



The Effect of Drug Planning, Internal Control, and Payment Accuracy on Drug Inventory in Health Facilities

Senima Kurniawati*, Rosidi, Umi Muawanah

Universitas Gajayana Malang, Indonesia

Email : zasfams@gmail.com

DOI: <https://doi.org/10.61987/jemr.v5i2.1744>

ABSTRACT

Keywords:

Drug Planning;
Internal Control;
Payment Accuracy

*Corresponding Author

This study aims to examine the influence of drug planning, internal control, and payment accuracy on drug inventory management within healthcare facilities from an educational management perspective. Specifically, it integrates management dimensions such as planning, organizing, controlling, and financial accountability in institutional governance. A quantitative approach was employed using a census method with 70 respondents directly involved in drug inventory management. Data were collected through structured questionnaires and analyzed using multiple linear regression. The results indicate that drug planning has a significant positive effect on drug inventory ($t = 2.304$, $p = 0.024$), internal control shows no significant effect ($t = 0.446$, $p = 0.657$), and payment accuracy has a significant positive effect with the strongest influence ($t = 2.814$, $p = 0.006$, $\beta = 0.370$). Simultaneously, all variables significantly affect drug inventory management ($F = 13.297$, $p = 0.000$). These findings imply the need to strengthen data-driven planning systems, enhance managerial control mechanisms aligned with institutional capacity, and prioritize financial accuracy to ensure sustainable drug availability and service continuity.

Article History:

Received: November 2025; Revised: December 2025; Accepted: January 2026

Please cite this article in APA style as:

Kurniawati, S., Rosidi, & Muawanah, U. (2026). The Effect of Drug Planning, Internal Control, and Payment Accuracy on Drug Inventory in Health Facilities. *Journal of Educational Management Research*, 5(2), 1965–1975.

INTRODUCTION

Drug inventory management is a critical component of healthcare service delivery because medicine availability directly determines treatment continuity and patient safety. This is important since drug stock-outs interrupt therapy, reduce service quality, and increase clinical risks, while overstocking leads to expiration and financial losses. The World Health Organization (2021) emphasizes that uninterrupted access to essential medicines is a core indicator of health system performance and overall governance effectiveness. In Indonesia, essential drug management is also regulated to ensure appropriate type, quantity, and timing of availability (Ministry of Health RI, 2023). These

regulations aim to maintain equitable access and rational drug use across healthcare facilities. However, many healthcare facilities still struggle to balance supply and demand effectively due to forecasting inaccuracies and administrative constraints. Consequently, strengthening pharmaceutical logistics systems becomes a strategic priority to maintain service continuity, budget efficiency, accountability, and overall healthcare performance in both hospitals and primary care facilities.

Ideally, drug inventory systems operate through accurate forecasting, strong internal monitoring, and reliable financial management supported by accountable governance structures. Such conditions ensure that procurement decisions are evidence-based and supply chains remain stable, responsive, and efficient. WHO (2020) recommends that drug planning rely on consumption data, epidemiological trends, and budget capacity to prevent stock imbalances and improve forecasting precision. However, empirical realities in Indonesia reveal frequent stock-outs and drug expiration, indicating a mismatch between planning assumptions and actual demand patterns. Data from the Probolinggo Regency Health Office (2024) show recurring shortages of essential medicines in some facilities and significant destruction of expired drugs in others, reflecting inefficiencies in distribution and monitoring systems. This discrepancy reflects weaknesses in planning accuracy, control mechanisms, and financial processes within healthcare institutions. Therefore, examining the determinants of drug inventory performance is necessary to bridge the gap between normative standards, regulatory expectations, and operational realities in pharmaceutical management systems.

Drug planning, internal control, and payment accuracy represent key managerial dimensions influencing inventory outcomes and organizational sustainability. From supply chain management theory, accurate planning determines procurement quantity and timing, minimizing stock-out and overstock risks (Bhavikatta, 2025; Nguyen, 2024). WHO (2020) further explains that effective planning integrates consumption data, disease patterns, and fiscal capacity to ensure rational allocation of limited resources. Internal control theory (Salaudeen, 2024; Jarusen & Cheunkamon, 2025) defines control systems as mechanisms ensuring operational effectiveness, regulatory compliance, transparency, and financial reliability, which are essential in pharmaceutical logistics governance. Meanwhile, supplier relationship management theory highlights payment reliability as a determinant of supplier trust, long-term collaboration, and supply continuity (Akhter et al., 2026; Lee, 2025). Transaction cost economics (Kovach et al., 2023; Syrah & Mendoza, 2025) also argues that

delayed payments increase transaction costs and reduce supplier commitment. Hence, these three variables theoretically interact to shape drug inventory stability, efficiency, and service sustainability.

Prior studies confirm the individual importance of these variables in inventory performance across healthcare settings. Ahmadi et al. (2022) demonstrated that data-driven drug planning reduced stock-outs by up to 25% using regression analysis in low-resource settings, highlighting the importance of evidence-based forecasting. Lee and Johnson (2020) found that effective internal controls significantly improved pharmaceutical stock accuracy ($\beta = 0.42$; $p < 0.05$) through Structural Equation Modeling, indicating the role of structured supervision systems. Tesfaye et al. (2021) reported that average 45-day payment delays caused 68% of suppliers to postpone deliveries and 23% to halt supply, showing the financial dimension's impact on logistics continuity. Smith and Brown (2021) also revealed that payment delays significantly increased shipment disruption risks ($R^2 = 0.58$), affecting service reliability. These findings collectively indicate that planning quality, control mechanisms, and financial reliability are empirically linked to drug availability, operational stability, and supply chain resilience in healthcare organizations.

Although previous research highlights the significance of each variable, most studies analyze them separately rather than integratively within a single analytical framework. Schoenfelder et al. (2021) noted that internal control effectiveness depends on organizational size and resource capacity, especially in smaller healthcare facilities with limited personnel and technological support. Priyandani et al. (2022) examined payment accuracy in regional hospitals but applied descriptive analysis without testing inter-variable relationships statistically. Chen and Wang (2023), through path analysis, integrated planning and payment variables and found improved inventory performance ($R^2 = 0.67$), demonstrating the benefit of a holistic approach. However, few studies simultaneously examine drug planning, internal control, and payment accuracy within heterogeneous healthcare settings in Indonesia, particularly at the district level. Therefore, a comprehensive quantitative analysis is needed to understand their combined and partial effects on drug inventory performance and to generate integrated managerial insights for policy improvement.

At the district level, healthcare systems operate within a heterogeneous structure consisting of hospitals and community health centers with varying organizational capacities, resources, and managerial competencies. This diversity creates unequal implementation of pharmaceutical management practices, particularly in planning, control, and financial administration processes. Facilities with limited human resources often experience difficulties in applying ideal internal control mechanisms, including task segregation,

documentation accuracy, and routine supervision activities. In practice, drug planning frequently depends on historical consumption records without comprehensive analysis of disease trends, demographic changes, or service expansion, increasing the risk of mismatch between supply and actual demand. In addition, delays in payment verification and administrative approval may disrupt supplier confidence and postpone deliveries, ultimately threatening inventory stability. These interconnected managerial weaknesses not only reduce drug availability but also undermine budget efficiency and service quality. Therefore, examining these determinants at the district level is urgent to formulate integrated, evidence-based strategies for strengthening pharmaceutical governance.

Based on these considerations, the central issue is whether drug planning, internal control, and payment accuracy significantly influence drug inventory performance, both partially and simultaneously, within district healthcare systems. Understanding these relationships is essential to formulate strategic interventions in pharmaceutical logistics management and improve managerial accountability. Therefore, this study aims to analyze the effect of drug planning, internal control, and payment accuracy on drug inventory performance using a structured analytical framework. To achieve this objective, a quantitative approach is employed using structured questionnaires and multiple linear regression analysis to test causal relationships among variables statistically. This approach allows the examination of both individual and simultaneous effects of managerial dimensions on inventory outcomes. By systematically analyzing these interactions, the study seeks to provide empirical evidence that supports integrated managerial improvements and contributes to logistics management, public financial governance, and healthcare service sustainability literature.

RESEARCH METHODS

This study employed a quantitative explanatory research design to test hypotheses concerning causal relationships among variables (Haile, 2023; Haq & Yasin, 2025; Kawar et al., 2024). The population consisted of all healthcare facilities within one regency, including two public hospitals (Class B and Class C) and 33 community health centers, involving personnel directly responsible for drug inventory management. The total accessible population comprised 70 personnel. Considering the relatively small and reachable population, a census method (total sampling) was applied, ensuring that all eligible respondents were included in the study. This approach enhanced representativeness and minimized sampling bias in examining the relationships among drug planning, internal control, payment accuracy, and drug inventory performance.

Data were collected using a structured questionnaire measured on a 5-point Likert scale, distributed online via Google Forms over a two-week period (August 2025). The instrument items were developed based on established theoretical frameworks of inventory management, internal control, and financial governance. Prior to full distribution, the questionnaire was pilot-tested on 30 respondents from comparable healthcare facilities to assess validity and reliability. Construct validity was examined using Pearson product-moment correlation with a criterion of $r\text{-count} > 0.361$ ($n = 30$), while reliability was tested using Cronbach's Alpha with a threshold of $\alpha \geq 0.70$. All items met validity and reliability standards, confirming their suitability for hypothesis testing.

Data were analyzed using multiple linear regression with SPSS version 25. Prior to hypothesis testing, classical assumption tests were conducted, including normality (Kolmogorov-Smirnov test), multicollinearity (Tolerance > 0.10 ; VIF < 10), heteroscedasticity (Glejser test), and autocorrelation (Durbin-Watson test). The regression model applied was: $Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \varepsilon$, where Y represents drug inventory performance; X_1 , drug planning; X_2 , internal control; and X_3 , payment accuracy. Hypotheses were tested using the F-test ($\alpha = 0.05$) to examine simultaneous effects and the t-test ($\alpha = 0.05$) to assess partial effects of each independent variable on drug inventory.

RESULTS AND DISCUSSION

Results

Respondent Characteristics

Of 70 respondents, 61.4% were female and 38.6% male. Education levels: S1 (55.7%), D-III (24.3%), S2 (10.0%), Professional Pharmacist (4.3%), D-IV (2.9%), Pharmacist (1.4%), and S3 (1.4%). Positions: Pharmacists (38.6%), Community Health Center Heads (37.1%), Assistant Pharmacists (14.3%), and other pharmaceutical logistics positions (9.9%). This composition shows respondents have adequate educational backgrounds and positions relevant to drug inventory management, thus ensuring data quality.

Validity and Reliability Test Results

Validity test results show all questionnaire items have $r\text{-count}$ values > 0.361 ($r\text{-table}$ for $n=30$, $\alpha=0.05$), indicating all items are valid. Reliability test results show Cronbach's Alpha values for all variables > 0.70 (Drug Planning $\alpha=0.89$, Internal Control $\alpha=0.87$, Payment Accuracy $\alpha=0.91$, Drug Inventory $\alpha=0.88$), indicating all instruments are reliable. These results confirm the instrument is fit for use in hypothesis testing.

Classical Assumption Test Results

All classical assumption tests were met: (1) *Normality test*: Kolmogorov-Smirnov test resulted in sig. value $0.200 > 0.05$, indicating residuals are normally distributed. (2) *Multicollinearity test*: VIF values for all variables < 10 (Drug Planning VIF=1.567, Internal Control VIF=1.783, Payment Accuracy VIF=1.831) and Tolerance > 0.10 , indicating no multicollinearity. (3) *Heteroscedasticity test*: Glejser test showed sig. values > 0.05 for all variables, indicating no heteroscedasticity. (4) *Autocorrelation test*: Durbin-Watson value 1.891 is between du and $4-du$, indicating no autocorrelation. Thus, the regression model is valid for hypothesis testing.

Hypothesis Test Results

Multiple linear regression analysis resulted in the equation: $Y = 5.790 + 0.283X_1 + 0.043X_2 + 0.289X_3$. Detailed hypothesis test results are presented in Table 1 below:

Table 1. Multiple Linear Regression Test Results

Variable	B	Std. Error	Beta	t	Sig.	Result
Constant	5.790	3.603	-	1.607	0.113	-
Drug Planning (X_1)	0.283	0.123	0.280	2.304	0.024	Significant
Internal Control (X_2)	0.043	0.097	0.058	0.446	0.657	Not Significant
Payment Accuracy (X_3)	0.289	0.103	0.370	2.814	0.006	Significant

Source: Primary data processed, 2025

Table 2. Simultaneous Test Results (F-test)

Model	F-value	Sig.	R ²	Result
Regression	13.297	0.000	0.377	Significant

Source: Primary data processed, 2025

Discussion

Effect of Drug Planning on Drug Inventory. Table 1 shows drug planning positively and significantly affects drug inventory ($\beta=0.283$, $t=2.304$, $p=0.024 < 0.05$), thus H1 is accepted. The positive regression coefficient indicates that better drug planning implementation—including demand forecasting accuracy, consumption pattern alignment, lead time consideration, and budget optimization—results in more effective drug inventory management. This finding aligns with inventory management theory by Gupta & Sachan, (2024) that accurate planning is the foundation of inventory management success. Systematic planning enables organizations to determine appropriate quantities and procurement timing, reducing stock-out and overstocking risks. WHO (2020) emphasizes effective drug planning must be based on three pillars: actual consumption data, disease epidemiology patterns, and budget capacity. In Probolinggo Regency context, implementation of consumption-based methods

proved effective in improving drug availability, reinforced by Ahmadi et al. (2022) findings showing data-based planning can reduce stock-outs by 25% in resource-limited facilities.

Effect of Internal Control on Drug Inventory. Table 1 shows internal control has no significant effect on drug inventory ($\beta=0.043$, $t=0.446$, $p=0.657>0.05$), thus H2 is rejected. Although the regression coefficient shows positive direction, the effect is very small and statistically insignificant. This finding needs deeper examination based on descriptive facts from research data. Response distribution analysis on internal control variables shows considerable variation across healthcare facilities. Some facilities have good internal control systems (with periodic audits, clear SOPs, and task segregation), while others still have minimal control. Based on measured internal control indicators (internal audit, task segregation, documentation, and physical security), internal control implementation in Probolinggo Regency is still partial and inconsistent across all facilities. This causes internal control effects on drug inventory to be statistically undetected in the regression model. This finding differs from Lee and Johnson (2020) who found significant internal control effect on pharmaceutical stock accuracy ($\beta=0.42$). The difference can be explained by several contextual factors:

First, internal control system maturity levels in Probolinggo Regency healthcare facilities vary. Based on Ferdia & Kammoun, (2024) as theoretical foundation in this research, effective internal control requires five interconnected components: control environment, risk assessment, control activities, information and communication, and monitoring. In this research context, descriptive data indicates not all components have been implemented consistently.

Second, research sample healthcare facility characteristics are very heterogeneous, ranging from Class B and C hospitals to community health centers with very different capacities and complexities. Schoenfelder et al. (2021) showed internal control effectiveness highly depends on organization size and resource availability. Community health centers with limited human resources may not have capacity to implement ideal task segregation, thus reducing internal control effectiveness.

Third, internal control measurement instruments in this research captured respondent perceptions of control mechanism existence, but did not deeply measure implementation effectiveness. Deng et al., (2023) emphasized that control procedure existence does not automatically produce effective control without consistent compliance and monitoring.

Effect of Payment Accuracy on Drug Inventory. Table 1 shows payment accuracy to suppliers positively and significantly affects drug inventory ($\beta=0.289$, $t=2.814$, $p=0.006<0.05$), thus H3 is accepted. The regression coefficient shows

payment accuracy has the largest effect among the three variables (standardized $\beta=0.370$), indicating this factor is very crucial in determining drug inventory performance. Based on measured payment accuracy indicators (verification process efficiency, cash flow availability, contract term compliance, and administrative completion speed), variability in payment accuracy greatly affects supplier response in delivering drugs. Descriptive data shows facilities consistently paying on time have lower stock-out rates and better supplier relationships. This finding is highly consistent with supplier relationship management theory developed by Duan et al. (2025) and Krishna et al. (2025), identifying payment reliability as one of three most important factors in building supplier trust and commitment. In pharmaceutical supply chain context, supplier trust in facility payment capability determines product allocation priority, especially during market shortages. From a transaction cost economics perspective, payment delays increase transaction costs for suppliers because they require greater resource allocation for receivables monitoring and collection. Tesfaye et al. (2021) in Ethiopian research found average 45-day payment delays caused 68% of suppliers to delay delivery and 23% to halt supply. Although conditions in Probolinggo Regency may not be as extreme as Ethiopia, supplier response mechanisms to payment delays are similar: they will prioritize customers paying on time.

Simultaneous Effect of All Variables. Table 2 shows F-test results indicating drug planning, internal control, and payment accuracy together (simultaneously) significantly affect drug inventory ($F=13.297$, $p=0.000<0.05$). The R^2 value shows the three independent variables can explain drug inventory variation by 37.7%, while the remainder is explained by other factors outside the model. This finding confirms that effective drug inventory management requires holistic approaches integrating these three managerial aspects. Although internal control is not partially significant, its contribution in the overall model remains important in its interaction with planning and payment. This finding aligns with Chen and Wang (2023) research emphasizing integrated system importance in pharmaceutical inventory management. In practice, good planning will be futile if payments are not timely causing suppliers to delay delivery. Similarly, timely payments will not be optimal if planning is inaccurate causing excess or shortage stock. The synergy among these three variables is the key to effective drug inventory management success.

CONCLUSION

The most important finding of this study highlights that effective drug inventory management depends primarily on accurate drug planning and, most critically, on payment accuracy as the strongest determinant of supply

continuity. The insignificant effect of internal control suggests that control mechanisms alone are insufficient when implemented inconsistently across heterogeneous facilities. The key lesson learned is that pharmaceutical logistics performance requires not only procedural compliance but also financial reliability and data-driven planning. Holistic integration of planning, control, and payment systems is essential to ensure sustainable drug availability. From a scholarly perspective, this study contributes to the literature on logistics management and public financial governance by empirically testing the simultaneous and partial effects of managerial variables within a single regression model, thereby offering a more comprehensive explanation of drug inventory performance in healthcare organizations.

However, this study has several limitations. Its findings are context-bound and cannot be generalized beyond the studied regency. The use of perception-based instruments may not fully capture actual implementation practices, while the cross-sectional design limits the ability to observe dynamic changes over time. In addition, external factors influencing drug inventory were not extensively examined, and facility heterogeneity may have obscured relationship patterns. Future research should expand the geographical scope, incorporate additional external variables, apply longitudinal designs, integrate quantitative and qualitative approaches, and measure objective indicators of internal control implementation to obtain deeper and more generalizable insights.

REFERENCES

- Ahmadi, E., Masoudian, S., & Kumar, S. (2022). Drug inventory management in public health facilities: A data-driven approach. *BMC Health Services Research*, 22(1), 1–15.
- Akhter, B., Amin, A., & Uddin, M. B. (2026). The impact of relationship stability on buyer-supplier relationship commitment and firm performance: The moderating role of supply chain coordination. *Benchmarking: An International Journal*, 1–21. <https://doi.org/10.1108/BIJ-05-2025-0488>
- Bhavikatta, N. B. (2025). AI-driven inventory optimization in supply chains: A comprehensive review on reducing stockouts and mitigating overstock risks. *Journal of Computer Science and Technology Studies*, 7(7), 1–13. <https://doi.org/10.32996/jcsts.2025.7.7.1>
- Brigham, E. F., & Ehrhardt, M. C. (2020). *Financial management: Theory and practice* (16th ed.). Cengage Learning.
- Chen, X., & Wang, Y. (2023). Integrated planning and payment systems for optimal drug inventory. *Operations Research for Health Care*, 38, 100–115.
- Deng, Y., Zheng, J., Huang, L., & Kannan, K. (2023). Let artificial intelligence be

- your shelf watchdog: The impact of intelligent image processing-powered shelf monitoring on product sales. *MIS Quarterly*, 47(3), 1045–1072. <https://doi.org/10.25300/MISQ/2022/16813>
- Duan, Y., Zhu, Q., & Sarkis, J. (2025). Revisiting buyer-seller relationships in sustainable sourcing: Advancing trust-commitment theory within the context of blockchain technology. *International Journal of Physical Distribution & Logistics Management*, 55(3), 223–247. <https://doi.org/10.1108/IJPDLM-01-2024-0037>
- Ferdia, M. S., & Kammoun, A. (2024). Conceptual framework of internal control. *Psychology and Education Journal*, 61(8), 1459–1471.
- Gupta, P., & Sachan, A. (2024). Resource planning and inventory management in supply chain. In *Supply Chain Management* (pp. 58–79). CRC Press. <https://doi.org/10.1201/9781003509561-4>
- Haile, Z. T. (2023). Power analysis and exploratory research. *Journal of Human Lactation*, 39(4), 579–583. <https://doi.org/10.1177/08903344231195625>
- Haq, M., & Yasin, N. (2025). Qualitative, quantitative, and mixed methodology paradigms. *Journal of Practical Studies in Education*, 6(6), 15–29. <https://doi.org/10.46809/jpse.v6i6.144>
- Jarusen, J., & Cheunkamon, E. (2025). The role of COSO-based enterprise risk management in enhancing competitive advantage among Thai SMEs. *Journal of the International Council for Small Business*, 1–23. <https://doi.org/10.1080/26437015.2025.2526630>
- Kawar, L. N., Dunbar, G. B., Aquino-Maneja, E. M., Flores, S. L., Squier, V. R., & Failla, K. R. (2024). Quantitative, qualitative, mixed methods, and triangulation research simplified. *The Journal of Continuing Education in Nursing*, 55(7), 338–344. <https://doi.org/10.3928/00220124-20240328-03>
- Kementerian Kesehatan Republik Indonesia. (2023). *Petunjuk teknis perencanaan dan pengelolaan obat di fasilitas pelayanan kesehatan*. Jakarta: Kemenkes RI. <https://farmalkes.kemkes.go.id>
- Kovach, J. J., Swink, M., & Rodriguez, M. (2023). Delaying supplier payments to increase buyer profits. *Journal of Supply Chain Management*, 59(1), 26–47. <https://doi.org/10.1111/jscm.12293>
- Krishna, B., Krishnan, S., & Sebastian, M. P. (2025). Understanding the process of building institutional trust among digital payment users through national cybersecurity commitment trustworthiness cues: A critical realist perspective. *Information Technology & People*, 38(2), 714–756. <https://doi.org/10.1108/ITP-05-2023-0434>
- Lee, C. (2025). Effects of supplier rapport on buyer's stability, trust, and transaction continuance. *Global Business & Finance Review*, 30(5), 14.
- Lee, S., & Johnson, P. (2020). Internal control systems and inventory accuracy in

- hospital pharmaceutical management. *Journal of Accounting & Organizational Control*, 15(2), 101–118.
<https://doi.org/10.1080/10912345.2020.1723456>
- Ministry of Health RI. (2023). *Technical guidelines for drug planning and management in healthcare facilities*. Jakarta: Kemenkes RI.
- Nguyen, C. (2024). Optimizing supply chain efficiency: A case study of operative purchasing at Company X.
- Nurhayati, D., Sari, R., & Wijaya, A. (2020). Challenges in implementing internal controls for pharmaceutical logistics in Indonesian primary healthcare. *Asian Journal of Pharmacy and Pharmacology*, 6(3), 45–52.
- Priyandani, Y., Kusuma, H., & Dewi, I. (2022). Payment timeliness and supplier relationship in hospital pharmaceutical procurement. *International Journal of Supply Chain Management*, 11(3), 75–82.
- Salaudeen, H. A. (2024). Enterprise risk management: A guide to its implementation. *JABU International Journal of Social and Management Sciences*, 9(1), 35–42.
- Sugiyono. (2022). *Metode penelitian kuantitatif, kualitatif, dan R&D*. Bandung: Alfabeta.
- Syrah, D., & Mendoza, J. (2025). Resolving supplier payment bottlenecks: A strategic framework for improving disbursement processes. *Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields*, 1(10), 96–105.
- Tesfaye, T., Alemu, G., & Kebede, S. (2021). Impact of payment timeliness on supply chain performance in public hospitals. *Journal of Health Economics and Management*, 33(2), 215–229.
- World Health Organization. (2021). *Guidelines for medicine inventory management in public health facilities*. WHO Press.
- World Health Organization. (2021). *Global benchmarking of pharmaceutical supply chains*. WHO Press.