

Research

Strategic Evaluation and Analysis of The Pharmacy Logistics Management System at The Tamalate Community Health Center in Makassar City

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ABSTRACT

Quality primary healthcare services depend heavily on the availability of safe, high-quality, and affordable pharmaceutical preparations. This study aims to conduct an in-depth analysis of the pharmaceutical logistics management system at the Tamalate Community Health Center in Makassar City in 2025. The method used is descriptive qualitative with data collection techniques through participatory observation, in-depth interviews, and documentation studies of managerial instruments such as LPLPO, stock cards, and minutes. Research informants included the Head of the Community Health Center, Pharmaceutical Technical Personnel, and Warehouse Officers. The results show that the Tamalate Community Health Center has implemented a logistics cycle in accordance with Minister of Health Regulation Number 74 of 2016. The planning stage is carried out using the consumption method using the LPLPO application. At the receiving stage, the community health center implements detailed physical verification per item although it does not use formal minutes for each transaction. Storage has implemented the FEFO and FIFO principles, supported by daily temperature monitoring, although limited warehouse space poses a physical challenge. Distribution is carried out systematically to service units, with challenges in real-time data integration. This study recommends strengthening the digitalization of stock management and optimizing storage infrastructure to ensure the efficiency of the drug supply chain in the digital health era.

1. Introduction

Quality healthcare services are inseparable from the availability of safe, high-quality, and affordable medicines. Medicines are not simply medical commodities, but vital components that

determine the success of clinical interventions at every level of healthcare. Globally, the World Health Organization (WHO) emphasizes that a resilient health system requires strong pharmaceutical supply chain management. In developing countries, logistical challenges often create a bottleneck, hindering access to essential medicines, which in turn increases morbidity and mortality from diseases that should be manageable.

In Indonesia, Community Health Centers (Puskesmas), as first-level health care facilities (FKTP), have a strategic dual role. On the one hand, they serve as providers of basic clinical services and, on the other, as health logistics managers for the communities within their jurisdictions. Suboptimal medication management at Puskesmas has a far-reaching domino effect. Clinically, drug unavailability can lead to therapy failure and antimicrobial resistance. From a managerial perspective, this results in wasted state budget due to the accumulation of expired or damaged drugs due to inadequate storage conditions (Mustika et al., 2022).

Pharmaceutical logistics management is defined as an integrated system to ensure the availability of healthcare products at the right time, type, quantity, and condition for patients. This encompasses the entire supply chain, from estimating needs to eliminating medical waste. In community health centers (Puskesmas), this management is crucial because limited healthcare budgets demand maximum efficiency without compromising clinical quality (Putri et al., 2023). Drug requirement planning generally uses consumption methods (based on previous period usage) and epidemiological methods (based on disease patterns). The accuracy of this planning is highly dependent on the quality of LPLPO (Drug Usage Report and Drug Request Sheet) data. Procurement in the current digital era is also encouraged through e-catalog mechanisms to ensure transparency and accountability in drug pricing (Hilmawati et al., 2020). Drug storage must pay attention to the physical and chemical stability of the preparation. Temperature, humidity, and light exposure are environmental factors that must be controlled. The FEFO (First Expired First Out) and FIFO (First In First Out) methods are operational standards to prevent expiration. Meanwhile, internal distribution to service units (such as general clinics or maternal and child health services) must be carried out using a well-documented system to maintain the integrity of stock data (Chasanah et al., 2021).

Tamalate Community Health Center (Puskesmas) is located in the growth center of Makassar City, serving a heterogeneous population with a complex disease burden. The characteristics of urban areas with high population mobility require a steady supply of medicines. The high number of daily patient visits places significant pressure on the internal logistics system. Based on initial observations, the drug turnover at this Puskesmas is highly dynamic, with essential drug stocks often reaching critical levels in less than a month. This makes logistics management no longer a secondary administrative task but rather the lifeblood of service operations, requiring precision management.

This study is based on Minister of Health Regulation No. 74 of 2016 concerning Pharmaceutical Service Standards in Community Health Centers. This standard covers the management of pharmaceutical supplies, encompassing seven main stages: planning, requesting, receiving, storing, distributing, controlling, and recording and reporting. Furthermore, in line with the strengthening of the Healthy Indonesia Program with a Family Approach (PIS-PK), medication management must

also adapt to the need for long-term treatment for non-communicable diseases (NCDs), such as hypertension and diabetes mellitus, which continue to increase (Safrizal et al., 2024).

This analysis aims to evaluate the extent to which field practices at the Tamalate Community Health Center align with these regulatory standards and identify operational barriers arising from limited human resources and infrastructure.

2. Method

This study used a descriptive design with a qualitative approach. The research location was the Pharmacy Installation of the Tamalate Community Health Center in Makassar City. The study was conducted in December 2025 to analyze the current year's logistics cycle.

Research informants were selected using purposive sampling techniques, which consisted of:

1. **Key Informant:** The Head of Tamalate Community Health Center, who is responsible for policy oversight.
2. **Primary Informants:** The Pharmacist and Pharmaceutical Technical Personnel responsible for medication management.
3. **Supporting Informants:** Pharmacy warehouse officers and nurses responsible for service sub-units.

Data were collected through in-depth interviews using a semi-structured interview guide to explore workflow details and challenges encountered. Participatory observation included direct observation of the pharmacy warehouse layout, the use of the LPLPO application, and the process of delivering medications to patients. Document review included examining the Drug Requirement Plan (RKO), Stock Card, LPLPO, Order Letter to PBF, and Destruction Report.

Data were analyzed using thematic analysis. Interviews were transcribed and coded to identify key patterns at each stage of logistics management. Data validity was ensured through source triangulation (comparing statements between informants) and method triangulation (comparing interview results with documentary evidence).

3. Results & Discussion

Drug Needs Planning: LPLPO Data Integration

The research results show that drug requirement planning at Tamalate Community Health Center is carried out systematically by developing a Drug Requirement Plan (RKO). Staff use the LPLPO application as the primary database. An informant stated, "We use the LPLPO application, request sheets, and usage reports," indicating that basic administrative digitization has been implemented.

Theoretically, drug management is part of the pharmaceutical logistics management cycle, which encompasses planning, procurement, distribution, use, and evaluation (Quick et al., 2012). According to the World Health Organization (WHO), drug planning methods can use consumption, epidemiology, or a combination approach. In community health centers with relatively stable patient visits, the consumption approach is a rational choice because it is based on usage data from previous

periods. The LPLPO supports this method by recording usage amounts, remaining stock, and requested requirements, thus helping to prevent stockouts and overstocking.

From a logistics management information system (LMIS) perspective, the integration of usage and demand data within the LPLPO represents a logistics information system implementation that supports data-driven decision-making (USAID DELIVER Project, 2011). However, the system's effectiveness is highly dependent on the accuracy of the input. Limited human resources juggling multiple tasks increases the risk of recording errors, particularly in the recapitulation of remaining stock. This finding aligns with research by Naela Afiya et al. (2022), which states that dual workloads can reduce the accuracy of drug logistics reporting.

In addition to individual factors, workload management theory explains that multitasking without adequate system support can reduce cognitive performance and documentation accuracy (Carayon & Gurses, 2008). Therefore, coordination between service units is crucial for stock reconciliation before the LPLPO report is sent to the Health Office. This practice aligns with the World Health Organization's recommendation on the importance of regular physical stock verification to ensure consistency between administrative records and actual conditions.

Overall, the integration of LPLPO in the preparation of the RKO at the Tamalate Community Health Center reflects the implementation of consumption-based planning supported by a logistics information system. However, strengthening human resource capacity, proportional task allocation, and internal audits are still necessary to ensure data accuracy and ensure that drug requirement planning truly reflects community service needs.

Demand and Procurement: Stock Fulfillment Strategy

Drug requests are submitted to the Makassar City Health Office every month. For drugs not available at the Office, Community Health Centers (Puskesmas) independently procure from official Pharmaceutical Wholesalers (PBF) using National Health Insurance (JKN) or Public Service Agency (BLUD) funds. A warehouse officer informant stated, "We use a purchase order and send it to the PBF."

Procurement is an integral part of the drug management cycle, aiming to ensure the availability of the correct type, quantity, quality, time, and price of drugs (Quick et al., 2012). According to the World Health Organization, an effective procurement system must be transparent, accountable, efficient, and ensure quality. The use of an e-catalog managed by the Government Goods/Services Procurement Policy Agency (LKPP) strengthens efficiency and price certainty because products have undergone administrative selection and quality evaluation.

However, a major challenge lies in distribution lead times. In healthcare supply chain management theory, uncertain lead times increase the risk of stockouts if not balanced with appropriate safety stock calculations and reorder points (USAID DELIVER Project, 2011). At Tamalate Community Health Center, delivery delays have the potential to disrupt the continuity of therapy for chronic disease patients who routinely require medication. This aligns with Yadav's (2015) findings that supply chain disruptions in primary care directly impact service quality and therapy adherence.

Therefore, proactive strategies such as confirming delivery schedules with the Primary Care Provider (PBF), monitoring order status, and calculating buffer stocks are crucial to prevent drug

shortages. Overall, the combination of centralized requisitions and e-catalog-based independent procurement at Tamalate Community Health Center reflects adaptive procurement management practices, although optimizing lead time control remains key to service continuity.

Acceptance: Physical Verification and Documentation

The receipt process at Tamalate Community Health Center involves a detailed physical inspection of each item. Although informants stated that they do not always use a formal Minutes (BA) for every routine transaction, verification is carried out using a medication list sheet that lists the drug name, batch number, and expiration date. "It's not a minutes sheet, but there's a medication sheet, with the names of the drugs and their expiration dates," said a Pharmaceutical Technician.

Regulatoryly, the Indonesian Ministry of Health, through Regulation No. 74 of 2016, requires official documentation for every receipt of pharmaceutical preparations as a form of legality and accountability. From a pharmaceutical logistics management perspective, formal documents such as the BAST function as an audit and internal control instrument (Quick et al., 2012). Without formal documentation, the risk of audit findings increases even if the physical inspection has been properly conducted.

Research by Sari et al. (2020) shows that administrative simplifications often occur in community health centers due to limited human resources. However, thorough physical verification—especially batch and expiration checks—has been shown to reduce the risk of damaged or unfit drugs. Chasanah et al. (2021) also emphasized that incomplete documentation can lead to discrepancies in stock data during audits, so technical and administrative aspects must be implemented in parallel. This aligns with internal control theory, which places documentation as part of control activities to ensure organizational transparency.

The strength of Tamalate's practice lies in checking each box to ensure uniformity of batch numbers for a single production run. This step aligns with the batch traceability principle in the World Health Organization's Good Distribution Practices guidelines, which is essential for facilitating recall processes in the event of quality issues. Research by Aisyah et al. (2019) shows that consistent batch recording improves healthcare facilities' preparedness in the event of drug recalls.

Thus, the receiving stage at Tamalate Community Health Center is strong in terms of technical accuracy, but formal documentation (BAST) needs to be strengthened to fully align with regulations and audit standards. Integrating detailed physical verification with administrative completeness will result in an accountable, transparent, and sustainable logistics control system.

Storage: FEFO Setup and Infrastructure Constraints

Medication storage is carried out in an air-conditioned pharmacy warehouse. They are arranged alphabetically and by dosage form. Temperature monitoring is carried out daily, including the refrigerator temperature for heat-sensitive medications (vaccines/injections). "The refrigerator temperature is checked daily," reported the officer.

This practice aligns with the World Health Organization's Good Storage Practices standards, which emphasize temperature control and routine recording to maintain drug stability and potency. Research by Rahmawati et al. (2020) shows that daily temperature recording significantly impacts the quality of preparations, particularly vaccines, while Putri et al. (2019) confirms that active temperature control reduces the risk of damage due to environmental fluctuations.

The FEFO (First Expired First Out) principle has been implemented as the primary strategy for controlling expiration, in line with drug inventory management recommendations (Quick et al., 2012). However, under busy service conditions, new medications are sometimes placed at the front of the shelves, potentially disrupting stock rotation. This situation reflects operational vulnerabilities due to workload. Chasanah et al. (2021) stated that limited infrastructure often hinders consistent FEFO implementation, and Wulandari et al. (2022) found that cramped warehouses increase the risk of picking errors and slow stock rotation.

Limited warehouse space in Tamalate also impacts ergonomics and packaging safety. Overcrowding can damage physical packaging and complicate the rotation process based on expiration dates. Research by Yuniarti et al. (2021) shows that optimizing warehouse layout significantly improves FEFO compliance and reduces the number of expired medications.

Thus, the storage system at the Tamalate Community Health Center meets the basic principles of good storage through daily temperature control and the implementation of FEFO. However, strengthening warehouse infrastructure and ergonomic arrangements is still needed to ensure more consistent stock rotation, reduce the risk of packaging damage, and improve efficient and sustainable medication logistics management.

Distribution and Service Dynamics

Medication distribution at the Tamalate Community Health Center is based on service unit requests recorded in the sub-unit's LPLPO. This health center is characterized by a very high medication turnover rate. "Medications are distributed very quickly here; they're usually gone within a month," said one informant.

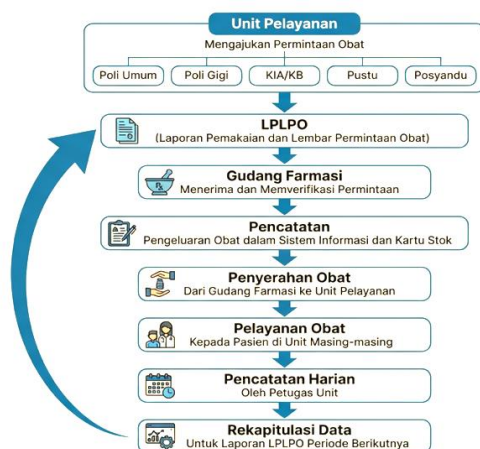


Figure 1. Drug Distribution Flow at Tamalate Health Center

The drug distribution process at Tamalate Community Health Center begins with service units (General Clinic, Dental Clinic, KIA/KB, Community Health Center, and Integrated Health Post) submitting requests based on usage through the LPLPO (Large-Scale Inventory Management System). This document serves as the basis for the Pharmacy Warehouse to verify and approve stock availability.

Once approved, drug expenditure is recorded in the system and on stock cards, then submitted to service units for use in patient care. Each use is recorded daily and summarized to form the LPLPO for the next period, creating a controlled, data-driven, and accountable distribution cycle.

The rapid turnover of drugs requires stricter stock monitoring than in community health centers in rural areas. Researchers observed the need for integration of a more real-time distribution recording information system. Currently, warehouse staff often only discover stock depletion in sub-units (such as the General Clinic) after receiving a physical report, which risks brief stockouts during peak service hours.

Research by Sari et al. (2020) indicates that high drug consumption rates in urban community health centers correlate with an increased risk of stockouts if the recording system is not real-time. Similar findings were reported by Malinggas et al. (2015) that delays in distribution reporting from service units to the pharmacy warehouse were a major factor in temporary drug shortages. In the Tamalate context, warehouse staff often only learned of stock depletion after receiving physical reports, potentially leading to temporary shortages during peak service hours.

Health logistics management literature emphasizes the importance of integrating electronic-based pharmaceutical information systems to improve stock visibility and accelerate decision-making (Seto et al., 2019). An integrated, real-time distribution recording system has been shown to reduce the risk of drug shortages, improve the accuracy of demand planning, and strengthen the accountability of pharmaceutical logistics management in primary care facilities. Therefore, strengthening distribution information systems is a strategic necessity for community health centers (Puskesmas) with high drug turnover, such as Tamalate.

Quality Monitoring and Destruction

Monitoring is carried out by observing the physical condition of the preparations. For medications approaching their expiration date, staff coordinate with the prescribing physician. "If they're about to expire, confirm with the doctor first," explained the informant. Medication destruction is carried out according to the type of preparation (tablets are crushed, syrups are dissolved) and documented in a destruction report or return to the Health Office.

Coordinating with doctors regarding medications approaching their expiration date is a smart move to minimize financial losses without compromising patient safety. Medical waste management at the Tamalate Community Health Center also follows proper bureaucratic procedures by returning damaged/expired medications to the Makassar City Health Office, which is a good environmental safety standard.

Research by Pratiwi et al. (2021) confirmed that coordination between pharmacists and physicians in managing medications approaching their expiration date can significantly reduce the number of expired medications. Meanwhile, Widayati et al. (2018) found that regular monitoring of expiration dates, coupled with cross-professional communication, contributed to increased pharmaceutical budget efficiency in primary care facilities.

Regarding destruction, the Tamalate Community Health Center has implemented procedures according to the type of preparation – tablets are crushed, syrup is dissolved – and the entire process is documented through a destruction report or a return mechanism to the Makassar City Health Office. This practice aligns with the principles of safe and environmentally friendly pharmaceutical

waste management. A study by Kusturica et al. (2017) emphasized that returning damaged or expired medications to health authorities is an effective approach to preventing environmental pollution and drug misuse.

Thus, the quality monitoring and destruction system at the Tamalate Community Health Center demonstrates adherence to the principles of patient safety, efficient budget management, and environmental protection. Strengthening documentation and integrating information systems will further enhance the overall quality of pharmaceutical governance.

4. Conclusion

Pharmaceutical logistics management at the Tamalate Community Health Center (Puskesmas) in 2025 has essentially been implemented in accordance with the provisions of Minister of Health Regulation No. 74 of 2016 concerning Pharmaceutical Service Standards in Community Health Centers. The system's strength is evident in the LPLPO application-based drug requirements planning, the accuracy of physical inspections upon receipt (including conformity of quantity, batch number, and expiration date), and the consistency of storage temperature monitoring as part of pharmaceutical quality assurance.

However, its effectiveness remains constrained by limited capacity and a less-than-ergonomic warehouse layout, high staff workloads, and suboptimal digital integration of stock monitoring between service sub-units, resulting in reconciliation still relying on periodic physical reports. As a follow-up, warehouse infrastructure improvements or restructuring are needed to comply with the principles of safe and orderly storage; development of an integrated pharmaceutical module within SIMPUS to enable real-time stock monitoring; and strengthening administration through the completion of the Handover Report (BAST) for each drug received from the PBF or the Health Office. and optimization of human resources through more specific division of tasks or the addition of logistics administration staff so that pharmacists can focus more on clinical pharmacy services and drug quality control.

5. References

- Aisyah, N., et al. (2019). Evaluasi sistem pelacakan nomor batch dalam pengelolaan obat. *Jurnal Manajemen Pelayanan Kesehatan*, 22(3), 145–152.
- Carayon, P., & Gurses, A. P. (2008). Nursing workload and patient safety – A human factors engineering perspective.
- Chasanah, D. F., Adi, S., & Mawarni, D. (2021). Implementasi Manajemen Logistik Obat di Puskesmas Kendalkerep Kota Malang. *Prosiding Seminar Nasional Kesehatan*, 59-68.
- Dokumen Internal: LPLPO, Kartu Stok, dan Berita Acara Puskesmas Tamalate (2023-2025).
- Hilmawati, S., Chotimah, I., & Dwimawati, E. (2020). Analisis Manajemen Logistik Obat Di Puskesmas Cipayung Kota Depok. *Promotor*, 3(4), 427-439.
- Kementerian Kesehatan RI. (2016). Peraturan Menteri Kesehatan Nomor 74 Tahun 2016 tentang Standar Pelayanan Kefarmasian di Puskesmas.

- Kusturica, M. P., et al. (2017). Pharmaceutical waste management and regulatory challenges. *Waste Management*, 65, 54–63.
- Lembaga Kebijakan Pengadaan Barang/Jasa Pemerintah. Kebijakan e-Katalog Pengadaan Obat Pemerintah.
- Malinggas, N. E., Posangi, J., & Soleman, T. (2015). Analisis manajemen logistik obat di Instalasi Farmasi Puskesmas. *Jurnal e-Biomedik*, 3(1), 1–7.
- Mustika, M., Yulastuti, F., & Septianingrum, N. M. A. N. (2022). Gambaran kesesuaian ketersediaan obat dengan formularium nasional di puskesmas. *Borobudur Pharmacy Review*, 2(1), 1–7.
- Naela Afiya, et al. (2022). Analisis Pengelolaan Manajemen Logistik Obat Di Instalasi Farmasi. *Jurnal Ilmiah Jophus*, 3(2), 138–145.
- Pratiwi, A., et al. (2021). Evaluasi pengelolaan obat mendekati kedaluwarsa di fasilitas pelayanan kesehatan primer. *Jurnal Farmasi Klinik Indonesia*, 10(2), 85–92.
- Putri, D., et al. (2019). Evaluasi sistem penyimpanan obat di fasilitas pelayanan kesehatan tingkat pertama. *Jurnal Manajemen Pelayanan Kesehatan*, 22(4), 201–209.
- Putri, U. A., Prasetyo, A. B., & Purnami, C. T. (2023). Drug Logistics Management Information System in Puskesmas Pharmacy Services. *Media Publikasi Promosi Kesehatan Indonesia*, 6(6), 1016–1024.
- Quick, J. D., et al. (2012). *Managing Drug Supply*. Kumarian Press.
- Rahmawati, L., et al. (2020). Pengaruh pemantauan suhu terhadap mutu sediaan farmasi di puskesmas. *Jurnal Kefarmasian Indonesia*, 10(1), 45–53.
- Safrizal, S., et al. (2024). Strategi dan Upaya Pengendalian Penyakit Tidak Menular. *Jka*, 1(2), 1–9.
- Sari, D. P., et al. (2020). Analisis kejadian kekosongan obat di puskesmas wilayah perkotaan. *Jurnal Manajemen dan Pelayanan Farmasi*, 10(3), 150–158.
- Sari, R., et al. (2020). Evaluasi pelaksanaan penerimaan dan penyimpanan obat di puskesmas. *Jurnal Kefarmasian Indonesia*, 10(2), 85–94.
- Seto, S., et al. (2019). Strengthening pharmaceutical supply chain management in primary health care. *BMC Health Services Research*, 19, 1–9.
- Sunandar, S., Salman, S., & Sholih, M. G. (2022). Analisis Manajemen Pengelolaan Obat di Puskesmas Cibuaya Kabupaten Karawang. *Jurnal Ilmu Kesehatan*, 6(2).
- Ulfa, A. M., & Chalidyanto, D. (2021). Evaluasi proses manajemen logistik obat di UPTD Puskesmas Kabupaten Sampang. *Media Gizi Kemas*.
- USAID DELIVER Project. (2011). *The Logistics Handbook: A Practical Guide for the Supply Chain Management of Health Commodities*.
- Widayati, A., et al. (2018). Improving drug management efficiency in Indonesian primary health care facilities. *International Journal of Clinical Pharmacy*, 40(4), 894–902.
- Wulandari, D. A., Hidayat, N., & Damayanti, S. (2023). Pengendalian penyakit tidak menular berbasis posbindu. *Health Sciences and Pharmacy Journal*, 6(3), 116–124.
- Yadav, P. (2015). Health product supply chains in developing countries. *Health Systems & Reform*, 1(2), 142–154.

- Yuniarti, N., et al. (2021). Optimalisasi tata letak gudang dalam meningkatkan efisiensi manajemen logistik obat. *Jurnal Administrasi Kesehatan Indonesia*, 9(1), 33–41.
- Yusuf, S., et al. (2022). Manajemen pengelolaan obat di puskesmas kabere kabupaten enrekang. *Jurnal Ilmiah Manusia dan Kesehatan*, 6(2).
- World Health Organization. (2019). *Guidelines for Medicines Supply Management at Primary Health Care Level*. Geneva.
- World Health Organization. (2010). *Good Distribution Practices for Pharmaceutical Products*