

Analysis of Drug Supply Management of the Pharmacy Warehouse of Prof. Dr. Soerojo Mental Health Hospital, Magelang, Indonesia

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Abstract

The World Health Organization (WHO) states that drugs take the largest portion of the healthcare expenditure budget. In developing countries, the drugs budget ranges from 24%–66% of the total and should therefore be managed effectively and efficiently. In Indonesia, the drug budget consumes around 40% of total healthcare expenditure. This study aimed to determine the effectiveness and efficiency of the drug supply management of the pharmacy warehouse of the Prof. Dr. Soerojo Mental Health Hospital in the Magelang subdistrict, Central Java Province, Indonesia. This is a non-experimental descriptive study in which quantitative data were retrospectively obtained by observing and tracing documents on the drug supply management process at the hospital's pharmacy warehouse, i.e., the selection, planning, procurement, storage, and distribution. The obtained data were analyzed with indicators of effectiveness and efficiency of drug supply management from the Indonesian Ministry of Health and a hospital indicator as a complement. Results showed that the conformity of drug selection was 81%; drug planning was 65.93% for budgets and 61% for the number of drug types; drug procurement was 7.2% for allocated budgets, 0% for incorrect invoices, and 1.5 times for delayed payments; drug storage was 100% for drugs listed on stock cards, 0.1% for expired and damaged drugs, and 2.6% for dead stock; and drug distribution was 100% for serviced drugs. It can be concluded that the process of selection, procurement, storage, and distribution shows conformity; in contrast, the planning processes were not found to conform. This study suggests that the pharmacy installation of the hospital should improve the quality of the drug supply management performance by optimizing the use of information system management to evaluate the supply management on a regular basis, based on predetermined indicators. This will enable the next steps to be taken to improve the effectivity and efficiency of the management.

Keywords: Drug supply management • Hospital • Pharmacy warehouse • Pharmaceutical services

Introduction

The World Health Organization (WHO) states that drugs take the largest portion of the healthcare expenditure budget. In developing countries, the drugs budget ranges from 24%–66% of the total and should therefore be managed effectively and efficiently. In Indonesia, the drug budget is around 40% of the total healthcare expenditure budget. Unfortunately, many Indonesians may not have access to essential drugs for a number of reasons. The available budgets are very limited and are often also spent on ineffective, unnecessary, or even dangerous drugs [1]. Drug budgets for basic health service purposes may vary greatly from one district to another, due to differences in local government perceptions and priorities regarding health. However, central government remains responsible for assisting districts or municipalities in providing drugs and other pharmaceutical preparations for disasters and for a lack of drugs [2].

Drug supply management is one of the hospital pharmaceutical service activities carried out by the pharmacy installation. The activities mainly include selection, planning, procurement, storage, and distribution [3]. The aim of these activities is to provide drugs in sufficient quantities with guaranteed quality and affordable prices to support the quality of pharmaceutical services. It is vital for the overall management of hospital activities as it has a negative impact on the hospital, both medically and economically, if the services are inefficient. Therefore, this management is expected to run well, in order to achieve effective and efficient management goals.

As healthcare providers, hospitals are expected to provide fast, complete, and affordable services to all levels of society, with the humanitarian principles of realizing optimal public health degrees through the provision of quality health services. Based on the Regulation of the Minister of Health

of the Republic of Indonesia Number 58 of 2014, the pharmacy installation describes a functional implementing unit that organizes all activities on pharmaceutical services in the hospital. The services are an inseparable part of the hospital health care system oriented to patient care, providing quality and affordable pharmaceutical preparations and medical devices, as well as disposables, for all levels of society, including the clinical pharmacy services, which aim to identify, prevent, and resolve drug-related problems.

Drugs are an essential component in healthcare facilities, including hospitals, because they can affect the quality of pharmaceutical services if they are not well provided. To ensure their availability, an effective and efficient drug supply management is essential. Therefore, it is necessary to evaluate the drug supply management in the pharmacy warehouse of the Prof. Dr. Soerojo Mental Health Hospital in the Magelang Subdistrict, Central Java Province, Indonesia, in order to determine its conformity with supply management indicators.

Materials and Methods

This is a non-experimental descriptive study in which quantitative data were retrospectively obtained by observing and tracing documents on the drug supply management at the pharmacy warehouse of Prof. Dr. Soerojo Mental Health Hospital in the Magelang Subdistrict, Central Java Province, Indonesia from December 2020 to April 2021. Activities on the supply management included selection, planning, procurement, storage, and distribution. The instruments used in this study include:

1. Hospital formulary and hospital reports (including drug stock; drug planning; drug purchase; hospital drug management budget; and hospital budget), stock cards, invoices, cost of purchase, drug orders, and a list of damaged, expired, and unused drugs; drugs serviced; and prescribed drugs.

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2. Indicators of effectiveness and efficiency of drug supply management by the Indonesian Ministry of Health [4], and a hospital indicator taken from a previous study as a complement [5].

Table 1 shows a list of formulas for each parameter of the drug supply management activities applied in the pharmacy warehouse of the Prof. Dr. Soerojo Mental Health Hospital of Magelang.

Results

Selection

The percentage conformity of drug types available at the pharmacy warehouse of the Prof. Dr. Soerojo Mental Health Hospital of Magelang compared with the list of hospital formulary was 81% (Table 2), which is in accordance with the standard. A good conformity for this indicator ranges from 80%–100%.

Planning

Percentage conformity of available budgets to required budgets: The percentage conformity of this indicator, as presented in Table 3, was found to be 65.93%, which was lower than the standard and therefore ineffective. This indicates that available budgets have not been effective for drug planning at the pharmacy warehouse of the Prof. Dr. Soerojo Mental Health Hospital of Magelang. An effective conformity should reach 100%.

Percentage conformity of drug planning to actual use for each drug type: Table 4 presents the non-conformity regarding drug planning to actual use for each drug type in the pharmacy warehouse of the Prof. Dr. Soerojo Mental Health Hospital of Magelang, with a percentage of 61.07 being lower than the standard, and therefore ineffective. This shows that the drug planning activities at the pharmacy warehouse were not in line with the actual use.

Procurement

Percentage conformity of allocated budgets for drug procurement: The percentage conformity of allocated budgets for drug procurement at the Prof. Dr. Soerojo Mental Health Hospital of Magelang, shown in Table 5, was found to be 7.21%, which was lower than the 30%-40% standard required. This means that indicators regarding allocated budgets for drug procurement at the pharmacy warehouse are inefficient.

Frequency of incorrect invoices: The Pharmacy Warehouse of the Prof. Dr. Soerojo Mental Health Hospital of Magelang had no report regarding incorrect invoices as the invoices were immediately returned to distributors or suppliers if any errors were found.

Frequency of delayed payment at the due date: The frequency of delayed payment at the due date at the pharmacy warehouse of the Prof. Dr. Soerojo Mental Health Hospital of Magelang, shown in Table 6, was 1.5 times. According to the standard of drug management [5], a good value for this indicator ranges between 0–25 times. This shows that activities on invoice payment by the pharmacy warehouse to distributors or suppliers have been effective and efficient.

Storage

Percentage conformity of drug type listed on the stock card vs. actual use: The percentage conformity of drug type listed on the stock card compared with the actual use at the pharmacy warehouse of the Prof. Dr. Soerojo Mental Health Hospital of Magelang, shown in Table 7, was 100 percent, meaning that the indicator was effective.

Percentage conformity of damaged or expired drugs: Table 8 shows the percentage conformity of damaged or expired drugs, which was found to be 0.1%, meaning that this indicator meets the standard, which states that the expired or damaged drug standard should be equal or less than 0.2%. This indicates that the percentage conformity of expired or damaged drugs at the pharmacy hospital was effective and efficient.

Percentage conformity of dead stock: The percentage conformity of dead stock at the pharmacy warehouse of the Prof. Dr. Soerojo Mental Health Hospital of Magelang was 2.6%, which is greater than the 0% standard, as shown in Table 9. This shows that this indicator was not efficient as it did not meet the standard [5].

Distribution

The percentage conformity of drugs serviced to the patients at the pharmacy warehouse of the Prof. Dr. Soerojo Mental Health Hospital of Magelang was 100%, according to Table 10, which was in accordance with the drug management standard, in which the standard value for measuring the efficiency of the percentage of drug prescriptions served was 100%. Thus, the findings of the study indicate that prescription services at the pharmacy installation of the hospital were effective and efficient.

Table 1. A list of formulas for each indicator of drug management supply in the pharmacy warehouse of the prof. Dr. Soerojo mental health hospital of magelang.

Indicators	Formula	Standard
Selection	$Z = X/Y \times 100\%$	100%
	X=number of available drug types	
	Y=number of drug types listed in the hospital formulary	
Planning	$Z = X/Y \times 100\%$	100%
	X=available budgets in drug planning	
	Y=required budgets in drug planning	
	$Z = X/Y \times 100\%$	100%
	X=number of drug types in drug planning	
	Y=number of drug types in real use	

Procurement	$Z=X/Y \times 100\%$	30%-40%
	X=required budgets in drug procurement	
	Y = available budgets in drug procurement	
	$Z=X/Y \times 100\%$	0%
	X=number of incorrect invoices	
	Y=number of received invoices	
Storage	$Z=X/Y$	0%-25%
	X=Difference between payment date and due date (days)	
	Y=Due date	
	$Z=X/Y \times 100\%$	100%
	X=number of drug types listed on stock card	
	Y=number of drug types in real use	
Storage	$TOR=(X1+Y - X2)/X3$	10-23x
	X1=beginning inventory	
	X2=ending inventory	
	X3=average inventory	
	Y=purchase	
	$X=A/B \times 100\%$	$\leq 0.2\%$
	A=number of damaged or expired drugs	
	B=number of stock-takings	
	$X=A/B \times 100\%$	0%
	A = number of one-year-unused drug types	
B = number of available drug types		
Distribution	$X=A/B \times 100\%$	100%
	A=number of serviced drug types	
	B=number of prescribed drug type	

Table 2. Conformity (%) of available drug types at the pharmacy warehouse of the prof. Dr. Soerojo mental health hospital of magelang with the hospital formulary.

Description	Values (n)	Conformity (%)	Standard (%)
Number of drug types available in the pharmacy warehouse	941	81	80%–100%
Number of drug types listed in the hospital formulary	984		
Number of drug types available in the pharmacy warehouse and listed in the hospital formulary	803		

Table 3. Conformity (%) of available budgets to required budgets at the pharmacy warehouse of the prof. Dr. Soerojo mental health hospital of magelang.

Description	Values (IDR)	Conformity (%)	Standard (%)
Available budgets in drug planning	8,132,514,105	65.93	100%
Required budgets in drug planning	12,335,227,000		

Table 4. Conformity (%) of drug planning to actual use for each drug type at the pharmacy warehouse of the prof. Dr. Soerojo mental health hospital of magelang.

Description	Values (n)	Conformity (%)	Standard (%)
Number of drug types in drug planning	601	61.07	100%
Number of drug types in real use	984		

Table 5. Conformity (%) of budget allocations for drug procurement at the pharmacy warehouse of the prof. Dr. Soerojo mental health hospital of magelang.

Description	Values (IDR)	Conformity (%)	Standard (%)
Allocated budgets for drug procurement	12,335,227,000	7.21	30%-40%
Real budgets for drug procurement	170,939,720,000		

Table 6. Conformity of delayed payment at the due date at the pharmacy warehouse of the prof. Dr. Soerojo mental health hospital of magelang.

Description	Values (days)	Conformity	Standard
Difference on payment date and due date	932	1.5	0%–25%
Due date	60		

Table 7. Conformity (%) of drug types listed on the stock card compared to real use at the prof. Dr. Soerojo mental health hospital of magelang.

Description	Values (n)	Conformity (%)	Standard (%)
Number of drug types listed on the stock card	316	100	100%
Number of drug types in real use	316		

Table 8. Conformity (%) of damaged or expired drugs at the pharmacy warehouse of the prof. Dr. Soerojo mental health hospital of magelang.

Description	Values (IDR)	Conformity (%)	Standard (%)
Values of expired drugs	13,799,929	0.01	≤ 0.2%
Values of stock-taking at the end of year	8,132,514,105		

Table 9. Conformity (%) of dead stock at the pharmacy warehouse of the prof. Dr. Soerojo mental health hospital of magelang.

Description	Values (n)	Conformity (%)	Standard (%)
Number of unused drug types in a year	26	2.6	0%
Number of available drugs	984		

Table 10. Conformity (%) of drug distribution of the pharmacy warehouse of the prof. Dr. Soerojo mental health hospital of magelang.

Description	Values (n)	Conformity (%)	Standard (%)
Number of serviced drug types	20,603	100	100%
Number of prescribed drug types	20,603		

Discussion

The availability of drugs in complete types and sufficient quantities, with guaranteed efficacy, safety, efficiency, and high quality, is an achievement in terms of healthcare services. To ensure the availability, distribution, and affordability of drugs, it is necessary to have an effective and efficient drug supply management. The activities of management include: selection, planning, procurement, storage, and distribution. In actual practice, there are problems related to the management, and an observational field study is therefore needed to determine the extent to which the drug supply management activities at the pharmacy warehouse of the Prof. Dr. Soerojo Mental Health Hospital of Magelang conform with the standard.

Selection

Selection involves activities to determine the type of drugs and pharmaceutical preparations required, according to needs. The selection

at hospitals should be based on the hospital formulary and agreed standards of treatment or diagnosis and therapy, effectiveness and safety, evidence-based treatment, quality, price, and availability in the market [6]. The evaluation of the selection process of drugs and pharmaceutical preparations was carried out by calculating the percentage conformity of the number of drug types available at the pharmacy warehouse versus the number of drug types included in the hospital formulary. The measured data for the selection process were retrospectively taken from the 2019 drug management data of the hospital.

The drug selection process in the pharmacy warehouse of the Prof. Dr. Soerojo Mental Health Hospital of Magelang showed conformity with the standard. This was because the Pharmaceutical and Therapy Committee of the hospital take control in the selection process and carry out the process once every year. An evaluation is also conducted if there are any required drugs not yet listed in the hospital formulary.

Planning

Drug and pharmaceutical preparation planning is the process that occurs in the supply management activities after selecting the type of drug and other pharmaceutical preparations [7]. The number of drugs is adjusted to the need and budget of the hospital, with the aim of avoiding drug unavailability. It is implemented using an approach such as consumption, epidemiology, and a combination of both, and the approach is adjusted based on the available budget in the hospital. There are two indicators in this activity: a comparison of available budgets with required budgets and a comparison of drug planning with actual use for each drug type.

The percentage conformity of available budgets to required budgets aimed to determine how effective the budget for planning the drugs needed by the pharmacy warehouse of the hospital is compared to the available budget for the drug supply management at the hospital. The findings showed that the available budgets were not effective for this indicator. According to a previous study [8], to make the budgets more effective and efficient, the use of an e-catalogue is suggested.

The percentage conformity of drug planning to actual use for each drug type mainly aimed to determine the accuracy of drug selection during drug planning. In this study, the indicator was shown to be ineffective due to the accumulation of drugs in the department of pharmacy service and pharmacy warehouse; therefore, no drug planning was carried out, which caused the available budgets to be greater than required.

Procurement

Procurement is an activity to realize the need for drugs and other pharmaceutical preparations in accordance with their number and type [9]. It consists of 3 indicators, namely: the percentage of allocated budgets for drug procurement, the frequency of incorrect invoices, and the frequency of delayed payment at the due date. All activities are carried out after drug planning has been agreed and approved by hospital officials.

The percentage of allocated budgets for drug procurement aims to determine the budgets provided by the hospital to pharmaceutical installations for drug procurement (required budgets) compared to the overall hospital budgets (available budgets). The percentage of allocated budgets for drug procurement at the Prof. Dr. Soerojo Mental Health Hospital of Magelang was reported to be inefficient because of fluctuations in the need for numbers and types of drug.

The indicator concerning the frequency of incorrect invoices is meant to measure how many times invoice errors occur in drug supply management activities of hospitals. The incorrect invoices that occurred in the pharmacy warehouse of the Prof. Dr. Soerojo Mental Health Hospital of Magelang included a mismatch between the type of drug listed on the invoice and the received drug. When drugs and other pharmaceutical preparations arrive at the pharmacy warehouse, staff will immediately check the physical condition of the drugs against the data of the drug type listed on the invoice. Therefore, if an invoice error occurs, it can be identified immediately. Incorrect invoices are not documented by the hospital, since the receiving staff immediately exchange or replace the drugs whenever nonconformity occurs between the drugs and the invoice. The frequency of incorrect invoices at the pharmacy warehouse reportedly occurs minimally, as the procurement is carried out in accordance with applicable procedures.

The frequency of delayed payment at the due date determines the quality of payment made by the hospital at the due date. This study found that payments by the finance department of the hospital were effective and efficient. In most cases, delayed invoice payments were caused by incorrect invoices, drugs ordered by the hospital but not yet completed, and a lack of revision of incorrect invoices.

Storage

Storage is an activity to maintain the quality and safety of drugs and other pharmaceutical preparations before they are used in accordance with pharmaceutical requirements [10]. The included requirements are intended

for safety, stability, sanitation, light, ventilation, and humidity, as well as the classification of types of drugs and other pharmaceutical preparations [11]. The pharmacy installation should be able to ensure that each drug or preparation is stored properly and is periodically inspected. The storage activities consist of 3 indicators, including percentage conformity of drug type listed on the stock card versus the actual use, percentage conformity of damaged or expired drugs, and percentage conformity of dead stock.

The percentage conformity of the drug type listed on the stock card compared to the actual use in the pharmacy warehouse of the Prof. Dr. Soerojo Mental Health Hospital of Magelang was in accordance with the standard. Data for this indicator were obtained by matching the physical number of drug types listed on the stock card with the actual use. As staff routinely check the number of drugs against the stock cards in the pharmacy warehouse, the physical accuracy of the number of drugs versus the stock cards was always correct.

The indicators of damaged or expired drugs at the hospital showed conformity. Damaged or expired drugs in the pharmacy warehouse occurred minimally, as the procurement process of drugs and other pharmaceutical preparations is concerned with expiration dates, which range from 1 to 2 years from the date of purchase.

The indicators of dead stock, as the name implies, aim to determine the amount of dead stock of drugs available at the pharmacy warehouse of the Prof. Dr. Soerojo Mental Health Hospital of Magelang. This study found that the indicator was inappropriate, suggesting that better control activities are needed in terms of drug distribution in the pharmacy warehouse.

Distribution

Distribution relates to the series of activities carried out to distribute the drugs or other pharmaceutical preparations from storage to the patient care units, while still paying attention to their quality, type, quantity, stability, and timeliness [12-14]. In the Prof. Dr. Soerojo Mental Health Hospital of Magelang, it was reported that prescription services at the pharmacy installation were effective and efficient, which means that activities of supervision and control relating to drug storage and the distribution process in the pharmacy warehouse were effective.

The results of this observational field study reported that drug supply management activities, such as selection, procurement, storage, and distribution, at the Prof. Dr. Soerojo Mental Health Hospital of Magelang showed conformity. Unfortunately, the indicators of planning were not appropriate in terms of the standard. Based on the results of this study, it is suggested that the pharmacy installation of the hospital should improve the quality of the drug supply management performance by optimizing the use of information system management to evaluate the supply management on a regular basis, based on predetermined indicators. This will enable the next steps to be taken to improve the effectivity and efficiency of the management.

Conclusion

It can be concluded that the process of selection, procurement, storage, and distribution shows conformity; in contrast, the planning processes were not found to conform. This study suggests that the pharmacy installation of the hospital should improve the quality of the drug supply management performance by optimizing the use of information system management to evaluate the supply management on a regular basis, based on predetermined indicators. This will enable the next steps to be taken to improve the effectivity and efficiency of the management.

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Research Ethics

The protocols of this study were officially approved by the Research Ethics Committee (KEPK) of The Faculty of Medicine and Health Sciences of Universitas Muhammadiyah Yogyakarta (No.059/EC-KEPK FKIK UMY/II/2021).

Declaration of Competing Interests

The authors declare no conflicts of interests relative to this study.

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