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Evaluation of Drug Storage at the Pharmaceutical Installation of Mutiara Cikutra Clinic Bandung for the Period of May 2025 – June 2025

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Abstract. *Drug storage is a crucial component of pharmaceutical services aimed at maintaining the quality, stability, and safety of medications until they are administered to patients. This study aimed to evaluate the compliance of drug storage practices at the Pharmacy Installation of Mutiara Cikutra Clinic Bandung with the standards set by the Indonesian Ministry of Health Regulation No. 34 of 2021. The research was conducted from May to June 2025 using a descriptive qualitative approach through direct observation, in-depth interviews, and documentation. The results showed a compliance rate of 90,48% (19 out of 21 variables met the criteria). Overall, the storage system adhered to Good Storage Practice (GSP) principles, including proper arrangement based on dosage forms, temperature and humidity monitoring, and implementation of FIFO/FEFO systems. However, the study identified weaknesses in storage location vulnerability to flooding and the lack of physical separation for high alert medications. These findings underscore the need to strengthen SOPs, provide routine staff training, and implement risk-based digital monitoring systems to enhance the quality of pharmaceutical services in the clinic.*

Keywords : *Evaluation, drug storage, clinic, regulatory compliance, high alert medication*

1. Introduction

Clinics are a form of health service facilities that provide individual health services, both basic and specialist. In order to ensure the quality of health services, every clinic that provides outpatient services is required to have a pharmacy installation managed by a pharmacist. This installation is responsible for all aspects of pharmaceutical services, from procurement, storage, to distribution of pharmaceutical preparations and medical devices, to ensure that the services provided remain of quality, safety, and benefit the community (Giwangkara, Dewi, Mayun, & Suryaningsih, 2023).

One of the main components in pharmaceutical services is the drug storage system. Drug storage aims to maintain the stability, safety, and effectiveness of drugs until they are used by patients (Demisse, Abuye, Foga, & Amare, 2024). This process includes regulating temperature, humidity, storage room layout, as well as grouping by preparation form and therapy class. Errors in storage can reduce the quality of the drug, increase the risk of damage, and even endanger patient safety (Wandira, Hermiyanty, & Chikita, 2022)

In practice, principles such as FIFO (*First In First Out*) and FEFO (*First Expired First Out*) should be applied to avoid drug buildup and expiration. Medications that require special attention, such as emergency or high-risk medications, need to be stored separately and given special marking (Canales-Siguero et al., 2025). Permenkes No. 34 of 2021 concerning Technical Guidelines for Clinical Pharmacy Installations is the main reference in the implementation of

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storage standards, including provisions for information systems, risk management, and accurate and systematic documentation (Minister of Health of the Republic of Indonesia, 2021).

Evaluation of the drug storage system is crucial to ensure the effectiveness of pharmaceutical services and prevent losses both in terms of drug quality and patient safety (Fan & Zhang, 2016; Mauliana & Wiryanto, 2020). Several previous studies by Giwangkara et al (2023) show that inconsistencies in the storage process have a significant impact on the quality of drugs and the operation of pharmaceutical services. Periodic evaluation is also part of the internal quality control system in health care facilities (Anggraeni & Rosmiati, 2022; Sukasih, Apriyanto, & Firdiansjah, 2020).

Although technical guidelines have been set, there are still various challenges in the implementation of standard drug storage in various clinics. Lack of supervision, limited resources, or low adherence to standard procedures are often obstacles in drug storage systems. Therefore, a comprehensive evaluative study is needed to find out the extent to which the implementation of drug storage is in accordance with the provisions of applicable regulations.

Based on this background, the evaluation of the drug storage system in health care facilities is an important step in ensuring the efficiency and effectiveness of pharmaceutical services. Some previous studies have shown that non-standard storage can degrade the quality of drugs and harm patients. Therefore, periodic evaluation is part of the quality control system in pharmaceutical services. This study aims to evaluate the suitability of drug storage practices to applicable regulations, as well as provide relevant recommendations for improving the storage system in the clinic to improve the quality of overall pharmaceutical services.

2. Methods

This research was conducted at the Mutiara Cikutra Clinic in Bandung, the implementation time was carried out on May 1, 2025 – June 1, 2025. This research uses qualitative research that is descriptive, where ongoing activities are monitored. The data collection techniques used in the research are observation, data collection, and in-depth interviews . The tools used in this study are stationery to record the results of observations, data collection with a recording device for interviews. With reference to the Regulation of the Minister of Health Number 34 of 2021.

3. Results and Discussion

Based on the results of observations regarding the evaluation of drug storage at the Pharmacy Installation of the Mutiara Cikutra Clinic Bandung 2025. Research related to the condition of the room, storage of medicines and facilities in the drug warehouse at the Pharmacy Installation of Mutiara Cikutra Clinic Bandung. The results obtained can be seen in the checklist table.

Table 1. Recapitulation of Temperature and Humidity of Drug Storage Rooms (May-June 2025)

Measurement Location	Average Temperature (°C)	Temperature Range (°C)	Average Humidity (%)	Humidity Range (%)	Additional Details
Main Pharmacy Room	24.8	24.5 - 25.5	61	58 - 65	Affected by the use of air conditioning.
General Medicine Refrigerator	7.2	6.0 - 8.0	N/A	N/A	Internal thermometer.
Vaccine Refrigerator	6.5	5.0 - 7.0	N/A	N/A	Internal thermometer.

Table 2. Table of Variables for the Evaluation of the Mutiara Cikutra Bandung Clinic based on Permenkes No.34 of 2021.

NO	Evaluation Variables	Compliance	Brief Description
1	Pharmaceutical preparations are stored in suitable conditions.	Appropriate	
2	Sufficient shelves/cabinets are available for pharmaceutical preparations, medical devices, and BMHP.	Appropriate	Shelves and cabinets for pharmaceutical preparations, medical devices and BMHP separately
3	The distance between the highest item and the ceiling is at least 30 cm.	Appropriate	
4	The condition of the ceiling is non-porous and does not leak.	Appropriate	
5	The room is free of insects.	Appropriate	
6	A cooling system is available to maintain room temperature.	Appropriate	There is air conditioning in the Pharmacy room
7	Flood-free location.	Inappropriate	
8	Refrigerators are available for storage of certain medications.	Appropriate	Medicines that must be stored in the refrigerator such as vaccines, suppositories, insulin etc,.
9	Temperature monitoring of storage areas (rooms and refrigerators) with temperature recording cards.	Appropriate	
10	Medication dispensing uses FIFO and FEFO systems.	Appropriate	
11	The drug storage system pays attention to the form of the preparation, the class of therapy, and the type of preparation.	Appropriate	Drugs are separated alphabetically, temperature, stability, dosage form and type of dosage but not by class of therapy
12	Neatness and cleanliness of the storage space.	Appropriate	The room is very neat and clean all well arranged
13	Pharmaceutical preparations are stored in original containers from the factory.	Appropriate	Except for drugs that must be formulated such as compounding ointments and tablets, labeled ed and how to use
14	There are separate shelves/cabinets for dangerous drugs (high alert).	Inappropriate	High *alert drugs* are combined with other medicine cabinets, only they are given a marker label to distinguish
15	Dangerous drug information (*high alert*) and LASA are available.	Appropriate	

16	Use of external and internal thermometers for temperature measurement.	Appropriate	
17	Periodic inspection/monitoring of pharmaceutical preparations storage.	Appropriate	
18	The vaccine is stored in a place with special and separate temperature controls.	Appropriate	Specifically vaccines are stored in the refrigerator and separated from other drug refrigerators
19	Pharmaceutical preparations are stored in conditions that maintain the stability of the active ingredients.	Appropriate	
20	Pharmaceutical preparations close to expiration (3-6 months) are specially marked and stored separately.	Appropriate	Pharmaceutical preparations close to ED in separate cabinets
21	There is a special cabinet available for narcotics and psychotropic drugs.	Appropriate	Narcotics and psychotropics are stored separately and have double locks
Total		**21**	
Compliance Percentage		**90,48%**	**(19/21 variables accordingly)**

Based on the results of the evaluation contained in tables 1 and 2 carried out on the storage of drugs at the Pharmacy Installation of the Mutiara Cikutra Clinic in Bandung, it is known that the level of conformity with the standards set in the Regulation of the Minister of Health of the Republic of Indonesia Number 34 of 2021 reached 90.48%. Of the total 21 variables used as a reference in the evaluation, as many as 19 variables have met the required criteria, while one variable has not met, namely the storage location that is not fully guaranteed to be free from flood risk. Practices such as the use of the First In First Out / First Expired First Out (FIFO/FEFO) system, temperature recording, separation of preparation forms, and cleanliness of storage spaces have been optimally implemented. This reflects the systematic implementation of Good Storage Practice (GSP) (Wondie Mekonen et al., 2024). These findings are consistent with a study by Fahriati et al. (2021) which reported that the level of compliance with regulations is greatly influenced by the consistency of supervision and the existence of written standard operating procedures (SOPs) that are applied in a disciplined manner.

In addition to procedural compliance, infrastructure and environmental aspects are also decisive elements in the storage management of pharmaceutical preparations. One of the important findings is that storage sites are not yet completely free of flood risk, which means there is a potential disruption to the temperature stability and physical safety of the preparation. These risks indicate the need for a review of spatial design and disaster mitigation mechanisms, such as elevation rack systems or the procurement of emergency storage spaces (Fahriati et al., 2021).

Although the level of suitability of storage in clinics can be categorized as high, this shows that in general, Pharmaceutical Installations have implemented good drug storage practices and in accordance with the provisions of national regulations. This reflects a commitment to the quality of pharmaceutical services and the maintenance of drug stability and safety during the storage period. However, the existence of one variable that has not been met indicates that there are aspects that still need to be improved, especially related to the safety of the physical environment of the storage warehouse.

The aspect of vulnerability to flooding can have a significant impact on the quality and safety of medicines, especially in emergency or disaster conditions. Therefore, improvement

efforts targeting environmental risk mitigation, such as raising warehouse floors, mapping flood-prone areas, or relocating storage facilities to safer areas, need to be considered to ensure full compliance with all indicators in applicable regulations.

Storage aspects include: Shelves, storefronts, or storage cabinets, drug storage at Mutiara Cikutra Bandung Clinic is arranged on shelves, storefronts, and storage cabinets based on the shape of the drug preparation separated alphabetically, temperature stability, dosage form and type of preparation but not based on therapy class, and using the FIFO/FEFO system (Budiawan, Simanjuntak, & Rosely, 2019).

The temperature of the storage room is adjusted to the temperature requirements. To find out the temperature of the storage room, it is equipped with a thermometer, the tool can also be used to measure humidity, in addition to measuring temperature (Satibi, Rokhman, & Aditama, 2019; Shu, Jayawardena, Jayaweera Patabandige, Tennegedara, & Liyanapathirana, 2022). Based on the results of the recording, the temperature and humidity were obtained which were 24.5 °C-25 °C. For vaccines and injections are stored in a waiting cabinet. Based on the research of the recording results, the temperature of the refrigerator was obtained, which is 6 °C. The refrigerator temperature recording form comes with a name and initials. If the temperature of the refrigerator at Mutiara Cikutra Bandung Clinic is outside the required temperature range, the pharmacist will turn the temperature regulator inside the refrigerator.

The drug dispensing system, drug dispensing at Mutiara Cikutra Bandung Clinic uses the FIFO and FEFO systems, the FIFO system is a system that applies drugs that come first must be dispensed first rather than drugs that come later, and the FEFO system is a drug dispensing system where drugs expire faster, the drugs are dispensed first. This definition is the same as other studies on drug dispensing using the FIFO and FEFO systems (Di, Uptd, Mokoau, Taridala, & Rezal, 2025; Vieillard, Foulley, Benkhalifa, & Paul, 2025).

LASA and high alert drugs, stored together with other drugs. The storage of LASA and high alert drugs is labeled with special markers, but must be equipped again to apply the storage of High Alert drugs in different cabinets, because according to the Gem Gift Research, high alert drugs are drugs that must be watched out for because they often cause serious errors (sentinel event) and Drugs that are at high risk of causing Adverse Drug Reactions (ROTD). The storage of high alert drugs must be watched out for to ensure patient safety (Kurnia & Permata, 2024; Pourroy et al., 2025). In reducing the risk of danger due to high alert drugs and LASA double check when packaging.

Narcotics and Psychotropic Drugs Mutiara Cikutra Clinic has a special cabinet to store Narcotics and Psychotropic drugs placed in a safe place, a double cabinet and has 2 different keys, and a special cabinet key is brought by the Pharmacist in charge or who gets a delegation. Expired medications are stored in separate cabinets. Mutiara Cikutra Clinic stores expired medicines with the criterion of 6 months before the expiration period stated on the packaging. The goal is to avoid selling expired drugs. With the results of this evaluation, the management can use the findings as a basis for planning to improve infrastructure facilities and a more comprehensive storage management system in the future (Aljohar, Altoum, Alkarni, Alburaidi, & Alhabardi, 2025).

The findings of this evaluation provide a strategic basis for strengthening the clinic's internal policies, especially in the development of SOPs for disaster risk mitigation and the arrangement of physically separate high alert preparations in accordance with national safety standards. In addition, routine training for pharmacists on risk-based storage management

needs to be improved to maintain consistency in service quality (Jung, Walsh, Patel, & Lai, 2025).

This research has several important limitations that need to be examined. No qualitative survey of pharmaceutical personnel was conducted, so the understanding of perception, compliance, and staff initiative could only be indirectly concluded based on observational indicators. In addition, the limited observation period of May to June 2025 may not be able to represent annual climatic variations, in particular temperature and humidity fluctuations that may affect the stability of drug storage.

Conclusions

Mutiara Cikutra Clinic shows high compliance with pharmaceutical preparation storage standards, with a score of 90.48% out of 21 evaluation indicators. However, there are aspects of infrastructure (flood risk) and *high alert* drug management that still need to be improved to achieve maximum safety. Strategic recommendations are directed at improving environmental risk mitigation systems and optimizing storage systems based on drug risk classification.

Recommendations based on the results of the evaluation of drug storage at the Pharmacy Installation of the Mutiara Cikutra Clinic Bandung, there are several things that can be used as a reference for continuous improvement to ensure the quality of pharmaceutical services and patient safety. It is necessary to review the location and infrastructure of storage spaces, especially related to flood risk. Mitigation efforts such as floor elevation, the use of elevation racks, and relocation planning to safer areas can be considered as part of a risk management strategy.

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Conflicts of Interest

The authors declare no conflict of interest.

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