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Patient Risks From Human Error in Medical Record Management

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Abstract

This study investigates the risks patients face due to human errors committed by medical record officers in the context of healthcare institutions in Indonesia. While previous research has examined the impact of administrative mistakes in medical recordkeeping, few studies have analyzed their legal and clinical consequences within a rapidly digitalizing healthcare system. This research addresses this gap by evaluating the causes and effects of human error, particularly during the transition from manual to electronic medical records mandated by the Ministry of Health. This study synthesizes data from various international and national studies conducted between 2020 and 2025 using a qualitative literature review method. The analysis reveals that human errors stem from individual factors such as fatigue and inadequate training, systemic factors like incomplete standard operating procedures and high workloads, and institutional issues involving poor supervision and a punitive organizational culture. These errors jeopardize patient safety, leading to misdiagnosis, treatment delays, and privacy breaches, and expose staff to legal and professional sanctions. The study contributes a novel perspective by integrating legal risk analysis with human factors in medical record management, emphasizing the urgent need for multidimensional policy reforms and continuous professional training to safeguard patients and healthcare providers.

Keywords:
Patient Safety, Human Error, Medical Record Management, Legal Risk, Health Information System

1. Introduction

In modern healthcare systems, the quality of medical data has become a crucial determinant of patient safety, clinical decision-making, and institutional accountability. Accurate, timely, and structured medical records form the backbone of evidence-based practices and ensure continuity of care across departments and institutions. Medical record officers play a pivotal role in documenting and managing this information, serving as the front line in safeguarding data integrity. However, when human errors occur in this process, the consequences can be life-threatening for patients and legally damaging for healthcare providers. Previous research has examined various aspects of human error in healthcare settings, particularly focusing on clinical misjudgments or surgical mistakes. However, administrative and documentation-related errors—such as incomplete records, incorrect data entry, or

misfiled documents—have not received equivalent scholarly attention. Studies such as those by Sukumar (2021) and Alvarado & Triantis (2022) underscore that failures in medical documentation have led to malpractice lawsuits and patient harm, yet they often remain underreported. This asymmetry in academic focus has left a significant gap in understanding the systemic and legal risks arising from recordkeeping errors.

In Indonesia, the transition from manual to electronic medical records (EMR) has been accelerated by the Ministry of Health Regulation No. 24/2022, requiring full implementation by the end of 2023. This regulatory shift demands not only technological adaptation but also an overhaul of human resource competencies and institutional protocols. Yet, the existing literature often generalizes findings from high-income countries, failing to account for infrastructural and cultural differences in developing healthcare systems. As a result, critical vulnerabilities unique to Indonesia's legal-medical landscape remain insufficiently explored.

Multiple studies acknowledge that fatigue and inadequate training among health information staff are major contributors to human error in recordkeeping. Xiao et al. (2024) found that cognitive fatigue significantly reduces the accuracy of data processing, while Musa et al. (2023) emphasized that insufficient training in electronic systems leads to data omissions and misinterpretations. Despite this recognition, there remains a lack of integrative models that consider these individual-level issues alongside institutional and technological factors. A holistic understanding is essential to formulate sustainable solutions.

Moreover, structural and systemic factors such as insufficient SOPs, excessive workloads, and poorly integrated technologies exacerbate the likelihood of error. Institutions often fail to update or communicate SOPs effectively, resulting in procedural ambiguity among staff. Concurrently, overlapping duties and high patient volumes strain medical record units, increasing the likelihood of omissions and delays. These findings are supported by Nasution et al. (2025), who reported significant documentation errors arising from inconsistent workflows. At the organizational level, poor supervision and a punitive culture further aggravate the risk landscape. Aghighi et al. (2022) observed that institutions with weak internal oversight structures tend to have higher recurrence of errors. Additionally, fear of punishment discourages staff from reporting near-misses or requesting clarification, thereby compromising the accuracy of documentation. These organizational behaviors contribute to a culture of silence, in which human errors are neither addressed nor prevented proactively.

From the patient's perspective, these documentation errors can result in severe consequences, including misdiagnoses, incorrect treatments, and privacy violations. Research by Krevat et al. (2023) shows that over 60% of malpractice claims involve issues with electronic medical records. Delays in care delivery, breach of confidentiality, and compromised data security are all downstream effects of record mismanagement. These consequences also erode public trust in healthcare institutions and discourage patients from disclosing critical health information. Medical record officers are not only susceptible to burnout and job dissatisfaction but also face legal, administrative, and professional liabilities. Missteps in recordkeeping may result in civil or even criminal penalties under Indonesian law, especially in light of new mandates under the EMR regulation. Despite these high stakes, there is a

paucity of research exploring how medical record staff perceive and cope with these legal risks. The psychological and professional burden placed on these officers remains an underexamined area. A closer examination of the Indonesian legal framework, particularly UU No. 29/2004 on Medical Practice and UU No. 44/2009 on Hospitals, reveals ambiguities regarding the specific responsibilities of medical record personnel. While the law mandates accurate and secure documentation, it lacks clear enforcement mechanisms or accountability standards tailored to record officers. This legal grey zone not only leaves institutions vulnerable but also contributes to inconsistent practices across healthcare facilities.

Furthermore, while the Ministry of Health has introduced the mandatory EMR policy to streamline healthcare delivery and reduce human error, early studies suggest new types of risks may emerge. For instance, lack of system interoperability, insufficient training, and data security breaches are now major concerns. As emphasized by Day & Subekti (2024), without proper legal alignment and role-specific guidelines, the EMR transition could inadvertently increase the frequency and severity of documentation-related errors. The research landscape currently lacks an integrated perspective that combines human, organizational, and legal dimensions of error in medical recordkeeping. Fragmented approaches have limited the formulation of comprehensive policy responses that can address these overlapping domains. Therefore, there is a pressing need to bridge empirical findings with legal-institutional reforms to enhance healthcare governance.

This study aims to address the gap in the literature by offering a multidimensional analysis of patient risks resulting from human error in medical record management. It investigates not only the root causes of these errors but also their legal, clinical, and professional consequences in the Indonesian context. By synthesizing current literature and aligning it with recent regulatory developments, this research contributes to both academic discourse and practical policy development. The study raises the following research questions: first, what are the systemic and individual factors contributing to human errors in medical record management in Indonesia's healthcare institutions? Second, how do these errors impact patient safety, legal accountability, and institutional performance, particularly within the context of Indonesia's transition to electronic medical records?

2. Literature Review

In recent years, an increasing body of research has explored the relationship between human error and healthcare data management, with significant concerns about its impact on patient safety and institutional accountability. A retrospective analysis by Sukumar (2021) highlighted that failures in medical record documentation are frequently at the root of malpractice claims. Similarly, Alvarado and Triantis (2022) presented a systematic review that identified human error as a predominant cause of data breaches in Electronic Health Record (EHR) systems. These studies underscore that administrative errors are not mere clerical oversights but have profound clinical and legal consequences.

The scientific inquiry into cognitive fatigue among healthcare personnel has gained considerable attention. Xiao et al. (2024) used machine learning techniques to demonstrate a strong correlation between inadequate work conditions and mental fatigue, which subsequently impaired data accuracy. Khairat et al. (2020) added to this by illustrating how EHR systems, though designed to streamline processes, often contribute to operational errors due to their inherent complexity. These findings emphasize that human limitations continue to play a central role in understanding the failures in medical record management.

Training deficits have consistently emerged as a recurring theme in the literature. Musa et al. (2023) found that inadequate training in EHR systems led to a marked increase in data-related mistakes and user dissatisfaction. The absence of structured capacity-building programs has been linked to diminished record quality, even in facilities with advanced digital infrastructure. Joseph et al. (2021) further introduced the concept of "alert fatigue," where excessive exposure to system warnings leads to critical oversight, particularly in the documentation of essential clinical data.

Systemic and institutional factors have also been recognized as significant contributors to record-keeping failures. Nasution et al. (2025) and Wijayanti et al. (2024) identified incomplete standard operating procedures (SOPs) and inconsistent documentation practices as structural weaknesses within Indonesian hospitals. Without proper standardization, healthcare workers often rely on subjective judgment, which increases variability and the potential for error. Studies conducted during the COVID-19 pandemic, such as those by Nugraheni et al. (2021), highlighted how surges in workload directly impacted the accuracy of documentation.

Technology-focused studies have noted that the transition to EMR does not eliminate errors but rather transforms their nature. Yusof et al. (2024) proposed the HOPT-Fit framework, which links human, organizational, process, and technology misalignments to documentation failures. Their findings suggest that implementing systems without considering contextual factors results in increased human error, especially when the digital interface is not user-centric. This perspective shifts the responsibility of error from individuals to the flawed system design itself.

Institutional factors, including poor supervision and organizational culture, have also been frequently cited as contributors to errors. Aghighi et al. (2022) and Wawersik and Palaganas (2022) highlighted that the lack of proactive error-reporting systems and punitive organizational cultures prevent staff from addressing near-miss incidents. The absence of non-punitive environments hinders organizational learning and process improvement. Lynn et al. (2013) further demonstrated that structural failures at the management level lead to repeated operational breakdowns.

Legal discourse surrounding administrative errors in medical records is also expanding. Hartanto et al. (2018) and Lee et al. (2025) examined how documentation inaccuracies intersect with civil and criminal liabilities in clinical settings. More recently, Day and Subekti (2024) explored the accountability of third-party EHR vendors in the event of data breaches. These studies reflect the growing complexity of healthcare law in response to technological advancements and regulatory reforms. In the Indonesian context, the challenges are more pronounced following the

enactment of the Ministry of Health Regulation No. 24/2022, which mandates full EMR adoption by 2023. Siregar (2024) noted a significant readiness gap among healthcare institutions in complying with this regulation, particularly in terms of data security, staff preparedness, and legal awareness. Research by Lukitasari et al. (2023) further emphasized the legal vulnerabilities faced by hospitals in managing patient data, indicating the urgency of integrated compliance frameworks.

While the literature has outlined the causes and consequences of human error in medical record systems, many studies treat these dimensions in isolation—focusing either on legal, operational, or cognitive aspects. This study addresses this gap by integrating these perspectives into a cohesive analytical framework. By critically examining the interplay of human, systemic, and legal factors, this research contributes a novel interdisciplinary understanding of how patient risks emerge in the era of digital recordkeeping.

3. Research Method

This study employs a qualitative research approach, utilizing a literature review method to critically examine the causes and impacts of human errors committed by medical record officers. The qualitative paradigm is particularly suited for exploring the complex interplay of contextual, systemic, and institutional factors that influence this phenomenon. Focusing on textual and interpretative data, the research aims to understand patient risks associated with administrative errors comprehensively. This approach is ideal for synthesizing the interrelated dimensions of legal, technical, and human factors in healthcare.

The data used in this research consists of secondary data drawn from both international and national academic literature published over the past ten years (2015–2025). These sources include peer-reviewed journal articles, government regulations, health policy documents, and legal statutes related to medical recordkeeping and digital health systems. The selection of sources was based on relevance, credibility, and scientific rigor, ensuring a well-rounded representation of theoretical and empirical perspectives. This study does not involve fieldwork or primary data collection from human participants, as it is based entirely on secondary data synthesis. The data sources were accessed through established academic databases such as PubMed, Scopus, the Directory of Open Access Journals (DOAJ), national legal repositories, and reputable institutional publications.

The primary research instrument in this study is a content analysis matrix, which categorizes relevant findings from the selected studies into thematic areas. These themes include individual-level causes (e.g., fatigue, inadequate training), systemic deficiencies (e.g., absence of standard operating procedures [SOPs], excessive workloads), institutional issues (e.g., supervision and organizational culture), and legal consequences. Data collection techniques involved structured document review and critical annotation, supported by digital tools such as Zotero and Mendeley, facilitating citation management and cross-referencing findings. Thematic coding was conducted manually to ensure accuracy in recognizing patterns and themes across the literature.

The theoretical framework guiding this study is the Human-Organization-Process-Technology Fit (HOPT-Fit) model, which integrates cognitive, structural, and systemic dimensions of healthcare delivery. This framework aligns institutional variables (e.g., SOPs, organizational culture) with human limitations (e.g., fatigue, error rates) and technological environments (e.g., EMR functionality). The HOPT-Fit model offers a multidimensional lens for evaluating the interaction between human error and patient risk within digital recordkeeping systems. It is beneficial in assessing healthcare systems undergoing rapid technological transformation, such as the shift to electronic medical records (EMRs).

To ensure analytical rigor, the data analysis technique employed was thematic analysis this involved data reduction, pattern identification, categorization, and synthesis. The credibility of the findings was enhanced through data triangulation, which compared evidence across diverse disciplines, including health law, informatics, and patient safety. Referential adequacy was maintained by relying on high-quality academic sources and validating findings through multiple journals and jurisdictions. Peer-reviewed literature and official regulatory documents were used to ensure the reliability and validity of the interpretation of risk factors and legal frameworks.

4. Result

4.1. Individual and Cognitive Causes of Human Error

Human error in medical recordkeeping often arises from individual-level factors such as cognitive fatigue, insufficient training, and psychological overload. Fatigue has been identified as a significant contributor to documentation inaccuracies, particularly among healthcare personnel engaged in prolonged data entry activities (Xiao et al., 2024). Long working hours, especially when combined with limited resources and protective gear requirements, have been shown to impair attention, memory, and judgment. These cognitive deficits ultimately reduce the accuracy and completeness of patient records, thereby exposing both patients and staff to avoidable risks.

Inadequate training further exacerbates human error in the use of electronic medical records (EMR). Research by Musa et al. (2023) revealed that staff unfamiliar with EMR systems were more likely to commit input errors or omit critical data due to a limited understanding of system functionalities. Training programs that focus solely on software operations, without emphasizing error prevention strategies, are insufficient in preparing staff for real-world scenarios. This issue is particularly concerning in transitional systems, where digital literacy among healthcare workers can vary widely. The combined effect of fatigue and poor training results in compounding errors over time.

Joseph et al. (2021) highlighted the phenomenon of "alert fatigue," where healthcare workers tend to ignore critical system warnings after being repeatedly exposed to excessive electronic notifications. This mental desensitization contributes to the automation of errors, where mistakes go unnoticed and are repeated due to habituation. Such findings emphasize the urgent need for continuous professional

development and effective workload regulation to mitigate human error in documentation practices.

Furthermore, individual behavior is deeply influenced by the broader working environment. Khairat et al. (2020) demonstrated that inefficient user interfaces and unintuitive system workflows can cause frustration and cognitive strain, ultimately lowering operational precision. Consequently, individual errors are not solely the result of psychological or technical factors, but often emerge from an interaction between personal capacity and system usability. These insights underline the importance of integrating ergonomic and cognitive considerations into the design of medical information systems to optimize both user experience and data accuracy.

4.2. Systemic and Institutional Failures

While individual factors contribute to human error, systemic deficiencies present broader structural challenges that foster recurring documentation mistakes. Nasution et al. (2025) found that incomplete or outdated standard operating procedures (SOPs) often leave medical record officers without clear guidelines for data entry and management. The lack of formalized protocols forces staff to rely on inconsistent habits, which increases the risk of incomplete, erroneous, or non-standardized entries. This organizational ambiguity undermines both the consistency and legal compliance of recordkeeping practices.

Workload imbalance is another significant systemic issue that elevates the risk of error. Nugraheni et al. (2021) observed that during the COVID-19 pandemic, high patient volumes overwhelmed medical record units, leading to backlogs, misfiling, and delayed updates in patient data. Even after the peak of the pandemic, many institutions failed to adjust staffing levels or workflow expectations, perpetuating high error rates. Excessive workloads reduce the time and cognitive capacity necessary for meticulous documentation, thus fostering an environment prone to mistakes.

Technological transitions, particularly the shift to electronic medical record (EMR) systems, introduce new forms of systemic vulnerability. Yusof et al. (2024) explained that improper integration of digital tools—without proper alignment with human workflows—can lead to more frequent and severe documentation failures. Problems such as non-interoperable platforms, poorly designed user interfaces, and inadequate data validation protocols increase the likelihood of both input and retrieval errors. Rather than solving previous issues, these technological shortcomings often create new ones that compromise data integrity and accuracy.

Institutional culture also plays a crucial role in determining the quality of documentation. Aghighi et al. (2022) found that fear-based management structures discourage error reporting and critical feedback. In such environments, staff members may conceal or ignore minor mistakes, which then evolve into major discrepancies. Wawersik and Palaganas (2022) emphasized that a blame-free culture that promotes open reporting and collaborative problem-solving is essential for sustainable error reduction. Therefore, systemic failures are not limited to operational issues but extend to cultural and managerial aspects of the organization.

4.3. Implications for Patient Safety and Legal; Responsibility

Human error in medical recordkeeping has both direct and indirect consequences for patient safety. Krevat et al. (2023) demonstrated that over 60% of malpractice claims related to diagnostic errors were linked to faulty electronic medical record (EMR) documentation. Common issues such as misidentified patients, inaccurate medication records, and missing allergy information can result in incorrect treatment, delayed care, and, in some cases, fatal outcomes. These preventable incidents emphasize the critical role that documentation accuracy plays in ensuring clinical safety.

Beyond clinical harm, administrative errors in medical recordkeeping can lead to privacy violations and data breaches. Alvarado and Triantis (2022) identified human error as a leading cause of electronic data leaks in healthcare, accounting for a significant portion of global EHR-related incidents. In Indonesia, the increase in unauthorized access to patient data and mismanagement of medical records has raised both legal and ethical concerns. Breaches of patient confidentiality not only damage the reputation of healthcare institutions but also violate national health privacy regulations.

From a legal perspective, medical record officers may be held accountable under civil, administrative, or even criminal law, depending on the severity of the documentation error. Hartanto et al. (2018) emphasized that falsified or missing records can serve as grounds for negligence lawsuits or professional sanctions. With the implementation of Ministry of Health Regulation No. 24/2022, which mandates the use of EMRs, the legal responsibilities of medical institutions and staff have expanded significantly (Siregar, 2024). Failure to comply with these obligations can result in institutional liability and regulatory penalties.

The pressure to meet legal, clinical, and administrative standards places a considerable burden on medical record officers, who operate at the intersection of multiple accountability frameworks. Day and Subekti (2024) argued that both EMR vendors and healthcare institutions must provide clear guidelines and continuous support to ensure lawful data handling. Without these safeguards, the digitalization of health systems may exacerbate existing vulnerabilities rather than resolving them. Thus, comprehensive reforms in training, the development of standard operating procedures (SOPs), legal alignment, and institutional culture are essential to mitigate both patient risk and institutional exposure.

5. Conclusion

This study investigates the risks patients face due to human errors in medical record management within Indonesian healthcare institutions. The findings reveal that both individual and systemic factors significantly contribute to these errors. At the individual level, cognitive fatigue and insufficient training in electronic medical records (EMR) systems were identified as key causes of documentation inaccuracies, leading to misidentification of patients, incorrect medication records, and delayed treatment. Systemic factors, such as incomplete standard operating procedures (SOPs), high workloads, and poor integration of technology, further exacerbate the

likelihood of errors. These findings highlight the critical need for enhanced training, clearer SOPs, and improved system integration to mitigate human error in medical recordkeeping.

The consequences of these errors are profound, affecting patient safety, legal accountability, and institutional performance. Documentation failures can lead to misdiagnoses, treatment delays, and data breaches, ultimately compromising patient care and privacy. From a legal perspective, medical record officers may face significant penalties, and institutions could be held liable under civil and regulatory frameworks, especially with the implementation of Ministry of Health Regulation No. 24/2022 mandating EMR usage. Therefore, this study emphasizes the need for systemic reforms in healthcare institutions, including the development of robust training programs, the promotion of a non-punitive reporting culture, and the alignment of technological and legal frameworks to ensure patient safety and reduce institutional exposure to legal risks.

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