

## Evaluation of Drug Storage at Godean I Health Center

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### ABSTRACT

**Background:** The availability of drugs in health centers must be adjusted to the needs for medical services for the community in their work area. Effective storage of drugs in health centers are needed to maintain the availability of drugs in health centers to avoid the accumulation of drug stocks and shortages of drug stocks that can be detrimental to health centers. The purpose of this study was to evaluate the storage of drugs in Godean I Health Center. **Method:** The research method used is descriptive observational research with a cross-sectional approach. The data collected is secondary data in the form of Drug Usage Report and Request Sheet (LPLPO) and Medication Needs Plan (RKO) documents. The collected data were analyzed using Microsoft Excel **Results:** The results of the drug storage evaluation on the indicator dead stock of drugs 26.58%, average drug empty time 46.12% which is drug shortage day 168,35 days, expired drugs 11.39%, damaged drugs 0%, TOR value 4.81 times/year. **Conclusion:** The result of evaluating drug storage in Godean I Health Center that meets standards is the percentage of damaged drugs.

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## Introduction

Community Health Center (Puskesmas) is a health facility that organizes first-level public and individual health efforts by prioritizing promotive and preventive efforts in the workplace environment. Based on the Regulation of the Minister of Health of the Republic of Indonesia No. 74 of 2016, pharmaceutical services are part of the implementation of health efforts, especially in improving health services for the community [1]. One important part of improving pharmaceutical services in health centers is the availability of drugs. Effective and efficient drug management is a very important part of supporting drug availability [2]. Health centers in drug management include several stages, namely planning, requesting, receiving, storing, distributing, controlling, recording, reporting, archiving, monitoring and evaluating management [1]. The stage that plays an important role in the availability of drugs in health centers is the drug storage stage [3]. Drug storage is the process of arranging drugs to ensure their safety, prevent chemical and physical damage and maintain their quality based on established standards [4]. Ineffective and inefficient drug storage in health centers can cause suboptimal drug availability, such as piling up drug stocks that cause drug storage areas to be full, so that there is a risk of expired drugs, damaged drugs that cause dead drug stocks, and shortages that result in drugs not being available so that this can be detrimental to health centers. Drug storage in health centers can be evaluated using indicators of dead drug stock, average time of drug shortage, expired drugs, damaged drugs, Turn Over Ratio (TOR) [5]. Based on the results of research in several health centers in Indonesia, they still do not meet the standards for planning, storage and drug availability. Research at the Tulungagung Regency Health Center showed that in the drug storage process, there was an indicator of dead drug stock with a percentage of 1.90%. The drug availability process on the average drug availability indicator was 27.69 months (excess) and the percentage of drug availability was 63.38% [6]. In addition, the evaluation of stored drugs at the Barito Kuala "X" Health Center obtained results that were not yet appropriate based on the comparative value of each indicator, namely the percentage of expired drugs in 2021 of 5.37%; the percentage of dead stock of 2.19%; the results of the TOR calculation at the "X" Health Center in 2021 were 1.7 times/year [7]. Evaluation of drug storage is important to be carried out periodically to allow drug management in a health facility. Research related to the evaluation of indicators for planning, storage and availability of drugs has never been conducted before, so Godean I Health Center was chosen as the research location with the hope that it can help improve pharmaceutical services, especially in optimal drug management and maintaining the availability of drugs so that they remain affordable for the community.

## Materials and Method

This study is a descriptive observational study with a cross-sectional approach. The main data in this study are secondary data in the form of Drug Use and Request Report Sheets (LPLPO) and Drug Needs Plans (RKO) for the period January to December 2023. The location of the study was at the Pharmacy Installation of the Godean I Health Center, Godean District, Sleman Regency, Special Region of Yogyakarta. This study was conducted in May 2024.

Evaluation of drug storage using dead stock indicators, average drug shortage time, expired drugs, damaged drugs, Turn Over Ratio (TOR). The data collected were data on all drugs in 2023 in the LPLPO Health Center document. The research instrument was in the form of data collection in Microsoft Excel. After the data was collected, the data processing process was continued using Microsoft Excel, then displayed in percentage form by grouping the results based on the research indicators. In this study, interviews were conducted with pharmacists who were directly responsible for drug storage at the health center to ensure the results of the research data obtained. The formula used to illuminate each indicator can be seen in table 1.

**Table 1.** Indicator Formula

No	Indicator	Calculation Formula	Standard Value
1	Percentage of dead stock of drugs	$\frac{\text{Number of types of drugs not used for 3 consecutive months}}{\text{Number of types of drugs available}} \times 100\%$	0%
2	Percentage Average drug	$\frac{\text{Number of days of drug shortage in 1 year}}{\text{Total types of drugs} \times 365 \text{ days}} \times 100\%$	0%

No	Indicator	Calculation Formula	Standard Value
	shelf life is 1 year		
3	Drug shortage day	$\frac{\text{Percentage number of days of drug shortage in 1 year}}{100} \times 100\%$	10 days
4	Percentage of expired/damage drugs	$\frac{\text{Number of expired/damage drugs in 1 year}}{\text{Number of types of drugs available}} \times 100\%$	0%
5	Turn Over Ratio (TOR)	$\frac{(\text{initial stock} + \text{total receipts}) - \text{ending stock}}{\text{average inventory}} \times 100\%$	8-12 times/year

### Results and Discussion

This retrospective study uses data on all drugs managed by the Community Health Center Godean 1 for 2023 based on LPLPO 2023. The storage evaluation results are presented in Table 2.

**Table 2.** The Results of evaluation of drug storage at Godean I Community Health Center

No	Indicator	Standar Value	Result	interpretation
1	Percentage of dead stock of drugs	0%	12.03%.	not appropriate
2	Percentage Average drug shelf life is 1 year.	0%	46.12%	not appropriate
3	Drug shortage day	10 days	168 days	not appropriate
4	Percentage of expired/damage drugs	0%	11.39%.	not appropriate
5	Percentage of damage drugs	0%	0%	appropriate
6	Turn Over Ratic (TOR)	8-12 times/year	4.81 times/year	not appropriate

### Discussion

The percentage of dead stock of medicines at the Godean I Community Health Center was 12.03%. The percentage of dead stock is the stock of drugs that are not used or have no transactions for 3 consecutive months. This shows that the stock of dead drugs does not meet the standard of 0%. The cause of dead stock is due to changes in prescribing patterns due to changes in doctors who write prescriptions. Apart from that, there are emergency drugs such as Atropine Sulfate inj. 0.25mg/ml, Calsil Gluconate inj. 100 mg, Diazepam injection. 5 mg/ml-2 ml, Rectal Diazepam 10 mg/2.5 ml, Rectal Diazepam 5 mg/2.5 ml and Magnesium Sulfate inj. 20% is not always used so it becomes dead stock of medicines. The occurrence of dead stock of drugs is related to low TOR values. If drug turnover is low, it is caused by dead stock due to drugs not being released. The efforts that have been made by the Godean I Community Health Center to prevent dead stocks are by coordinating with doctors to prescribe drugs that are still in stock, so that they can optimize the use of drugs that are still available. Dead stock of medicines can cause the circulation of medicine supplies to become less smooth because medicines that are not released can become damaged in storage and expire [3]. In line with the research entitled "Evaluation of Drug Storage Management at the "X" Health Center, Barito Kuala Regency", the

percentage of dead stock of drugs was 2.19%. This result is due to the presence of drugs in the vital and essential categories, so that drug stocks must always be available in basic health services even though prescriptions are rarely carried out because they depend on the incidence of the disease [8]. Another study at the Margamulya Community Health Center in North Bekasi District found a dead stock percentage of 37.58%. The high dead stock value is due to several factors, such as the use of government-provided drugs, which are only required once every six months, a decrease in patient visits during the Covid-19 pandemic, and sometimes a lack of information to doctors regarding drug availability at the community health center [9]. A study showed that the causes of dead stock and slow-moving drugs at Kendari City Hospital are due to prescribing patterns, control systems, and planning. In prescribing patterns, dead or slow-moving drugs occur due to the large number of cases of drugs being slowly distributed and eventually expiring. This occurs due to changes in doctors who have different prescribing patterns. This can be addressed by adherence to prescribing standards based on the national formulary [10]. Previous research conducted at the Magelang Community Health Center stated that the dead stock percentage was 9%, expired drugs were 4%, with a loss of Rp2,903,954, and damaged drugs were 0%. This is due to changes in doctor's prescribing patterns and the absence of a type of disease that requires the drug, resulting in no expenditure [11]. A similar study at the Saptosari Gunungkidul Community Health Center pharmacy warehouse found that 17 out of 157 drug items had no transactions for 3 consecutive months. The dead stock percentage was 10.82% [12]. Dead stock can disrupt drug inventory turnover because unused drugs can be damaged in storage and expire. Several ways to ensure the occurrence of dead stock are for warehouse staff to inform doctors of drugs that are almost out of stock, so that doctors can prescribe the drug. In addition, pharmacists and warehouse staff know which drugs are rarely used and which are frequently used before carrying out the procurement process [13]. Dead stock is a consequence of inefficiencies in the procurement system, as drug procurement should be based on planning and needs. Before procuring drugs, it is important to identify slow-moving and fast-moving drugs as a way to address dead stock [14]. Several ways to reduce the occurrence of dead stock are for warehouse staff to ensure that doctors notify doctors of drugs that are almost out of stock, so that doctors can prescribe the drug. In addition, pharmacists and warehouse staff know which drugs are rarely used and which are frequently used before carrying out the procurement process [13].

The average duration of drug shortages at Godean I Community Health Center, as shown in table 2, is 168.35 days, representing a percentage of 46.12%. The standard average duration of drug shortages is 10 days, representing a percentage of 0%. The results of this study indicate that the average duration of drug shortages at Godean I Community Health Center remains quite high. Drug shortages are caused by an increase in cases and an empty stock of drugs from the Health Office. Based on the results of the data analysis that has been carried out, several drugs remain due to an increase in cases caused by the use of drugs that have run out before one year. This causes drug availability to be empty. Several things that Godean I Community Health Center has done to prevent drug shortages at the community health center include replacing drugs with drugs with the same efficacy to replace empty drugs. In addition, they can make their own purchases until drug stocks at the Health Office are available again and carry out drug relocation between community health centers, namely the process of transferring drugs from one community health center to another that needs drugs. Drug shortages occur due to a lack of proper planning, such as inaccurately calculating the quantity of drugs and selecting the types of drugs needed by the health center. Godean I Health Center has implemented a Regional Public Service Agency (BLUD) to ensure drug availability so that if there is a drug shortage, the Sleman Regency Health Office can make its own purchases from Pharmaceutical Wholesalers (PBF). Factors that influence the empty time are drug planning, especially in determining the average monthly usage. In drug planning, data on drug empty time can be used to anticipate drug shortages in the following year [15]. In line with research at Gamping II Health Center, Sleman, the average drug inhalation time was 58.4 days with a percentage of 16% [16]. In addition, research results at Ngaglik 2 Health Center, Sleman Regency showed an average percentage of drug empty time of 30% [17]. Another study at the Jombang Regency Health Center found an average drug empty time of 27.60%, which is 100.74 days of drug shortages caused by inaccuracies in drug planning due to the calculation of drug needs and there are drugs that are still needed but are no longer included in the DOEN (National Essential Drug List) and FORNAS (National Drug Formulary) so

that drug procurement cannot be carried out [18]. Inappropriate drug planning will result in drug shortages at certain times, so it must be done correctly in calculating drug needs. Factors that influence empty time are drug planning, especially in determining average usage per month. In drug planning, drug empty time data can be used to anticipate drug shortages in the following year. In addition, the problem of drug availability also occurs due to the unavailability of the same drugs at the district pharmacy installation and delays in collecting or sending drugs from the district pharmacy installation by the community health center which is also caused by the geographical location of the community health center which is difficult to reach, as well as limited transportation, or availability from the District or City Health Office Pharmacy Warehouse [19].

The percentage of expired medicines at the Godean I Community Health Center is 11.39% with a loss value of Rp. 1,293,148. These results still do not meet the standard, namely 0%. There are 18 types of drugs that have expired, including Mefenamic Acid 500 mg, Atapulgit tab. 600 mg, Atropine Sulfate inj. 0.25 mg/ml, Doxycycline 100 mg, Haloperidol inj. 5 mg/ml, Lidocaine HCl inj. 2%, Methyldopa tab. 250 mg, Methylergometrine M. inj. 0.200 mg, Ranitidine inj. 50 mg/2 ml, Rifapentin 300 mg/Isoniazid 300 mg (3HP), Ringer Lactate lar. Infusion 500 ml, Risperidone 2 mg, Ointment 2-4, Serum ATS inj. 1,500 IU/amp, Cetirizine Syrup 5 mg/5 ml, Potassium and Zinc Tablets tab. 20 mg. Expired medication is caused by a change of doctor so that the prescribing pattern changes, there is a change in disease pattern and the presence of emergency medication such as Atropine Sulphate inj. 0.25mg/ml, Methylergometrine M. inj. 0.200 mg and Ringer's Lactate sol. 500 ml infusion which was not used optimally so it was stored in the warehouse for too long. The percentage of expired medicines indicates a lack of precise planning due to the excessive number of medicines planned, causing excess medicine stock. Expired medicine is one of the causes of losses for the government, so if medicine management is carried out well it can minimize the losses incurred [20]. In line with the Bantul I Health Center, the percentage of expired drugs was 10.96% [21]. Another study conducted at two community health centers (Puskesmas) in Pontianak City found expired medication percentages of 16.7% and 15.4%. Interviews with the pharmaceutical departments of both health centers revealed that this high percentage of expired medications is due to changes in disease patterns and prescriptions, leading to inaccuracies in planning by the health centers. Many expired medications are no longer used, resulting in expired prescriptions [22]. Another study conducted by Rukmana et al. (2023) at the Margamulya Health Center, North Bekasi District, obtained a percentage of expired drugs of 3.29%. This is because the demand for drugs is high, but there is a decrease in cases and doctors tend to prescribe different types of drugs more often. The percentage of expired drugs shows that planning is not appropriate because the number of drug plans is excessive, resulting in excess drug stock. Excessive drug stock can cause drugs to pile up in the warehouse and are likely not used. The drug will be stored for a long time, causing damage to the drug and the drug to expire [9]. In addition, the inaccuracy of drug receipt is because the number of drugs provided by the Health Office exceeds that requested by the health center. Several types of drugs were added because they were considered necessary and because of the receipt of drugs from the Health Service that were approaching their expiration date. Expired drugs are one of the causes of losses for the government, thus if drug management is carried out properly, it can minimize the losses incurred [20]. Another study at the Harapan Raya Community Health Center in Pekanbaru City showed that a large number of medications were in good condition, including amlodipine 10 mg (5,000 tablets), vitamin C 50 mg (6,179 tablets), and isoniazid (108 tablets). These expired medications were caused by changes in disease patterns, inaccurate planning, and the continued stockpiling of medications received by the community health center, which led to a buildup of medications and the resulting expired medications. Furthermore, substandard storage also contributed to the increase in the number of expired medications. Therefore, improvements are needed in the community health center's medication management system to reduce medication risks, increase the efficiency of medication use, and ensure the availability of medications appropriate to patient needs [23].

Based on the results of the study, the percentage of damaged drugs at the Godean I Health Center was 0%, which has met the standards. The absence of damaged drugs was due to the pharmaceutical warehouse space at the Godean I Health Center having met the standards for drug storage, such as a dry room, not humid because it is equipped with a temperature controller (AC) and humidity is always monitored using a hygrometer. A good storage space also

needs to pay attention to sanitation, temperature and ventilation conditions so that product quality is maintained. This can support the drug storage process to minimize damage to the drug. Another effort that has been made by the Godean I Health Center is that if there is a damaged drug when received, it will be immediately returned to the Sleman Regency Health Office. In line with research at the Magelang Regional Health Center, it showed that the results of the percentage of damaged drugs were in accordance with the standard, namely 0%, because drug storage had met the standards for pharmaceutical services at the health center [24]. Another study conducted by Sidrotullah et al (2023) at the Narmada Health Center showed that the percentage of damaged drugs with a standard of 0% had been achieved. Damaged drugs indicate inaccuracy in planning so that there is a delivery of drug availability that causes damage to the drug. Damaged drugs are caused by physical changes in the drug and factors in the drug storage room that do not meet standards such as room conditions with poor air circulation, which can accelerate the drug to become damaged [25]. Other research at Health Centers X and Y in the Magelang area showed the same results, no damaged drugs were found. Damaged drugs are drugs that have experienced changes in quality such as changes in smell, shape, color and taste of the drug. Based on research that has been conducted at Health Center X in Magelang City and Health Center Y in Magelang Regency, no damaged drugs were found because drug storage at Health Center X and Health Center Y was in accordance with pharmaceutical service standards at the health center [24]. Damaged or expired medications can occur due to storage conditions that do not meet requirements and improper medication arrangement. This can be avoided by storing medications according to temperature and humidity, and by implementing the first-in-first-out (FIFO) and first-expired-first-out (FEFO) systems [26].

The calculation result of Turn Over Ratio (TOR) value in Godean I Health Center is 4.81 times/year. This result is still below the standard value that has been set, which is 8-12 times/year. The low TOR value is related to the results of other indicators such as excessive precision of drug planning. Low drug turnover occurs due to excessive planning, so that there are some drugs that are planned but not implemented. Low drug inventory turnover is related to drug dead stock, the results of this study indicate excessive drug dead stock. This is because there are drugs that are not dispensed or not used for 3 consecutive months, causing drug circulation to not run smoothly. The low TOR value also illustrates that low drug turnover is caused by excess drug stock [8]. This study obtained a high excess drug stock. This drug overstock can cause drugs to pile up in the warehouse and possibly not be used, so that it can cause an increase in expired and damaged drugs and dead drug stock. Similar to other studies at the "X" Community Health Center in Sleman Regency which showed results that the TOR value was 5.2 times per year [27]. Another study conducted by Astuti et al (2022) entitled "Evaluation of Drug Distribution and Storage at the Purwojati Health Center, Banyumas Regency" obtained a TOR value of 3.13 times/year which does not meet the standard. The cause of the low TOR value is the lack of accuracy in drug planning due to Covid-19, resulting in reduced visitors and drug turnover [28]. The smaller the TOR number, the longer the average time the drug stock is held in storage, which will also affect the storage costs which will be greater. Excessive drug planning also has an impact on the low TOR value, which will cause drug stocks to pile up at the health center and not be used because the stock exceeds existing needs, then the drug has the potential to expire [29]. The level of distribution efficiency is directly proportional to the turnover ratio. The higher the turnover ratio, the more efficient the distribution. A low TOR value indicates significant procurement with an imbalance between demand and demand. Procurement from the Health Office through a grant method also increases inventory values because community health centers are required to receive large quantities of pharmaceutical preparations. The large number of satellites/service units results in increased distribution activity, which can impact the reduction in the TOR value [30].

## Conclusion

The results of the evaluation of drug storage at the Godean I Health Center that meet the standards are the percentage of damaged drugs. Indicators that do not meet the standard value include other dead drug stocks exceeding the standard caused by low drug turnover, the average time of drug shortages that occurs due to increasing cases that cause drug use to run out before one year. The high percentage indicator of expired drugs is caused by the receipt of drugs from

the Sleman Regency Health Office that is approaching the expiration date. The low TOR value is caused by slow drug turnover. In further research, research can be conducted related to drug management in the request and receipt process, because it is related to the level of drug availability.

### Declaration

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