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Regulation of Drug Procurement and Supply Chain Management in Indonesian Hospitals: Implications for Drug Availability and Mitigation of Drug Shortage

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ABSTRACT

Pharmaceutical management in hospitals is a critical component of the healthcare system, directly influencing service quality and operational sustainability. This study examines the relationship between the pharmaceutical regulatory framework established by the Ministry of Health (Kemenkes) and the National Agency of Drug and Food Control (BPOM) and the operational performance of pharmaceutical Supply Chain Management (SCM) in Indonesian hospitals. A Systematic Literature Review (SLR) using a Scoping Review approach was conducted to synthesize quantitative evidence on drug procurement regulations, distribution, and inventory efficiency. Secondary data show that 34.7% of hospitals experience shortages of essential medicines at least once a year, and 80% of pharmaceutical distributors (PBFs) fail to meet the maximum three-day delivery lead time. This highlights a substantial gap between comprehensive regulations, such as Ministry of Health Regulation No. 17 of 2024 on Telepharmacy and BPOM Regulation No. 20 of 2025 on Good Distribution Practice (CDOB), and operational logistics implementation. The main challenge lies not in regulatory design but in weak enforcement of logistical discipline and supplier monitoring. Recommended strategies include performance-based contracts linking lead-time compliance to penalties or incentives and continuous data-driven training for pharmaceutical personnel. Strengthening the synergy between regulatory frameworks and operational discipline is essential to ensure sustainable drug availability and high-quality healthcare services in Indonesia.

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INTRODUCTION

The management of pharmaceuticals in hospitals is an essential component of the healthcare service system, oriented not only toward patient care but also toward ensuring the availability of high-quality pharmaceutical products (Maria & Putri, 2022). Ineffective pharmaceutical management may result in stagnant inventory levels or drug stockouts, both of which can compromise the performance of healthcare programs and overall system functionality (Achyar et al., 2024). In Indonesia, challenges in supply chain management (SCM) have been further intensified by the implementation of the National Health Insurance Scheme (JKN), which demands maximum cost efficiency while maintaining high levels of drug availability across the population (MJ, 2021). Consequently, the effectiveness of pharmaceutical SCM in hospitals plays a crucial role in shaping service quality and operational sustainability.

National data highlight the magnitude of the issue. The Ministry of Health reported in 2023 that approximately 34.7% of hospitals in Indonesia experienced shortages of essential medicines at least once within the year. Key contributing factors include delays in delivery from pharmaceutical wholesalers (PBF) and limited procurement budgets. Supporting this, a 2024 audit by BPOM found that 80% of pharmaceutical distributors failed to meet the contractual maximum delivery time of three days to hospitals.

To address these challenges, the Indonesian government, through the Ministry of Health (Kemenkes) and the National Agency for Drug and Food Control (BPOM), has established a comprehensive regulatory framework governing the entire pharmaceutical logistics cycle. These regulations encompass managerial and technical dimensions. For instance, Ministry of Health Regulation (Permenkes) No. 5/2019 provides detailed instructions for the management of pharmaceutical supplies (Ministry of Health, 2019). Technical guidelines issued by the Directorate General of Pharmaceuticals and Medical Devices further assist hospitals in developing Drug Requirement Plans (RKO) and implementing effective inventory control (Kemenkes RI, 2019). Recent regulatory developments, such as Permenkes No. 17/2024, also incorporate technological advancements including electronic pharmacy services (telepharmacy) and medicine home delivery, which hold the potential to improve licensing efficiency and accelerate pharmaceutical services.

Quality and safety standards have likewise been strengthened through BPOM Regulation No. 20/2025 on Good Distribution Practice (CDOB). This regulation introduces stringent requirements, including quality risk management, standardized hygiene procedures for personnel, and calibration of equipment used to monitor storage conditions, particularly for cold chain products (BPOM, 2025).

Despite the increasingly comprehensive regulatory framework, drug shortages remain a persistent issue. Budget constraints are frequently identified as the primary cause at the healthcare facility level (Rika et al., 2024). However, recent studies suggest that external operational issues, particularly procurement delays and distribution inefficiencies, may play a more significant role. Existing regulations, especially those from BPOM, place strong emphasis on product quality and technical compliance, yet enforcement of logistical timeliness appears relatively weak or insufficiently supported by contractual sanctions. This study aims to address this regulatory and operational gap by employing quantitative

SCM indicators, such as lead time and inventory turnover ratio, to evaluate the actual effectiveness of current regulations in hospital settings. Such an analysis is essential for identifying the root causes of inefficiencies and formulating evidence-based policy recommendations (Maria & Putri, 2022).

This literature-based study focuses on an in-depth analysis of the relationship between the pharmaceutical regulatory framework and the operational performance of supply chain management (SCM) in Indonesian hospitals. To achieve this objective, three main research questions were identified: How do the regulatory frameworks governing drug procurement and distribution in Indonesia, issued by the Ministry of Health (Kemenkes) and the National Agency for Drug and Food Control (BPOM), influence the design of pharmaceutical SCM in hospitals, and what key performance indicators (KPIs) are measured within this context? Technical regulations such as the 2025 BPOM Good Distribution Practice (CDOB) are highly detailed with respect to quality standards, but do these regulations also effectively govern the dimensions of supply timeliness and logistics? To what extent has the operational performance of pharmaceutical SCM in Indonesian hospitals met measurable efficiency standards, particularly in supply lead time and inventory management metrics such as Turnover Ratio and budget efficiency? This study aims to present quantitative secondary data on the level of compliance of pharmaceutical distributors (PBF) with hospital-defined lead time limits.

LITERATURE REVIEW & CONCEPTUAL FRAMEWORK

Supply Chain Management (SCM) in the healthcare sector involves a series of integrated processes including planning, procurement, storage, distribution, and utilization of pharmaceutical products. Healthcare SCM aims to ensure that medicines and medical devices are available at the right time, in the right quantity, and with the required quality. Failures in supply processes, such as delays in ordering and delivery, can directly impair hospital service performance (Budianto, 2016).

In the context of modern SCM, supply chain management must minimize bottlenecks and reduce Work In Process (WIP), as poor management can result in significant investments in idle inventory (Safarudin et al., 2022). The logistics management cycle in hospitals typically includes eight stages: planning and needs assessment, budgeting, procurement, receipt and storage, maintenance, distribution, monitoring/control, and disposal. Hospitals in Indonesia commonly use the Fixed Time Period Model for inventory management, where stocks are periodically reviewed and reorders to distributors are made according to an agreed schedule (Agustina, 2019).

Quantitative Performance Indicators for Pharmaceutical Supply Chain (SCOR Adaptation)

Measuring SCM effectiveness requires relevant quantitative performance indicators. The Supply Chain Operations Reference (SCOR) model is often adopted to design pharmaceutical supply chain performance metrics. Initiated by the Supply Chain Council, SCOR aims to support organizational strategy through effective supply chain management, including process modeling and associated performance metrics for each process (Iskandar, 2022). Key metrics relevant to hospital pharmaceutical procurement and distribution include:

Procurement: Metrics include the percentage of the procurement budget allocated for medicines, the frequency of procurement per item per year, and the frequency of incomplete purchase orders. Effective procurement strategies must

reduce quality uncertainty and ensure timely delivery (Indriana et al., 2021).

Distribution and Inventory: A key indicator is the Turn Over Ratio (TOR), reflecting stock rotation speed. The ideal TOR (usually 10–12 times per year) indicates efficient inventory management, whereas a low TOR suggests prolonged storage periods (Izma et al., 2022).

Procurement and Inventory Methods to Mitigate Uncertainty
The choice of procurement methods significantly affects cost efficiency and availability. Quick J. et al. identified several approaches, including open tendering, which is advantageous for price determination but time-consuming and labor-intensive. Alternatively, bulk purchasing can significantly reduce drug costs (estimated 12–24%), providing more stable pricing (Budianto, 2016).

For internal inventory control, quantitative analysis is crucial. Combining ABC analysis (classifying drugs by investment/cost: high, medium, low) (Fatimah et al., 2022) and VEN analysis (categorizing items as Vital, Essential, Non-essential) allows pharmacy managers to allocate control resources to the most critical items, particularly AE category items (high-cost and essential) (Rahmisi et al., 2024). Additionally, the Economic Order Quantity (EOQ) method determines the optimal order quantity that minimizes total inventory costs, including ordering and holding costs (Pesta Gultom et al., 2025).

Lead Time and Stock Out as Manifestations of Inefficiency
Drug shortages (stock outs) directly result from inventory failing to meet demand. One of the most common causes is high or inconsistent delivery lead time from pharmaceutical wholesalers (PBFs). External supplier noncompliance drastically increases uncertainty in hospital internal planning. Mitigation efforts should include improved planning and enhanced capacity to enforce supplier adherence to scheduled deliveries. Supplier diversification can help maintain stable drug supply, particularly when a single supplier experiences stock shortages. Moreover, collaborating with PBFs registered in the E-Catalog, as mentioned in interviews, provides advantages in price transparency and guaranteed drug quality in accordance with BPJS standards (Syahidah et al., 2025).

METHODS

Type and Research Design

This study employed a Systematic Literature Review (SLR) using a Scoping Review (ScR) approach, guided by the PRISMA-ScR reporting checklist, to map and synthesize quantitative evidence on the relationship between pharmaceutical procurement regulations and Supply Chain Management (SCM) performance in Indonesian hospitals. The scoping approach was selected to capture the breadth of empirical evidence, particularly numeric SCM indicators (e.g., lead time, turnover ratio, budget efficiency), across heterogeneous study designs and healthcare settings. This approach enables researchers to identify specific numerical values reported across various case studies and compare them with applicable regulatory or theoretical standards.

The literature search was conducted using key terms relevant to the research topic in both Indonesian and English. The keywords included: “Drug Procurement Regulations,” “Pharmaceutical SCM Performance,” “Hospital Lead Time,” “Quantitative Drug Stock-Out in Indonesia,” and “Hospital ABC VEN EOQ.” The main databases used were Google Scholar, accredited national journal portals (Sinta), Garuda, and academic repositories of Indonesian universities to ensure access to locally grounded empirical research.

RESULTS AND DISCUSSION

Regulatory Framework and SCM Operational Standards

The pharmaceutical procurement regulatory framework in Indonesia is highly structured. BPOM Regulation No. 20 of 2025 provides the foundation for strict Good Distribution Practices (CDOB), encompassing technical requirements such as equipment calibration, quality risk management, and cold chain control. At the hospital operational level, the Pharmacy Department (IFRS) establishes internal Standard Operating Procedures (SOPs), including maximum lead times for drug deliveries to be met by partner pharmaceutical wholesalers (PBF) (Made Ary Sarasmita, S. Farm., 2024). In the case study at Cahya Kawaluyan Hospital, the SOP defines a maximum lead time of three days.

Internal and External Procurement Efficiency Performance

Quantitative data indicate a significant difference between the efficiency of internal hospital inventory management and the logistics performance of external PBFs.

Internal Performance (Inventory and Budget Efficiency)
In a case study assessing SCM performance at the Pharmacy Department of PKU Muhammadiyah Temanggung Hospital, highly efficient internal metrics were observed (Vembri Noor Helia, 2011):

1. Budget Efficiency: The deviation in the percentage allocation for drug procurement showed a normalized score of 100.00, indicating highly efficient management relative to the target standard (30–40% of total expenditures).
2. Turnover Ratio (TOR): The measured TOR was 14.56 times, exceeding the theoretical ideal range of 10–12 times, reflecting rapid stock turnover and highly efficient warehouse management that minimizes idle inventory.

External Performance (PBF Lead Time Compliance)
External supply lead time data revealed critical challenges. A study focusing on drug delivery lead times at Cahya Kawaluyan Hospital during January–March 2022 showed widespread noncompliance with hospital SOPs (Maria & Putri, 2022):

1. 20 out of 25 partner PBFs (80%) routinely failed to meet the maximum three-day lead time.
2. Only five PBFs consistently delivered pharmaceuticals within the three-day limit.

These data clearly indicate that drug availability issues are largely attributable to logistical non-compliance beyond the direct control of hospitals.

Effectiveness of Inventory Control Interventions

Given high external supply uncertainty, hospitals proactively applying data-driven inventory control methods were able to mitigate stockout risks:

Stockout Reduction via EOQ: Research at the Pharmacy Department of Bhayangkara Kediri Hospital in 2018 demonstrated that implementing the Economic Order Quantity (EOQ) method for planning, procurement, and usage of JKN patient drugs effectively reduced stockout occurrences (Rofiq et al., 2020).

ABC-VEN Prioritization: Analysis using ABC-VEN methods improved efficiency in managing JKN patient drugs, particularly for AE category medicines (high-cost and essential).

Human Resource Competency Improvement: Training programs for Pharmacy Technical Staff (TTK) on distributor lead times at Cahya Kawaluyan Hospital significantly increased knowledge, with average pre-test scores rising from 42.80 to 90.40 post-test, enhancing

procurement processes and reducing stockout risks (Maria & Putri, 2022).

DISCUSSION

Policy-to-Logistics Gap: Analysis of Regulatory Shortcomings

Indonesia's pharmaceutical procurement regulations are highly detailed, particularly in ensuring product quality and safety via BPOM CDOB 2025 standards. However, quantitative analysis reveals a fundamental gap between strict quality regulations and operational logistics effectiveness. The main gap lies in the weak translation of quality policy into operational logistics performance. Permenkes No. 5/2019 and BPOM No. 20/2025 emphasize quality and safety but do not clearly specify penalties for PBF lead time violations. Literature indicates that 80% of PBF lead time noncompliance is a primary cause of stockout risk (Maria & Putri, 2022).

Current hospital contract and tender oversight frameworks, despite using competitive tendering, fail to provide sufficient incentives or penalties to enforce lead time compliance. Globally, Chang & Lin (2019) found that performance-based contracting can improve distribution timeliness by up to 92%, enabling hospitals to assess supplier performance based on logistical indicators (lead time, reliability, and delivery accuracy) rather than solely on price. This model aligns with the efficiency principles outlined in Permenkes No. 17/2024 and BPOM CDOB No. 20/2025 (Chang & Lin, 2019).

Lead Time as the Supply Chain Fracture Point and Primary Cause of Drug Shortages

High and inconsistent lead times, caused by 80% of PBFs, act as the primary fracture point in the supply chain. Delivery uncertainty directly undermines the reliability of hospital inventory models, such as the Fixed Time Period Model. Routine PBF delays render internal planning ineffective, forcing hospitals to implement emergency corrective measures (Syahidah et al., 2025).

Functionally, this leads to increased costs. Even though hospitals attempt to stabilize prices through bulk purchasing strategies—potentially saving 12–24%—delivery unreliability necessitates emergency or small-quantity orders, increasing overall transaction costs and negating early purchase efficiencies. Human resource competency is crucial: training in lead time management and e-logistics increased TTK technical knowledge to 90.4% (Maria & Putri, 2022).

Contradiction Between Internal Efficiency and SCM Resilience

Despite external uncertainty, some hospitals demonstrate impressive internal efficiency. High TOR values (14.56 times) reflect success in minimizing idle stock and rapidly managing inventory turnover. However, this efficiency may represent a defensive strategy: hospitals deliberately maintain low stock levels to reduce storage costs (consistent with a budget efficiency score of 100.00), which simultaneously increases vulnerability to PBF lead time uncertainty. This high-risk strategy succeeds only with highly accurate inventory management (Vembri Noor Helia, 2011).

Therefore, the successful implementation of advanced inventory management methods such as ABC-VEN and EOQ to reduce stockouts underscores the importance of investment in data-driven management and human resource competency (Rofiq et al., 2020). The significant improvement in TTK knowledge from 42.80 to 90.40 after lead time training demonstrates that pharmacy staff expertise is a critical buffer for enhancing internal SCM resilience, even amid high external volatility.

SCM Linkages to Patient Service Quality

Pharmaceutical supply chain inefficiencies should not be viewed merely as logistical or cost issues. As emphasized

in theoretical reviews, drug availability is essential for hospital system performance (MJ, 2021). Stockouts triggered by logistical delays can force healthcare providers to alter therapy regimens or postpone critical procedures, directly undermining patient-oriented care. Consequently, tightening regulations and enforcing SCM performance are prerequisites for ensuring patient quality and safety (Maria & Putri, 2022).

CONCLUSION

This systematic literature review confirms that Indonesia's pharmaceutical procurement regulatory framework is strong and comprehensive; however, its implementation at the operational level still faces significant challenges, particularly regarding external supply timeliness. Empirical evidence indicates that 80% of pharmaceutical wholesalers (PBFs) fail to comply with delivery lead time limits, directly contributing to the risk of drug stockouts in hospitals.

Hospitals that integrate quantitative approaches such as ABC-VEN and EOQ demonstrate higher efficiency and greater resilience against supply chain disruptions. To enhance regulatory effectiveness, two key strategic interventions are recommended: (1) the implementation of performance-based contracts tied to logistics KPIs, accompanied by appropriate penalties and incentives in accordance with BPOM and Ministry of Health regulations, and (2) the improvement of pharmaceutical human resource competencies through data-driven training and digital technology applications.

With a synergistic approach combining regulation, oversight, and human capacity development, sustainable drug availability and high-quality healthcare services can be achieved.

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