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ANALYSIS OF THE IMPLEMENTATION OF MEDICINE STORAGE SYSTEMS IN PHARMACIES

Ahmad Subagiyo*[1]
DIII Farmasi, Politeknik Tiara Bunda, Indonesia
Email: giyo.apt@gmail.com

Niati Ambarsari
DIII Farmasi, Politeknik Tiara Bunda, Indonesia
Email: ambarambarsari22@gmail.com

Milla Oktaviani
DIII Farmasi, Politeknik Tiara Bunda, Indonesia
Email: milla.oktaviani21@gmail.com

Abstract

The pharmacy is one of the places and dedication of the pharmacist profession to carry out pharmaceutical work. Storage of medicines in pharmacies is an inseparable part of medicine management activities. The activity of storing and maintaining the medicines received in a safe place to maintain the quality of the medicines and from theft is medicine storage. One of the determining factors for the quality of distributed medicines is a good and appropriate medicine storage system. Drug storage is an inseparable part of all pharmaceutical activities, both hospital pharmacy and community pharmacy. The act of keeping received medications in a location that is both secure against theft and capable of preserving their quality is known as medicine storage. An appropriate and good storage system will be one of the determining factors for the quality of medicines distributed. Implementing a medicine storage system in pharmacies is very crucial to ensure that medicines are stored safely, efficiently and in accordance with regulatory standards. Implementing a good medicine storage system not only helps in maintaining the quality and effectiveness of medicines, but also increases the operational efficiency of pharmacies and ensures patient safety.

Keywords: analysis, implementation, drug storage system, pharmacy

[1] Correspondence author

INTRODUCTION

Drug management is a supporting aspect of health services. Efforts to develop and perfect drug management must be carried out continuously. According to WHO in developing countries, one of the things that is important for the implementation of pharmaceutical work activities is drug management which includes planning, procurement, receiving, storage, distribution, recording and reporting as well as destruction or withdrawal.

Lazuardi, L. (2023) stated that the pharmacy is one of the places and dedication of the pharmacist profession to carry out pharmaceutical work. Storage of medicines in pharmacies is an inseparable part of medicine management activities. The process of keeping the medications you get in a secure location to prevent theft and preserve their quality is medicine storage (Hardi, 2020). One of the determining factors for the quality of distributed medicines is a good and appropriate medicine storage system.

Today's pharmaceutical services have seen a paradigm shift from drug oriented to patient oriented which aims to improve the quality of life of patients. Quality service apart from reducing the risk of medication errors, also meets the needs and demands of the community so that the public will give a good perception of the pharmacy, especially the speed of service and availability of the medicines needed (Kurniawan, A. H., & Fajri, 2020).

One of the factors that supports drug quality assurance is how to store drugs properly and in accordance with established standards. Storage activities here include three factors, namely room arrangement, preparation of medicines, and observation of the physical quality of medicines (Suherman et al., 2024). Drug storage is an inseparable part of all pharmaceutical activities, both hospital pharmacy and community pharmacy. Medicine The act of storing and maintaining medication involves keeping it in a location that is both thought to be secure against theft and capable of preserving its quality. An appropriate and good storage system will be one of the determining factors for the quality of distributed medicines (Rendrayani et al., 2023).

According to the Republic of Indonesia Minister of Health Regulation Number 73 of 2016 concerning Pharmacy Pharmaceutical Service Standards, it contains rules for an appropriate drug storage system in pharmacies. These regulations state that pharmaceutical preparations must be kept in their original manufacturer's container and kept in suitable conditions to ensure their safety and stability. They also state that the drug's name and expiration date must be on the container, that other items cannot be stored in the drug storage area to avoid contamination, and that the system storage should

maintain therapeutic classes and pharmaceutical dosage forms in addition to organizing pharmaceutical preparations alphabetically and dispensing drugs according to FIFO (First In First Out) and FEFO (First Expired First Out). The same thing is stated in the Republic of Indonesia Minister of Health Regulation number 58 of 2014 concerning Pharmaceutical Service Standards in Hospitals, adding that storage of medicinal preparations, medical equipment, and consumable medical supplies that are labeled LASA (Look Alike Sound Alike) and have a similar look are not placed. closely spaced and require specific labeling to avoid drug mistakes (Ferdiana et al., 2021). Medicines distributed in pharmacies will be the same as medicines distributed in hospitals, although not all types of medicines available in hospitals are also available in pharmacies. Therefore, implementing a good drug storage system in a pharmacy is the same as a good drug storage system in a hospital.

The storage stage is a crucial component of drug management that helps to preserve the quality of medications, prevent careless use, keep supplies continuous, make search and monitoring easier, optimize supplies, provide information on future drug needs, and lower the risk of damage and loss. When medications are stored incorrectly or inefficiently, they may not be recognized and can result in losses for huge pharmaceutical firms, hospitals, and pharmacies. As a result, in order to provide drug services in an effective and efficient manner, a storage system must be chosen and tailored to the current environment (Cokro et al., 2021).

Based on research conducted by Martins et al., (2019), it shows that errors in administering drugs are caused by inappropriate drug storage procedures, especially for LASA drugs, namely drugs that have similar shapes and names. In addition, in research by Harahap et al., (2020) it was stated that more than one prescribing error, a total of 1,632 errors, was found in drugs that require high alertness, therefore it is very important for pharmaceutical staff to manage appropriate storage for high-prescription drugs. alert to minimize errors when administering high alert drugs. Based on previous research, this has occurred in the case of administering the wrong medication due to inappropriate drug storage factors. The most effective way to deal with the problem of medication administration errors is by improving the storage system.

The purpose of this research is to find out how to implement a drug storage system based on Pharmaceutical Service Standards, while the benefits of this research are expected to provide information to pharmacists about a good drug storage system, so that patients get good, correct and safe drugs

with a potential drug storage system. causes the wrong medication to be taken which has an impact on the continuity of the pharmacy business (Medication Error) and can also be used as reference material for subsequent research related to this research.

RESEARCH METHOD

This research in-depth investigates the analysis of the implementation of drug storage systems in pharmacies using a literature review approach. The results include a thorough understanding of drug storage, correct use of drug storage, and implementation of drug storage systems in pharmacies. Literature analysis involves an in-depth review of the literature on drug storage systems in pharmacies. With a strong conceptual foundation, this research makes an important contribution to enriching the discussion regarding what and how to implement drug storage systems in pharmacies.

RESULT AND DISCUSSION

Drug Storage

In research, Ying et al., 2021) states that drugs are preparations or combinations of ingredients that are prepared for use in pathological diseases or physiological systems to explore or impact them in the context of diagnosis, prevention, healing, recovery, enhancement, health, and contraception. Storing medications involves taking security precautions by keeping them in a secure location. The goal of storage is to keep medications at optimal quality prevent loss/damage/theft/waste, avoid the wrong use of medicines, maintain continuity of supplies, and facilitate supervision and search.

Storage of medicines is an activity of managing medicines to avoid physical or chemical damage, so that they are safe and their quality is guaranteed. Maintaining the quality of received medications and medical supplies requires keeping them in a location that is secure from physical disturbances and theft. This process is known as medicine storage (Jafarzadeh, 2020). In the treatment of an illness, there are several different types of medicine, either in dosage form or packaging, so it is necessary to pay attention to how to store medicine properly and correctly. If the method of storing the drug does not meet the requirements, there will be changes in the properties of the drug, damaging the drug so that the efficacious substances in the drug are also damaged. This situation can affect the process of treating a disease until its cure.

According to Al-Worafi, Y. M. (2020), the causes of damaged medicine are humid air, sunlight, temperature and physical shock. Storage of medicines must take into account various things, namely:

1. Form and type of dosage.
2. Whether or not it explodes or burns easily.
3. Stability, narcotics and psychotropic substances are stored in a special cupboard.

Purpose of Drug Storage

1. Maintain drug quality.
2. Avoid misuse and incorrect use.
3. Maintain continuity of inventory.
4. Makes searching and monitoring easier

Incorrect Storage of Medicines

1. Medicines can experience physical or chemical damage
2. The quality of medicines cannot be maintained
3. Irresponsible use occurs.
4. Availability is not maintained
5. Makes supervision difficult

Shukar et al., (2021) stated that drug storage needs to be kept in the manufacturer's original container. Contamination must be avoided and explicit instructions must be printed on the new container in the event of an exception or emergency requiring the transfer of the contents to another container. Pharmaceutical supplies are stored based on dosage form (tablets, injections, syrups are stored separately), based on pharmacology, drug stability, expiration date (FEFO with a short expiration date is placed at the front so it comes out first).

Special Medication Storage

1. Narcotics & psychotropic substances: special two-door cupboard equipped with double locks
2. Flammable drugs (acetone, ether, & alcohol): well-ventilated cupboard, away from flammable materials and electronic equipment.
3. Drug storage temperature is divided into:
   a. Freezer
   b. freezer indicates a room with a temperature maintained thermostatically between -25° and -10°C, for example for storing vaccines.
   c. Cold is a temperature condition of no more than 8°C, the refrigerator has a temperature between 2°C and 8°C, for example insulin

d. Cool is a temperature condition between 8°C and 15°C.
e. A controlled room is a thermostatically maintained temperature between 15° and 30°C.

How to store medicines if adjusted to the dosage form

1. Tablets and capsules
   Avoid storing tablets or capsules in hot or humid places
2. Liquid medicinal preparations (syrup and suspension)
3. Avoid storing medicine in liquid form in the refrigerator (freezer) to prevent it from freezing, unless specified on the label or medicine packaging.
4. Vaginal and anal preparations
5. Aerosol or spray preparations
   Avoid storing aerosol or spray forms in high temperatures because it can cause an explosion.

Proper drug storage is very important to maintain drug effectiveness. Generally medicines should be stored in a cool and dry place. Some medicines require storage at special temperatures such as in a refrigerator or even a freezer. Not all medicines need to be kept in the refrigerator. Read the provisions on the medicine packaging or ask the pharmacist for medicine storage. Knowing how to store medicine properly is important to maintain the effectiveness of the medicine, and not cause dangerous side effects (Al-Worafi, 2020). The reason is, not a few people store medicines incorrectly. For example, placing the medicine in a place exposed to direct sunlight, humidity, or even in the freezer. In fact, each drug has special storage instructions. Check out the various common mistakes made when storing the following medicines:

1. Sun Exposure Medicine
   Delivered by Dr. Dyah Novita Anggraeni, placing medicine in a place exposed to sunlight or hot temperatures can reduce the effectiveness of the medicine in treating disease symptoms. Not a few drug molecules are photosensitive to sunlight. When drugs are exposed to excessive sunlight, the chemical structure of the drug can be damaged and its efficacy is reduced. This also occurs when the drug is stored at hot room temperature. Therefore, it is highly recommended not to put medicine on window sills, car dashboards, or on top of the refrigerator. According to Dr. Sarah Westberg from the University of Minnesota College of Pharmacy, the correct way to store medicine is to put it in a medicine box. The temperature of the storage room or medicine box must also be dry and not damp, and away from heat or exposure to the sun. This applies to

medicines that have instructions for storing at room temperature around 25 degrees Celsius.

2. Medicines are stored at inappropriate temperatures
   Generally drugs are stored at room temperature. However, there are also types of medicine that are stored at cold temperatures, around 2-4 degrees Celsius. For this reason, it is important to understand the instructions for storing medicines. The reason is, each drug molecule has unique properties. For example, medicines that must be stored in the refrigerator contain active compounds, because they are easily damaged when exposed to high temperatures. But remember, store medicine not in the freezer, but in the refrigerator chiller. Storing it in the freezer can cause the medicine to freeze and damage the structure of the medicine.
3. Medicines are stored in damp places
   Moisture can damage the structure of drugs, especially drugs that can absorb water. If you store medicine in a cupboard or drawer, make sure the place is not damp and has good air circulation.
4. Storing expired medication
   The next mistake in storing medicine is keeping it past the expiration date. Apart from decreasing effectiveness, expired drugs are no longer guaranteed to be safe. It is not impossible for expired medicine to grow microbes. Therefore, double-check the deadline for using the drug before consuming it. Then, separate and throw away medications that have expired.
5. Medicines are not stored in their original packaging
   The way to store medicine after opening is to keep it in its original packaging. Placing medicines not in their original packaging, such as in special medicine containers, actually has the potential to reduce the effectiveness of the medicine or increase side effects.

Leftover medication that is no longer used should be stored in a separate medication container from other items that are not easily accessible to children. However, if the medicine is damaged or expired, the medicine must be destroyed, so that it is not used by other people who do not know about the medicine. If the medicine is damaged due to long storage or the medicine has expired, the medicine must be packaged. Disposal of damaged medicines cannot be thrown directly into the trash along with the packaging (Liu et al., 2021). Medicines to be thrown away need to be removed from the packaging. Packaging can be thrown away after being torn or cut. Medicines need to be processed first before being disposed of and the process for each

medicine is different depending on the dosage form of the medicine. Medicines need to be disposed of in the correct way to prevent environmental pollution and avoid misuse by irresponsible individuals. Conclusion Medicines are preparations or combinations of materials that are ready to be used to influence or investigate physiological systems or pathological conditions in the context of determining diagnosis, prevention, healing, recovery, improvement, health and contraception. If the medicine is damaged due to long storage or the medicine has expired, the medicine must be repackaged. Disposal of damaged medicines cannot be thrown directly into the trash along with the packaging. Medicines to be thrown away need to be removed from the packaging. Packaging can be thrown away after being torn or cut. Medicines need to be processed first before being disposed of and the process for each medicine is different depending on the dosage form of the medicine (Andrade et al., 2019).

Correct Use of Medication Storage

We still encounter various drug-related problems in the communities around us. There are various problems in society's lack of understanding about the correct use and handling of drugs. The government, through the Indonesian Ministry of Health, has provided a good and correct way to manage medicines, namely by implementing the DAGUSIBU (Get, Use, Save, Dispose) program. However, in reality in the field, there are still many people who need outreach activities in the community, especially in rural areas, regarding information about the correct use and handling of medicines to family members.

Correct use of drug storage is very important to maintain the quality and effectiveness of drugs. The following are several ways to store medicine according to Naser et al., (2021):

1. Storage Method: Medicines should be stored in a cool place, protected from direct sunlight, and according to the instructions stated on the packaging
2. Separation of medicines: Medicines should be separated and stored based on type to make searching easier
3. Original Container: Medication should be stored in the original container from the manufacturer. If it must be transferred to another container, make sure there is no contamination and write clear information on the new container.
4. Temperature Management: Some medications require special storage temperatures, such as in a refrigerator or freezer. However, not all

medicines need to be stored in the refrigerator. Pay attention to the storage instructions listed on the medicine packaging

5. Expiration Period: Pay attention to the expiration date of the drug and do not use the drug after that date. Some medicines also have information about the storage period after the package is opened. Make sure to pay attention to this.
6. Signs of Damage: Look for signs of drug damage, such as discoloration, odor, or clumping. Do not use medication that has expired or is damaged.

When storing medicines, it is important to pay attention to the correct storage method, separation of medicines by type, use of original containers, appropriate temperature settings, expiration date, and signs of damage to the medicine. By keeping drugs in good condition, we can ensure the effectiveness and safety of using the drug (Hailat et al., 2020).

Implementation of a Medicine Storage System in Pharmacies

Implementing a drug storage system in pharmacies is very crucial to ensure that medicines are stored safely, efficiently and in accordance with regulatory standards. The following is an analysis related to the implementation of a drug storage system in pharmacies. Hua et al., (2020):

1. Drug Grouping

   By Therapeutic Category: Grouping medications according to therapeutic categories (e.g., antibiotics, analgesics, antihypertensives) makes it easier to find and retrieve medications.

   Based on dosage form: Liquid medicines, tablets, capsules, ointments and other dosage forms should be separated to avoid errors in taking.
2. Temperature and Humidity

   Temperature Control: Some drugs require storage at certain temperatures, such as vaccines which need to be stored in the refrigerator.

   Humidity Control: Use of a humidity control device can help maintain the stability of moisture-sensitive medications.
3. FIFO system (First In, First Out)

   Stock Rotation: Using a FIFO system ensures that drugs that have been in stock longer are used first thereby reducing the risk of expiration.
4. Security and Surveillance

   Storage of Certain Medications: Medicines that have the potential for abuse (e.g. narcotics) must be stored in a locked place and accessible only to authorized personnel.

   CCTV and Surveillance: The use of CCTV can help in surveillance and prevent theft.

5. Labels and Marking
   Clear Labeling: Each shelf and storage area should be clearly labeled to identify the type and location of the medication. Important Information: Labels must include information such as expiration date, batch number, and special storage conditions if any.
6. Inventory Management System
   Management Software: Using inventory management software can help in monitoring drug stock in real-time, managing orders, and alerting if drug stock is approaching expiration.
   Barcodes and QR Codes: Using barcodes or QR codes on medicine packaging can make recording and tracking easier.
7. Cleanliness and Maintenance
   Routine Cleaning: Medication storage areas should be cleaned regularly to maintain cleanliness and prevent contamination.
   Pest Control: Control pests that can damage medicine, such as mice and insects.
8. Staff Training
   Routine Training: Pharmacy staff should be regularly trained on proper medication storage procedures, use of inventory management systems, and handling of medications that require special conditions.
   Knowledge of Regulations: Staff must be familiar with regulations and guidelines from health authorities regarding medication storage.
9. Medicine Waste Management
   Management of Expired Medicines: Expired medicines must be managed properly in accordance with applicable regulations, such as safe destruction.
   Returning Medicines from Consumers: A system for accepting returns from consumers of unused or expired medicines is also important to prevent misuse.

Implementing a good medicine storage system not only helps in maintaining the quality and effectiveness of medicines, but also increases the operational efficiency of pharmacies and ensures patient safety.

CONCLUSION

The drug storage system in the pharmacy is very important to maintain the quality and safety of drugs. Here are some important tips for proper medication storage in the pharmacy:

1. Storage Conditions: The drug should be stored under appropriate conditions, including room temperature maintained below 25°C. The storage space must also be free from insects and disturbing animals.
2. Shelves/Storage Cupboards: Make sure there are sufficient shelves or storage cupboards to store medicines. The distance between items in the highest position and the ceiling is at least 50 cm. The ceiling must also not leak so that no water drips onto items.
3. Cooling System: Pharmacies must provide a cooling system that can keep the room temperature below 25°C. Apart from that, there are also special refrigerators available to store certain medicines.
4. Temperature Monitoring: The temperature of medicine storage areas (rooms and refrigerators) must always be monitored using a calibrated thermometer. This is important to ensure that the drug storage temperature remains in accordance with the requirements.
5. Dispensing System: Medicines must be dispensed using the First In First Out (FIFO) or First Expired First Out (FEFO) system. This system ensures that medicines that have taken longer to come in will be taken out first, thereby reducing the risk of the medicine expiring.
6. Storage Grouping: Drug storage systems in pharmacies can be grouped based on drug form, therapeutic class, or expiration time

   This grouping helps make it easier to store and search for medicines.

REFERENCES

Al-Worafi, Y. M. (2020). Drug safety in Indonesia. In *Drug safety in developing countries* (pp. 279-285). Academic Press.

Al-Worafi, Y. M. (2020). Safety of medications in special population. In *Drug safety in developing countries* (pp. 143-162). Academic Press.

Andrade, R. J., Aithal, G. P., Björnsson, E. S., Kaplowitz, N., Kullak-Ublick, G. A., Larrey, D., ... & European Association for the Study of the Liver. (2019). EASL clinical practice guidelines: drug-induced liver injury. *Journal of hepatology*, *70*(6), 1222-1261.

Cokro, F., Atmanda, P. F. K., Sagala, R. J., Arrang, S. T., Notario, D., Rukmini, E., & Aparasu, R. (2021). Pharmacy education in Indonesia. *Pharmacy Education*, *21*, 432-442.

Ferdiana, A., Liverani, M., Khan, M., Wulandari, L. P. L., Mashuri, Y. A., Batura, N., ... & Probandari, A. (2021). Community pharmacies, drug stores, and antibiotic dispensing in Indonesia: a qualitative study. *BMC Public Health*, *21*, 1-10.

Hailat, M., Al-Shdefat, R. I., Muflih, S. M., Ahmed, N., Attarabeen, O., Alkhateeb, F. M., ... & Gassar, E. S. (2020). Public knowledge about dosage forms, routes of drug administration and medication proper storage conditions in Riyadh District, Saudi Arabia. *Journal of Pharmaceutical Health Services Research*, *11*(3), 205-213.

Harahap, M. S. Y., Megawati, M., & Asriwati, A. (2020). Analysis of Drug Logistic Management in the Pharmaceutical Installation of the Health Office of North Sumatera Province. *Journal La Medihealtico*, *1*(3), 26-32.

Hardi, W. (2020). Collaborative Governance Framework in Health Care: A Qualitative Exploration of Hospital Pharmacy Management Reform at Hospital Setting in Indonesia.

Hua, X., Gu, M., Zeng, F., Hu, H., Zhou, T., Zhang, Y., & Shi, C. (2020). Pharmacy administration and pharmaceutical care practice in a module hospital during the COVID-19 epidemic. *Journal of the American Pharmacists Association*, *60*(3), 431-438.

Jafarzadeh, A., Mahboub–Ahari, A., Najafi, M., Yousefi, M., & Dalal, K. (2020). Medicine Storage, Wastage and Associated Determinants among Urban Households: A Systematic Review of Household Surveys.

Kurniawan, A. H., & Fajri, P. (2020). Factors Associated with the 'Dagusibu'Drug Management Behavior Via Home Pharmacy Care for Community in Central Jakarta District. *Sanitas*, *11*(2), 122-135.

Lazuardi, L. (2023). Development of a drug management performance application: a needs assessment in indonesia. *Healthcare Informatics Research*, *29*(2), 103-111.

Liu, X., Barenji, A. V., Li, Z., Montreuil, B., & Huang, G. Q. (2021). Blockchain-based smart tracking and tracing platform for drug supply chain. *Computers & Industrial Engineering*, *161*, 107669.

Martins, S., Muntasir, M., & Ferreira, D. C. X. (2019). Drug management analysis in the department of pharmacy hospital nacional Guido Valadares Dili Timor Leste 2017. *Int J of Rec Acad Res*, *1*, 226-230.

Naser, A. Y., Amara, N., Dagash, A., & Naddaf, A. (2021). Medications disposal and medications storage in Jordan: A cross-sectional study. *International Journal of Clinical Practice*, *75*(3), e13822.

Rendrayani, F., Alfian, S. D., Wahyudin, W., & Puspitasari, I. M. (2023). Knowledge, attitude, and practice of medication therapy management: a national survey among pharmacists in Indonesia. *Frontiers in Public Health*, *11*, 1213520.

Shukar, S., Zahoor, F., Hayat, K., Saeed, A., Gillani, A. H., Omer, S., ... & Yang, C. (2021). Drug shortage: causes, impact, and mitigation strategies. *Frontiers in pharmacology*, *12*, 693426.

Suherman, S. D. N. R., Oetari, R. A., & Saptarini, O. (2024). The Evaluation of Drug Management and Improvement Strategies Using the Hanlon Method in the Pharmacy Installation of the Bahteramas Hospital Southeast Sulawesi. *Formosa Journal of Multidisciplinary Research*, *3*(3), 653-672.

World Health Organization. (2024). *Quality assurance of pharmaceuticals: a compendium of guidelines and related materials. Volume 2. Good manufacturing practices and inspection*. World Health Organization.

Ying, W., Qian, Y., & Kun, Z. (2021). Drugs supply and pharmaceutical care management practices at a designated hospital during the COVID-19 epidemic. *Research in Social and Administrative Pharmacy*, *17*(1), 1978-1983.