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EVALUATION OF THE SUITABILITY OF HIGH-ALERT MEDICATION STORAGE IN THE PHARMACEUTICAL WAREHOUSE OF THE INDONESIAN RED CROSS (PMI) BOGOR HOSPITAL

Nyayu Siti Aminah Lily Elfrida[1*], Alya Ramadhani Baladraf[2], Nisa Najwa Rokhmah[3]

[1,2,3]Pharmacy Study Program, Faculty of Mathematics and Natural Sciences, Pakuan University, Bogor.
elfridalily79@gmail.com

Abstract

The storage of high-alert medications requires evaluation to prevent medication errors and inappropriate drug use and to facilitate the monitoring as well as control of these medications. Hospitals need to develop policies for managing high-alert medications. Therefore, the storage system must be established and aligned with actual conditions to ensure accurate drug delivery. This study aimed to describe the storage of high-alert medications in the pharmacy warehouse of PMI Bogor Hospital in 2023, determine the level of compliance with the storage of high-alert medications, assess the impact of storage practices on drug damage, and describe the knowledge and behavior of warehouse staff regarding high-alert medication storage. The results showed that the average compliance rates were as follows: 71% for Look-Alike Sound-Alike (LASA) medications (good), 73% for high-concentration electrolytes (good), 88% for narcotics (very good), 76% for psychotropics (good), and 75% for precursors (good). The staff's knowledge was rated as very good, with an average score of 9.17, while their behavior was rated as good, with a score of 9.5.

Keywords**:** *Evaluation, High-alert drug storage, Pharmacy warehouse, PMI Bogor Hospital*

✉Corresponding author :
Address : Jl. Pakuan, Tegallega. Kecamatan Bogor Tengah, Kota Bogor. Jawa Barat Indonesia
Email : elfridalily79@gmail.com
Phone : +62 877-7008-9212

INTRODUCTION

Hospitals need to organize drug management and make drug storage policies in pharmaceutical warehouses to improve safety, especially for storing high-alert drugs that require attention and caution because of the frequent occurrence of unwanted things. High-alert drugs require supervision in their use, so hospitals need to pay attention to storage, recording, and monitoring (KARS, 2018). Drug storage is one of the activities of placing drugs in a place that is considered safe and can maintain and maintain drug quality. An appropriate and suitable storage system will be one of the determining factors for the quality of drugs distributed (IAI, 2015).

Based on the results of research by Bachtiar et al. (2021), drug storage in the hospital pharmaceutical installation warehouse is in a good category, which includes spatial arrangements 88.34%, how to store drugs 86.67%, and recording stock cards 100%. According to the results of research by Lestari et al. (2020), namely the percentage of drug inventory is 100%, the percentage of drug placement is 85%, the percentage of drug retrieval is 97%, the time required by warehouse staff in processing drug requests is 3-66 minutes, and the percentage of warehouse utilization for storing drugs is 43%, and there is a Standard Operating Procedure for the level of drug safety in the drug storage warehouse.

It is necessary to evaluate the storage of high-alert drugs to determine the level of conformity of high-alert drug storage based on Permenkes No. 72 of 2016 and the Pharmaceutical and Medical Device Development in 2021. The results of the study are expected to be used as material for evaluating drug management that focuses on good and correct storage of high-alert drugs at PMI Bogor Hospital.

METHOD

Type of Research

This prospective descriptive study was conducted using direct observation and questionnaire-filling methods as a description and evaluation of the suitability of drug storage based on the standards/guidelines of Permenkes No. 72 of 2016 and Pharmaceutical Development (BINFAR) in 2021. Descriptive because this research aims to explain and describe an evaluation process that aims to assess an ongoing process in accordance or not with the guidelines. Descriptive research is data or information obtained from interviews, observations, documentation, and field notes compiled by researchers by describing the findings obtained (Jaya, 2021).

Place and Time of Research

The research was conducted from February 20 to April 20, 2023, at the Main Warehouse of the Bogor PMI Hospital Pharmacy.

Population and Sample

The population in this study consisted of pharmaceutical staff from PMI Bogor Hospital. The samples in this study were all pharmaceutical warehouse staff of PMI Bogor Hospital.

Data Collection Techniques

The data collected was for 2 months, starting from February-April 2023. Data collection was carried out every 2 weeks. Data was taken in the form of primary and secondary data, where primary data was obtained from the results of filling out the warehouse staff questionnaire. Secondary data is obtained from the drug entry and exit book, stock cards, and direct observation of activities taking place in the PMI Bogor Hospital warehouse.

Instruments

The research instruments used in this study were observation checklists and questionnaires. The questionnaire was given to warehouse staff as informants or respondents in this study. They were needed to answer questions about drug management focused on the storage of high-alert drugs LASA (Look Alike Sound Alike), high-concentration electrolytes, narcotics, psychotropic drugs, and precursors in hospital pharmaceutical installation warehouses based on the guidelines of Permenkes RI No. 72 of 2016 concerning pharmaceutical service standards in hospitals and the Directorate General of Pharmaceutical and Medical Devices of the Indonesian Ministry of Health in 2021.

Data Analysis

1. Test

   According to Sugiyono (2017), the validity test is conducted to determine the accuracy of the data taken on the object of research, along with the results obtained by the researcher. This validity test aims to test the validity of the research instrument to be distributed. The testing method to be used is

the correlation technique in which the ordinal score of each question item tested for validity is correlated with the ordinal score on the entire item if the correlation coefficient (r) is positive and greater than the table r value, then the item is valid, while if it is negative and smaller than the table r value, it is invalid, then the question item must be removed from the questionnaire or replaced with another question.

The decision to test the validity of an item is based on the following:

a. Question items are valid if r count> r table
b. Question items are invalid if r count < r

2. Test

According to Arikunto (2010), the reliability test is used to show whether an instrument is reliable enough to be used as a data collection tool. Reliable means reliable. Cronbach's Alpha coefficient is a statistic that is often used to test the reliability of a research instrument. A research instrument is indicated to have an adequate level of reliability if the Cronbach's Alpha value is greater than or equal to 0.60.

The following conditions determine the reliability test decision:

a. If the Cronbach Alpha value ≥ 0.6, it means that the questionnaire is said to be reliable
b. If the Cronbach Alpha value is <0.6, the questionnaire is said to be

3. Analysis

According to Notoatmodjo (2010), *univariate* analysis was conducted to describe the characteristics of the research variables. This analysis will get the results of the frequency distribution of each variable. Frequency distribution is based on length of service, education, and age.

4. Analysis

According to Notoatmodj (2010), *bivariate* tests are carried out after the univariate test. If the results of two variables are suspected of having a correlation, it is analyzed by stages:

a. Proportion or percentage analysis is done by comparing the cross-distribution between two variables.
b. Analyze the results of the statistical tests: *chi-square test*, z-test, t-test, and others. The statistical test results concluded whether the two variables had a meaningful relationship or not.

5. Sample Weight

Data collection is done by filling out questionnaires and answering questions (checklist) from warehouse officers and observation. According to Octavia's research (2020), the sampling method uses the total sampling method, the percentage of suitability is calculated using the following formula:

$$P_{yes} = \frac{F}{n} \times 100\%$$

Pno = 100% - Pyes

Description:

P = percentage

F = total score

n= score

According to BINFAR (2021), the empirical score is calculated based on two criteria as follows:

Score 1 for Yes

Score 0 for No

Results were analyzed descriptively using percentage analysis for observations and points for questionnaires.

Observation assessment criteria:

Very good : 80,50-100,00%

Good : 60,50-80,00%

Fair : 40,50-60,00%

Poor : 20,50-40,00%

Very Poor : 0,00-20,00%

Questionnaire scoring criteria:

Good : 8 - 10

Fair : 5 - 7

Less : 1-4

RESULTS AND DISCUSSION

This research was conducted at PMI Bogor Hospital in February-April 2023 with the aim of knowing the description and level of suitability of high-alert drug storage, especially drugs belonging to the LASA (Look Alike Sound Alike) group, High Concentration Electrolytes, Narcotics, Psychotropic and Precursors at PMI Bogor Hospital in 2023, according to the guidelines of the Minister of Health Regulation No. 72 in 2016 and the Pharmaceutical and Medical Device Development in 2021 by comparing the results of both. Data was taken in the form of questionnaires on warehouse staff, drug entry, and exit books, stock cards, direct observation of activities taking

place in the main warehouse of the PMI Bogor hospital, and damaged drug data (expired). The data used is prospective and descriptive.

Hospital Pharmacy Main Warehouse

The Hospital's main pharmaceutical warehouse carries out many pharmaceutical supply activities such as selection, planning, procurement, receipt, storage, distribution, recall, and control. The number of employees in charge of the main pharmaceutical warehouse at PMI Bogor Hospital is six people. The activities are making an order letter for pharmaceutical supplies to authorized distributors, receiving and checking invoices, distributing pharmaceutical supplies and reagents to radiology installations, hemodialysis installations, radiographs for laboratory installations, and other support.

The main warehouse stock of pharmaceutical supplies consists of drugs, medical devices, and Medical Consumables (BMHP) that support pharmaceutical supplies and support the *Floor Stock* distribution system to rooms in the Regular Pharmacy Depot, Inpatient Rooms, Afiat Pharmacy Depot, OK IBS Pharmacy Depot, Radiology installation, hemodialysis installation, laboratory installation, and other support are needed. Physical stock activities at PMI Bogor Hospital are carried out once a month in all inpatient rooms.

Observation Results of Pharmaceutical Inventory Storage in the Main Warehouse of Bogor PMI Hospital Pharmacy

Based on the observations made, the layout of the pharmaceutical storage room in the main warehouse of the Bogor PMI Hospital was adjusted to the hospital's conditions. This is because there is limited space for many kinds of drugs and large amounts of drug stock, so drug storage must be adjusted to the conditions of the storage area. Storage of high-alert drugs on the storage shelves of the Bogor PMI Hospital is based on the form and type of drug preparation; the preparation of drug stocks has applied the FIFO and FEFO principles and applies alphabetical drug preparation, but storage is not arranged by therapeutic class. In the storage of Narcotic and Psychotropic category drugs, the preparation does not follow alphabetical and therapeutic classes. Drugs should be stored in alphabetical and therapeutic classes so that it can make it easier for officers to find the necessary drugs (Octavia, 2020) and minimize errors in drug retrieval.

LASA (*Look Alike Sound Alike*) Medicine Storage Observation

Storage of LASA drugs in the pharmaceutical warehouse of PMI Bogor Hospital is made separately based on drug dosage, dosage form, and type of drug; this is in accordance with the standard storage requirements for LASA drugs. However, in the standard storage requirements point 3 (storage of LASA category drugs are not placed close together), the results of the checks were inconsistent, where during the 2nd, 3rd, and 5th checks, the LASA drugs were stored close together, and the drug storage shelves were mostly not labeled LASA (Look Alike Sound Alike). This could be due to the limited space, the large number of drugs, and the large amounts of drug stock, so the drug storage must adjust to the limited storage conditions and the position of the drug storage, which is made close together. However, the storage of LASA (Look Alike Sound Alike) drugs should not be close together and needs to be labeled LASA (Look Alike Sound Alike) because it can risk causing errors in drug retrieval even though the storage is arranged alphabetically (Elis Susilawati, 2022).

High Concentration Electrolyte Medicine Storage Observation

The storage of high-concentration electrolyte drugs and high-risk drugs in the main pharmaceutical warehouse of PMI Bogor Hospital follows the guidelines: high-concentration drugs and high-risk drugs are specially marked with high-alert stickers and given a red line. This is to avoid accidental retrieval errors. According to the Indonesian Ministry of Health (2016), hospitals must compile a list of drugs that must be monitored based on procedures and adjusted to the hospital's approved forumlarium data. Procedures are used to identify which areas of high-concentration electrolytes and dangerous drugs are allowed and how to store them in those areas.

Observation of Drug Storage

The results of observations of drug storage in the Narcotics category show that the storage of Narcotics drugs is in accordance with the guidelines where the storage warehouse officer has implemented the storage of Narcotic drug preparations, which are stored in a special cupboard that only contains Narcotic drugs and the cupboard is equipped with locks and double doors where there are two doors and two different locks so as to prevent drug loss, in accordance with

applicable regulations in Permenkes No. 72 of 2016. The officer in charge holds or stores the key to the Narcotics medicine cabinet. Shelves/cabinets are also made of strong materials and not easily moved.

The results of this study are in accordance with the results of Winarni's research (2019), where the storage of narcotic drugs uses the FIFO principle (*First in, First Out)*, namely, the method of placing drugs based on the first drug received by warehouse officers, drugs that are preceded out. Meanwhile, the FEFO (*First Expired, First Out*) principle is carried out by placing drugs with a short expiration date at the front of the shelf, while drugs with a longer expiration date are placed at the back of the shelf.

Observation of Drug Storage

There are observations of drug storage for the Psychotropic category. In the storage of psychotropic drugs, some are following the guidelines, including psychotropic drugs. There is separate storage from other drug classes; the officer in charge keeps the cabinet key. However, in Psychotropic storage, there is still something that is not appropriate, namely, the cabinet door is not layered and does not have two different keys, so storage security is not guaranteed. This is because the storage cabinet still uses SOP (Standard Operating Procedure), which has not been updated. According to research by Duri and Defi (2018), drug storage for the Narcotics and Psychotropic categories is carried out in separate storage with the aim of preventing errors when taking, preventing theft, preventing drug abuse, and making it easier for officers to take drugs.

Drug Storage Observation

The storage of precursor drugs in the pharmaceutical warehouse of PMI Bogor Hospital follows storage guidelines or standards, where precursor drugs are stored in a safe place. However, the storage is not based on risk analysis. This is because the Precursor category drugs are stored together with the LASA category drugs, making it difficult to distinguish, and the possibility of errors in retrieval is very large. Precursor category drugs should be stored on a separate shelf/cabinet based on risk analysis. According to the officers interviewed, this happened due to limited space, so the storage of precursor drugs was combined with LASA drugs. Risk analysis can be done qualitatively, semi-qualitatively, and quantitatively. Qualitative methods are related to providing an overview of the risks that occur, while quantitative methods provide statistical explanations based on actual data (Kementerian Kesehatan Republik Indonesia, 2016).

Standard Operating

Standard Operating Procedures (SOP) follow the guidelines of Permenkes No. 72 of 2016. The storage of pharmaceutical supplies in the main warehouse listed in the SOP is grouped according to type, arranged alphabetically, and in the preparation of drug stocks using the FIFO system *(First in, First Out)* and the FEFO system *(First Expired, First Out)*, which is adjusted to the storage temperature and humidity of the place. The SOP is made based on what is done in warehouse management activities. It aims to provide quality pharmaceutical supplies in the right amount and time, according to the specifications and functions determined by the pharmaceutical and therapy committee, efficiently and effectively. The SOP also states that high-alert drugs need to be stored in a special place so as not to cause medication errors.

Evaluation Result of Medicine Stock Card Checklist

The use of stock cards, especially the storage of high-alert drugs, has not been implemented optimally. This is because drug stock cards are only provided for the storage of Narcotic and Psychotropic drugs, whereas drugs in the Narcotic and Psychotropic categories are routinely and completely recorded every time there is a drug mutation. The absence of stock cards can cause confusion among officers if there is a difference in the stock of drugs available and the stock of drugs listed in the system. All categories of drugs should be stored with a drug stock card, and one stock card should only be used for one type of pharmaceutical preparation and placed adjacent to the preparation. The function of the stock card is to help determine the amount of drug inventory, manage stock availability and input sources, and act as a control tool to formulate a pharmaceutical supply procurement plan (Duri & Defi, 2018).

The results of the examination for drugs in the LASA *(Look Alike Sound Alike)* category, high concentration electrolytes, and precursors did not have stock cards that were filled in routinely and completely, and no mutation records were made on the drug stock cards. This is due to the lack of human resources, so using a stock card will slow

down drug retrieval. However, pharmacy officers immediately record in the drug mutation book or enter directly into the computer using an electronic system. The results of this study are the same as research conducted by Hidayati et al. (2022), in which all drugs in the LASA (Look Alike Sound Alike) category, high-concentration electrolytes, and precursors did not include stock cards on their storage shelves.

The results of the inspection found drug stock cards for the Narcotics and Psychotropic category. Each type of Narcotic and Psychotropic preparation has a stock card containing the name of the item, date, depot name, number of drugs in, number of drugs out, remaining stock, and para. In addition to filling in the stock card, pharmacy officers also record every mutation on the computer. Regular recording of drug stocks can be a reference to drugs that are damaged, expired, or lost drugs (Nurlina et al., 2022). The effect obtained is that the storage of drug preparations is controlled, and there is no difference between the amount of physical drugs and the amount of drugs on the stock card. The results of this study are the same as Winarni's research (2019), where the stock card has implemented a standard, namely a manual stock card containing the name of the drug, dosage form, dosage strength, date of the number of incoming goods, number of outgoing goods, remaining stock and information.

Conformity Between Standard Storage Requirements and Storage of High-alert Drugs in the Main Warehouse of Bogor PMI Hospital Pharmacy

Table 1. Observation Results of Storage of High Alert Drugs in the Main Warehouse of Bogor PMI Hospital Pharmacy Based on Permenkes No. 72 of 2016 and Pharmaceutical and Medical Device Development Medical Devices in 2021

Medicine Category	P1 20-2-2023	P2 06-3-2023	P3 20-3-2023	P4 03-4-2023	P5 17-4-2023	x̄ Score	Criteria
Look Alike Sound Alike	73%	67%	67%	73%	73%	74.4 %	Good
High-Concentration Electrolytes	75%	75%	75%	75%	67%	72%	Good
Narcotics	88%	88%	88%	88%	88%	88%	Very Good
Psychotropic	76%	76%	76%	76%	76%	76%	Good
Precursors	75%	75%	75%	75%	75%	75%	Good

The storage requirements for high-alert drugs consist of several requirements, which must be adjusted to the applicable standards for storage. The results of the suitability of high-alert drug storage can be seen in the table, which shows that the LASA (Look Alike Sound Alike) category drugs obtained the results of the storage suitability calculation, namely as follows at the 1st, 4th, and 5th checks, the percentage of suitability was 73%, at the 2nd and 3rd checks, the percentage of suitability was 67%, with an average suitability value of 71% and in the good category, where there were 29% non-conformities to the standards including LASA stored close together, and drug storage shelves were mostly not labeled LASA (Look Alike Sound Alike). The results of this study are much lower than the results of research conducted by Hidayati et al. (2022), where the percentage of conformity in LASA drug storage was 97.78%.

In assessing the suitability of drug storage in the high-concentration electrolyte category, the results of suitability in the 1st, 2nd, 3rd, and 4th checks were 75%. There was a decrease in the percentage of suitability in the 5th check, which was 67%, so the average score of suitability obtained was 73% and fell into the good category, where the results obtained in the 5th check electrolyte storage were not arranged by therapeutic class, but in high concentration electrolytes and high-risk drugs stored separately and given clear markings/stickers. The results of this study are also lower than the results of research conducted by (Wahyuni et al., 2021), where the percentage of conformity in the storage of electrolyte drugs is 100%.

In the assessment of the suitability of drug storage for the Narcotics category, the percentage of suitability was 88% in the 1st to 5th checks, and the average score was 88% with a very good category. The results of this study are much higher than the results of research conducted by Hidayati et al. (2022), where the percentage of conformity in the storage of narcotic drugs was 78.43%. This is because the research is following the standards, namely, stored in a special cupboard that only contains narcotic drugs. The cupboard is equipped with locks and double doors where there are 2 doors and 2 different locks to prevent drug loss. The key to the narcotic drug cabinet is held or stored by the officer in charge, and the shelf/cupboard is also made of strong material, not easily moved.

In assessing the suitability of drug storage in the Psychotropic category, the percentage of suitability was 76% at checks 1 to 5, and the average score was 76% with a good category. The results of this study are slightly lower than the results of Octavia's research (2020), which obtained a percentage of 79.2%. The thing that distinguishes this research from Octavia's research (2020) is that the results of the research obtained the psychotropic drug cabinet doors are not layered and do not have two different locks, so the security of the storage is not guaranteed so that the storage of psychotropic drugs is not following the Permenkes no. 72 of 2016 and BINFAR of 2021 standards.

In assessing the suitability of drug storage in the Precursor category, the percentage of suitability in the 1st to 5th checks was 75%, and the average score was also 75% with a good category. The results of this study are the same as research (Hidayati et al., 2022). Where it was found that the non-conformity with the standard was not based on risk analysis and the Precursor category drugs were stored together with the LASA category drugs, the Precursor category drugs should be stored on separate shelves/cabinets based on risk analysis in accordance with the standard (Ministry of Health of the Republic of Indonesia, 2016).

It can be concluded that the storage of high-alert drugs is in accordance with the standards of Permenkes No. 72 of 2016 and BINFAR in 2021. However, the storage of high-alert drugs should be further improved to meet all standard storage requirements in order to minimize errors. Because high-alert drugs often cause errors in taking drugs due to the large number of types of drugs and drug names, this can potentially lead to Medication Errors. Medication Error is an event that can not only harm patients but can endanger patient safety carried out by health workers, especially in terms of patient treatment services that can actually be prevented (Khairurrijal & Putriana, 2017). So, in the storage of high-alert drugs, one must be very careful so that there are no errors in taking drugs.

Results of High-alert Drug Storage Conformity to the Number of Damaged Drugs for the Period February 2023-April 2023

In the period February 2023 - April 2023, no damaged drugs were found in the drug storage in the warehouse or in the depot. However, expired drugs were found in the drug stock. Expired drugs in the pharmaceutical warehouse are stored separately. Drugs that are close to expiration or pharmaceutical supplies that have an expiration date close to 6 months before the expiration date are given special markings. Drugs can avoid damage and minimize the discovery of expired drugs, indicating that the quality of drugs is well maintained. Damaged and expired drugs indicate problems in drug storage procedures in the storage warehouse (Lestari et al., 2020).

Recording of expired or damaged drugs is carried out at stock-taking time, which is carried out once a month at the end of the month according to the established standard operating procedures. Stock-taking is a stock calculation activity that controls the supply of pharmaceutical supplies. The purpose of stock-taking is to ensure the supply of drugs in the storage warehouse so that there is no difference between the stock card and the physical amount of drugs (Lestari et al., 2020).

Criteria

In this study, the respondents were the main pharmaceutical warehouse staff, totaling six people. Respondents have different characteristics, including length of service and age. After collecting questionnaire data, data processing is carried out using the total sampling method.

Length of Service

In the data collection that has been done, it is obtained that most respondents with a length of > 10 years with a percentage result of 67%, 6-10 years with a percentage of 17%, and the smallest percentage of the length of work of 1-5 years with a percentage of 16%. Based on the results of the *chi-square* test between the length of work and the level of staff compliance, it produces a significance value of 0.391; this value is greater than 0.050, which means that there is no significant relationship or influence between the level of staff knowledge and the length of staff work. Based on the test results using the *chi-square* test, the significance value is 0.541, which is greater than 0.050, which means that there is no significant relationship or influence between the level of staff behavior and the length of staff work

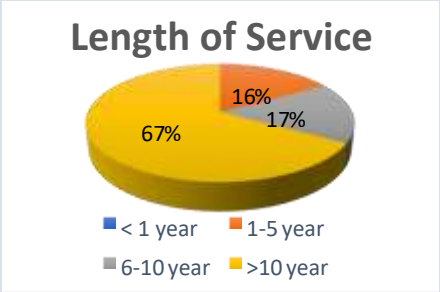

Figure 1. Diagram of Staff by Length of Service

Age

In the data collection conducted, it is known that the most staff aged 2635 years with a percentage of 67% amounted to 4 staff and aged 46-55 years obtained a percentage of 33% with a total of 2 staff. Based on the results of the *chi-square* test, the significance result is 0.670, which is greater than 0.050, which means that there is no significant relationship or influence between the level of staff knowledge and the respondent's age. In the *chi-square* test, the significance value is 0.116, which is greater than 0.050, which means that there is no significant relationship or influence between the level of staff behavior and staff age.

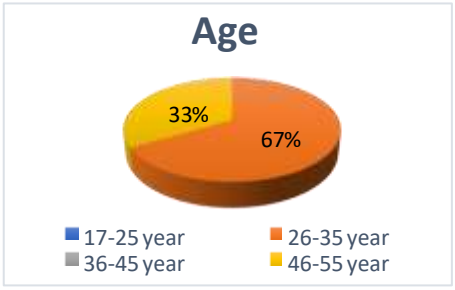

Figure 2. Diagram of Staff by Age

Evaluation of Knowledge and Storage Behavior of High-Alert Drugs

Table 2. Results of Staff Knowledge Score on Storage of High Alert Drugs Based on Permenkes No. 72 of 2016 and Pharmaceutical and Medical Device Development Medical Devices in 2021

Staff Code	Total Score	x̄ Score	Criteria
R1	10	9.17	Good
R2	10		Good
R3	9		Good
R4	9		Good
R5	9		Good
R6	8		Good

In this study, an evaluation was carried out regarding the knowledge of the main pharmacy warehouse staff regarding the storage of high-alert drugs at PMI Bogor Hospital. The evaluation was carried out by giving a questionnaire containing several questions about how to store high-alert drugs that must be answered with correct or incorrect choices, which, if all answers are in accordance with the answer key provided, will get a score of 10.

In Table 2, it can be seen that staff knowledge falls into the good category with an average score of 9.17, so it is certain that all staff members understand the storage of high-alert drugs. However, some staff did not all get a score of 10. On the 7th question point, namely, high-concentration electrolytes are not stored in the nursing unit, some staff answered 'wrong,' which they should have answered 'correct.' This is because some staff are accustomed to storing high-concentration electrolytes in emergency trolleys in the treatment unit, which are equipped with security and clearly labeled, and physical stock checks are carried out once a month so that the safety of high-concentration electrolytes is guaranteed. In the 9th question point, namely, Narcotics and Psychotropic drugs are stored specifically on shelves/cabinets that have one door with a lock/door, some staff answered 'right,' which should be answered 'wrong' because the Narcotics or Psychotropic cabinets must be equipped with two doors and two locks. However, there are staff who do not know this because the Psychotropic storage in the main warehouse has a cupboard with one door and one lock. Poor knowledge about drugs will have an impact on the drug management process, including planning, procurement, storage, and distribution of drugs. If the knowledge of drug management is not good, the drug management officers will be confused in managing the availability of drugs, drug storage, drug distribution, and services to patients. It will hamper drug management, which will have an impact on the health service process (Herlinawati & Lestari, 2020).

Table 3. Results of Staff Behavior Value Towards High-alert Drug Storage Based on Permenkes No. 72 of 2016 and Pharmaceutical and Medical Device Development in 2021

Staff Code	Total Score		Criteria
	Yes	No	
R1	10	0	Good
R2	9	1	Good
R3	10	0	Good

R4	9	1	Good
R5	10	0	Good
R6	9	1	Good
x̄ Score	9.5	0.5	Good

The suitability of drug storage cannot be separated from the performance of staff. So, the staff behavior questionnaire is needed to see a picture of the suitability of knowledge and behavior (Ernawati et al., 2025). The results were obtained in the good category. It can be seen in the table, where three staff scored 10 and 3 other staff scored 9. This is because some staff are responsible for storing drugs in the treatment unit room; the drug is stored on the emergency trolley. High-concentration electrolytes should not be stored in the treatment unit room to prevent careless management but may be stored in the treatment unit if storage is done separately, easily accessible, and not necessarily locked; high-alert labeling is recommended to avoid errors.

CONCLUSION

The storage of high-alert drugs in the pharmaceutical warehouse of the Bogor PMI Hospital is alphabetical, applying the FIFO and FEFO principles and storing them according to the form and type of preparation. The level of conformity of drug storage from the results of observations obtained in the period February 2023 - April 2023, namely obtained an average of 71% LASA *(*Look Alike Sound Alike*)* category drugs with good criteria, 73% High Concentration Electrolyte category drugs with good criteria, Narcotics 88% with very good criteria, Psychotropic drugs with 76% good criteria and Precursors 75% with good criteria. The results of the suitability of high-alert drug storage compared to damaged drugs in the pharmaceutical warehouse of the Bogor PMI Hospital did not contain damaged drugs in the period February 2023 - April 2023. The level of staff knowledge falls into the excellent criteria, with an average point score of 9.17. While the level of staff behavior is 9.5, it is included in the good criteria.

REFERENCES

Arikunto, S. (2010). *Prosedur Penelitian: Suatu Pendekatan Praktik [Research Procedures: A Practical Approach]*. Rineka Cipta.

Bachtiar, A., Setyaningsih, I., & Hidayati, N. R. (2021). Gambaran Pengelolaan Penyimpanan Obat di Gudang Farmasi Rumah Sakit Pertamina Cirebon [Overview of Drug Storage Management in the Pertamina Cirebon Hospital Pharmacy Warehouse]. *Medical Sains : Jurnal Ilmiah Kefarmasian*, *5*(2), 161–166. https://doi.org/10.37874/ms.v5i2.193

Dirjen Bina Kefarmasian dan Alat Kesehatan RI. (2021). *Pedoman Pembinaan dan Pengawasan Fasilitas Pelayanan Kefarmasian*. Kementerian Kesehatan RI.

Duri, I. D., & Defi, D. (2018). Gambaran Penyimpanan Obat di Instalasi Farmasi RSUD dr. M. Yunus Bengkulu [Overview of Drug Storage in the Pharmaceutical Installation at dr. M. Yunus Hospital Bengkulu]. *Jurnal Manajemen Informasi Kesehatan (Health Information Management)*, *3*(2), 45–50. https://doi.org/https://doi.org/10.51851/jmis.v3i2.181

Elis Susilawati, E. S. (2022). Evaluasi Kesesuaian Penyimpanan Obat di Salah Satu Apotek Kota Cimahi [Evaluation of the Appropriateness of Drug Storage in One of Cimahi City Pharmacies]. *Borneo Journal of Pharmascientech*, *6*(1), 31–37. https://doi.org/10.51817/bjp.v6i1.386

Ernawati, E., Damayantie, N., Dewi, M., & Muliyadi, M. (2025). Effectiveness Of Inspecsi Applications On The Quality Of Nursing Care Documentation. *Jurnal Ners*, *9*(2), 1284–1288. https://doi.org/10.31004/jn.v9i2.41246

Herlinawati, H., & Lestari, S. A. (2020). Hubungan Tingkat Pengetahuan dan Pendidikan Dengan Pengelolaan Obat di Puskesmas [Relationship between Knowledge and Education Level with Medication Management at the Health Center]. *Jurnal Kesehatan*, *11*(1), 43–49. https://doi.org/10.38165/jk.v11i1.196

Hidayati, N. R., Indawati, I., Indriaty, S., & Lestiyani, S. (2022). Evaluasi Kesesuaian Penyimpanan Obat High Alert di Instalasi Farmasi Rawat Inap Rumah Sakit Mitra Plumbon [Evaluation of the Appropriateness of High Alert Drug Storage in the Inpatient Pharmacy Installation of Plumbon Partner Hospital]. *Journal of Pharmacopolium*, *4*(3). https://doi.org/10.36465/jop.v4i3.801

IAI. (2015). *Informasi Spesialite Obat Indonesia [Indonesia Drug Specialty Information]*. PT ISFI.

Jaya, I. M. L. M. (2021). *Metode Penelitian Kuantitatif dan Kualitatif: Teori, Penerapan dan Riset Nyata [Quantitative and Qualitative Research Methods: Theory, Application and Real Research]*. Quadrant.

KARS. (2018). *Standar Nasional Akreditasi Rumah Sakit* (1st ed.). Komisi Akreditasi Rumah Sakit.

Kementerian Kesehatan Republik Indonesia. (2016). *Peraturan Menteri Kesehatan Republik Indonesia Nomor 73 Tahun 2016 Tentang Standar Pelayanan Kefarmasian di Apotek [Regulation of the Minister of Health of the Republic of Indonesia Number 73 of 2016 concerning Pharmaceutical Service Standards in Pharmacies]*. Kementerian Kesehatan Indonesia.

Khairurrijal, M. A. W., & Putriana, N. A. (2017). Medication erorr pada tahap prescribing, transcribing, dispensing, dan administration [Medication errors at the prescribing, transcribing, dispensing, and administration stages]. *Majalah Farmasetika*, *2*(4), 8–13. https://jurnal.unpad.ac.id/farmasetika/article/view/15020/10684

Lestari, O. L., Kartinah, N., & Hafizah, N. (2020). Evaluasi Penyimpanan Obat di Gudang Farmasi RSUD Ratu Zalecha Martapura [Evaluation of Drug Storage in the Pharmaceutical Warehouse of Ratu Zalecha Martapura Hospital]. *Jurnal Pharmascience*, *7*(2), 48. https://doi.org/10.20527/jps.v7i2.7926

Notoatmodjo, S. (2010). *Metodologi Penelitian Kesehatan [Health Research Methodology]*. Rineka Cipta.

Nurlina, N., Kamri, A. M., & Arfah, A. N. (2022). Evaluasi Profil Penyimpanan Obat Di Rumah Sakit Islam Faisal Kota Makassar Terhadap Pelayanan Kefarmasian [Evaluation of Drug Storage Profile at Faisal Islamic Hospital Makassar City towards Pharmaceutical Services]. *JUMANTIK (Jurnal Ilmiah Penelitian Kesehatan)*, *7*(4), 383–389. https://doi.org/https://doi.org/10.30829/jumantik.v7i4.12638

Octavia, D. R. (2020). Evaluasi Penyimpanan Obat di Instalasi Farmasi RSI Nashrul Ummah Lamongan Berdasarkan Standart Nasional Akreditasi RS [Evaluation of Drug Storage in the Pharmacy Installation of RSI Nashrul Ummah Lamongan Based on National Hospital Accreditation Standards]. *Jurnal Surya*, *11*(01), 27–33. https://doi.org/10.38040/js.v11i01.80

Sugiyono, S. (2017). *Metode Penelitian: Kuantitatif, Kualitatif, dan R&D [Research Methods: Quantitative, Qualitative, and R&D]*. Alfabeta CV.

Wahyuni, A., Rita Puspa Negara, A., & Nurmiati, N. (2021). Evaluasi Penyimpanan Obat High Alert di Rumah Sakit TK. IV Guntung Payung Banjarbaru [Evaluation of High Alert Drug Storage at Banjarbaru TK. IV Guntung Payung Hospital]. *Jurnal Insan Farmasi Indonesia*, *4*(2). https://doi.org/10.36387/jifi.v4i2.241

Winarni, D. (2019). *Evaluasi Penyimpanan Narkotika, Psikotropika, dan Prekursor Farmasi di Rumah Sakit Jiwa Grhasia Yogyakarta Tahun 2019 [Evaluation of Narcotic, Psychotropic, and Pharmaceutical Precursor Storage at Grhasia Mental Hospital Yogyakarta in 2019]* [Doctoral dissertation]. Universitas Islam Indonesia.