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Accuracy Audit of Icd-10 Coding for Pregnancy and Childbirth Cases: An Effort to Strengthen Medical Record Data Governance at Muhammadiyah Mother and Child Hospital Malang

Dorkas Bali Mema[1], Ervita Nindy Oktoriani[2]
[1,2] Sekolah Tinggi Ilmu Administrasi Malang

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ABSTRACT

Objective: *This study aimed to audit the coding accuracy of ICD-10 diagnoses for pregnancy and childbirth cases and identify patterns of inaccuracy at Muhammadiyah Mother and Child Hospital (RSIA) Malang.* ***Method:*** *This quantitative descriptive study applied a coding-audit approach to 55 inpatient medical records from February to April 2026, selected through total sampling. Data were collected using an audit checklist and analyzed descriptively through frequency and percentage distributions.* ***Results:*** *The audit revealed that 20 records (36.36%) were accurately coded, whereas 35 records (63.64%) still contained inaccuracies. These inaccuracies were dominated by fourth-character coding errors (51.43%), followed by errors in principal diagnosis determination (22.86%), obstetric code selection errors (20.00%), and secondary diagnosis coding errors (5.71%). No errors were identified in the use of the Outcome of Delivery (Z37) code.* ***Novelty:*** *Coding audits prove effective in revealing critical points within coding governance. Periodic audit implementation, competency reinforcement for Health Information Management (HIM) personnel, and consistent adherence to ICD-10 guidelines are necessary corrective measures.*

INTRODUCTION

Hospital healthcare facilities are required to provide comprehensive services to the public [1]. The issuance of Regulation of the Minister of Health of the Republic of Indonesia Number 24 of 2022 concerning Medical Records mandates every healthcare facility to implement Electronic Medical Records (EMR) to support administrative, legal, financing, educational, and research aspects in an integrated manner [2]. In the era of digital transformation, the quality of medical record data occupies a central position in both clinical and managerial decision-making [3]. One of the processes determining this quality is diagnosis coding using the International Classification of Diseases Tenth Revision (ICD-10) system [4].

The accuracy of diagnosis coding directly affects the smoothness of hospital administrative and financial processes, particularly in the accuracy of national morbidity reporting and health financing claims through the National Health Insurance (JKN/BPJS) scheme based on the INA-CBGs system [5], [6]. Errors in assigning diagnosis codes have the potential to trigger pending claims, inaccuracies in hospital statistical data, and misinterpretations of clinical data in epidemiological research [6], [7].

Obstetric cases encompassing pregnancy, childbirth, and the puerperium listed in Chapter XV of ICD-10 (codes O00–O99) are recognized for their high coding complexity [4], [8]. Unlike general cases, obstetric coding requires medical record officers to identify in detail the primary maternal condition underlying the care, pregnancy complications or comorbidities, the method of delivery (spontaneous or operative), and the outcome of delivery recorded through the additional code Z37 [4], [9]. Frequent errors, such as

assigning the delivery procedure method as the principal diagnosis without documenting the underlying maternal medical indication, often become weak points in the coding process [6], [8].

As a Class C specialty hospital with Plenary (*Paripurna*) accreditation and one of the maternal and child healthcare referral centers in Malang City, RSIA Muhammadiyah Malang handles a high volume of pregnancy and childbirth cases daily. Nevertheless, a systematic evaluation of the coding accuracy rate for obstetric cases has never been conducted at this institution [3], [10].

Departing from this gap, this study was conducted to comprehensively audit the accuracy of ICD-10 diagnosis coding in inpatient pregnancy and childbirth cases at RSIA Muhammadiyah Malang for the February–April 2026 period. The findings of this audit are expected to serve as a policy reference for evaluating coding performance, strengthening the competence of Health Information Management (HIM) personnel (*Perekam Medis dan Informasi Kesehatan* / PMIK), and improving EMR data governance at the institution.

RESEARCH METHODS

This study applied a quantitative descriptive design through a clinical coding audit approach [11], [12]. Data collection was carried out at the Medical Record Unit of RSIA Muhammadiyah Malang, East Java, from May 2 to 28, 2026.

The study population comprised all inpatient medical records of pregnancy and childbirth cases for the February–April 2026 period, totaling 55 documents. The sample was determined using a total sampling technique, whereby the entire population meeting the inclusion criteria—inpatient obstetric records from February to April 2026—was included as the sample [12]. Data from January 2026 were excluded because they coincided with the early-year archiving system transition and adjustment period, which risked introducing bias, while May 2026 data were excluded because the medical records were not yet finalized at the time of data collection.

Primary data were collected through direct observation and document review of admission-discharge summary sheets and delivery reports within the patients' EMR [13]. The research instrument was a self-developed coding audit checklist referring to the provisions of ICD-10 Volumes 1, 2, and 3 [4], [9], [10]. Each document was assessed using a binary score: a score of 1 was assigned to codes that fully complied with ICD-10 provisions up to the fourth character, and a score of 0 was assigned to codes that failed to meet these provisions [11]. Data were analyzed descriptively using the following percentage formula:

$$P = \left(\frac{f}{N}\right) \times 100\%$$

where P represents the percentage of accuracy, f represents the frequency of accurately coded documents, and N represents the total sample (55 documents) [12].

RESULTS AND DISCUSSION

Results

The audit of 55 inpatient medical records of pregnancy and childbirth cases at RSIA Muhammadiyah Malang yielded a varied picture regarding diagnosis coding compliance with ICD-10 standards, as presented in Table 1.

Table 1. Frequency Distribution of Coding Accuracy for Pregnancy and Childbirth Cases at RSIA Muhammadiyah Malang, February–April 2026 ($N = 55$)

No	Coding Accuracy Category	Frequency (f)	Percentage (%)
1	Accurate Code (Score 1)	20	36.36%
2	Inaccurate Code (Score 0)	35	63.64%
Total (N)		**55**	**100.00%**

Source: Researcher data (2026)

Based on Table 1, the majority of documents (35 records or 63.64%) were still categorized as inaccurate, whereas only 20 records (36.36%) met the coding accuracy criteria. For these 35 documents, further classification was performed to map the types of coding errors, as presented in Table 2.

Table 2. Analysis of Coding Inaccuracy Patterns in Pregnancy and Childbirth Cases ($N = 35$)

No	Pattern of Coding Inaccuracy	Number of Cases (f)	Percentage (%)
1	Code character error (4th character omitted/incorrect)	18	51.43%
2	Principal diagnosis determination error	8	22.86%
3	Obstetric code selection error (Chapter XV)	7	20.00%
4	Secondary diagnosis writing/coding error	2	5.71%
Total		**35**	**100.00%**

Source: Researcher data (2026)

Table 2 confirms that code character errors—specifically in the fourth-character subcategory—were the largest contributor to inaccuracy, with 18 documents (51.43%) experiencing this type of error. Conversely, the documentation of the Outcome of Delivery (Z37) code demonstrated excellent quality, marked by zero errors across all audited samples.

Discussion

4.1 Interpretation and Analysis of Causative Factors of Inaccuracy

The findings of this audit indicate that the coding accuracy rate for pregnancy and childbirth cases at RSIA Muhammadiyah Malang (36.36%) is relatively low compared to national healthcare quality standards, which demand coding accuracy approaching 100% to ensure data security and smooth hospital administration [12], [13]. This achievement underscores the need for intensive improvements from both clinical and administrative perspectives [14].

The dominance of code character errors (51.43%) is suspected to be related to the tendency of coding officers to halt the code-lookup process at the three-character category (3-digit code), even though the fourth character plays a crucial role in specifying the patient's exact condition in obstetric cases [4], [8]. As an illustration, code O14 (pre-eclampsia) should be specified further into O14.0 (mild to moderate pre-eclampsia) or O14.1 (severe pre-eclampsia) to accurately reflect the severity level [9]. Neglecting the fourth character not only violates the coding rules of ICD-10 Volume 1, but also risks triggering claim rejections by BPJS Kesehatan verifiers [5], [6], [9].

The second largest error, namely principal diagnosis determination error (22.86%), is suspected to stem from inconsistencies in writing the principal diagnosis by the Attending Physician (*Dokter Penanggung Jawab Pelayanan* / DPJP) on the medical summary sheet [6], [13]. Procedural methods, such as Cesarean Section (*Sectio Caesarea*), were frequently recorded as the principal diagnosis, while the underlying medical indications (such as cephalopelvic disproportion/CPD or fetal distress) were recorded as secondary diagnoses or omitted altogether [6]. Referring to the ICD-10 Volume 2 guidelines, delivery method codes (O80–O84) should not be used as the principal diagnosis when an underlying maternal or fetal complication exists that necessitated the procedure [4].

Obstetric code selection errors (20.00%) also included classification mistakes between pregnancy conditions ending in abortion (O00–O08) and ordinary antepartum hemorrhage [4], [8]. This condition was exacerbated by coding officers' limited understanding of the differing coding rules for maternal care related to fetal conditions (O30–O48) and maternal diseases complicating pregnancy (O98–O99) [4], [8], [14].

4.2 Practical and Theoretical Implications

Practically, low coding accuracy directly impacts the reliability of morbidity reporting at RSIA Muhammadiyah Malang [7], [10]. Statistical data reported to the Health Office and the Ministry of Health through the Hospital Information System (*Sistem Informasi Rumah Sakit* / SIRS) are potentially biased, thus failing to accurately reflect the maternal health profile in the Malang region [2], [7], [10]. Financially, coding errors risk causing discrepancies in the INA-CBGs tariffs claimed by the hospital, manifesting either as underpayments that harm hospital finances or overpayments that potentially trigger administrative disputes [5], [6].

Theoretically, these findings reinforce the argument in health information management that the reliability of an EMR system does not solely depend on software capabilities, but is also determined by the *brainware* factor—namely the competence of medical record officers and attending physicians, as well as adherence to applicable standard operating procedures for coding [2], [10], [15].

4.3 Study Limitations

This study has several methodological limitations that must be considered when interpreting the findings. First, the cross-sectional design only captured conditions within a single period (February–April 2026), preventing the identification of seasonal trends or changes in coding quality over time [12]. Second, the research scope being limited to a single institution with specific characteristics (a Class C specialty hospital with Plenary accreditation) restricts the generalizability of the findings to hospitals of different classes or with different EMR systems. Third, the relatively small sample size (55 documents) makes percentage estimates in low-frequency error subcategories, such as secondary diagnosis errors (2 cases), susceptible to fluctuation if the sample is expanded [12].

Fourth, coding accuracy was assessed by a single auditor without inter-rater reliability testing, which introduces potential evaluator subjectivity [11], [12]. Fifth, the binary scoring scheme (accurate/inaccurate) could not differentiate the severity of errors, such as distinguishing minor administrative errors from substantial errors with clinical or financial impacts. Sixth, the descriptive-percentage analysis was not reinforced with inferential statistical testing to confirm the determinant factors of coding inaccuracy—such as coding officers' length of service, workload, or EMR interface quality; these factors remain assumptions based on researcher observation and have not been confirmed through data triangulation via interviews with coding officers or attending physicians [12], [14].

Future research is recommended to extend the observation period to a full year to capture seasonal trends, involve multiple institutions, implement dual-auditor audits accompanied by reliability testing, and integrate a mixed-methods approach to confirm the causative factors of coding inaccuracy more comprehensively [11], [12].

CONCLUSION

Fundamental Finding: This clinical audit concludes that the accuracy rate of ICD-10 diagnosis coding for pregnancy and childbirth cases among inpatients at RSIA Muhammadiyah Malang remains relatively low at 36.36%, while the remaining 63.64% are categorized as inaccurate. The most dominant forms of inaccuracy include fourth-character coding errors (51.43%), principal diagnosis determination errors (22.86%), obstetric code selection errors (20.00%), and secondary diagnosis coding errors (5.71%). **Implication:** To improve medical record data governance and the quality of health information at RSIA Muhammadiyah Malang, several concrete steps are recommended: (1) integrated socialization for all attending physicians (DPJPs) regarding the importance of documenting diagnoses specifically and completely in the EMR ; (2) periodic internal coding audits conducted at least once a month by the medical record committee; (3) facilitation of continuous training for HIM practitioners (PMIK) regarding the obstetric coding guidelines in ICD-10 Chapter XV; and (4) integration of an automated coding quality control system (decision support system) into the EMR application to prevent incomplete three-character codes from passing through. **Limitation:** This study is limited to the audit of ICD-10 diagnosis coding accuracy for pregnancy and childbirth cases among inpatients at RSIA Muhammadiyah Malang. Therefore, the findings may not fully represent coding practices in other hospitals with different medical record management systems, staffing capabilities, and coding procedures. Furthermore, the audit focuses on identifying coding inaccuracies and their distribution without evaluating the

effectiveness of specific interventions in improving coding accuracy. **Future Research:** Future research should evaluate the effectiveness of interventions such as continuous training for medical record professionals, physician socialization, and periodic internal coding audits in improving ICD-10 coding accuracy for pregnancy and childbirth cases. Further studies should also investigate the implementation of automated coding quality control systems integrated into Electronic Medical Records (EMR) to prevent incomplete and inaccurate code selection. In addition, comparative studies across multiple hospitals are recommended to identify organizational and professional factors influencing obstetric diagnosis coding accuracy.

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Dorkas Bali Mema
Sekolah Tinggi Ilmu Administrasi Malang
Email: dorkasmema@gmail.com

Ervita Nindy Oktoriani
Sekolah Tinggi Ilmu Administrasi Malang
Email: ervitanindy8@gmail.com