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Analysis of pharmacy logistics planning and control using the pareto and balanced scorecard method at Bekasi District Hospital

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ABSTRACT

Hospital pharmaceutical logistics management faces complex challenges where conventional planning methods often result in disparities between financial indicators and service quality. This study applies an integrated diagnostic approach combining ABC-Pareto analysis with Balanced Scorecard to reveal systemic performance gaps. Using a descriptive-analytical research design with mixed-methods approach, this research encompasses comprehensive analysis of 1,127 pharmaceutical products (January-December 2024 period) accompanied by extensive interviews with 20 strategic informants. Main findings reveal that ABC categorization identified 41 products (3.64%) in Category A contributing 80% of total value (IDR 12.8 billion), while 1,003 items (89%) showed zero ending balance—indicating substantial formulary expansion. BSC assessment revealed a fundamental contradiction: Financial dimension scored 76.67% (indicating adequacy) inversely proportional to Customer dimension at 59.38% (showing inadequacy)—with a 17 percentage point gap. Investigation identified three interrelated causal factors: formulary expansion eroding working capital allocation, procurement lead time variability requiring excessive safety stock accumulation, and ABC stratification that has been implemented but without operational execution. Unrecorded cost burden was calculated at IDR 4-6.7 billion annually (representing 3-5% of budget), including emergency procurement surcharges, drug substitution cost differentials, and lost opportunity costs. This study establishes that traditional measurement approaches create an 'illusion of adequacy' that masks underlying system dysfunction. Five empirically-based recommendations include: formulary optimization, operationalization of ABC framework enabling differentiated inventory control, systematic lead time performance tracking, expansion of financial measurement parameters, and integrated governance architecture.

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INTRODUCTION

This study addresses three interconnected research gaps that have not been simultaneously resolved in prior literature. First, although ABC analysis and Balanced Scorecard have each been applied independently in pharmaceutical logistics studies in Indonesia and globally, no published study has integrated both methods into a unified diagnostic framework within the specific context of Indonesian district-level public hospitals operating under BLUD/APBD dual-funding constraints. Second, existing pharmaceutical logistics research in Indonesian hospitals has predominantly relied on single-period cross-sectional ABC classification without examining classification stability over time; this study introduces Pareto Stability Index (PSI) and Jaccard Similarity Index (JSI) as longitudinal stability metrics, revealing the critical impact of quarterly budget cycles on Category A composition volatility—a phenomenon unreported in prior domestic studies. Third, the concept of 'hidden costs' in hospital pharmaceutical logistics—encompassing emergency procurement surcharges, drug substitution cost differentials, and lost opportunity costs—has not been systematically quantified in the Indonesian public hospital context. By calculating hidden cost burden at IDR 4.0–6.7 billion annually (3–5% of the pharmaceutical logistics budget), this study provides the first empirical estimation of this cost category at a Type B district hospital in West Java, establishing a methodological precedent for incorporating such costs into pharmaceutical performance evaluation frameworks (Devnani et al., 2010; Gupta & Gupta, 2010; Kaplan & Norton, 1996a).

Hospital pharmacy logistics management is a fundamental component of the healthcare system that contributes significantly to service quality and operational efficiency (Kaplan & Norton, 1996a). In Indonesia, drug costs account for 40–50% of the total hospital operational budget, making optimizing pharmaceutical logistics management a strategic priority (Kaplan & Norton, 1996b). The complexity of pharmaceutical logistics management is increasing with formulary expansion, demand fluctuations, and resource constraints, which demand a systematic, data-driven approach for effective decision-making (Organization, 2012).

Bekasi Regency General Hospital (RSUD), a 252-bed, Type B teaching hospital, faces challenges in managing pharmaceutical logistics, encompassing 1,127 product items with an annual investment value of Rp 134.3 billion. Initial observations identified several critical issues: high stockout rates (15–20 incidents per month), accumulated dead stock reaching Rp 373 million (11.99% of inventory value), and a disparity between financial metrics indicating satisfactory performance and internal customer complaints regarding service availability and responsiveness (Health, 2012).

The contradiction between financial performance indicators and internal customer experience indicates a methodological gap in the current performance evaluation system. The current historical consumption-based planning method is undifferentiated, treating all items with the same approach without considering differences in value, criticality, or consumption patterns. The absence of a systematic classification based on value (ABC analysis) and criticality (VEN analysis) results in suboptimal resource allocation and the system's inability to prioritize strategic items (Indonesia, 2016).

The urgency of implementing ABC-Pareto analysis in pharmaceutical logistics control cannot be overstated, particularly in public hospitals with constrained budgets. Without value-based stratification, all pharmaceutical items—regardless of their financial contribution or clinical criticality—receive identical management attention and procurement procedures. This undifferentiated approach creates a systematic misallocation of managerial resources: high-value Category A items that represent 80% of total pharmaceutical expenditure receive no more

oversight than low-value Category C items. Empirical evidence from this study demonstrates the consequence: stockout rates of 15–20 incidents per month for critical medications, emergency procurement constituting 12–15% of total procurement volume (at a 15–20% price premium), and IDR 4.0–6.7 billion in hidden annual costs that conventional accounting fails to capture. Implementation of ABC-Pareto analysis provides the analytical foundation for differentiated control strategies that align managerial effort with economic and clinical impact—making it not merely beneficial but essential for sustainable pharmaceutical logistics management (Devnani et al., 2010; Vaz et al., 2008).

This study aims to analyze pharmaceutical logistics planning and control at Bekasi District General Hospital using an integrated diagnostic approach that combines ABC-Pareto Analysis with Balanced Scorecard. Specifically, this study aims to: (1) classify pharmaceutical items using Pareto Analysis based on investment value and frequency of use, (2) evaluate pharmaceutical logistics management performance from a financial perspective within the Balanced Scorecard framework, (3) evaluate performance from an internal customer perspective, (4) evaluate performance from an internal business process perspective, (5) evaluate performance from a learning and growth perspective, (6) identify problems in the drug planning, control, and distribution system, and (7) formulate data-based improvement recommendations for optimizing pharmaceutical logistics management (Sakit, 2018).

ABC-Pareto analysis allows stratification of pharmaceutical items based on value contribution to identify strategic items that require tight control, while the Balanced Scorecard provides a multidimensional evaluation framework that includes financial, customer, internal business process, and learning and growth perspectives (Gupta & Gupta, 2010). The integration of these two methods is expected to provide a comprehensive picture of the effectiveness and efficiency of the pharmaceutical logistics system, uncover hidden costs not captured by conventional metrics, and identify critical areas that require priority intervention (Devnani et al., 2010).

RESEARCH METHOD

The 80%–95%–100% cumulative contribution thresholds used in this study's ABC classification are grounded in Vilfredo Pareto's empirical observation that, in most economic systems, approximately 80% of outcomes are attributable to 20% of inputs. Applied to pharmaceutical inventory, decades of validated evidence across diverse hospital settings consistently demonstrate that a small proportion of pharmaceutical items—typically 10–20% of the total formulary—accounts for 70–85% of total procurement expenditure. The 80% threshold for Category A is therefore not arbitrary but represents the empirically-validated 'critical mass' of value concentration that justifies intensive management resources. The intermediate 80–95% boundary for Category B captures items of moderate economic significance that warrant periodic (rather than continuous) attention, while the residual 95–100% Category C encompasses the large number of low-value items that can be efficiently managed through simplified bulk-ordering systems. Sensitivity analyses conducted in prior studies indicate that minor threshold variations (e.g., 75%/90%/100% or 80%/96%/100%) produce marginal differences in operational outcomes, validating the robustness of the 80/95/100 standard adopted by WHO pharmaceutical management guidelines and Indonesian Ministry of Health regulations (Devnani et al., 2010; Health, 2012; Vaz et al., 2008).

This study used a descriptive-analytical design with a mixed methods approach. The quantitative component included a comprehensive analysis of pharmaceutical logistics data from January to December 2024, covering 1,127 product items with a total transaction value of IDR 134.3 billion. Secondary data were obtained from the hospital management information system (SIMRS), the Pharmacy Installation's quarterly financial reports, daily stockout records, and procurement documents.

The ABC-Pareto classification in this study follows internationally validated criteria based on cumulative annual consumption value. Specifically: (1) Category A encompasses items whose cumulative investment value reaches up to 80% of the total annual pharmaceutical expenditure—these are high-value items requiring intensive management with tight controls, daily monitoring, and strategic procurement approaches; (2) Category B encompasses items contributing to the next 15% of cumulative value (80–95% of total), representing items of moderate importance managed through periodic review systems; and (3) Category C encompasses the remaining items contributing to the final 5% of cumulative value (95–100% of total), typically comprising the largest number of items but with minimal financial impact, managed through bulk ordering with minimal oversight. This tiered structure directly maps management intensity to economic impact, ensuring that managerial effort is concentrated where it generates the greatest return on control investment (Gupta & Gupta, 2010; Kanthed & Anand, 2013).

ABC-Pareto analysis is performed by calculating the annual consumption value for each item, sorting the items by value from highest to lowest, and classifying them based on cumulative contribution: Category A (items that contribute up to 80% of the total value), Category B (items that contribute 80–95% of the total cumulative value), and Category C (items that contribute 95–100% of the total cumulative value) (Vaz et al., 2008). To measure the stability of the ABC classification, the Pareto Stability Index (PSI) and Jaccard Similarity Index (JSI) are calculated between monthly periods (Wandalkar et al., 2013).

Performance evaluation uses the Balanced Scorecard framework with four main perspectives (Piroglu Doguc & Ceyhan Dogan, 2015). The Financial Perspective is measured through Inventory Turnover Ratio (ITOR), Days Inventory Outstanding (DIO), Drug Cost Percentage, Stockout Cost, and Obsolescence Cost. The Internal Customer Perspective is evaluated through Stockout Frequency, Medication Error Rate, Service Waiting Time, Distribution Response Time, and Customer Satisfaction. The Internal Business Process Perspective is assessed based on planning effectiveness, procurement efficiency, stock control accuracy, and distribution speed. The Learning and Growth Perspective includes HR competencies, system automation levels, and a culture of continuous improvement (Kanthed & Anand, 2013).

The qualitative component was conducted through in-depth interviews with 20 purposively selected key informants, consisting of the Deputy Director of the Regional General Hospital, the Head of Medical Services, the Head of the Pharmacy Installation, the Pharmacy Team, the Pharmacy Warehouse Team, the Head of Finance, the Chair of the Pharmacy Therapy Committee, doctors, nurses, and pharmacy administration staff. Data triangulation was conducted by comparing findings from the quantitative analysis, interview results, and field observations to ensure the validity of the research findings (Mollahaliloglu et al., 2012).

RESULTS AND DISCUSSIONS

The low internal customer satisfaction scores—2.17/4.00 for doctors and 2.58/4.00 for nurses—carry profound and multidimensional implications that extend far beyond administrative performance metrics. From a patient safety perspective, physician dissatisfaction with pharmaceutical logistics availability directly translates into elevated medication substitution rates, as clinicians are compelled to prescribe second-line alternatives when preferred formulary items are unavailable—a practice that introduces pharmacological variability and increases the risk of adverse drug events. From a clinical workflow perspective, nursing dissatisfaction with distribution response times (45–60 minutes against a 30-minute target) disrupts treatment schedules, forces ward-level stockpiling behaviors that circumvent the formal logistics system, and degrades the quality of care documentation. From an organizational culture perspective, persistent dissatisfaction among clinical staff erodes trust in the pharmaceutical logistics system, discourages formal reporting of stockout incidents through established channels, and creates a 'workaround culture' that makes the true scale of supply disruption invisible to management. Longitudinal

research in hospital pharmacy management consistently demonstrates that unaddressed internal customer dissatisfaction is a leading predictor of medication error rates, treatment delays, and ultimately patient safety incidents—establishing a direct causal pathway from pharmaceutical logistics performance to clinical outcome quality (Essa, 2025; Klink et al., 2021).

ABC-Pareto Classification Analysis

An ABC-Pareto analysis of 1,127 formulary items at Bekasi Regency Hospital revealed a significant concentration of value in a small number of items. Of the total formulary, only 124 items (11%) had active transactions during the analysis period, while 1,003 items (89%) showed a zero ending balance—indicating uncontrolled formulary expansion unsupported by actual needs. Of the 124 active items, the classification resulted in a distribution: 41 items (3.64% of the total formulary or 33.06% of active items) were in Category A with an 80% contribution to the total investment value (Rp 12.8 billion), 20 items (16.13% of active items) were in Category B with a 15% contribution (Rp 2.4 billion), and 63 items (50.81% of active items) were in Category C with a 5% contribution (Rp 800 million) (Christopher, 2016).

Table 1. Distribution of ABC classification of pharmaceutical logistics at Bekasi Regency Hospital in 2024

Category	Number of Items	Item Proportion (%)	Value (Billion Rp)	Contribution Value (%)
A	41	3.64%	12.8	80.0%
B	20	1.78%	2.4	15.0%
C	63	5.59%	0.8	5.0%
Total	124	11.00%	16.0	100.0%

Source: Research Data (ABC-Pareto Analysis 2024)

Validation of the 80-20 Pareto principle showed high consistency throughout the 12-month observation period. The mean proportion of Category A items was 18.09% (SD=2.00%), while the mean proportion of values was 79.76% (SD=0.13%)—very close to the ideal target of 80% with minimal deviation. Of the 12 months of measurement, the entire period (100%) validated the Pareto principle with Category A absorbing 70–90% of the investment value. The efficiency ratio of Category A was recorded at 1:4.4, meaning that every 1% of items in this category controlled an average of 4.4% of the investment value—much higher than Category B (1:0.6) and Category C (1:0.09). Analysis of Category A stability using the Pareto Stability Index (PSI) yielded an average value of 0.83 with a median of 0.96, indicating that the majority of items in Category A in one month remained in the same category the following month. Of the 11 transition periods analyzed, 8 showed PSIs above 0.90 (very good stability). Significant volatility was identified in the quarterly transition periods (March–April, June–July, September–October) with the lowest PSI of 0.40 and the lowest JSI of 0.24—indicating dramatic changes in Category A composition likely due to the quarterly budget-based procurement pattern (Klink et al., 2021; Makarov & Schoar, 2022).

Balanced Scorecard Performance Analysis

Performance evaluation using the Balanced Scorecard framework revealed significant disparities across perspectives. The aggregate BSC score reached 69.22% (Sufficient, requires improvement) with substantial variations: Financial Perspective 76.67% (Sufficient), Internal Customer Perspective 59.38% (Poor—lowest), Internal Business Process Perspective 68.33% (Sufficient), and Learning & Growth Perspective 72.50% (Sufficient). The 17.29 percentage point gap between the Financial and Customer perspectives indicates the phenomenon of 'financial adequacy illusion' where conventional financial metrics fail to capture the reality of the internal customer experience (Amin, 2018).

Table 2. Summary of balanced scorecard for pharmacy logistics at Bekasi Regency Hospital in 2024

Perspective	Score (%)	Category	Status
Financial Perspective	76.67	Enough	Needs Improvement
Internal Customer Perspective	59.38	Not enough	Important to Note

Perspective	Score (%)	Category	Status
Internal Business Process Perspective	68.33	Enough	Needs Improvement
Learning & Growth Perspective	72.50	Enough	Needs Improvement
BSC TOTAL SCORE	69.22	ENOUGH	NEEDS IMPROVEMENT

Description: Good Score (80–100%), Sufficient (60–79%), Poor (<60%). Source: Research Data (BSC Evaluation 2024)

Financial Perspective

From a financial perspective, several indicators show unbalanced performance. The Inventory Turnover Ratio (ITOR) shows an extreme dichotomy: the average APBD is 8.88 times/year and the average BLUD is 7.72 times/year (Good category), but the median APBD is only 3.31 and the median BLUD is 2.00 (Low category). The large gap between the mean and median indicates an asymmetrical distribution. Dead stock reached IDR 373 million (11.99% of inventory value), far exceeding the ideal benchmark of <5%. Hidden stockout costs are estimated to be 15–20% more expensive than regular procurement, equivalent to IDR 2–2.7 billion per year (Hubbard, 2020).

Internal Customer Perspective

The Internal Customer Perspective revealed the most critical issues. Stockouts reached 15–20 per month for critical medications. Customer satisfaction surveys yielded average scores of only 2.17/4.00 for doctors and 2.58/4.00 for nurses. Waiting times for outpatient pharmacy services averaged 25–30 minutes (target <20 minutes), while response times for distribution to units for urgent requests reached 45–60 minutes (target <30 minutes). Low customer perspective scores indicate a significant gap between operational systems and clinical needs, which directly impacts satisfaction and the effectiveness of healthcare services (Essa, 2025).

Internal Business Process Perspective

The Internal Business Process Perspective recorded a score of 68.33% (Sufficient), identifying several structural weaknesses in the planning and control system. The planning method applied is undifferentiated—using a simple historical consumption approach (3–6 months average plus a 20–30% buffer) for all items without considering differences in strategic value or clinical criticality. The procurement system does not differentiate strategies based on item importance; the choice of procurement method (tender, e-catalog, or direct purchase) is determined solely by the dollar value without consideration of criticality or stability of needs. High variability in procurement lead times—tenders require 10–12 weeks while e-catalogs only 3–4 weeks—results in difficulties in maintaining supply continuity, especially during quarterly transition periods. The high proportion of emergency procurement (12–15% of the total) confirms the existence of systemic gaps in planning that force the organization to use reactive mechanisms at a premium cost (Ooi et al., 2023).

Learning and Growth Perspective

The Learning and Growth perspective scored 72.50% (Sufficient), the second highest score after the financial perspective, but still requires attention. The composition of human resources is adequate, with a pharmacist to pharmaceutical technician (TTK) ratio of 1:2, in accordance with regulatory standards. All staff have the required certifications (100% active STR/STTK), indicating the organization's commitment to professional standards. However, interviews revealed that internal training is limited to Communication, Information, and Education (KIE) activities, while external training is left to individual initiatives to meet Professional Credit Units (SKP) without clear institutional budget support. Limitations in human resource capacity development have the potential to hinder the adoption of innovations and system improvements needed to improve the performance of other perspectives (Magnuson, 2018).

Identify Problems and Hidden Costs

Hidden costs are calculated to reach Rp 4.0–6.7 billion per year (3–5% of the budget), including stockout costs, dead stock storage costs, and inefficiency costs—substantial amounts that are not visible in traditional accounting.

Discussion and Implications

The integration of findings from ABC-Pareto Analysis and Balanced Scorecard reveals the phenomenon of 'illusion of financial adequacy' that creates a blind spot in the performance evaluation system. The disparity of 17.29 percentage points between the financial perspective (76.67%) and the customer perspective (59.38%) is not a statistical anomaly, but rather a manifestation of the fundamental limitations of conventional financial metrics that fail to capture critical operational dimensions such as drug availability, service responsiveness, and internal user satisfaction. These findings confirm Kaplan and Norton's argument that measuring organizational performance relying solely on financial indicators will produce a partial and potentially misleading picture in strategic decision-making (Dangi & Kohli, 2018).

Causal analysis identified three mutually reinforcing systemic factors. First, the uncontrolled expansion of the formulary—with 89% of items showing zero balances—indicates weak utilization evaluation mechanisms and delisting processes. Each addition of a new item to the formulary without the elimination of slow-moving or non-moving items progressively erodes working capital that should be allocated to strategic Category A items. Second, the extreme variability of procurement lead times—with coefficients of variation reaching 60–80% for some critical items—forces the system to adopt a defensive strategy of accumulating excessive safety stock that has the dual effect of increasing the risk of obsolescence and tying up working capital unproductively. Third, although ABC classification has been performed periodically, the finding that all items—regardless of ABC category—are treated with identical procedures indicates a failure of translation from analysis to operational action (Shonkwiler, 2017).

The impact of formulary expansion on the sustainability of the pharmaceutical logistics system operates through multiple, interconnected pathways. From a working capital perspective, each additional non-moving item in the formulary represents a direct drain: capital is tied up in inventory that generates no therapeutic value, while simultaneously the organization lacks funds to maintain adequate safety stock for actively-consumed Category A items. This 'capital displacement' effect explains the paradox observed in this study—where the hospital maintains IDR 373 million in dead stock while simultaneously experiencing 15–20 stockout incidents per month for critical medications. From a managerial bandwidth perspective, an oversized formulary fragments procurement attention, distributes administrative workload across items with negligible clinical impact, and degrades the system's capacity to focus on the 41 Category A items that represent 80% of pharmaceutical expenditure. From a long-term sustainability perspective, each formulary addition that escapes periodic delisting review compounds the problem exponentially: the 1,003 items with zero balances in this study represent not merely current waste but a structural vulnerability that will progressively worsen without systematic governance intervention. Evidence from international hospital pharmacy studies supports a formulary size of 400–600 active items as the optimal range for effective differentiated management in hospitals of comparable complexity (Devnani et al., 2010; Gupta & Gupta, 2010).

The high stability in Category A composition (PSI 0.83, JSI 0.76) has important strategic implications: high predictability allows the implementation of long-term contracts, vendor-managed inventory, or consignment for these strategic items, which will reduce the administrative burden of recurring procurement and mitigate the risk of stockouts. However, significant volatility in the quarterly transition period (PSI 0.40) reveals a structural weakness in procurement patterns that are driven by budget cycles rather than actual demand patterns—a dysfunction common in public sector institutions with fiscal year-based budgeting systems (Lev, 2018).

Hidden costs, calculated at Rp 4.0–6.7 billion per year (3–5% of the budget), represent significant opportunity costs that are not visible in conventional financial statements but have a

real impact on operational efficiency and service quality. This amount is equivalent to the ability to recruit 15–20 additional pharmacists, implement an integrated pharmaceutical management information system, or expand the production capacity of the drug and sterile manufacturing unit (Golf-Papez et al., 2022).

CONCLUSION

Strengthening the governance framework for pharmaceutical logistics at Bekasi Regency Hospital carries systemic implications that will reverberate across all four Balanced Scorecard perspectives. From a financial perspective, an integrated cross-functional governance structure—incorporating representatives from pharmacy installation, procurement, finance, and clinical departments—will enable coordinated formulary rationalization decisions that currently fall through institutional gaps between departmental silos, directly addressing the IDR 4–6.7 billion annual hidden cost burden. From an internal customer perspective, governance mechanisms that give clinical staff (doctors and nurses) a formal voice in formulary management and procurement priority-setting will systematically align the logistics system with clinical demand realities, addressing the root cause of the 2.17–2.58/4.00 satisfaction scores. From an internal business process perspective, a governance framework that mandates quarterly ABC-reclassification reviews, vendor scorecard reporting, and lead-time performance accountability will transform the current reactive procurement culture into a proactive, evidence-driven supply management system. From a learning and growth perspective, institutionalized governance with dedicated HR capacity development funding will create the organizational capability infrastructure needed to sustain performance improvements over time. Collectively, these governance-driven changes are projected to elevate the aggregate BSC score from 69.22% toward the 80%+ 'Good' threshold within 18–24 months of full implementation, representing a fundamental transformation in pharmaceutical logistics management maturity (Kaplan & Norton, 1996b; Sakit, 2018).

Based on the established research objectives, this research produced the following findings: First, regarding the classification of pharmaceutical items using Pareto Analysis based on investment value and frequency of use (first research objective), the analysis identified extreme concentrations of values where 41 items (3.64% of the formulary or 33.06% of active items) were in Category A with an 80% contribution to the total investment value (Rp 12.8 billion), while 1,003 items (89% of the formulary) showed a zero ending balance—indicating uncontrolled formulary expansion. The high stability of the classification (average PSI 0.83, median 0.96) validated the feasibility of implementing a sustainable differentiated management strategy, but volatility in the quarterly transition period (PSI 0.40, JSI 0.24) revealed the weakness of procurement patterns driven by budget cycles rather than actual demand patterns.

Second, the evaluation of pharmaceutical logistics management performance from a financial perspective within the Balanced Scorecard framework (second research objective) showed a score of 76.67% (Sufficient, requires improvement category). The Inventory Turnover Ratio showed an extreme dichotomy with a mean of 8.88 times/year in the APBD but a median of only 3.31 times/year, indicating an asymmetrical distribution. Dead stock reached IDR 373 million (11.99% of inventory value), far exceeding the benchmark of <5%, while hidden stockout costs were estimated at IDR 2–2.7 billion per year due to emergency procurement premiums.

Third, the evaluation of the internal customer perspective (the third research objective) yielded a score of 59.38% (Poor category)—the lowest score of the four BSC perspectives. Stockout frequency reached 15–20 incidents per month for critical drugs, internal customer satisfaction scores were only 2.17/4.00 for doctors and 2.58/4.00 for nurses, service waiting time was 25–30 minutes (target <20 minutes), and emergency distribution response time was 45–60 minutes (target <30 minutes). The 17.29 percentage point gap between the financial perspective and the customer perspective confirms the phenomenon of the 'illusion of financial adequacy.'

Fourth, the evaluation of the internal business process perspective (the fourth research objective) recorded a score of 68.33% (Sufficient, requires improvement). The undifferentiated planning method treats all items equally without considering differences in strategic value or clinical criticality. High variability in procurement lead times (tender 10–12 weeks versus e-catalog 3–4 weeks) and a high proportion of emergency procurement (12–15% of the total) indicate systemic gaps in planning.

Fifth, the evaluation of the learning and growth perspective (the fifth research objective) showed a score of 72.50% (Adequate, requires improvement)—the second highest score after the financial perspective. The composition of human resources is adequate with a pharmacist: TTK ratio of 1:2 and 100% of staff are actively certified. However, limitations in the capacity development program have the potential to hinder the adoption of innovations needed for system improvement.

Sixth, the identification of problems in the drug planning, control, and distribution system (the sixth research objective) revealed three interrelated causal factors: uncontrolled formulary expansion that eroded working capital allocation, variability in procurement lead times that required excessive safety stock accumulation, and ABC stratification that had been implemented but not operationalized in daily control practices. Hidden costs were calculated to reach Rp 4.0–6.7 billion per year (3–5% of the pharmaceutical logistics budget).

Suggestion, seventh, regarding the formulation of data-based improvement recommendations (seventh research objective), this study proposes five priority recommendations: First, formulary optimization through a reduction from 1,127 items to 400–600 items based on actual utilization evidence to free up working capital currently tied up in the 89% of formularies with zero balances. Second, operationalization of the ABC framework with differentiated control strategies: Category A (3.64% of items, 80% of value) requires close monitoring with daily reviews, long-term contracts with suppliers, and an early warning system; Category B implements monthly periodic reviews; Category C uses bulk ordering with minimal control and annual reviews. Third, systematically tracking lead time performance by establishing a vendor scorecard that measures delivery time reliability, quality consistency, and responsiveness to reduce variability that currently forces excessive safety stock accumulation.

Fourth, expanding the financial measurement parameters to include hidden costs—stockout costs, obsolescence costs, opportunity costs, and inefficiency costs—into the performance dashboard. Fifth, the establishment of an integrated governance architecture with a cross-functional team including representatives from pharmacy installation, planning, procurement, finance, and clinical departments.

Future Research Agenda: The findings of this study open several promising directions for further research that could significantly advance pharmaceutical logistics science in the Indonesian hospital context. First, the integration of ABC-VEN (Vital, Essential, Non-essential) analysis with Balanced Scorecard presents a particularly valuable opportunity: while this study demonstrated the financial stratification power of ABC-Pareto analysis, combining it with VEN classification would enable a dual-axis matrix that simultaneously captures economic value and clinical criticality—providing a more nuanced basis for differentiated control strategies. Items classified as Category A-Vital would receive the highest level of management attention as they are both high-cost and life-critical, while Category C-Non-essential items could be safely subjected to minimal oversight or even formulary exclusion. Second, longitudinal studies examining the impact of implementing ABC-based differentiated control on BSC performance metrics over 2–3 years would provide the evidence base currently lacking for quantifying return on investment from pharmaceutical logistics optimization. Third, multi-center comparative studies across Type B district hospitals in West Java would enable benchmarking and identification of system-level variables that moderate the relationship between ABC implementation and performance outcomes. Fourth, the application of machine learning algorithms for dynamic ABC reclassification—

responding in real-time to demand pattern changes rather than relying on quarterly batch reclassification—represents a frontier area with significant practical implications for reducing the quarterly volatility (PSI 0.40) identified in this study (Devnani et al., 2010; Kanthed & Anand, 2013; Piroglu Doguc & Ceyhan Dogan, 2015).

The implementation of the five priority recommendations is projected to produce measurable impacts: reduction of dead stock from 11.99% to <5% (savings of Rp 215–260 million), reduction of stockout frequency from 15–20 events/month to <5 events/month (savings of Rp 1.2–1.6 billion from elimination of emergency procurement premiums), optimization of working capital through targeted buffer reduction for Category C (savings of Rp 160–240 million), and improvement of internal customer satisfaction score from 2.17–2.58 to >3.00. Total potential savings are estimated to reach Rp 2.5–3.5 billion per year (1.9–2.6% of the total pharmaceutical logistics budget).

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