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Analysis of Electronic Medical Record Data Quality Following the Implementation of a New Hospital Information System at Hospital X

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Abstract. *The transition to a new Hospital Information System (SIMRS) at Hospital X changed the electronic medical record (EMR) documentation workflow and created a need to evaluate the quality of recorded data. Preliminary observations identified inconsistencies in diagnosis entries and patient age data. This study analyzed EMR data quality after implementation of the new SIMRS, focusing on completeness and accuracy. A descriptive quantitative design was used with 195 general outpatient EMRs. Primary data were obtained through direct observation using a checklist and were processed in SPSS using frequency and percentage distributions. Thirteen relevant data elements achieved 100% completeness. Three elements—civil-service rank/grade, NRP/NIP, and organizational unit—were unfilled, but these fields were considered conditionally applicable and therefore were not interpreted as deficiencies for general patients. Accuracy was high across the assessed dimensions: patient name and identity, ICD-10 coding, and follow-up data reached 100%; patient age data reached 99.5%; and diagnosis-entry conformity reached 95%. The average accuracy reported in the source study was 98.9%. Overall, EMR data quality following implementation of the new SIMRS was very good, although diagnosis-entry consistency and the design of conditionally applicable fields require improvement. Periodic monitoring, automatic input validation, clearer electronic-form logic, and regular staff training are recommended to maintain and improve EMR data quality.*

Keywords: *Electronic Medical Records; Data Quality; Hospital Information System; Completeness; Accuracy*

1. Introduction

Advances in health information technology have transformed medical record documentation from paper-based systems to electronic medical records (EMRs). EMRs facilitate the recording, storage, retrieval, and availability of patient information and can support more efficient health-service delivery (1). In Indonesia, electronic medical record implementation is supported by national regulation requiring health facilities to organize medical records electronically (2). EMRs may be integrated with a Hospital Information System (SIMRS), which supports clinical services, documentation, administration, and reporting. The usefulness of such systems depends substantially on the completeness and accuracy of the data entered (3). Implementation of a new SIMRS generally requires users to adapt to changes in interface design, data-entry pathways, and migration processes. These changes may temporarily affect documentation performance. At Hospital X, a new SIMRS had recently been implemented, making the quality of EMR data an important area for evaluation, particularly with respect to completeness and accuracy.

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A preliminary study conducted on 1 May 2026 in the general outpatient unit of Hospital X included direct observation of EMR completion and discussion with medical record personnel. Staff were still adapting to the new interface and workflow. Inconsistencies were identified in diagnosis documentation, including double spaces and variable abbreviations, indicating non-uniform data entry. One inconsistency was also identified in patient age data. Staff further reported that early data migration from the previous system had created difficulties that affected the speed of data entry. These findings are important because high-quality EMR data are needed for clinical decision-making, administrative processes, reporting, and secondary data use. Completeness reflects whether required elements are recorded, whereas accuracy reflects whether recorded information is correct and consistent with the intended data definition. Previous Indonesian studies have emphasized the importance of evaluating EMR implementation and information quality to ensure that digital transformation translates into effective healthcare services (4-9).

Accordingly, this study aimed to analyze the quality of electronic medical record data following implementation of a new SIMRS at Hospital X, focusing specifically on completeness and accuracy among general outpatient records. The findings are expected to provide an evidence base for hospital monitoring and for improvements in system design and staff data-entry practices. This study is also relevant to the Sustainable Development Goals, particularly SDG 3 (Good Health and Well-Being) and SDG 9 (Industry, Innovation and Infrastructure). Reliable electronic medical records and well-functioning hospital information systems can support safer and higher-quality healthcare by improving the completeness, accuracy, accessibility, and continuity of patient information. At the same time, strengthening the quality of digital health data contributes to the development of resilient and interoperable healthcare infrastructure. Therefore, evaluating EMR data quality after SIMRS implementation is important not only for improving clinical and administrative processes but also for supporting broader efforts to strengthen digital health systems and healthcare quality in line with SDG 3 and SDG 9.

2. Methods

This study used a descriptive quantitative design to evaluate electronic medical record data quality following implementation of a new SIMRS at Hospital X. The study was conducted at Hospital X on 1 May 2026. The study population consisted of all electronic medical records of general outpatients generated after implementation of the new SIMRS during the defined observation period. The sampling frame was constructed from the list of general outpatient EMRs available in the SIMRS for the period **1 April to 30 April 2026**, representing one full month of outpatient documentation after the new system had become operational. A total of **195 general outpatient EMRs** were included in the study. Records were selected from the sampling frame using **systematic random sampling**. The total number of eligible outpatient records during the study period was first identified from the SIMRS database, after which a sampling interval was determined by dividing the number of eligible records by the required sample size. The first record was selected randomly, and subsequent records were selected according to the calculated interval until 195 records were obtained. Records were eligible if they represented general outpatient visits documented using the new SIMRS during the study period and contained the data elements required for assessment of completeness and accuracy. Duplicate records, cancelled visits, and records with technical-access problems that prevented assessment were excluded.

The sample of 195 records was intended to provide a descriptive representation of general outpatient EMRs recorded during the specified one-month period after implementation of the new SIMRS. However, the sample should not be interpreted as representing all outpatient EMRs across other departments, different periods, or the entire post-implementation phase. The estimates of completeness and accuracy therefore apply primarily to the sampled general outpatient records generated during April 2026. The source manuscript identifies the data as primary data obtained through direct observation of the electronic records and supporting outpatient-service data available at the hospital. Data were collected using a structured observation checklist. The principal variable was EMR data quality, operationalized through two indicators: completeness and accuracy. Each indicator was assessed for the relevant data elements in all 195 sampled records. Data were coded as 1 when an element was complete or conforming and 0 when it was incomplete or non-conforming.

The collected data were entered and processed using SPSS. Descriptive analysis was performed by calculating frequencies and percentages for each assessed indicator using the formula $P = (f/n) \times 100\%$, where P is the percentage, f is the number of complete or conforming observations, and n is the total number of sampled records. Results were interpreted descriptively and summarized in tables to characterize overall EMR data quality.

For the accuracy assessment, patient name and identity and patient age were evaluated using predefined formatting criteria. Names were checked for anomalous characters, while age was expected to be entered numerically within the range of 0–120 years. Diagnosis-entry conformity was assessed for input inconsistencies such as double spaces, hidden characters, or other formatting irregularities that could interfere with data processing. ICD-10 conformity was assessed by comparing the recorded ICD-10 code with the documented diagnosis, while follow-up conformity was assessed by examining whether follow-up instructions were aligned with the patient's diagnosis and documented clinical plan. The source manuscript does not report an ethics committee name or ethical approval code. This information should be completed by the authors if ethical approval was required under the applicable institutional policy.

3. Results and Discussion

3.1. Completeness of Electronic Medical Record Data

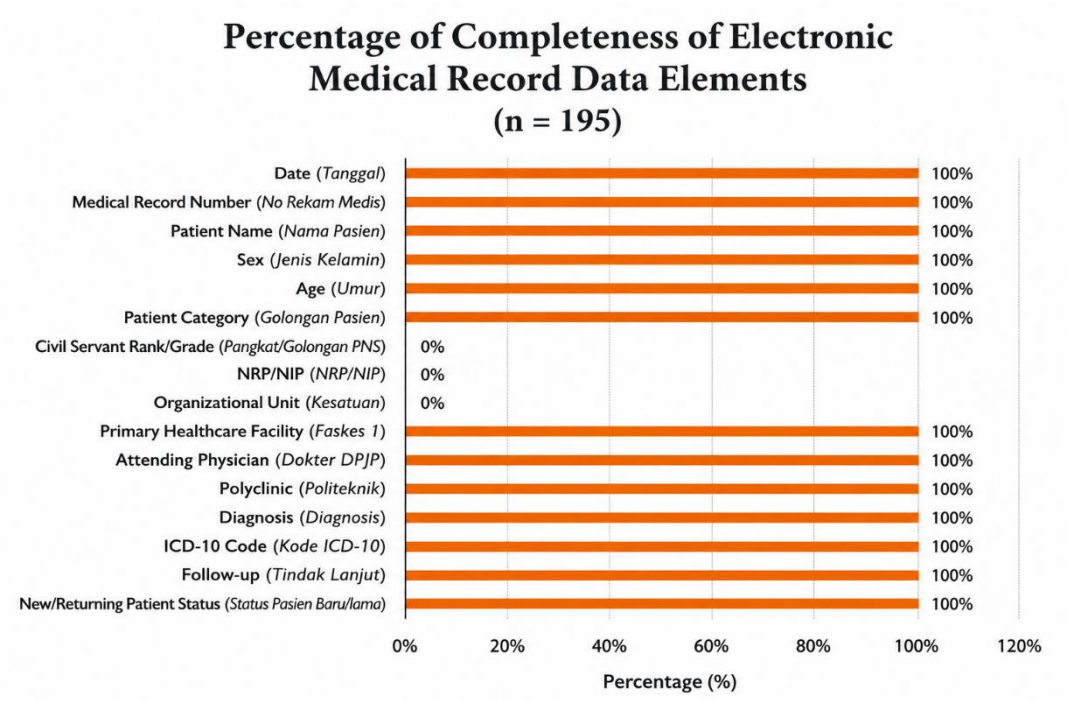

Figure 1. Percentage of Completeness of Electronic Medical Record Data Elements

Of the 16 evaluated data elements, 13 elements (81.25%) achieved 100% completeness. These included the principal demographic and clinical elements required for general outpatient care. Three fields—civil-service rank/grade, NRP/NIP, and organizational unit—showed 0% completion. The source study interprets these fields as conditionally applicable to specific patient groups such as civil servants or military/police personnel; therefore, their non-completion among general patients was not automatically treated as a documentation failure. This distinction is methodologically important. A field that is not applicable should not necessarily be treated as missing data. The finding instead suggests that the electronic form could benefit from clearer conditional logic so that non-applicable fields are distinguished from genuinely incomplete fields. Such design refinement would improve the validity of future completeness audits.

3.2. Accuracy of Electronic Medical Record Data

Accuracy was high across all assessed indicators. Patient name and identity, ICD-10 coding, and follow-up conformity each reached 100%. Patient age accuracy reached 99.5%, indicating one inconsistent age entry in the source study. Diagnosis-entry conformity was the lowest indicator at 95%, reflecting formatting problems such as double spaces or hidden characters. The source abstract reports an average data accuracy of 98.9%. The diagnosis finding demonstrates that complete documentation is not synonymous with accurate documentation. A diagnosis field may be populated while still containing inconsistent formatting. The source manuscript suggests that such errors may arise from human error, workload, or the absence of automatic validation in the new SIMRS. Although ICD-10 conformity was reported as 100% in the assessed sample, inconsistent diagnosis text could still complicate downstream coding, reporting, analytics, and claim-related workflows if not controlled.

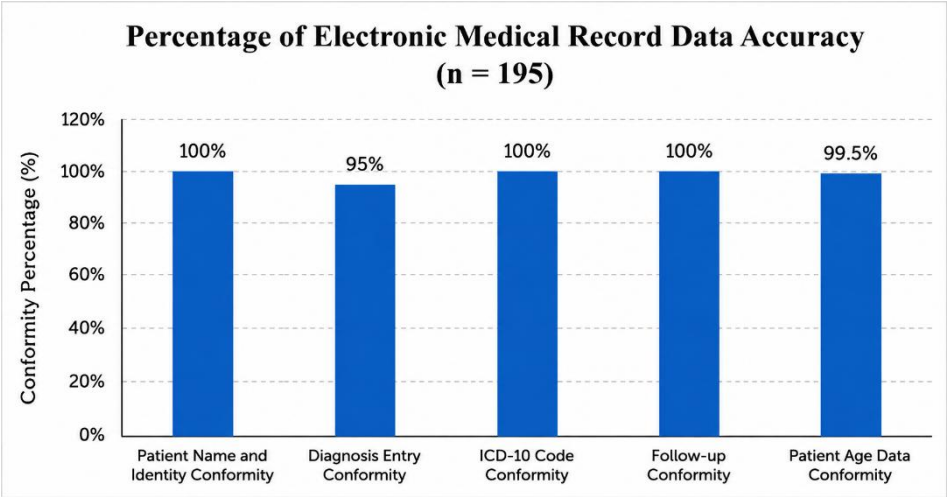

Figure 2. Percetage of Electronic Medical Record Data Accuracy

3.3. Overall Data Quality and Implications

Taken together, the results indicate that the new SIMRS supported a high level of EMR data quality in the general outpatient unit. The main required data elements were complete, and the assessed accuracy indicators were consistently high. This suggests that transition to the new system did not substantially compromise core documentation quality in the sampled records. Nevertheless, two improvement priorities emerge from the source data. First, electronic forms should clearly distinguish mandatory fields from fields that apply only to specific patient categories. Conditional display or validation rules could prevent non-applicable fields from being misclassified as incomplete. Second, automatic input validation should be considered for text fields such as diagnosis entries to detect double spaces, unusual characters, or other formatting inconsistencies before data are saved. Regular monitoring and user training are also warranted. Studies of EMR and hospital information system implementation in Indonesia have highlighted the importance of system evaluation, information quality, user adaptation, and alignment with national electronic medical record requirements (4-11). The findings of the present study reinforce the need to combine technical system improvements with continuous staff competency development.

Diagnosis-entry conformity showed the lowest accuracy level among the assessed indicators, although the proportion remained relatively high at 95%. The identified inconsistencies, such as double spaces, hidden characters, or other formatting irregularities, may appear minor from a visual perspective but can have important consequences for electronic data processing. Non-standardized diagnosis entries can interfere with keyword-based data retrieval, duplicate detection, automated searching, and the matching of diagnoses with corresponding ICD-10 codes. These inconsistencies may also increase the workload of coding personnel because entries that are not structured or consistently formatted may require additional verification and manual correction before coding or reporting. From a broader information-management perspective, inconsistencies in diagnosis entry may affect the reliability of morbidity reports, service statistics, reimbursement-related data processing, and secondary use of EMR data for quality evaluation or research. They may also create interoperability problems when data are exchanged between SIMRS and external digital health platforms, because structured systems generally depend on standardized terminology and machine-readable formats. Even small variations in spacing, hidden characters, or text structure can reduce the ability of automated systems to recognize equivalent clinical concepts

consistently. Therefore, the 95% conformity rate should not be interpreted only as a high level of accuracy; the remaining 5% of non-conforming entries represents a practical data-quality gap that may become more consequential when large volumes of records are processed or exchanged electronically. Standardization of diagnosis-entry formats, use of controlled terminology, automated validation rules, user-interface restrictions, and periodic data-quality audits may help reduce these inconsistencies. Strengthening these mechanisms is particularly important for supporting efficient coding workflows, reliable reporting, interoperability, and the subsequent clinical, administrative, and research use of EMR data.

Conclusions

Electronic medical record data quality following implementation of the new SIMRS at Hospital X was generally very good. Thirteen of 16 evaluated data elements achieved 100% completeness, while three unfilled fields were interpreted as conditionally applicable to particular patient categories rather than universally required. Accuracy was also high: patient identity, ICD-10 coding, and follow-up data reached 100%; patient age reached 99.5%; and diagnosis-entry conformity reached 95%. The remaining issues were therefore concentrated in diagnosis-entry consistency and the design of patient-specific fields. Hospital X should implement periodic data-quality monitoring, strengthen automatic validation for data entry, clarify conditional electronic-form fields, and provide regular staff training. Future research may expand the assessment to additional data-quality dimensions, such as timeliness and consistency, and include broader patient populations.

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Conflicts of Interest

The source manuscript does not report any conflicts of interest. The authors should confirm the appropriate declaration before submission.

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