http://dx.doi.org/10.18623/rvd.v23.n2.4472

STUDY OF THE ANALYSIS OF DRUG LOGISTICS MANAGEMENT IMPLEMENTATION ON STAGNANT AND STOCKOUT INCIDENTS IN THE PHARMACY UNIT OF NORTH BUTON REGIONAL HOSPITAL, SOUTHEAST SULAWESI

ESTUDO DA ANÁLISE DA IMPLEMENTAÇÃO DA GESTÃO LOGÍSTICA DE MEDICAMENTOS EM INCIDENTES DE ESTAGNAÇÃO E FALTA DE ESTOQUE NA UNIDADE DE FARMÁCIA DO HOSPITAL REGIONAL DE NORTH BUTON, SUDESTE DE SULAWESI

Article received on: 8/25/2025
Article accepted on: 11/24/2025

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The authors declare that there is no conflict of interest

Abstract
Timely and continuous drug availability is a key indicator of hospital service quality; however, drug stagnation (overstocking) and stockouts persist as critical challenges in the Pharmacy Unit of North Buton Regional Hospital. This qualitative case study aimed to analyze the

Resumo
A disponibilidade oportuna e contínua de medicamentos é um indicador fundamental da qualidade dos serviços hospitalares; no entanto, a estagnação (excesso de estoque) e a falta de medicamentos continuam sendo desafios críticos na Unidade Farmacêutica do Hospital

implementation of drug logistics management and its contribution to these problems, involving in-depth interviews with drug logistics managers, the head of the pharmacy unit, and hospital management, complemented by document review and field observations. Data were thematically analyzed using NVivo and benchmarked against the indicators stipulated in the Indonesian Minister of Health Regulation No. 72 of 2016. The findings reveal that most stages of logistics management planning, procurement, receiving, storage, distribution, and control were suboptimally implemented. Drug stagnation was primarily driven by inaccurate demand forecasting and uneven distribution, whereas stockouts resulted from supply delays, weak procurement coordination, and the limited effectiveness of the Pharmacy and Therapeutics Committee. Overall, deficiencies in the logistics information system, constrained human and financial resources, and poor inter-unit integration emerged as the main underlying factors, indicating the urgent need for strengthening data-driven demand planning, optimizing the role of the Drug Logistics Unit (KFT), and developing an integrated logistics information system to improve drug availability and service performance at the hospital.

Keywords: Drug Logistics Management. Stagnation. Stockouts. Pharmacy Installation.

Regional de Buton Norte. Este estudo de caso qualitativo teve como objetivo analisar a implementação da gestão logística de medicamentos e sua contribuição para esses problemas, envolvendo entrevistas aprofundadas com gestores de logística de medicamentos, o chefe da unidade farmacêutica e a administração do hospital, complementadas por análise de documentos e observações de campo.

Os dados foram analisados tematicamente usando o NVivo e comparados com os indicadores estipulados no Regulamento do Ministro da Saúde da Indonésia nº 72 de 2016. Os resultados revelam que a maioria das etapas do planejamento, aquisição, recebimento, armazenamento, distribuição e controle da gestão logística foram implementadas de forma subótima. A estagnação dos medicamentos foi impulsionada principalmente por previsões imprecisas da demanda e distribuição desigual, enquanto a falta de estoque resultou de atrasos no fornecimento, coordenação deficiente das aquisições e eficácia limitada do Comitê de Farmácia e Terapêutica. De modo geral, as deficiências no sistema de informações logísticas, os recursos humanos e financeiros limitados e a integração deficiente entre as unidades surgiram como os principais fatores subjacentes, indicando a necessidade urgente de fortalecer o planejamento da demanda baseado em dados, otimizar o papel da Unidade de Logística de Medicamentos (KFT) e desenvolver um sistema integrado de informações logísticas para melhorar a disponibilidade de medicamentos e o desempenho dos serviços no hospital.

Palavras-chave: *Gestão logística de medicamentos. Estagnação. Falta de estoque. Instalação farmacêutica.*

1 BACKGROUND

Access to essential medicines constitutes a cornerstone of Universal Health Coverage (UHC) and remains a central priority of the World Health Organization (WHO) in strengthening health system performance worldwide [1]. Ensuring the continuous availability of safe, effective, and affordable medicines is fundamental to the delivery of high-quality care and to safeguarding population health, particularly in resource-constrained settings [2].

Despite sustained global efforts, pharmaceutical supply chains in many low- and middle-income countries (LMICs) continue to face structural and operational challenges. Inaccurate demand forecasting, fragmented procurement processes, distribution delays, and underdeveloped logistics information systems persistently undermine supply reliability [3]. These weaknesses often translate into stockouts, overstocking, inefficient use of budgets, and interruptions in patient treatment, thereby compromising both clinical outcomes and system efficiency [4].

Within hospital settings, pharmaceutical logistics management plays a pivotal role, given that medicine expenditures may account for up to 40–50% of total operational costs in healthcare facilities in developing countries [5]. Inefficiencies across the logistics cycle, encompassing planning, procurement, storage, distribution, and monitoring, can generate substantial financial losses, elevate the risk of product expiration, and erode the overall quality of health services [6].

Two interrelated phenomena frequently emerge from such inefficiencies: stagnant stock and stockouts. Stagnant stock, defined as medicines that remain unused for extended periods, reflects poor alignment between procurement and actual clinical needs, resulting in wastage and unnecessary occupation of storage capacity [7]. In contrast, stockouts signal failures in maintaining adequate supply levels, creating gaps between demand and availability that can delay treatment, reduce patient satisfaction, and weaken trust in health services [8].

Empirical evidence from national studies indicates that these problems are widespread across diverse healthcare facilities. Reports have documented substantial proportions of stagnant stock and frequent stockout events in government hospitals, alongside weaknesses in procurement, distribution, and disposal practices [9]. These patterns reveal a persistent disconnect between regulatory frameworks such as Indonesia's Ministry of Health Regulation No. 72/2016 and their translation into effective routine practice [10].

The Regional General Hospital of North Buton reflects these broader systemic challenges. Data from its Pharmacy Installation Management Information System between 2021 and 2023 indicate a steady increase in stagnant medicines, from 150 to 180 items annually, accompanied by fluctuating stockout cases ranging from 138 to 170 items. Such trends suggest ongoing inaccuracies in quantification, suboptimal distribution

mechanisms, and limited use of logistics monitoring tools to support timely decision-making.

These conditions point not only to technical shortcomings but also to deeper systemic and organizational issues. Weak coordination among units, constrained human resources, and limited managerial capacity may shape how logistics policies are interpreted and implemented in practice [11]. Moreover, behavioral factors influencing adherence to standard procedures remain insufficiently explored, despite their potential role in perpetuating inefficiencies.

Against this backdrop, the present study seeks to examine the implementation of pharmaceutical logistics management at North Buton Regional General Hospital and to identify the underlying systemic, organizational, and behavioral factors contributing to stagnant stock and stockouts. By generating context-sensitive and practice-oriented insights, this study aims to inform strategies for strengthening logistics management and improving medicine availability in hospitals facing similar constraints, thereby contributing to the broader goals of UHC and health system resilience.

2 METHODS

2.1 Study design

This study employed a qualitative case study design to explore how and why stagnant stock and stockout incidents occur within the drug logistics system of North Buton Regional General Hospital (RSUD Buton Utara). This approach was chosen to enable an in-depth examination of complex organizational processes in their real-world context and to capture the systemic and behavioral factors shaping logistics performance through multiple sources of evidence.

2.2 Conceptual framework

The analysis was guided primarily by the Indonesian Ministry of Health Regulation No. 72/2016, which defines standards for hospital pharmaceutical services and drug logistics management. To enhance interpretive depth, Donabedian's Structure–Process–Outcome (SPO) model was integrated to examine how organizational structures

and operational processes influence outcomes related to medicine availability. The combined framework provided a comprehensive lens to assess both regulatory compliance and functional performance of the logistics system.

2.3 Study setting and period

The study was conducted at the Pharmacy Installation of RSUD Buton Utara, a public secondary-level hospital located in Southeast Sulawesi, Indonesia. Data collection took place between May and June 2025.

2.4 Participants and sampling

Purposive sampling was used to recruit informants with direct involvement and decision-making roles in drug logistics management. Eight participants were included to ensure variation across managerial, professional, and operational perspectives: the head of the pharmacy installation, two pharmacists, two pharmacy technical staff, a logistics/administrative officer, a warehouse officer, and a hospital management representative. Participants had professional experience ranging from 4 to 12 years.

Table 1

Characteristics of Informants

Code	Position	Years of Experience
P1	Head of Pharmacy Installation	10 years
P2	Pharmacist	7 years
P3	Pharmacist	5 years
P4	Pharmacy Technical Staff	6 years
P5	Pharmacy Technical Staff	4 years
P6	Logistics/Administrative Officer	8 years
P7	Warehouse Officer	6 years
P8	Management Representative	12 years

2.5 Data collection

Data were collected using three complementary methods: in-depth interviews, observations, and document review. Semi-structured interviews were conducted with all eight informants using an interview guide developed from the conceptual framework. Each interview lasted approximately 45–60 minutes, was audio-recorded with consent,

and transcribed verbatim. Passive participatory observations were undertaken across key logistics activities, including procurement, storage, inventory control, and distribution, with a total of approximately 40 hours over 10 days, focusing on workflow, adherence to standard operating procedures, FEFO/FIFO implementation, documentation practices, and real-time stock conditions. In addition, relevant documents were reviewed, including SOPs, hospital formularies, procurement records, stagnant and stockout reports, expired drug logs, supply chain documents, and organizational structure records, to corroborate interview and observational data.

2.6 Data analysis

Data analysis followed the interactive model of Miles and Huberman, consisting of data reduction, data display, and conclusion drawing. A hybrid coding strategy was applied, combining deductive codes derived from Permenkes No. 72/2016 and the SPO framework with inductive codes emerging from the data. Two researchers independently coded all transcripts and field notes, and discrepancies were discussed until consensus was reached, thereby strengthening analytic rigor through analyst triangulation.

2.7 Trustworthiness and reflexivity

Data saturation was achieved when no new themes emerged after the seventh interview and subsequent observational cycles. Throughout the study, researchers maintained reflexive notes to document assumptions, analytical decisions, and potential influences of their professional backgrounds in public health and hospital pharmacy management. NVivo version 12 software was used to support data management, coding, theme development, and visualization.

2.8 Ethical considerations

Ethical approval was obtained from the Institutional Review Board of Hasanuddin University (Approval No. 1384/UN4.14.1/TP.01.02/2025). Written informed consent was secured from all participants before data collection. Participation was voluntary,

confidentiality and anonymity were assured, and participants were informed of their right to withdraw from the study at any stage without consequence.

3 RESULTS

Table 2

Data Analysis Results

Drug Selection	The NVivo analysis indicates that the frequent occurrence of the term **"formularium"** reflects the central role of the hospital formulary as the primary reference in drug selection. This underscores that the selection process is strongly guided by standardized criteria to ensure appropriateness, rationality, and efficiency in pharmaceutical management. The prominence of the word **"doctor"** highlights the pivotal influence of clinical decision-making in proposing drug needs, while the recurrent mention of **"meeting"** illustrates that drug selection is generally conducted through formal deliberation forums. Together, these patterns show that formulary adherence, clinician involvement, and committee-based discussion are key elements shaping the drug selection process.
Needs Planning	The NVivo analysis shows that the frequent appearance of the word **"not yet"** reflects several planning components that remain suboptimal, including the absence of accurate demand data, the lack of an integrated information system, and limited synchronization between clinical units and the pharmacy department. This pattern suggests notable gaps in the planning mechanism. The recurring term "**adjustment"** indicates that drug planning is often driven by real-time constraints such as budget limitations, existing stock conditions, and shifting disease patterns rather than by robust, needs-based forecasting, highlighting a tendency toward adaptive rather than evidence-based planning. Additionally, the prominence of **"limitations"** underscores persistent barriers identified by informants, particularly related to budget, human resources, data quality, and storage capacity. These findings suggest that planning decisions are frequently shaped by resource constraints rather than optimal pharmaceutical requirements.
Procurement	The NVivo analysis indicates that the dominant occurrence of the term **"delay"** reflects that timeliness is the central challenge in the drug procurement process. Delays may arise from administrative procedures, procurement mechanisms, or external factors involving distributors, and these disruptions can directly contribute to stockout events. The frequent mention of **"time"** further emphasizes that procurement effectiveness is not only determined by the quantity and type of drugs purchased but also critically depends on their timely availability. The appearance of the word **"delivery"** highlights that procurement bottlenecks extend beyond internal administrative issues to include logistical constraints on the supplier side, such as limited transportation capacity, geographic barriers, and coordination problems. Additionally, the repeated phrase **"quite long"** reflects informants' concerns regarding the prolonged duration of procurement processes from approval stages to administrative requirements and final deliveryresulting in a substantial gap between planned needs and actual drug availability.
Receipt	The NVivo analysis shows that the frequent occurrence of the word **"drug"** reflects the central focus of the receipt process, which is to ensure that incoming pharmaceutical products match the requested type, quantity, and quality. This highlights the role of physical verification as a critical initial step in quality control before drugs enter the distribution chain. The appearance of the term **"immediately"** suggests that receipt procedures are often carried out promptly upon delivery. While this may prevent backlog and support workflow efficiency, it may also indicate that inspections can be rushed or insufficiently detailed when handling large volumes of medicines.

	Additionally, the prominence of the word **"documents"** underscores the importance of administrative verification in the receipt process. Drug receipt involves not only checking physical items but also ensuring the completeness and accuracy of accompanying documents, such as invoices, delivery notes, and receipt reports. This pattern demonstrates an effort to balance physical inspection with adherence to administrative and procedural requirements.
Storage	The NVivo analysis shows that the dominant appearance of the word **"drug"** reflects the central emphasis on maintaining the availability and quality of stored pharmaceutical products. Informants highlighted the importance of proper storage practices to ensure drug safety and compliance with quality standards. The frequent use of the term **"warehouse"** indicates that storage activities are centralized in the pharmacy warehouse, which functions as the core logistical facility. Its layout, capacity, and documentation systems were consistently noted as critical components of effective pharmaceutical management. The emergence of the word **"special"** suggests that certain categories of medicines require dedicated handling or specialized storage areas, such as narcotics, psychotropics, high-alert medications, or high-value items. This indicates that storage practices must be differentiated according to drug classification. Additionally, the prominence of the term **"temperature"** underscores the importance of temperature control as a key concern. Proper temperature maintenance, whether ambient, refrigerated (2–8°C), or frozen, was recognized by informants as essential for preserving drug stability and preventing quality degradation.
Distribution	The dominance of the word **"medicine"** indicates that informants emphasized ensuring the availability of medicines at service units. Distribution is viewed as a critical stage linking the pharmacy warehouse to clinical use, making its accuracy essential for uninterrupted patient care. The frequent use of the term **"distribution"** reflects the informants' focus on the flow and mechanisms of delivering medicines with precision in type, quantity, unit, and timing. The appearance of the word **"needs"** suggests that distribution is closely aligned with the actual requirements of service units, rather than merely based on warehouse stock. Meanwhile, the term **"requests"** highlights that the distribution process operates on a request-based system, which supports controlled delivery but may pose risks if unit requests are inaccurate or poorly planned.
Destruction and Recall	The frequent appearance of the word **"not"** reflects several control functions that are not being implemented as expected, such as the absence of routine monitoring, the lack of a real-time inventory system, or the absence of follow-up actions for reports of shortages or surpluses. This highlights weaknesses in oversight. The word **"not yet"** indicates that many control mechanisms remain in planning or are not fully operational, including the absence of comprehensive audits or routine evaluations of medicine use. Meanwhile, the term **"exists"** suggests that some control measures such as manual recording, periodic stock-taking, or monthly reports are present but limited in effectiveness. The repeated use of **"optimal"** reinforces that existing control activities have not reached the expected level of performance, as their implementation has not been sufficient to prevent stagnation, stock-outs, or wastage.
Inventory Control	The dominance of the word **"medicines"** highlights that destruction and recall activities primarily aim to ensure that damaged, expired, or unfit medicines are removed from circulation to maintain quality and safety at the end of the management cycle. The term **"stock"** indicates that destruction and recall are closely linked to inventory control, where excess or stagnant medicines often end up expiring due to inaccurate planning and procurement. The reference to **"third parties"** reflects that the hospital collaborates with authorized external agencies for destruction, in accordance with regulations requiring licensed entities to manage pharmaceutical waste safely and legally. The frequent use of the word **"process"** underscores that destruction and recall follow a structured sequence from identification and documentation to reporting and handover to third parties, ensuring procedural compliance and accountability.

Administration	The frequent appearance of the word **"not"** reflects several administrative procedures that are not functioning as required, such as irregular documentation, incomplete reporting, and unsynchronized data between the pharmacy warehouse and service units. This indicates weak adherence to administrative standards. The term **"not yet"** suggests that certain systems, such as electronic information systems, routine administrative audits, and standardized recording formats, are expected to be implemented but remain inconsistent in practice. The prominence of the word **"stock"** highlights that administrative quality is closely tied to accurate inventory records, which influence the entire pharmaceutical management cycle. The occurrence of the word **"expired"** points to administrative weaknesses that lead to poor monitoring of medicine shelf life, increasing the risk of expired stock, financial losses, and potential threats to patient safety.

3.1 Human resource constraints

Human resource limitations emerge as one of the most dominant structural factors hindering the optimal management of pharmaceutical supplies in this hospital. The insufficient number of personnel relative to the workload has resulted in many staff members performing double duties, including administrative tasks, warehouse management, and even clinical pharmacy services. This condition not only reduces operational efficiency but also increases the risk of documentation errors, delays in stock monitoring, and inadequate routine oversight of inventory levels. Consequently, essential processes such as needs planning, stock control, and medication use evaluation are often neglected and fail to operate according to established standards. The most tangible impact of this situation is the stagnation of logistical processes and the recurrent occurrence of stockouts, which ultimately threatens service continuity and patient safety.

The findings related to human resource constraints align with previous studies, indicating that shortages of pharmaceutical personnel are a key determinant of weakened medication logistics performance. Studies by Kurniati *et al*. (2025) and Mughofir (2024) report that excessive workloads and unstructured multitasking practices hinder pharmacy staff from effectively performing critical functions such as inventory monitoring, document verification, and periodic needs analysis [10,11]. International research, including reports by Angraini *et al*. (2025) and analyses by Amalia *et al*. (2025), further emphasizes that limited numbers of trained personnel contribute significantly to the high frequency of stockouts in health facilities, particularly when staff are required to assume multiple roles without adequate training or system support [12,13]. The consistency of these findings demonstrates that human resource constraints are not merely a local phenomenon but reflect a broader challenge commonly encountered in many low- and

middle-income countries. This reinforces the argument that strengthening pharmaceutical supply management requires systematic workforce capacity-building strategies rather than relying solely on procedural improvements.

3.2 Delayed delivery

In addition to human resource limitations, geographical factors also pose a significant barrier to the effective management of pharmaceutical supplies in this hospital. Its location, which is considerably distant from the main distribution center in Kendari City, frequently results in delays in the procurement process, both during the ordering and delivery stages. The long distance, unstable transportation conditions, and dependence on suppliers operating primarily in urban areas contribute to extended procurement lead times compared to health facilities located closer to the city center. These delays directly impede timely stock replenishment, thereby increasing the likelihood of logistical stagnation and medication stockouts, particularly for high-use items or those requiring continuous supply. This situation illustrates that geographical constraints not only affect distribution efficiency but also necessitate strengthened risk mitigation strategies, such as increasing buffer stock levels, enhancing coordination with distributors, and adopting more accurate and anticipatory needs planning.

The findings concerning geographical barriers are consistent with previous studies that highlight how facility location influences the effectiveness of pharmaceutical supply chains. Research by Laksono (2025) demonstrated that health facilities located far from distribution hubs are more susceptible to delivery delays and supply uncertainty, particularly when national logistics systems are not fully integrated [14]. Studies by Wulandari *et al*. (2024) and Yuliani *et al*. (2022) in Padang also reported that hospitals in rural areas experience longer procurement lead times, higher stock out frequencies, and greater dependence on a single distributor, ultimately weakening their logistical resilience [15,16]. Furthermore, Hasyim *et al*. (2025) emphasized that health facilities in remote regions often face irregularities in drug distribution due to distance, transportation constraints, and limited infrastructure [17]. The consistency of these findings demonstrates that geographical barriers are not merely operational obstacles but structural factors that require adaptive and locally responsive supply strategies.

3.2.1 Medicine storage facilities and recording systems

In addition to human resource and geographical constraints, this study also found that limitations in physical facilities and record-keeping systems significantly contribute to the ineffectiveness of pharmaceutical supply management. Storage facilities such as dedicated cabinets, shelving units, and storage rooms remain inadequate in both capacity and quality. Limited space often prevents proper arrangement of items according to the *First Expired, First Out* (FEFO) or *First In, First Out* (FIFO) principles, thereby increasing the risk of expired products, misplaced items, and difficulties in monitoring actual stock levels. This challenge is further compounded by the hospital's ongoing transition from a manual recording system to an online system. The hybrid process combining manual and electronic records creates duplication, data inconsistencies, and backlogs in stock information updates. These inaccuracies directly disrupt essential processes such as planning, stock control, and procurement, ultimately contributing to logistical stagnation and stockouts in several critical medicine categories. This situation demonstrates that reliable pharmaceutical management cannot be separated from adequate physical infrastructure and the integrity of the information systems in use.

The findings related to inadequate storage facilities and the unpreparedness of digital record-keeping systems are consistent with previous studies emphasizing that insufficient logistical infrastructure is a major contributor to inventory management irregularities in healthcare facilities. A study by Aulia *et al*. (2025) showed that limited storage space, non-standard stock arrangement, and the lack of essential physical resources such as shelving and dedicated cabinets contribute to low recording accuracy and high risks of inventory errors [18]. Rasendah *et al*. (2025) and Fadilah (2024) also highlighted that transitioning from manual to digital systems requires a complex adaptation phase [19]; during this period, many facilities experience data inconsistencies, loss of stock traceability, and duplicate entries that delay control and procurement processes [20]. Furthermore, a study in LMICs by Saimi (2025) found that inadequate physical facilities and weak integration of information systems often reinforce each other's negative effects, creating a *data visibility gap* that triggers logistical stagnation and stockouts [21]. The consistency of these findings underscores the importance of infrastructure readiness and robust information systems as essential components in building an effective pharmaceutical supply chain.

4 IMPLICATIONS

4.1 Human resource constraints

The implications of human resource limitations highlight the urgent need for reform in human resource management as an integral component of improving pharmaceutical inventory systems in hospitals. Strengthening human resources requires not only increasing the number of staff but also reorganizing workload distribution, ensuring more proportional task allocation, and enhancing staff capacity through continuous training in logistics management, information system utilization, and data-driven stock monitoring [22]. Institutional policies must also establish dedicated positions responsible for inventory planning and control to prevent these functions from being neglected due to overlapping duties [14]. Implementing clearer supervisory mechanisms, improving performance accountability, and optimizing digital tools to reduce administrative burden are equally essential [23]. Thus, strengthening human resources should be viewed not merely as a short-term intervention but as a structural strategy that can reduce stock-out incidents, improve operational efficiency, and support the sustainability of pharmaceutical services.

4.2 Delays in delivery

The policy implications of delayed medication delivery underscore the need for a more adaptive risk-management approach, particularly for healthcare facilities located far from distribution centers. Hospitals in peripheral areas must implement logistics strategies that account for geographical risks, such as establishing higher buffer stocks for critical medicines [24], utilizing needs-based planning grounded in historical consumption data and seasonal trends, and diversifying suppliers to reduce reliance on a single distribution channel [25]. Strengthened coordination with district or provincial pharmaceutical warehouses can also serve as an auxiliary mechanism to ensure emergency stock availability during procurement delays [26]. From a policy perspective, local governments should consider developing satellite distribution systems or buffer warehouses in remote regions to significantly shorten logistical lead time [27]. Additionally, leveraging information technology such as real-time order tracking and

delivery monitoring can enhance supply chain visibility [24]. Collectively, these risk-management strategies can minimize stock-out potential and maintain continuity of pharmaceutical services despite geographical constraints.

4.3 Storage facilities and recording systems

The policy implications of inadequate storage facilities and limited readiness for digital record-keeping indicate that improvement in pharmaceutical inventory management cannot be achieved without sufficient investment in physical infrastructure and information systems. Hospitals must ensure the availability of standardized storage facilities such as designated medicine cabinets, adequate shelving, and storage rooms that support consistent FEFO/FIFO implementation [28]. The transition toward digital recording should be carefully planned through capacity building for staff [29], development of clear and updated standard operating procedures [29], and adoption of real-time, fully integrated information systems across units [30]. Reducing reliance on hybrid documentation practices is critical to preventing data duplication and ensuring the accuracy of stock information [19]. At the managerial level, dedicated budg*et al*location is required for upgrading storage infrastructure and strengthening IT systems, accompanied by continuous monitoring to guarantee effective system utilization [31]. With a structured and well-resourced approach, improvements in physical storage facilities and digitalization of inventory records can significantly reduce risks of stagnation and stock-out while enhancing procurement accuracy and overall efficiency.

5 FURTHER RESEARCH

Future research should extend the present qualitative findings by employing mixed-methods or longitudinal designs to quantify the magnitude of stagnant stock and stockout events and to examine their trends over time in relation to service utilization, morbidity patterns, and budget performance. Comparative studies across hospitals with different levels of care and geographic contexts would be valuable to assess the transferability of identified systemic and organizational factors. In addition, intervention-based research is needed to evaluate the effectiveness of data-driven demand forecasting tools, integrated logistics information systems, and strengthened roles of Pharmacy and

Therapeutics Committees in improving medicine availability. Exploring patient-level and clinical outcomes associated with improved logistics performance, as well as the cost-effectiveness of logistics reforms, would further contribute to evidence-based strategies for strengthening pharmaceutical supply systems in resource-constrained health settings.

6 CONCLUSION

This study reveals that the pharmaceutical management system at the district hospital operates within a fragmented and inconsistently implemented framework. NVivo-based thematic analysis demonstrates that weaknesses are present across all components of the medication management cycle, from drug selection and needs planning to procurement, storage, distribution, and administrative control. While national guidelines, such as Permenkes 72/2016, provide a coherent regulatory structure, the translation of these policies into practice remains limited, resulting in a visible knowledge-do gap.

The findings collectively indicate that technical issues (e.g., procurement delays, documentation errors, stock discrepancies) are symptoms of deeper systemic challenges. These include siloed organizational culture, a lack of integrated data systems, limited accountability mechanisms, and an underdeveloped governance role for the Pharmacy and Therapeutics Committee (PTC). Consequently, the medication management process tends to be reactive rather than anticipatory, leading to inefficiencies, stock-outs, and risks to patient safety.

This study contributes to the growing evidence from Indonesia and other LMICs showing that pharmaceutical logistics problems are rarely caused by isolated operational failures but rather by structural and governance constraints. Strengthening institutional accountability, enhancing inter-unit coordination, and adopting real-time digital information systems are essential to improving system performance. Addressing these root causes will not only enhance the reliability of medicine availability but also support broader health system goals, including quality of care and patient safety.

FINANCING

The authors did not receive financing for the development of this research.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

REFERENCES

Abu Zwaida T, Pham C, Beauregard Y. Optimization of inventory management to prevent drug shortages in the hospital supply chain. Appl Sci. 2021;11(6):2726. doi:10.3390/app11062726

Saha, E., Rathore, P. A smart inventory management system with medication demand dependencies in a hospital supply chain: A multi-agent reinforcement learning approach. Computers & Industrial Engineering. 2024;191:110165. doi:10.1016/j.cie.2024.110165

Patel R, Sharma A, Agarwal S. AI-powered predictive analytics for pharmaceutical inventory optimization: A post-pandemic perspective. Comput Ind Eng. 2023;179:109100. doi:10.1016/j.cie.2023.109100

Torabi SA, Soufi HR, Sahebjamnia N. A novel integrated approach for resilient pharmaceutical supply chain network design under uncertainty. Omega. 2021;101:102263. doi:10.1016/j.omega.2020.102263

Xie H, Wang S, Chen Q. Pharmaceutical logistics and its role in hospital efficiency and patient care: A systematic review. J Pharm Policy Pract. 2024;17:55. doi:10.1186/s40545-024-00555-2

Louah S, Sarir H, Kriouich M. A systematic literature review of performance hospital supply chain management. J Robot Control (JRC). 2024;5(2):597–612. doi:10.18196/jrc.v5i2.21541

Gulo NF, Aini N, Jamal SA. Pharmaceutical supply chain optimization in healthcare: Insights from recent literature. Public Health Saf Int J. 2025;5(01):334–340. doi:10.55642/phasij.v5i01.1115

Vanbrabant, L., Verdonck, L., Mertens, S., Caris, A. Improving hospital material supply chain performance by integrating decision problems: A literature review and future research directions. Computers & Industrial Engineering. 2023;180:109235. doi:10.1016/j.cie.2023.109235

Ahmed, F., Akter, S., Rahman, MM., Mayze, SM. Supply chain strategies for reducing drug shortages in the U.S. healthcare system. Seybold Report, 20(6):162-180. 2025. DOI:10.5281/zenodo.15709946]

Olaniran, A., Briggs, J., Pradhan, A. *et al*. Stock-outs of essential medicines among community health workers (CHWs) in low- and middle-income countries (LMICs): a systematic literature review of the extent, reasons, and consequences. Hum Resour Health 20, 58 (2022). https://doi.org/10.1186/s12960-022-00755-8

Mughofir MS. Pengaruh Beban Kerja, Kecerdasan Emosional, Dan Occupational Burnout Terhadap Kinerja Pengawas Farmasi Dan Makanan. Jurnal Manajemen Pendidikan dan Ilmu Sosial. 2024;5(4):1275–85.

Angraini D, Novitri A, Irawan B. Analisis Faktor Penyebab Stock Out Obat Di Gudang Farmasi RSI Ibnu Sina Padang. SEHATMAS (Jurnal Ilmiah Kesehatan Masyarakat). 2025;4(1):307–21.

Rahman AZ. Analysis Of The Delay In The Distribution Of Food Aid Rice By Perum Bulog Kancab Bima Using The Six Sigma Method. Jurnal UNJ. 2025;18(1):165–79.

Laksono A. Optimalisasi Manajemen Logistik Rumah Sakit Untuk Meningkatkan Efisiensi Pengadaan Dan Distribusi Obat Di Era Digital. Journal Scientific of Mandalika. 2025;6(9):3569–78.

Sillehu S, Senewe FP, Ashar H, Khoiri A. Pemanfaatan pelayanan kesehatan di daerah tertinggal, perbatasan, dan kepulauan. Makassar. PERSAKMI. 2025

Yuliani E. Utilization Of Public Health And Medical Services In Central Lombok Regency. Journal of Public Health and Medical Studies. 2022;1(1):25–37.

Hasyim DM, Pratomo AB, Rosid A, Auliafendri N. Socialization Of Healthcare Service Innovation: Developing A Pharmacy Information System To Improve Access And Service Quality. Jurnal Sipakatau Inovasi Pengabdian Masyarakat. 2025;2:42–8.

Aulia DS, Muzid S. Peningkatan Akurasi Pendistribusian Obat Melalui Sistem Monitoring Di Instalasi Farmasi Dinas Kesehatan Kabupaten Kudus.Jurnal Teknik Infromatika. 2025;5(1).

Andriani H. Analisis Faktor Penyebab Stock Out Dan Stagnant Pada Pelayanan Farmasi Rumah Sakit Di Indonesia Serta Upaya Pencegahannya. Jurnal Sosial dan Sains (SOSAINS). 2025;5(7):3238–45.

Fadilah D. Analisis Strategi Peningkatan Kesejahteraan Sumber Daya Manusia Melalui Penyesuaian Beban Kerja Dan Pendapatan Di Pondok Pesantren Al-Bahjah Buyut. Lentera: Multidisciplinary Studies. 2024;1(2):87–106.

Pasal SP. Transformasi Kebijakan Kesehatan: Membangun Sistem Kesehatan Inklusif Di Era Digital. Jawa Tengah. Penerbit Arta Media Nusantara. 2025

Titik S, Wardatul W, Wahyu NH. Implementasi Standar Diagnosis Keperawatan Indonesia Berdasarkan Aspek Motivasi Kerja, Beban Kerja, Supervisi, Model

Kepemimpinan Dan Organisasi, Fasilitas Layananan Terhadap Pendokumentasian Asuhan Keperawatan. Jurnal Keperawatan Muhammadiyah. 2023;8(2).

Prima PB, Erlangga D, Aprilian H, Subyakto A. Onestop solution healthcare distribution service perusahaan pedagang besar farmasi PT Jagat Pharma Abadi. Jurnal Syntax Admiration. 2024;5(8):3074–91.

Arief P A, Muslimah, Syarifah N A Z. Strategi Pengadaan Obat-Obatan dan Bahan Medis Habis Pakai (BMHP) untuk Meningkatkan Efektivitas di Instalasi Farmasi. Jurnal Ilmu Kesehatan Masyarakat. 2025;14(18):313–20.

Aiba PS, Palandeng ID, Karuntu MM. Analisis tata letak gudang pada PT Sapta Sari Tama Cabang Manado. Jurnal EMBA. 2022;10(4):780–91.

Santoso NE, Nyoman N, Martini P, Ambarwati S. Penerapan Teknologi Digital Dalam Sistem Manajemen Farmasi: Studi Kasus Di Klinik Kesehatan. Jurnal Farmasi dan Manajemen Kefarmasian (JFMK). 2025;2(1):17–24.

Anggraeni R, Pahala R, Gultom J. Evaluasi mutu pengelolaan obat di Instalasi Farmasi RSU Imelda Pekerja Indonesia Medan. Jurnal Pharmascience. 2021;8(1):125–31.

Aulia E, Wijayanti AN, Nurcahyani D. Profil penyimpanan obat high alert di Instalasi Farmasi RS Islam At-Tin Husada Ngawi tahun 2023. An-Najat : Jurnal Ilmu Farmasi dan Kesehatan. 2024;2:190-198.

Zainudin A, Hadi AP, Priyadi A. Sistem Informasi Persediaan Obat Berbasis Web Di RS Bina Kasih. JURNAL ILMIAH SISTEM INFORMASI (JUISI). 2024;3(3):30–4.

Jegalus D, Sirait RW, Dodo DO, Kendjam Y. Manajemen Logistik Obat Antiretroviral Dalam Program Penanggulangan HIV/AIDS: Studi Kasus Di RSUD Manggarai. Timorese J Public Health. 2019;1:58–69.

Daylami I, Al Hakim L, Purnama DG. Penerapan Sistem Informasi Manajemen Digitalisasi Perawatan Kesehatan Pada Klinik Pratama Untuk Mendukung Kinerja Karyawan. Jurnal Ilmiah Indonesia. 2024;4:929–40.

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Data availability

All datasets relevant to this study's findings are fully available within the article.

How to cite this article (APA)

Mayasari, M., Rivai, F., Noor, N. B., Arifah, N., Anggraeni, R., & Mallongi, A. (2026). STUDY OF THE ANALYSIS OF DRUG LOGISTICS MANAGEMENT IMPLEMENTATION ON STAGNANT AND STOCKOUT INCIDENTS IN THE PHARMACY UNIT OF NORTH BUTON REGIONAL HOSPITAL, SOUTHEAST SULAWESI. Veredas Do Direito, 23(2), e234472. https://doi.org/10.18623/rvd.v23.n2.4472