potentially disrupt the stability of the hospital's cash flow (Krisdarmanto et al., 2025; Sarifa et al., 2026; Alnami & Almones, 2026; Garg & Mishra, 2026).

Another factor exacerbating the low completeness of RME documents is the suboptimal ergonomics (usability) of the information system interface. Complex application design, the need for repetitive manual data entry, and an inefficient number of clicks trigger digital interaction fatigue or "click fatigue" (Holmgren et al., 2023). This low perceived ease of use causes the RME system which was originally intended as a tool to instead become a secondary administrative burden (Burhan & Nadjib, 2023; Overhage & McCallie, 2020). Consequently, physicians' capacity to focus on clinical problem-solving is depleted. To address these ergonomic challenges, modern managerial interventions are now turning to the integration of technology-based solutions, such as artificial intelligence (AI)-assisted documentation, to eliminate physicians' secondary administrative burden (Kruse et al., 2022).

Most previous studies on medical record completion compliance have been observational and limited to a single institution, and thus have not been able to provide a comprehensive picture of the multidimensional interaction between clinical workload and health information technology (van Limpt et al., 2026; Sun et al., 2026; Wu et al., 2024). A structured scientific synthesis is needed to map the determinants of physicians' workload that most significantly influence the quality of medical documentation. Therefore, this study was designed to identify and analyze the determinants of completeness in Electronic Medical Record (EMR) documentation based on physicians' workload in inpatient units through a Systematic Literature Review (SLR) approach using the Google Scholar database. Through this evidence-based systematic review, it is hoped that practical managerial recommendations can be formulated for hospital management to improve the quality of EMRs while maintaining the well-being of medical staff.

## Methods

This research was designed as a *Systematic Literature Review* (SLR), strictly adhering to the 2020 version of the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA) guidelines. This approach was applied to ensure that the entire process of searching, screening, assessing eligibility, and synthesizing scientific articles was conducted transparently, systematically, and in a manner that could be accurately replicated. This literature review was carried out through four main sequential stages: identification, screening, eligibility assessment, and final inclusion. The overall flow of the literature selection process, from the initial search to the final selection of articles, is illustrated in Diagram 1 (Page et al., 2021).

The literature search was conducted comprehensively using a single electronic database, Google Scholar, with a strict publication date restriction set to the range of 2021 to 2026. This restriction aims to ensure that the analyzed articles represent the most up-to-date operational dynamics and technological challenges of Electronic Health Records (EHRs). The search strategy was designed using a combination of structured keywords with the aid of Boolean operators in the search field. The literature search in Indonesian used the syntax (“beban kerja dokter” OR “beban kerja klinis”) AND (“rekam medis elektronik” OR “RME” OR “kelengkapan rekam medis”), while the search for English-language literature used the syntax (“*physician workload*” OR “*clinical workload*”) AND (“*electronic health record*” OR “*EHR completeness*” OR “*documentation burden*”).

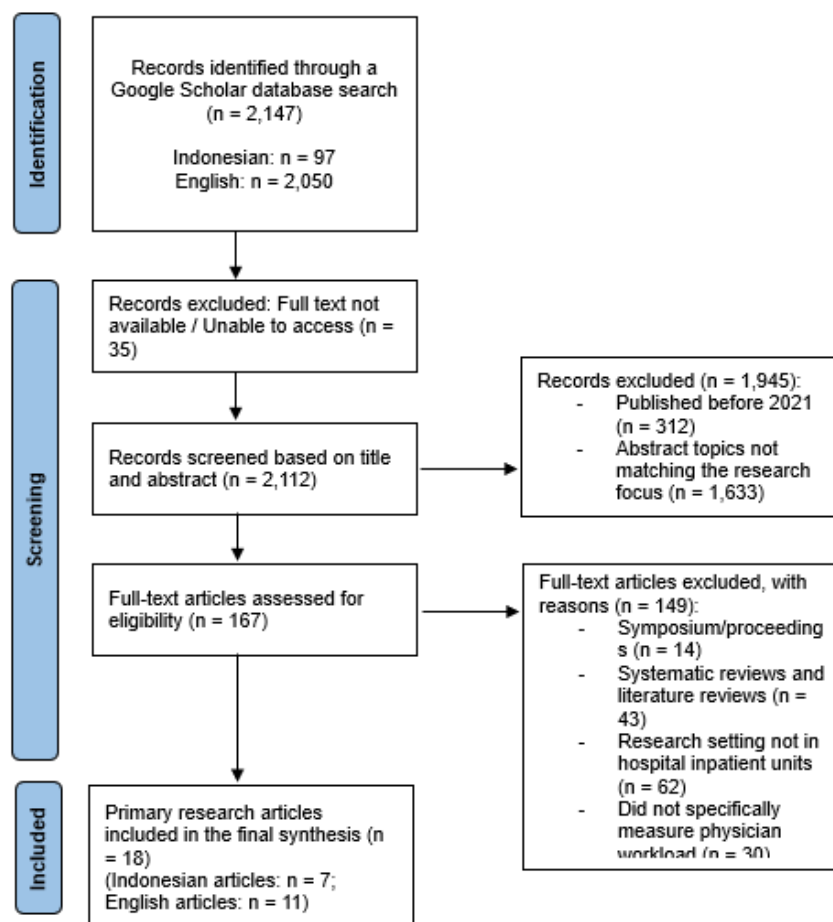


Figure 1. Literature Selection Flowchart Based on PRISMA 2020

To ensure the relevance and quality of the articles in relation to the study’s objectives, strict eligibility criteria were established. The inclusion criteria for this study required articles to be primary research journal articles that had undergone a peer-review process, focused on the

direct interaction between dimensions of physician workload and the level of EHR completeness, were set in the operational context of hospital inpatient facilities, and were available in full text in Indonesian or English. Conversely, exclusion criteria were applied to eliminate non-medical articles, symposium papers, conference proceedings, abstracts, editorials, opinion pieces, unpublished theses or dissertations, articles with a secondary review (*literature review*) design, and studies that focused solely on the financial efficiency of the RME without measuring compliance with clinical documentation.

All manuscripts that passed the eligibility screening were then analyzed in depth, and the data were extracted into a standardized synthesis matrix. The data components extracted included author names, year of publication, study design, workload parameters, and key findings determining RME quality. Subsequently, the synthesized data were analyzed qualitatively using thematic analysis techniques. Through this stage, various determinants of workload were identified and grouped into specific managerial and technical clusters to formulate a comprehensive framework for discussion.

## Result and Discussion

The literature search conducted via the Google Scholar database yielded a total of 2,147 articles during the initial identification stage. After screening for duplicates, evaluating the relevance of titles and abstracts, and assessing the eligibility of full-text manuscripts, 18 articles (7 in Indonesian and 11 in English) met all inclusion criteria. All included literature consisted of primary studies that thoroughly evaluated the structural relationship between clinical workload, administrative workload, and physicians' documentation compliance performance in hospitals.

Details of the data extraction results from these eighteen articles are presented in Table 1 to provide a transparent overview of the methodology and the key determinants identified.

Table 1. Data Extraction from Selected Literature

| No. | Author & Year              | Research Method          | Key Determinants of RME Completeness                                                                                |
|-----|----------------------------|--------------------------|---------------------------------------------------------------------------------------------------------------------|
| 1.  | Nurhayati et al. (2025)    | Literature Review        | The integration of CDSS reduces the cognitive load on physicians in medical decision-making.                        |
| 2.  | Amelia et al. (2025)       | Observational            | The implementation of RME supports performance, but the early adoption phase places a burden on clinical schedules. |
| 3.  | Adrian et al. (2023)       | <i>Literature Review</i> | High clinical workload and specialization affect compliance with medical record documentation.                      |
| 4.  | Sarifa et al. (2026)       | Quantitative             | Excessive workload reduces discipline and hinders the smooth processing of insurance claims.                        |
| 5.  | Munazhifah et al. (2023)   | Observational            | Time constraints and high levels of routine work are the main obstacles to the completeness of RME.                 |
| 6.  | Krisdarmanto et al. (2025) | Correlational            | Specialists' workload is inversely related to their commitment to completing the RME.                               |
| 7.  | Burhan & Nadjib (2023)     | <i>Literature Review</i> | A complex interface leads to low perceived <i>usability</i> .                                                       |
| 8.  | Levy et al. (2024)         | <i>Scoping Review</i>    | The misalignment of the RME interface with workflows creates an excessive administrative burden.                    |

|     |                            |                           |                                                                                                                          |
|-----|----------------------------|---------------------------|--------------------------------------------------------------------------------------------------------------------------|
| 9.  | Murad et al. (2024)        | Literature Review         | The lack of standards for measuring administrative burden obscures the reality of physician <i>burnout</i> .             |
| 10. | Lou et al. (2022)          | <i>Prospective Cohort</i> | Administrative <i>multitasking</i> and high hours of EHR use lead to reduced accuracy.                                   |
| 11. | Moy et al. (2021)          | <i>Scoping Review</i>     | <i>After-hours</i> documentation is directly associated with a decline in the quality of clinical summaries.             |
| 12. | Budd (2023)                | <i>Systematic Review</i>  | The high amount of time spent on RME data entry (16–24% of work time) leads to administrative work being done from home. |
| 13. | Asgari et al. (2024)       | <i>Cross-sectional</i>    | The volume of notifications ( <i>inbox</i> ) and night shifts are the main predictors of incomplete data.                |
| 14. | Rotenstein et al. (2022)   | <i>Log Data Analysis</i>  | <i>Delayed documentation</i> significantly reduces data accuracy.                                                        |
| 15. | Overhage & McCallie (2020) | Quantitative              | The use of assistive technology ( <i>scribes/voice recognition</i> ) improves the quality of RME.                        |
| 16. | Holmgren et al. (2023)     | Observational             | Repetitive <i>clicks</i> and <i>keystrokes</i> trigger <i>click fatigue</i> (navigation fatigue).                        |
| 17. | Alobayli et al. (2023)     | <i>Quasi-Experimental</i> | Interface redesign increased the completion rate of medical forms by up to 30% by reducing cognitive load.               |
| 18. | Lee et al. (2024)          | <i>Mixed-Methods</i>      | AI ( <i>Ambient Clinical Intelligence</i> ) drastically eliminates secondary administrative burden.                      |

An in-depth analysis of the 18 included studies shows that the phenomenon of incomplete Electronic Medical Records (EMR) in inpatient settings cannot be viewed solely as an indicator of individual indiscipline or negligence. This incompleteness is a logical manifestation of systemic friction between the high demands of direct clinical care and the heavy burden of digital administrative obligations. The determinants of this workload can be thematically classified into three main dimensions: the operational time burden dimension, the cognitive and system ergonomics burden dimension, and the institutional managerial implications.

### **The Time Burden Dimension and the Phenomenon of *After-Hours Work***

The literature consistently highlights that time deficits during operating hours are the greatest obstacle for physicians in documenting clinical records in real time. When the volume of inpatients surges, physicians face a professional dilemma, which ultimately leads them to prioritize direct medical care over completing administrative data (Budd, 2023). This situation leads to a high incidence of *delayed RME documentation*.

These time constraints force physicians to shift administrative work outside of official working hours, giving rise to a phenomenon known globally as “*pajama time*” (Overhage & McCallie, 2020). This extra administrative work at night or from home has been identified by various studies as the strongest predictor of emotional exhaustion and *burnout* (Moy et al., 2021). Furthermore, specialists’ compliance rates in completing RME have been shown to decrease linearly as the number of administrative overtime hours which are not formally tracked by management increases (Krisdarmanto et al., 2025; Murad et al., 2024). Log data analysis also demonstrates that a significant time *lag* between the time of a patient’s examination during the day and the time data is entered in the evening significantly reduces the accuracy and completeness of medical information (Rotenstein et al., 2022).

## Cognitive Load and System Interface Ergonomics (*Usability*)

The second critical determinant stems from weaknesses in the healthcare technology infrastructure itself. Many RME implementations in the field are designed without considering alignment with the specific workflows of medical specialists (Adrian et al., 2023). Doctors are often faced with non-ergonomic system *interfaces*, fragmented menu navigation, and administrative *multitasking* demands that trigger an overload of notifications (Lou et al., 2022). The demands of repetitive manual data entry lead to a phenomenon known as digital navigation fatigue or “*click fatigue*” (Holmgren et al., 2023).

When *the perceived ease of use* of a system is rated low, RME which was originally developed as a clinical aid actually becomes *an excessive documentation* burden (Burhan & Nadjib, 2023; Levy et al., 2024). Mental energy and cognitive capacity that should be focused on formulating medical diagnoses are instead completely drained simply by operating the application. Consequently, the quality of medical record entries becomes subpar, brief, and fails to meet accreditation standards for completeness (Ahmed et al., 2011).

## Implications for Managerial Governance and Solution-Oriented Interventions

From the perspective of hospital governance and operations, the high prevalence of incomplete medical records is not merely a regulatory violation but a systemic managerial risk. Incomplete clinical records threaten patient safety, hinder continuity of care across professions, and directly disrupt administrative verification processes (Amelia et al., 2025). Ultimately, this leads to the rejection or delay of insurance reimbursement claims, which undermines the overall financial stability of the hospital’s cash flow (Sarifa et al., 2026).

To mitigate the destructive impact of this workload friction, recent literature has begun recommending a transition toward operational interventions that combine technological engineering and workforce support. Redesigning the RME interface (*UI/UX redesign*) to be more responsive to physicians’ workflows has been shown to drastically improve the completeness of medical forms (Lou et al., 2022). Furthermore, the integration of technological assistants whether through delegation to data entry assistants (*medical scribes*) or artificial intelligence automation (*Ambient Clinical Intelligence* and voice recognition systems) has proven effective in reducing physicians’ cognitive load, accelerating documentation time, and restoring the quality and completeness of RME to optimal levels (Nurhayati et al., 2025; Page et al., 2021).

## Conclusion

Based on the results of a systematic literature review of 18 scientific articles extracted from the Google Scholar database, it can be concluded that physicians’ workload both in terms of clinical care and administrative obligations is a key determinant that significantly influences the completeness of Electronic Medical Record (EMR) entries in inpatient settings. The friction between a high volume of patient care and bureaucratic documentation demands creates operational barriers that manifest in two main dimensions.

First, limited operational time leads to *delayed documentation* and a high accumulation of administrative work outside official working hours (*after-hours work* or “*pajama time*”), which linearly increases the risk of emotional exhaustion (*burnout*) and reduces the accuracy of clinical data. Second, the high cognitive load on physicians is exacerbated by the non-ergonomic design of the EMR system interface, leading to “*click fatigue*” and transforming supportive technology into a secondary administrative burden (*excessive documentation burden*). This systemic incompleteness of clinical documentation not only compromises *patient safety* but also hinders the file verification process, leading to delays in hospital health insurance claims.

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