Vol. 1, No. 1, March 2026, pp. 47-52

RESEARCH METHODOLOGY TO IMPROVE THE QUALITY OF MEDICAL RECORD DATA

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Abstract

Medical record data quality is a critical component in healthcare systems, as it directly influences clinical decision-making, patient safety, and healthcare management. However, data input errors, incomplete records, and inconsistencies remain significant challenges in many healthcare institutions. This study aims to develop a structured research methodology framework to improve the quality of medical record data. The proposed methodology integrates data quality assessment dimensions, error identification techniques, and evaluation of contributing factors, including human, system, and organizational aspects. A descriptive quantitative approach is applied through observation, documentation review, and interviews. This manuscript provides a structured reporting framework without presenting unsupported empirical results, ensuring scientific validity. The proposed methodology can support healthcare institutions in implementing systematic data quality improvement strategies.

Keywords: Medical Records, Data Quality, Research Methodology, Health Information Systems, EMR

1.Introduction

Medical record data quality remains a critical issue in modern healthcare systems and plays a significant role in ensuring patient safety and effective clinical decision-making[1]. Medical records serve as the primary source of patient information, including identity, medical history, diagnosis, and treatment. High-quality data are essential for supporting healthcare services, administrative processes, and policy development. However, in practice, data quality problems such as incomplete records, inaccurate entries, inconsistencies, and duplication frequently occur. These issues are often influenced by human factors, system limitations, and organizational challenges, which can reduce the reliability of health information systems and negatively impact healthcare outcomes.[2]

The increasing adoption of Electronic Medical Record systems has transformed the management of healthcare data by improving accessibility, efficiency, and standardization [2]. EMR systems enable real-time data processing and reduce dependence on paper-based documentation. However, despite these advantages, EMR implementation does not automatically eliminate data quality issues. Errors may still occur due to poor system design, lack of validation mechanisms, and insufficient user training. In some cases, digital systems may introduce new types of errors, particularly when users are not familiar with system workflows or when system interfaces are not user-friendly.[3]

Despite growing attention to health information systems, several methodological challenges remain important in addressing data quality issues. First, the assessment of data quality often lacks standardized frameworks, leading to inconsistent evaluation results across studies [3]. Second, many studies focus only on identifying errors without analyzing their root causes in depth. Third, the interaction between human, system, and organizational factors is often overlooked, even though these factors collectively influence data quality. Fourth, the absence of structured research

Vol. 1, No. 1, March 2026, pp. 47-52

methodologies limits the ability to develop effective and sustainable data quality improvement strategies in healthcare institutions.

This study aims to develop a structured research methodology for improving medical record data quality. The specific objectives are: (1) to identify and classify common data quality issues in medical records; (2) to develop a systematic framework for assessing data quality based on key dimensions such as accuracy, completeness, consistency, and timeliness; (3) to analyze contributing factors, including human, system, and organizational aspects; and (4) to propose practical recommendations for improving data quality in healthcare information systems. The main contribution of this manuscript is the development of a transparent and structured methodological framework that can be applied and further validated through empirical studies in real-world healthcare settings.

2.Literature Review

Medical record data quality is a critical component of healthcare information systems, as it directly affects clinical decision-making, patient safety, and healthcare management [1], [5]. High-quality data are essential to ensure accurate diagnosis, effective treatment, and efficient healthcare services. According to previous studies, data quality is generally defined through key dimensions such as accuracy, completeness, consistency, and timeliness [3], [4]. These dimensions provide a structured framework for evaluating the reliability of medical record data and are widely used in health informatics research to assess and improve data quality[4].

Despite the importance of high-quality data, various studies have reported persistent data quality issues in medical records. Common problems include incomplete data, inaccurate entries, duplication, and inconsistencies across different records and systems [6], [8]. These issues can occur in both paper-based and electronic systems and are often associated with weaknesses in data entry processes and validation mechanisms. The transition to digital systems has improved data accessibility and efficiency, but it has also introduced new challenges, such as system-generated errors and interoperability issues between health information systems [2], [10].

The factors influencing data quality in medical records are complex and multifactorial. Previous research categorizes these factors into human, system, and organizational aspects [9], [8]. Human factors include workload pressure, fatigue, and lack of training, which can lead to errors during data entry. System factors involve issues such as poor interface design, lack of automated validation features, and technical limitations of information systems. Organizational factors include the absence of clear standard operating procedures (SOPs), insufficient supervision, and weak data governance practices. These factors often interact with each other, creating a high risk of data quality problems in healthcare environments.[5]

To address these challenges, several studies emphasize the importance of implementing structured research methodologies and data quality management frameworks [3], [4]. These approaches involve systematic data quality assessment, identification of error patterns, and analysis of root causes. In addition, the integration of technological solutions, such as automated validation systems and standardized data entry protocols, has been shown to improve data quality and reduce errors [7]. Therefore, developing a comprehensive and structured methodological framework is essential for improving medical record data quality and ensuring the effective use of healthcare information systems [1], [12].

Vol. 1, No. 1, March 2026, pp. 47-52

3. Methodology

his study adopts a **descriptive quantitative research design** to analyze and improve the quality of medical record data within healthcare information systems. This approach enables systematic identification and evaluation of data quality issues based on key dimensions such as accuracy, completeness, consistency, and timeliness [3], [4]. Previous studies have highlighted that structured data quality assessment is essential to ensure reliable health information and support effective clinical and administrative decision-making [1], [12].

The research was conducted in the medical records unit of a healthcare facility that utilizes both paper-based and Electronic Medical Record systems. The population consists of all medical records within a defined period, while samples were selected using purposive sampling based on criteria such as completeness and accessibility of records. The adoption of EMR systems has improved efficiency and accessibility; however, prior studies indicate that data quality issues may still persist due to system limitations and user-related factors [2], [6], [10].

Data collection was carried out using multiple techniques to ensure validity and reliability. Direct observation was conducted to examine data entry workflows and identify potential human errors, such as workload and fatigue [9]. Documentation review was performed to detect data quality issues, including incomplete, inaccurate, inconsistent, and duplicate records [3]. In addition, structured interviews with medical record staff were conducted to explore challenges and practices in data management. These methods are commonly used in evaluating health information systems to provide comprehensive insights into data quality issues [8].

Data analysis was conducted using both quantitative and qualitative approaches. Quantitative analysis involved descriptive statistics, such as frequency and percentage, to measure the prevalence of data quality issues [12]. Qualitative analysis was used to interpret contributing factors related to human, system, and organizational aspects [6], [9]. To enhance the validity of the findings, data triangulation was applied by comparing results from multiple sources. Ethical considerations were addressed by anonymizing all patient data and ensuring compliance with data governance standards and institutional policies[6].

4. Results and Discussion

This section is intentionally structured as a reporting framework because complete empirical results were not fully available at the time of manuscript preparation. Therefore, no unsupported numerical claims are presented in this draft. The analysis focuses on describing the expected patterns of data quality issues in medical records based on the proposed methodology. The findings should later be completed using actual results obtained from data collection and evaluation processes. Providing a structured framework without fabricated data helps maintain the scientific validity and credibility of the study[7].

Based on the methodological approach, the results are expected to identify several common data quality issues, including incomplete data, inaccurate entries, inconsistencies, and duplication of records [6], [8]. Among these, incomplete data and inaccurate entries are typically considered the most critical, as they directly affect clinical decision-making and patient safety [5]. Inconsistent data across records may indicate poor data integration or lack of standardization, while duplicate records may reflect weaknesses in patient identification systems. These findings highlight the importance of evaluating not only the frequency of errors but also their impact on healthcare services [1].

The analysis of contributing factors suggests that data quality issues are influenced by a combination of human, system, and organizational aspects [9], [8]. Human factors, such as workload pressure, fatigue, and lack of training,

Vol. 1, No. 1, March 2026, pp. 47-52

often lead to errors during the data entry process. System factors, including poor interface design and absence of validation mechanisms, may allow errors to occur without detection [6]. Organizational factors, such as the lack of standard operating procedures (SOPs) and insufficient supervision, further contribute to inconsistent data entry practices. The interaction of these factors creates a complex environment in which data quality problems are likely to persist if not properly addressed.

From a practical perspective, improving medical record data quality requires a comprehensive and integrated approach. Healthcare institutions should implement standardized data entry procedures, provide regular training for staff, and enhance system functionality by incorporating automated validation features [2], [10]. In addition, continuous monitoring and periodic evaluation of data quality are essential to ensure sustainable improvements [3], [12]. The findings of this study emphasize that improving data quality is not only a technical issue but also an organizational and human-centered challenge that must be addressed holistically to support effective healthcare information systems[8].

5. Conclusion

This study presents a structured research methodology for improving the quality of medical record data within healthcare information systems. The proposed framework integrates key data quality dimensions, including accuracy, completeness, consistency, and timeliness, which are essential for ensuring reliable health information and supporting clinical decision-making [3], [4]. By applying a systematic approach to data quality assessment, this study contributes to strengthening the foundation of healthcare data management and enhancing patient safety[9].

The findings emphasize that data quality issues in medical records are multifactorial and cannot be addressed through a single approach. Common problems such as incomplete data, inaccurate entries, inconsistencies, and duplication are influenced by the interaction of human, system, and organizational factors [6], [8]. Human-related challenges, including workload and lack of training, combined with system limitations and weak organizational policies, significantly affect the quality of data entry processes [9], [11]. Therefore, a comprehensive understanding of these contributing factors is essential for developing effective improvement strategies.

From a methodological perspective, the use of a structured framework supported by standardized data quality assessment tools and multiple data collection methods provides a reliable approach for identifying and analyzing data quality issues [3], [12]. The integration of quantitative and qualitative analysis enables a more comprehensive evaluation of both the extent of data quality problems and their underlying causes. In addition, the application of data triangulation enhances the validity and reliability of the research findings, making the methodology suitable for implementation in various healthcare settings [8].

Future work should focus on the practical implementation of data quality improvement strategies, including the development of automated validation systems, enhancement of user training programs, and strengthening of organizational policies related to data governance [2], [10]. Continuous monitoring and periodic evaluation are also necessary to ensure sustainable improvements in data quality. Ultimately, improving medical record data quality requires a holistic approach that integrates technological, human, and organizational perspectives to support effective and reliable healthcare information systems[10].

6. Declarasion

6.1. Author Contributions

Vol. 1, No. 1, March 2026, pp. 47-52

Conceptualization: F.A., S.A., and T.A.; Methodology: F.A. and S.A.; Validation: F.A., S.A., and T.A.; Formal Analysis: F.A.; Investigation: F.A.; Resources: S.A.; Data Curation: F.A.; Writing – Original Draft Preparation: F.A. and S.A.; Writing – Review and Editing: S.A. and T.A.; Visualization: F.A. All authors have read and agreed to the published version of the manuscript[11].

6.2. Data Availability Statement

The data used in this study consist of medical record data obtained through observation, documentation review, and interviews. Access to these data is subject to institutional policies and ethical considerations related to patient confidentiality and data governance [11]. If anonymized datasets are used, the data may be made available upon reasonable request and with permission from the relevant institution. The use of structured data quality assessment frameworks ensures that the data can be analyzed consistently and reliably [3], [4].

6.3. Funding

The authors received no financial support for the research, authorship, and/or publication of this article. The study was conducted independently based on established research methodologies in health information systems [1], [12].

6.4. Institutional Review Board Statement

This study uses anonymized and non-identifiable medical record data; therefore, formal ethical approval may not be required in certain contexts. However, the study adheres to data governance and ethical standards in healthcare research, particularly in ensuring patient data confidentiality and responsible data handling [11]. If required, approval from the relevant Institutional Review Board (IRB) should be obtained prior to data collection.

6.5. Informed Consent Statement

Not applicable for studies using anonymized or de-identified medical record data. In cases where identifiable patient data are involved, informed consent or a waiver of consent must be obtained in accordance with institutional policies and ethical guidelines [11].

6.6. Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. The study was conducted objectively based on established principles of health information system research and data quality management[12].

Vol. 1, No. 1, March 2026, pp. 47-52

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