

Relationship Between Completeness Medical Information and Accuracy of Gastroenteritis Diagnosis Codes in Inpatients at RSUD dr. Soediran Mangun Sumarso Wonogiri 2025

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ABSTRACT

Completeness of medical information is a critical prerequisite for accurate ICD-10 diagnosis coding. Incomplete documentation may lead to coding errors that distort morbidity data and impair healthcare reimbursement accuracy. This study aimed to determine the relationship between completeness of medical information and accuracy of gastroenteritis diagnosis codes among inpatients at RSUD dr. Soediran Mangun Sumarso Wonogiri in 2025. A quantitative analytic study with a cross-sectional design was used. Simple random sampling yielded 252 medical record documents from a population of 680 gastroenteritis inpatient cases. Data were collected through structured checklist observation of five medical information items and ICD-10 coding accuracy review, supplemented by guided interviews. Chi-square analysis was performed using SPSS. Results showed that 94.84% of documents (239/252) had complete medical information and 90.48% (228/252) had accurate diagnosis codes. Chi-square testing revealed a statistically significant relationship between completeness of medical information and coding accuracy ($p = 0.001$; OR = 13.091; 95% CI: 4.163–41.170). These findings confirm that complete medical documentation increases the likelihood of accurate ICD-10 coding by 13-fold, highlighting the necessity of comprehensive clinical documentation in hospital information management.

Keywords: Gastroenteritis; Accuracy of diagnosis code; medical information completeness.

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INTRODUCTION

Hospitals are required to maintain accurate and complete medical records as regulated by the Indonesian Minister of Health Regulation No. 24 of 2022. Completeness of medical information is essential because it supports diagnosis confirmation, treatment decisions, insurance claims, and accurate ICD-10 diagnosis coding (1). Incomplete medical information may lead to coding inaccuracies, affecting morbidity statistics, reimbursement systems, and healthcare quality. Previous studies have demonstrated a significant relationship between medical information completeness and coding accuracy. Suryandari et al. (2025) reported that 28% of diagnosis codes were inaccurate and found a significant association between completeness and coding accuracy ($p < 0.05$), while Rista and Jepisah (2021) found that 21.8% of medical records had incomplete diagnoses and 27.2% contained inaccurate codes (2,3). Gastroenteritis remains a major public health problem worldwide, with approximately 1.7 billion cases annually among children and 443,800 deaths in children under five years of age (4). In Indonesia, the 2023 Indonesian Health Survey reported a diarrheal prevalence of 6.8%, while Central Java recorded 1.6% (5). At RSUD dr. Soediran Mangun Sumarso Wonogiri, gastroenteritis was the second most common inpatient diagnosis in 2025, accounting for 680 cases. A preliminary review of 10 medical records revealed 10% incompleteness of medical information and 20% coding inaccuracies, including misclassification of typhoid fever and gastroenteritis of unknown etiology as A09.0 (6).

Although previous studies have consistently shown a relationship between medical information completeness and coding accuracy, evidence from district-level government hospitals in Central Java remains limited. Therefore, this study aimed to determine the relationship between completeness of medical information and the accuracy of gastroenteritis diagnosis codes among inpatients at RSUD dr. Soediran Mangun Sumarso Wonogiri in 2025.

METHODS

This study employed a quantitative analytic design with a cross-sectional approach, whereby the independent variable (completeness of medical information) and the dependent variable (accuracy of gastroenteritis diagnosis codes) were measured simultaneously. The study population comprised all 680 inpatient medical record documents with a gastroenteritis diagnosis (A09.0, A09.9, K52, P78.3, O99.6) at RSUD dr. Soediran Mangun Sumarso Wonogiri in 2025. Sample size was determined using the Slovin formula at a 5% margin of error ($n = 680 / [1 + 680 \times 0.05^2] = 251.85 \approx 252$). Simple random sampling was performed using the RAND() function in Microsoft Excel, yielding 252 medical record documents as the final sample (7).

Data were collected through two approaches. First, direct observation of inpatient medical record documents was conducted using a structured checklist assessing five medical information items: (1) admission diagnosis, (2) primary and secondary diagnoses, (3) anamnesis, (4) patient age, and (5) supporting examination results. Coding accuracy was simultaneously assessed by comparing hospital-assigned codes against ICD-10 Volumes 1, 2, and 3 (2016 edition) (8). Second, guided free-form interviews were conducted with the head of the medical records unit, the coder/verifier, the inpatient ward person-in-charge (PJ), and nursing staff to obtain qualitative data on coding procedures and documentation practices. Secondary data were obtained from the disease index, inpatient visit reports, and the hospital's Standard Operating Procedures (SOP No.

021/02/056 for coding and indexing; SOP No. 021/02/039 for completing incomplete records).

Data processing followed six stages: collecting, editing, coding, classification, tabulating, and data presentation in tabular and narrative formats. Analysis was conducted in two stages: (1) univariate analysis to describe frequency distributions and percentages of each variable, and (2) bivariate analysis using the chi-square test processed through SPSS to examine the relationship between completeness of medical information and accuracy of diagnosis codes. A p -value < 0.05 was considered statistically significant.

RESULTS

A. Completeness of Medical Information

Of the 252 medical record documents analyzed, 239 (94.84%) were categorized as complete and 13 (5.16%) as incomplete. Table 1 presents the completeness distribution per item.

Table 1. Distribution of Medical Information Completeness per Item (n = 252)

Medical Information Item	Complete (n)	Complete (%)	Incomplete (n)	Incomplete (%)
Admission Diagnosis	252	100.00	0	0.00
Primary & Secondary Diagnosis	252	100.00	0	0.00
Anamnesis	251	99.61	1	0.39
Patient Age	252	100.00	0	0.00
Supporting Exam Results	239	94.84	13	5.16
Total	239	94.84	13	5.16

As shown in Table 1, admission diagnosis, primary and secondary diagnoses, and patient age achieved 100% completeness, reflecting the mandatory fields enforced by the EMR system. Incompleteness was concentrated in supporting examination results (5.16%) and anamnesis (0.39%). The high overall completeness rate is attributable to the EMR system's automatic detection of unfilled items and the confirmation mechanism that requires physicians to complete missing data within 24 hours per SOP No. 021/02/039. Residual incompleteness in supporting examination results is linked to the ongoing adaptation of some physicians to the EMR system following its October 2023 implementation.

B. Accuracy of Gastroenteritis Diagnosis Codes

Of the 252 documents reviewed, 228 (90.48%) had accurate diagnosis codes and 24 (9.52%) were inaccurate. Table 2 presents the accuracy distribution by diagnosis code variant.

Table 2. Distribution of Gastroenteritis Diagnosis Code Accuracy (n = 252)

Diagnosis Code	Population (N)	Accurate (n)	Accurate (%)	Inaccurate (n)	Inaccurate (%)
A09.0	632	216	91.14	21	8.86
A09.9	39	11	73.33	4	26.67

Diagnosis Code	Population (N)	Accurate (n)	Accurate (%)	Inaccurate (n)	Inaccurate (%)
K52	6	-	-	-	-
P78.3	1	-	-	-	-
O99.6	2	-	-	-	-
Total (sample)	252	228	90.48	24	9.52

Three main types of coding errors were identified. First, code A09.0 was assigned to chronic diarrhea cases that should have been coded K52.9. Second, code A09.9 was assigned to a case with leukocytosis (17,000 cells) — a marker of infection — that should have been coded A09.0. Third, code A09.0 was assigned to nausea and vomiting in a patient with a history of breast cancer chemotherapy (Ca Mammae), where the correct code would reflect the chemotherapy-induced etiology rather than infectious gastroenteritis.

C. Relationship Between Completeness of Medical Information and Accuracy of Diagnosis Codes

The chi-square test results are presented in Table 3.

Table 3. Relationship Between Completeness of Medical Information and Accuracy of Gastroenteritis Diagnosis Codes (n = 252)

Medical Information	Accurate Code (n)	Accurate Code (%)	Inaccurate Code (n)	Inaccurate Code (%)	Total (n)	p-value	OR (95% CI)
Complete	217	91.2	21	8.8	238	0.001	13.091 (4.163–41.170)
Incomplete	6	42.9	8	57.1	14		
Total	223	88.5	29	11.5	252		

Table 3 shows that of 238 complete documents, 217 (91.2%) had accurate codes and 21 (8.8%) were inaccurate. Of 14 incomplete documents, only 6 (42.9%) had accurate codes while 8 (57.1%) were inaccurate. Chi-square analysis yielded $p = 0.001$ ($p < 0.05$), indicating a statistically significant relationship between completeness of medical information and accuracy of gastroenteritis diagnosis codes. The odds ratio of 13.091 (95% CI: 4.163–41.170) indicates that documents with complete medical information were 13 times more likely to have accurate diagnosis codes than incomplete documents.

DISCUSSION

A. Completeness of Medical Information

The high completeness rate of 94.84% reflects the positive impact of EMR implementation at RSUD dr. Soediran Mangun Sumarso Wonogiri since October 2023. The EMR system's automatic detection of unfilled fields and the mandatory confirmation protocol (SOP No. 021/02/039) have substantially improved documentation completeness compared to the previous manual system. These findings are consistent with Suryandari et al. (2025), who similarly reported high medical information completeness in inpatient records, particularly for supporting examinations (98%), medical resumes (96%), and clinical progress notes (87%) (2). The Ministry of Health (2023) affirms that EMR implementation contributes to improved documentation quality when accompanied by adequate personnel training (11). The residual incompleteness (5.16%), concentrated in supporting examination results, is explained by the ongoing adaptation of some physicians to the EMR documentation system — a phenomenon consistent with findings by Pratama et al. (2023), who demonstrated that incomplete supporting examination data directly impairs coder ability to verify and select precise diagnosis codes (12).

This finding is further corroborated by Yulia et al. (2023), who conducted a study on the relationship between medical information completeness and appendix diagnosis coding accuracy at RS Tk. III Dr. Reksodiwiryono Padang, and found that incompleteness of medical information in RM A-1 (medical resume), RM I-1 (integrated patient progress notes), and RM L-8 (laboratory examination results) contributed significantly to the incompleteness rate of 61.8% (68 out of 110 documents) (16). Similarly, Annisa and Akbar (2025) at RS X Kota Malang found that among 83 BPJS inpatient medical record documents, incompleteness of medical information reached 40%, with the highest incompleteness concentrated in the medical resume form (23%) and supporting examination results (19%) (17). Both studies highlight that the medical resume and supporting examination sheets are the most vulnerable documentation components — a pattern that mirrors the present study's finding of incompleteness concentrated in supporting examination results (5.16%). Wardhani (2025) further confirmed this pattern in CKD cases at RSUD dr. Soedono Madiun, where incompleteness of medical information reached 62% (42 out of 68 documents), with supporting examination data identified as the primary incomplete component (19). Mudayana (2023) at RS Santa Clara Madiun similarly reported that incomplete supporting examination data in fracture radius cases was the leading factor contributing to medical information incompleteness, reinforcing the conclusion that supporting examination documentation represents a systemic and cross-diagnostic vulnerability in Indonesian inpatient records (23).

B. Accuracy of Gastroenteritis Diagnosis Codes

The overall coding accuracy rate of 90.48%, while relatively high, reflects systematic error patterns with meaningful implications. The predominant finding is that coders conflate A09.0 and A09.9 based on the presence of the word "acute" in the diagnosis text rather than on objective clinical evidence of infection. One coder explained: "If the doctor writes GEA, that means A09.0; if just diarrhea or gastroenteritis, then A09.9." This approach bypasses the ICD-10 requirement to verify the infective etiology through laboratory or clinical evidence, as specified in ICD-10 Volumes 1, 2, and 3 (2016) (8). This finding is consistent with Rista and Jepisah (2021) and Rahmawati and Widyaningrum (2022), who both documented

persistent gastroenteritis coding inaccuracies attributable to insufficient clinical data utilization (3, 13). It is further supported by Kuntoadi et al. (2023), who found that the use of non-specific or insufficiently specified codes was the most prevalent cause of coding inaccuracy in inpatient gastroenteritis cases (14). The case involving a breast cancer chemotherapy patient (Ca Mammae) coded as A09.0 illustrates the risk of coding gastroenteritis without verifying that the gastrointestinal symptoms are not better explained by an underlying condition or treatment.

The 9.52% coding inaccuracy rate in this study is comparable to findings reported by Yulia et al. (2023), who found that 59.1% (65 out of 110 documents) of appendix diagnosis codes at RS Tk. III Dr. Reksodiwiryio Padang were inaccurate, with inaccuracy primarily caused by incomplete medical information — particularly unfilled or unreadable diagnoses in the medical resume and absent laboratory results — that prevented coders from verifying the appropriate code (16). Annisa and Akbar (2025) similarly reported a diagnosis code inaccuracy rate of 60% (50 out of 83 documents) at RS X Kota Malang, where inaccuracies were attributed to incorrect major diagnosis determination, failure to follow ICD-10 pregnancy coding rules in Chapter XV, and insufficient attention to ICD-10 notes including exclude, include, and additional code instructions (17). A shared finding across both studies and the present study is the pattern of coders relying solely on the physician's written diagnosis rather than cross-referencing available clinical evidence — a behavior that directly contributes to code selection errors. Wahyuni et al. (2024) confirmed this pattern at Reksodiwiryio Hospital, reporting ICD-10 coding inaccuracy of 26.2% from 84 medical record documents, where coders who did not thoroughly review anamnesis and supporting examination results were found more likely to produce inaccurate codes (20). Halid (2024) further demonstrated in fracture cases that coding inaccuracy reached 76.1%, with 62.0% of documents informationally incomplete, and identified that coders tended to employ shortcut coding practices by bypassing available clinical evidence — paralleling the practice observed in the present study where coders assigned A09.0 based on the abbreviation "GEA" without verifying infective etiology through laboratory results (22). The results of this study align with those of Khorrami et al. (2023), who stated that the quality of medical record documentation is a critical factor in generating accurate diagnosis codes (27). The study found that deficiencies in medical record documentation contributed to both major and minor coding errors. Furthermore, Ebberts et al. (2022) explained that structured and standardized clinical documentation can improve the quality and completeness of available medical information, thus supporting a more accurate diagnosis coding process. Therefore, the completeness of medical information needs to be a primary concern in efforts to improve the accuracy of diagnosis codes and the overall quality of health data (28).

C. Relationship Between Completeness of Medical Information and Accuracy of Diagnosis Codes

The statistically significant relationship ($p = 0.001$; $OR = 13.091$) found in this study is consistent with multiple prior studies. Suryandari et al. (2025) obtained $p = 0.000$, Hidayat et al. (2023) reported $p \leq 0.05$, and Miladia et al. (2024) found $p = 0.04$, all confirming that completeness of medical record information is a significant predictor of coding accuracy (2, 10, 15). The mechanistic explanation is straightforward: when medical information — including anamnesis, supporting examination results, and medical summaries — is complete, coders possess a

comprehensive clinical picture enabling more rigorous ICD-10 code verification. Conversely, absent supporting information forces coders to rely solely on the physician's written diagnosis without clinical validation, substantially increasing the risk of coding errors. The odds ratio of 13.091 carries substantial practical significance: it quantifies the degree to which documentation completeness amplifies coding accuracy. This finding reinforces the proposition that clinical coding quality is not solely determined by coder competency, but is fundamentally shaped by the quality of underlying medical documentation — a conclusion with direct implications for hospital quality management and health information systems design.

This finding is strongly corroborated by Yulia et al. (2023), who similarly demonstrated a statistically significant relationship between medical information completeness and accuracy of appendix diagnosis coding at RS Tk. III Dr. Reksodiwiryo Padang ($p = 0.003$), concluding that incomplete information in medical resumes and laboratory result sheets — both of which parallel the supporting examination results identified as the primary incomplete item in the present study — was the primary driver of coding inaccuracy (16). Annisa and Akbar (2025) likewise confirmed a significant relationship between medical information completeness and diagnosis code accuracy in BPJS inpatient records at RS X Kota Malang ($p = 0.019$), with incomplete medical resume and supporting examination forms identified as the key contributing factors — a finding consistent with the pattern observed in the present study (17). Hidayat et al. (2023), in a broader study across an inpatient hospital setting with a sample of 375 documents, obtained a Chi-square p -value of 0.005845, with incomplete supporting examination data (7.73%) and physical examination data (1.6%) identified as the primary sources of incompleteness contributing to 10.93% coding inaccuracy (18). Daniyah et al. (2024) further reinforced this mechanistic linkage, demonstrating a significant relationship between completeness of supporting examination data and coding accuracy ($p = 0.002$) at RS Islam Masyitoh Bangil, consistent with the present study's finding that absent laboratory or examination results force coders to make coding decisions without sufficient clinical validation (21). Wardhani (2025) in CKD cases and Mudayana (2023) in fracture radius cases both reported significant relationships between medical information completeness and coding accuracy, with supporting examination results identified as the most critical incomplete item in both settings (19, 23). Collectively, these convergent findings across different diagnostic categories, hospital types, and geographic settings provide strong multi-study evidence that completeness of medical information — particularly supporting examination results — is the foundational prerequisite for accurate ICD-10-based diagnosis coding.

CONCLUSION

This study found a statistically significant relationship between completeness of medical information and the accuracy of gastroenteritis diagnosis coding among inpatients at RSUD dr. Soediran Mangun Sumarso Wonogiri ($p = 0.001$; OR = 13.091; 95% CI: 4.163–41.170). Of 252 medical records reviewed, 94.84% contained complete medical information and 90.48% had accurate diagnosis codes. Incomplete supporting examination results were the main source of documentation deficiencies, while coding inaccuracies were primarily related to incorrect selection of A09.0, A09.9, and K52.9 codes. These findings indicate that completeness of medical information is a strong predictor of ICD-10 coding accuracy. Therefore, hospitals should strengthen coding practices by ensuring that coders review all relevant clinical information and by

improving physician compliance with EMR documentation. Future studies involving multiple hospitals and diagnoses are recommended to enhance generalizability and explore additional factors affecting coding accuracy.

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Conflicts of Interest: The authors declare no conflict of interest.

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