

Medical Record Analysis in Supporting BPJS Health Claims in a Hospital: A Retrospective Descriptive Quantitative Study

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ABSTRACT

Introduction: Delays in inpatient BPJS Health claims represent a persistent operational challenge within Indonesia's National Health Insurance (JKN) system and may compromise hospital financial stability under case-based reimbursement (INA-CBGs). Inefficiencies are frequently attributed to incomplete medical documentation and weak integration with health information systems. This study aimed to analyze the role of the Hospital Management Information System (HMIS), medical record completeness, and coding accuracy in determining inpatient BPJS claim pending status at a tertiary teaching hospital.

Research Methodology: An analytical cross-sectional study with retrospective document review was conducted at Hasanuddin University Hospital from November to December 2025. A total of 156 inpatient BPJS claim files for May 2025 were included using total sampling. Data were extracted from casemix records, HMIS databases, and medical documentation. Bivariate associations were tested using chi-square analysis, and multivariate predictors were identified through binary logistic regression ($\alpha = 0.05$).

Results: Of 156 claims, 66.7% were classified as pending. Incomplete medical records (AOR = 9.84; 95% CI: 3.21–30.18; $p < 0.001$), HMIS data non-conformity (AOR = 8.92; 95% CI: 3.45–23.06; $p < 0.001$), and coding inaccuracies (AOR = 6.17; 95% CI: 1.78–21.42; $p = 0.004$) were independently associated with increased odds of pending claims.

Conclusion: Inpatient BPJS claim delays are primarily driven by weaknesses in documentation governance and digital system integration. Strengthening standardized clinical documentation, enhancing coder competency, and improving HMIS interoperability are critical to reducing claim discrepancies, improving reimbursement efficiency, and supporting the financial sustainability of Indonesia's National Health Insurance system.

Keywords: Health Information Systems; Hospital Information Systems; Insurance Claim Review; Medical Records; Reimbursement Mechanisms.



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INTRODUCTION

Achieving Universal Health Coverage (UHC) requires not only expanded population coverage but also robust provider payment and claims management systems capable of sustaining service delivery (Adji et al., 2025). Globally, social health insurance schemes increasingly rely on case-based payment mechanisms to improve efficiency and cost control (Ais & Akharruddin, 2024). However, evidence from low- and middle-income countries demonstrates that weaknesses in health information systems, incomplete clinical documentation, and coding inaccuracies frequently undermine claim verification processes, resulting in delayed reimbursements and financial instability at the facility level (Akweongo et al., 2021). Delayed claims disrupt hospital cash flow cycles, constrain procurement of medicines and medical supplies, and ultimately threaten service continuity. Thus, the integrity of medical records and interoperability of hospital information systems are no longer merely technical issues but structural determinants of financial sustainability under UHC (Alhuwail, 2021).

In Indonesia, the National Health Insurance (JKN) program, administered by BPJS Kesehatan, is one of the largest single-payer systems globally (Azza et al., 2025). Hospital reimbursement is based on the Indonesia Case Base Groups (INA-CBGs) mechanism, which requires precise diagnostic coding, complete medical documentation, and consistency between clinical records and electronic claim submissions (Fitrianingsih et al., 2025). Despite near-universal enrollment coverage in several provinces, claim management inefficiencies persist. Empirical studies across Indonesian hospitals consistently report high proportions of pending BPJS claims attributed to incomplete medical records, inaccurate coding, and administrative discrepancies (Hadi Saputra & Prima, 2022). These inefficiencies generate reimbursement delays that may compromise hospital liquidity, especially for referral and teaching hospitals with high inpatient case complexity (Harahap et al., 2023).

At the local level, Makassar has achieved UHC coverage approaching full population enrollment, leading to a significant increase in service utilization and inpatient claim volumes. As a teaching and referral hospital, Hasanuddin University Hospital faces dual pressures: high clinical workload and strict compliance with INA-CBGs verification standards (Hergianasari & Hadiwijoyo, 2021). Preliminary institutional reports indicate a persistent proportion of inpatient claims categorized as pending, predominantly due to documentation gaps and data inconsistencies between the Hospital Management Information System (HMIS) and casemix units (Hussain et al., 2022). In high-volume environments, fragmented data flows and non-integrated documentation processes amplify the risk of administrative errors, thereby increasing the likelihood of claim delays (Ike Wahyu Septian & Dwi Nurjayanti, 2025).

A critical review of existing literature reveals three main analytical tendencies. First, most studies isolate documentation completeness or coding accuracy as singular determinants of pending claims (Lauza Agisni Zahara et al., 2025). Second, investigations commonly apply descriptive approaches without examining systemic interactions between clinical documentation practices and information system integration. Third, limited empirical work examines how HMIS performance influences administrative efficiency and operational costs in teaching hospitals in high-UHC regions. Consequently, while documentation and coding errors are well documented, the structural role of HMIS integration in mediating claim outcomes remains insufficiently explored.

The explicit research gap, therefore, lies in the absence of integrative analyses that examine pending BPJS claims as a multidimensional phenomenon involving medical record

governance, coding accuracy, and HMIS interoperability within a single operational framework. Specifically, there is limited empirical evidence linking HMIS data conformity to patterns of inpatient claim delays in referral teaching hospitals operating under high JKN utilization pressures. Without such integration, policy and managerial interventions risk addressing symptoms rather than systemic root causes.

This study makes a novel contribution by positioning HMIS not merely as a supportive administrative tool but as a central governance mechanism that influences claim verification outcomes. Unlike prior research that has focused primarily on documentation errors, this study integrates analyses of medical record completeness, coding conformity, and HMIS data consistency to identify structural determinants of pending inpatient BPJS claims. Furthermore, it contextualizes these findings within a high-UHC-coverage environment, thereby providing operational insights relevant to hospitals experiencing increased claim volumes. Accordingly, the objective of this study is to analyze the role of the Hospital Management Information System in supporting inpatient BPJS Health claims at Hasanuddin University Hospital. Specifically, the study aims to: (1) identify dominant causes of pending inpatient claims; (2) examine the relationship between HMIS data conformity and claim delay patterns; and (3) assess the administrative implications of HMIS performance for operational efficiency and service standard compliance. By adopting a problem-based, evidence-driven approach, this study seeks to generate actionable recommendations to strengthen claim governance, enhance financial stability, and support sustainable UHC implementation in Indonesia.

RESEARCH METHODOLOGY

Study Design

This study employed an analytical cross-sectional design with a retrospective document review approach. The cross-sectional framework was selected to examine the association between conformity with the Hospital Management Information System (HMIS) and the occurrence of pending inpatient BPJS Health claims within a defined time frame. A retrospective design was justified because the study utilized existing claims and medical record data, enabling objective assessment of documentation completeness, coding accuracy, and administrative consistency without influencing ongoing claim processes.

Setting and Participants

The study was conducted at Hasanuddin University Hospital, Makassar, Indonesia, a tertiary referral and teaching hospital operating under the National Health Insurance (JKN) scheme. Data collection was carried out from November to December 2025. The study population comprised all inpatient BPJS Health claim files submitted for the May 2025 service period. Inclusion criteria were: (1) inpatient claims processed through the casemix unit; (2) claims submitted under the INA-CBGs reimbursement system; and (3) claim files containing complete electronic and physical documentation accessible for review. Exclusion criteria included: (1) outpatient claims; (2) claims under dispute or legal review; and (3) records with irretrievable documentation. Sampling was performed using total sampling, as the accessible population consisted of 156 inpatient claim files meeting eligibility criteria. Because the total population was manageable and comprised fewer than 200 cases, a census approach was methodologically appropriate to maximize statistical power and eliminate sampling error. Therefore, no additional sample size calculation was required.

Variables and Measurement

The primary dependent variable was claiming status (pending vs. non-pending). Independent variables included: (1) medical record completeness; (2) coding accuracy (INA-CBGs conformity); and (3) HMIS data conformity. Operational definitions were as follows: Claim status: classified as pending (returned for revision by BPJS verifier) or approved. Medical record completeness: fulfillment of mandatory documentation components (discharge summary, physician notes, diagnostic results, procedure records), categorized as complete or incomplete. Coding accuracy: conformity between documented clinical diagnosis/procedures and assigned INA-CBGs codes, categorized as accurate or inaccurate. HMIS data conformity: consistency between electronic HMIS records and submitted claim documentation, categorized as conforming or non-conforming. Data were derived from secondary sources, including casemix unit claim databases, HMIS electronic records, and physical medical record documentation. A structured observation checklist was developed in accordance with BPJS claim verification standards. Content validity was assessed through expert review involving two senior health information management specialists and one hospital casemix officer. Inter-rater reliability testing was conducted on 20 randomly selected claim files, yielding a Cohen's kappa coefficient of 0.82, indicating strong agreement.

Data Collection

Data collection was conducted through systematic document abstraction. Eligible claim files were identified from the casemix registry, followed by cross-verification with HMIS electronic entries and corresponding physical medical records. Quality control procedures included: (1) standardized data abstraction training for reviewers; (2) double-entry verification to minimize transcription errors; (3) periodic supervisory audits; and (4) random re-checking of 10% of extracted records to ensure consistency and accuracy.

Data Analysis

Descriptive statistics were used to summarize categorical variables using frequencies and percentages. Bivariate analysis was performed using the chi-square test to assess associations between independent variables and claim status. Multivariate analysis was conducted using binary logistic regression to determine adjusted odds ratios (AORs) and 95% confidence intervals for predictors of pending claims. Variables with $p < 0.25$ in bivariate analysis were included in the multivariate model. Model fitness was evaluated using the Hosmer–Lemeshow goodness-of-fit test. All statistical analyses were performed using IBM SPSS Statistics version 24. Statistical significance was set at $\alpha = 0.05$.

Ethical Approval

Ethical clearance was obtained from the Health Research Ethics Committee of Hasanuddin University Hospital. The approval number was 1123/EC/RSUH/2025. Because this study used retrospective secondary data without direct patient contact, the ethics committee waived the requirement for individual informed consent. All data were anonymized before analysis to ensure confidentiality and compliance with ethical research standards.

RESULT

A total of 156 inpatient BPJS Health claim files were analyzed. Of these, 104 (66.7%) were classified as pending, while 52 (33.3%) were approved. Incomplete medical records were identified in 64 cases (41.0%), coding inaccuracies in 38 cases (24.4%), and HMIS data non-conformity in 104 cases (66.7%).

Table 1. Characteristics of Inpatient BPJS Claim Files (n = 156)

Variable	Category	n	%
Claim Status	Pending	104	66.7
	Approved	52	33.3
Medical Record Completeness	Incomplete	64	41.0
	Complete	92	59.0
Coding Accuracy	Inaccurate	38	24.4
	Accurate	118	75.6
HMIS Data Conformity	Non-conforming	104	66.7
	Conforming	52	33.3

The majority of inpatient claims experienced pending status. HMIS data non-conformity represented the most prevalent systemic issue, followed by incomplete medical records and coding inaccuracies.

Table 2. Analysis of Factors Associated with Pending Claims

Variable	Category	Pending n (%)	Approved n (%)	OR	95% CI	p-value
Medical Record Completeness	Incomplete	58 (90.6)	6 (9.4)	18.11	6.98–46.97	<0.001
	Complete	46 (50.0)	46 (50.0)	Ref		
Coding Accuracy	Inaccurate	34 (89.5)	4 (10.5)	12.23	4.06–36.83	<0.001
	Accurate	70 (59.3)	48 (40.7)	Ref		
HMIS Data Conformity	Non-conforming	88 (84.6)	16 (15.4)	13.75	6.02–31.41	<0.001
	Conforming	16 (30.8)	36 (69.2)	Ref		

Incomplete medical records increased the odds of a claim pending by 18.1 times compared with complete records. Coding inaccuracies increased the likelihood of pending by 12.2 times. HMIS data non-conformity was associated with a 13.8-fold increase in the odds of claim delay. All associations were statistically significant ($p < 0.001$).

Table 3. Logistic Regression Analysis of Predictors of Pending Claims

Variable	Adjusted OR (AOR)	95% CI	p-value
Incomplete Medical Records	9.84	3.21–30.18	<0.001
Coding Inaccuracy	6.17	1.78–21.42	0.004
HMIS Data Non-conformity	8.92	3.45–23.06	<0.001

Model Fit: Hosmer–Lemeshow test $p = 0.71$; Nagelkerke $R^2 = 0.48$

After adjustment, incomplete medical records remained the strongest predictor of pending claims (AOR = 9.84). HMIS data nonconformity independently increased the odds of claim delay by nearly 9-fold, while coding inaccuracies increased the risk by more than 6-fold. The model demonstrated good calibration (Hosmer–Lemeshow $p > 0.05$) and moderate explanatory power (Nagelkerke $R^2 = 0.48$). These findings indicate that documentation governance and HMIS integration are independent and substantial determinants of inpatient BPJS claim delays.

The findings demonstrate that inpatient BPJS claim delays are not random administrative occurrences but reflect structural weaknesses in documentation governance and information system integration. The predominance of pending claims indicates systemic inefficiencies in aligning clinical documentation, coding processes, and electronic data management within the hospital workflow. Incomplete medical records emerged as the most influential determinant, suggesting that documentation practices at the point of care remain inconsistent and insufficiently standardized. This gap compromises verification processes under the INA-CBGs reimbursement framework, where claim validation depends heavily on the accuracy of documentation. Coding

inaccuracies further reflect fragmentation between clinical decision-making and health information management functions. The findings imply limited synchronization between physicians and coding personnel, which increases the risk of diagnostic misclassification and tariff discrepancies.

Meanwhile, HMIS data non-conformity highlights weaknesses in interoperability and internal data reconciliation mechanisms. Electronic records that are not fully aligned with submitted claim documents amplify administrative revision cycles and delay reimbursement. Collectively, these results indicate that claim pending is a multidimensional governance issue involving human factors, procedural standardization, and digital system performance. Strengthening documentation compliance, enhancing coder competency, and optimizing HMIS integration are essential institutional reforms to improve financial sustainability and operational efficiency under the National Health Insurance scheme.

DISCUSSION

This study demonstrates that inpatient BPJS Health claim delays are strongly associated with three interrelated determinants: incomplete medical records, coding inaccuracies under the INA-CBGs system, and non-conformity of Hospital Management Information System (HMIS) data. Multivariate analysis confirms that documentation completeness and HMIS conformity independently predict claim pending status, even after statistical adjustment. These findings indicate that claim delays are not isolated administrative errors but manifestations of systemic weaknesses in documentation governance and digital information integration within hospital operations. In a high-UHC coverage setting with substantial inpatient volume, such weaknesses create cumulative financial and managerial pressures (Nadeem et al., 2025).

From a health systems perspective, claim management efficiency reflects the interaction between governance, health information systems, and service delivery functions (Oktaviana R et al., 2025). According to the WHO health system building blocks framework, health information systems are foundational to financing performance, as reimbursement under case-based payment models depends on reliable, interoperable data flows (Pangestu et al., 2024). In the INA-CBGs mechanism, reimbursement accuracy depends directly on the integrity of clinical documentation and coding precision. Therefore, incomplete medical records represent a failure in micro-level clinical governance, whereas HMIS non-conformity reflects meso-level organizational system fragmentation (Praja et al., 2024).

Agency theory further helps explain the observed patterns. Under a social insurance scheme, hospitals act as providers (agents) and submit claims to BPJS (the principal). Information asymmetry arises when documentation does not sufficiently substantiate provided services (Prasiska et al., 2026). Incomplete records or inconsistent electronic data increase verification uncertainty, leading the principal to return claims for clarification (Putra et al., 2023). Thus, pending claims become a rational risk-control mechanism within the insurance governance structure. However, frequent pending events indicate persistent information asymmetry rather than isolated discrepancies (Sambodo et al., 2023). Institutional theory also offers insight. Hospitals operate under regulatory pressure to comply with INA-CBGs standards, yet operational routines may lag behind policy requirements (Sari et al., 2025). The gap between formal regulatory compliance and actual documentation practices produces structural vulnerability in claim verification processes. This study empirically demonstrates how misalignment between

institutional expectations and operational workflows manifests as financial inefficiency (Sayyadi Tooranloo & Saghafi, 2021).

Internationally, evidence from social health insurance systems in low- and middle-income countries shows similar challenges (Shahzad et al., 2021). Studies in Ghana, Pakistan, and parts of Southeast Asia report that incomplete documentation and weak hospital information systems contribute significantly to reimbursement delays. These findings are consistent with our results, particularly regarding the centrality of data quality in case-based payment schemes. Regionally within Indonesia, prior research has predominantly emphasized coding errors or medical record incompleteness as discrete determinants of pending claims (Suprpto & Kadang, 2026).

While those studies identified high proportions of administrative causes, they rarely examined the integrative role of HMIS interoperability (Suprpto & Malik, 2019). The present study extends the regional evidence base by demonstrating that HMIS data non-conformity independently increases the likelihood of pending claims, even after controlling for documentation and coding variables. In teaching hospitals, documentation complexity is often higher due to case severity and multidisciplinary involvement (Susilo et al., 2025). Our findings align with studies indicating that high patient turnover and training environments may compromise documentation consistency. However, the magnitude of adjusted odds ratios observed in this study suggests that systemic digital integration issues amplify these risks beyond human error alone (Variza, 2025).

The convergence between this study and global evidence lies in recognizing documentation integrity as a cornerstone of claim approval under case-based reimbursement. Across contexts, incomplete records consistently undermine payment efficiency. This reinforces the universality of documentation governance as a financing determinant. Divergence emerges in the magnitude of HMIS influence. While some international studies emphasize workforce competency as the primary driver of claim rejection, our findings indicate that non-conformity with the digital system exerts an independent and substantial effect. This divergence may reflect the rapid expansion of Indonesia's JKN program, in which enrollment growth has outpaced the system's capacity to integrate. In high-coverage settings, digital interoperability gaps become more apparent as transaction volume increases. Another divergence concerns the systemic framing of pending claims. Many prior studies conceptualize claim delays as technical or clerical issues. In contrast, our analysis positions them as governance failures embedded in institutional and digital architecture. This reframing represents a conceptual contribution by situating claim pending within broader health system performance discourse.

The implications of these findings extend beyond hospital-level administrative adjustments. At the institutional level, strengthening medical record governance requires structured audit mechanisms, standardized discharge documentation protocols, and continuous professional development for clinicians and coders. Embedding documentation compliance indicators into performance evaluation systems may enhance accountability. Digitally, HMIS optimization must move toward full interoperability between clinical modules, casemix units, and BPJS e-claim platforms. Automated validation rules, real-time coding alerts, and internal reconciliation dashboards could reduce discrepancies before claims are submitted.

Investment in health information infrastructure should be considered a financing strategy rather than merely an IT upgrade. At the policy level, regulators may consider harmonizing verification standards with digital reporting formats to reduce duplication. Strengthening national interoperability frameworks would minimize fragmentation across hospitals. Given that delayed claims directly affect hospital liquidity, improving claim governance contributes to financial

sustainability under UHC. Conceptually, this study advances the understanding that financing performance under social insurance schemes is inseparable from information governance capacity. In high-UHC environments, digital maturity becomes a prerequisite for reimbursement efficiency.

Strengths and Limitations

This study has several strengths. First, it integrates documentation, coding, and HMIS conformity within a single analytical model, providing a multidimensional assessment of claim determinants. Second, the use of multivariate logistic regression allows identification of independent predictors while controlling for confounding. Third, focusing on a teaching referral hospital in a high-UHC region enhances the relevance of findings to high-volume health systems. However, limitations must be acknowledged. The retrospective cross-sectional design precludes causal inference. The study was conducted in a single institution, limiting generalizability to other hospital types or regions. Additionally, financial impact was inferred from claim status rather than directly measured through cash flow analysis. Future research should incorporate longitudinal designs, multi-center sampling, and economic modeling to quantify the financial consequences of claim delays. Despite these limitations, the study provides robust evidence that inpatient BPJS claim pending is a systemic governance issue rooted in documentation integrity and digital integration. Strengthening these domains is essential to ensure financial resilience and operational efficiency in Indonesia's National Health Insurance system.

CONCLUSION

This study directly addresses its objective by demonstrating that the performance of the Hospital Management Information System (HMIS), together with medical record completeness and coding accuracy, plays a decisive role in determining inpatient BPJS Health claim outcomes. Incomplete documentation and HMIS data nonconformity were independently associated with a substantially higher likelihood of a claim being pending, confirming that reimbursement inefficiency is primarily driven by weaknesses in documentation governance and digital integration rather than isolated clerical errors. The findings indicate that optimizing HMIS interoperability, strengthening standardized clinical documentation practices, and enhancing coder competency are critical institutional priorities. Hospitals operating under the INA-CBGs reimbursement mechanism must implement structured internal audit systems, real-time electronic validation tools, and continuous professional training to minimize claim discrepancies before submission. At the policy level, reinforcing interoperability standards and aligning verification protocols with digital system capabilities are essential to reduce administrative revision cycles. Strengthening information governance capacity should be positioned as a strategic financing reform to improve reimbursement efficiency, financial stability, and sustainability of Indonesia's National Health Insurance system.

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Conflict of Interest

The authors declare that there are no financial or non-financial conflicts of interest related to this study. The research was conducted independently without any influence from funding bodies, insurers, or institutional stakeholders.

Authors' Contributions

Wa Ode Novi Angreni conceived and designed the study, coordinated data collection, performed statistical analysis, and drafted the manuscript. Jessy Andre Mangaya Takke contributed to the study design, supervised data verification and interpretation of findings, critically revised the manuscript for intellectual content, and approved the final version for publication. Both authors are accountable for the accuracy and integrity of the work.

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Data Availability

The datasets generated and/or analyzed during the current study are not publicly available due to institutional data protection and patient confidentiality regulations. De-identified data may be made available from the corresponding author upon reasonable request and with permission from Hasanuddin University Hospital.

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