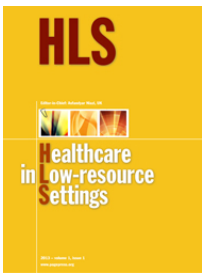
Healthcare in Low-resource Settings



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The evaluation of drug management (selection, procurement, and lead time of drug order) in hospital during COVID-19 in Indonesia

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Abstract

In the current COVID-19 era, one of the critical factors influencing the quality of hospital services is drug management, with planning and procurement being particularly pivotal to avoid drug shortages. This study aimed to examine the selection, procurement, and lead time aspects of drug management at the pharmacy installation hospital in Jakarta during the COVID-19 pandemic. Conducted as a descriptive study with retrospective data, total sampling was utilized to collect data, incorporating 1,413 drugs. The data, collected on observation sheets, underwent univariate analysis using Microsoft Excel. Results indicated that out of the seven measurable indicators, two met the standards: the percentage of allocated funds for drug procurement at 70.5%, and the frequency of errors in orders occurring five times. However, five indicators fell below the standards: the suitability of drug items with the National Formulary at 14.15%, the suitability of drug items with the Hospital Formulary at 68.15% (with an 80% benchmark), the frequency of each item's procurement in a year at a low category of 43.45%, the percentage of conformity between planning and reality at 99.61%, and the achievement of lead time for ordering drugs at 5.08 days. In conclusion, the selection, procurement, and lead time aspects of drug management at the "X" Hospital Pharmacy Installation did not fully meet the established standards. Therefore, it is recommended that healthcare management implements and adheres to robust drug management system regulations, particularly during pandemic situations, to ensure optimal hospital services.

Introduction

Pharmaceuticals are an integral part of healthcare delivery, and they play a great role in

improving treatment outcome and the quality of healthcare service. Drugs are a vital and expensive component of the provision of healthcare services to patients.[1] To ensure maximum benefit from such investment, the drugs should be available at health care institutions whenever they need them.[2] During COVID-19 outbreak periods, the pressure of medical service increased.[3,4] The limited information about the treatments available to treat the virus, and the sanitary restrictions caused a significant impact, not only on the projections made by a hospital for the purchase of medicines within its catalog, but also on new acquisitions to respond to the drug needs that arose with the advance in the number of cases.[5] The COVID-19 pandemic led to the emergence of a new type of drug shortage that is attributed to the increase in its demand.[6-9]

In the year 2021, the increase in hospitalization for patients sick with COVID-19 raised the average hospital stay by 45% in intermediate care and 140% in the intensive unit compared to 2019. This generated increases in the consumption of medicines by 45%. This fluctuation caused measures to be taken to drastically vary the products that initially would be requested, to remove products of greater use at the hospital level and negotiate the purchase directly with the supplier. According to the World Health Organization (WHO), in developing countries drug costs are 24-66% of total health costs.[10] Such large drug purchases must be managed effectively and efficiently. Inventory management system in Healthcare Supply Chain (HCSC) have been pushed to breaking point by the COVID-19 pandemic. Unanticipated demand shocks due to stockpiling of medical supplies caused stockouts, and the stockouts triggered systematic Supply Chain (SC) disruption inconceivable for risk managers working individually with limited information about the pandemic.[6,11-13]

Indonesia has changed its face in the world of health, where it will be able to grow to become one of the largest generic drug providers in the Asia Pacific region. By placing

a National Health Insurance system in Indonesia, the government through the ministries and health institutions must work harder to meet domestic drug needs.[14] Challenges in managing drug supplies and shortages are nothing new, and in some cases, a pandemic offers an unusual opportunity for pharmacists to prepare proactively for an uncertain spike in cases.[15,16]

Since the COVID-19 outbreak, the healthcare sector has been uncertain, especially the pharmaceuticals sector.[17-19] Medication availability may be a critical factor in the success of COVID-19 treatment, as well as an indicator of readiness and procurement, given that the COVID-19 pandemic cannot yet be predicted. If the drug stock is too small, the demand for use is often not met, so that patients or consumers are not satisfied, causing hospitals to lose customers. However, if the stock is too large, it causes storage costs that are too high, the possibility of the drug being damaged, expired, and there is a risk of death stock.[2,20]

Drug shortage is always a critical issue of inventory management in healthcare systems, since it potentially invokes several negative impacts.[1,21] In supply chain management, optimization goes hand-in-hand with inventory control to address several issues of the supply, management, and use of drugs. In the previous study, the results show that there are insufficient human resources in the pharmacy installation, the logistics storage area for drugs is not sufficient, and the availability of drugs sometimes experiences vacancies due to unavailability of stock and time of order (2020).[22] This last research showed that the selection and procurement of drugs in pharmacy installations was not fully in accordance with standard indicators.[23] Related to this research, there must be further research to examine the appropriateness of drug management. Reporting from rsx.co.id, the achievement of the indicator for outpatient waiting time, at RS “X” Jakarta reached 135 minutes, below the national service

quality target of 60 minutes. Patient waiting time can be influenced by the vacancy of drug supplies due to lead time of old drug orders. Lead time is the loadingtime for drugs starting from planning until the drugs are received at the pharmacy installation warehouse, which is one of the important indicators that affects the planning and control of drug inventory.[24,25] Because of the widespread use of COVID-19 drugs during the pandemic, some critically needed medical supplies were running low. Previous research showed that the selection and procurement of drugs in pharmacy installations was not fully in accordance with standard indicators, and the current challenge is COVID-19 pandemic that caused the changes in government guidelines, and some COVID-19 drug items are in a stagnant state (stock excess up to three times the average usage amount) that may cause hospitals to experience problems in a variety of ways, both financial and non-financial. The purpose of this study was to determine the selection, procurement, and lead time for ordering drugs at the pharmacy installation of Hospital "X" Jakarta.

Materials and Methods

Research design

This study used a descriptive research method with a quantitative approach that described and identified drug management retrospectively using data from the past. The research was conducted at Hospital "X" Jakarta.

Study participants

The population of this research was all drugs that were on the list of drug procurement at the pharmacy installation of Hospital "X" Jakarta, totaling 1,413 drug items as objects of research. The sampling technique used in the object of this research was to use non-

probability sampling, with total sampling where the entire population was sampled.

Variable, instrument and data collection

The data used were primary data and secondary data. The primary data in this study were obtained from interviews with related parties, namely the head of the pharmacy installation of Hospital "X" Jakarta, the main supervisor for the planning section, and the planning section implementer. The secondary data in this studyconsisted of a list of National Formulary drugs, a list of hospital formulary drugs, a list of drug procurement, budget reports, and loading time evaluation reports, lead time of drug orders, and interview sheets.

Data analysis

Data were collected in observation sheets and then analyzed using univariate analysis with Microsoft Excel. The aspect of data was analyzed, including the selection stage, the procurement stage, frequency of procurement of each drug item per year, and the lead time.

Ethical clearance

The research has received ethical approval from the Health Research Ethics Commission, Faculty of Public Health University of Jember, based on ethical certificate 112/KEPK/FKM-UNEJ/X/2021. During the research, the researcher pays attention to the ethical principles of information to consent, respect for human rights, beneficence, and non-maleficence.

Results

The results of the study were divided into 3 categories, namely the selection stage, the

procurement stage, and thelead time for ordering drugs. There were 1,413 drug items evaluated in this study.

The selection stage

At the selection stage shown in Table 1, there are two categories, namely the suitability of the drug items with the National Formulary (FORNAS), with the percentage value of conformity of 14.15%, and the suitability of the drug items with the Hospital Formulary, with the percentage of conformity of 68.15%.

The procurement stage

At the procurement stage shown in Table 2, there are three categories, including: i) the percentage of allocation of funds for drug procurement available, with the percentage value of conformity of 70.50%, ii) the frequency of incomplete orders/invoices, which is five times incomplete, and iii) the suitability of drug planning, with the reality of each drug with 99.61% results being appropriate. The last category, shown in Table 3, is the frequency of procurement of each drug item per year, with a value of 43.45% low, 28.88% moderate, and 27.67% high. In the last stage, the lead time for ordering drugs in Table 3 with a value of 5,08 working days.

The lead time

The results related to lead time of drug orders showed an average of 5.08 working days (Table 4).

Discussion

The selection stage

The selection stage in Table 1 showed that the percentage of suitability of drug items available at the X Hospital Pharmacy Installation (IFRS) with FORNAS is 14.15%. According to the Ministry of Health, the standard value for the suitability of drugs available at IFRS with FORNAS is ideally 100% as a guideline for providing drug items for Social Security Agency on Health (BPJS) in level II health facilities / type B hospitals.[26] The results of the research on the percentage of conformity of drug items with FORNAS at the Pharmacy Installation of X Hospital of 14.15% is smaller when compared to research conducted by Inacio Da Costa (2017), which shows the percentage of conformity of drug items available at IFRS Ungaran with FORNAS is 41.08%, and is much smaller when compared to the results of research from Nur Oktaviani *et al*., in 2018, which is 96.7% percentage of drug item conformity with FORNAS at West Nusa Tenggara (NTB) Provincial Hospital.[27,28] This small percentage value is based on the results of interviews with the IFRS planning department that for drug procurement, it refers to the Hospital Formulary list.

Therefore, the results of this study indicate that the percentage of conformity of drug items based on FORNAS at Hospital "X" Jakarta is not up to standards. The second category at the selection stage is the suitability of items available at the pharmacy installation of Hospital "X" Jakarta with the Hospital Formulary of 68.15%. According to the Ministry of Health, the standard value of the suitability of drugs available in hospitals with the hospital formulary for hospital accreditation requirements is 80%.[29] Therefore, it can be said that the indicator of the suitability of drug items with the Formulary of Hospital X Jakarta in 2020 has not been effective. One of the causes of the low percentage of drug item suitability based on the Hospital Formulary is the lack of commitment of doctors to the

implementation of the drug formulary in hospitals, not maximizing function of the Pharmacy and Therapeutic Committee (KFT), and also the influence of the pharmaceutical industry.[27,28,30]

The procurement stage

The procurement stage with the category of allocation of funds for the procurement of drugs available at the Hospital is 70.5%. This value shows that the percentage of budget allocation for drug procurement in 2020 has met the standard value set by WHO, which is between 30-40%. The results of this study indicate that the percentage value of the allocation of funds for drug procurement at Hospital "X" Jakarta is higher when compared to research by Inacio Da Costa (2017), which is 25.83% in Ungaran Hospital, and the results of Mompewa's research in 2015 of 29.3% in the pharmacy installation at Poso Hospital, Central Sulawesi.[27,31] Pharmacy installations are revenue center in hospitals, therefore, the budget function is an important basis to know in planning the procurement of drugs both in terms of type and quantity, so that drug managers must be involved in budget discussions and allocation of funds for drug procurement, with the aim of being a joint commitment to accountability for the use/expenditure and procurement of drugs quality by maximizing the coordination function and increasing the understanding of the hospital management team in making policy and priority decisions on the amount of budget allocation.[32] The results showed that the frequency of incomplete orders/invoices at the Pharmacy Installation of Hospital "X" Jakarta in 2020 was 5 times. According to drug management standards, the frequency indicator for incomplete SP/invoices is 1-9 times, so it can be stated that the frequency indicator for incomplete orders/invoices is effective according to the standards. The data are taken retrospectively, namely invoice documents

for 2020 from all Pharmaceutical Wholesaler (PBF) partners. The results of this study are smaller when compared to the research conducted by Nur Oktaviani *et al*., in 2018, at West Nusa Tenggara (NTB) Hospital, in which the frequency of incomplete orders/invoices was 30 times.[33] Meanwhile, in a study by Mompewa in 2015 at the pharmacy installation of Poso Hospital, Central Sulawesi, an analysis of invoice errors could not be carried out because the wrong invoice was not archived but returned to the PBF concerned.[34] At the pharmacy installation of Hospital "X" Jakarta, the frequency of invoice errors is small because if there is an incorrect invoice, the invoice is immediately rejected and returned to the partner/PBF. The erroneous invoice is corrected and then resent. From the results of interviews with the recipient of the goods, it was obtained information that the frequency or number of invoice errors at the Pharmacy Installation of Hospital "X" Jakarta is very minimal because the process of receiving goods is carried out according to standard procedures that have been set.[28,31]

The procurement stage with the category of procurement frequency of each drug item per year shows that if the procurement uses the EOQ approach/method, the frequency value of procurement of each drug item at Hospital "X" Jakarta is in the range of 1-61x/year, with each category being low (<12x/year), with 614 items (43.45%), medium (12-24x/year), with 408 items (28.88%), and high (>24x/year), with 391 items (27.67%). Based on the results of interviews with the planning executives, items that fall into low category are drugs in the slow-moving category or those whose procurement is based on special requests. Meanwhile, the drug items that fall into the high category are fast-moving drugs, drugs with high costs, so that the order must be divided into several orders in accordance with procurement provisions where the maximum value of one order letter cannot be more than 50 million or drugs that experience fluctuations in usage during the COVID-19 pandemic.

Quick *et al.* (2012) stated that the use of the EOQ method aims to reduce storage costs and the risk of damage/expiration although ordering costs increase, but there can be considerable cost efficiency. The higher the storage cost, the hospital will experience losses and conversely, the lower the inventory storage cost will benefit the hospital.[32-35] The results of this study are higher than those of the previous research conducted by Ismaya *et al.* in 2018, the frequency of procurement of each drug item at the Tangerang City General Hospital is 1-19x/year, and it is much higher when compared to the research conducted by Nur Oktaviani *et al.* (2017) at the West Nusa Tenggara (NTB) Hospital in 2017 as many as 4-5 times/year. The results of research by Yuki in 2021 stated that the frequency of procurement of drug items per year in 2020 at the RSUA is a maximum of 9 times, which shows that the frequency of procurement of each drug item per year is still relatively low. Then in mid-May to June 2020 there were Large-Scale Social Restrictions (PSBB) and WFH (Work from Home*)* which causes the provider's response to drug delivery to be longer than before.[28,36]

The procurement phase with the category of percentage of conformity between drug planning and the reality of each drug at the pharmacy installation of Hospital "X" Jakarta is 99.61%. This value indicates the discrepancy between planning and procurement, which according to Pudjaningsih in 1996, is 100-120%. This was due, among other things, to the fact that the stock at the PBF was empty, and because of the price difference between the price stated on the SP and the price prevailing in the PBF. Thus, the accuracy of drug planning at thePharmacy Installation of Hospital "X" Jakarta in 2020 was not efficient. The results of this study are in line with Anggia's research in 2019, stating the accuracy of drug planning at the Pharmacy Installation of An-Nisa Hospital, Tangerang City, which is 77.6%.[32]

The lead time

The results related to lead time of drug orders showed an average of 5.08 working days. Therefore, it can be said that lead time of drug orders was not effective because it is not in accordance with the targets standardized on the performance indicators of quality targets for the pharmacy installation of Hospital "X" Jakarta. From the observations, it is known that during 2020, there are 5 months (February, April, May, June, and October) where the lead time for ordering drugs is in accordance with the target, which is less than 5 working days, and there are 7 months (January, March, July, August, September, November, and December) where the lead time for ordering drugs does not reach the target, which is more than 5 working days. According to research by Mendrofa (2016), the procurement of BPJS drugs has a longer lead time than regular drugs, so the calculation of ROP for BPJS and regular drugs must be separated, which causes the stock in the service to be less than the safety stock. The results of this study are smaller than the results of research by Wijaya Andi Saputra *et al.* (2019) at the Grhasia Mental Hospital DI Yogyakarta, that there were 83 drug items with a lead time of more than 30 days from a total of 239 drug items in 2017, and 68 drug items with a lead time of more than 30 days. Lead time of more than 30 days from a total of 252 drug items in 2018. The percentages of the total number of drugs with a lead time of more than 30 days in 2017 and 2018 using e-purchasing method were 35.17% and 26.98%, respectively.[37] The longer drug lead time compared to direct procurement is due to the fact that the stock of drugs listed in the e-catalogue does not correspond to the real stock or ready stock at the distributor, as well as production delays caused by long imports of raw materials during the COVID-19 pandemic.[37-39]

This study provided valuable insights regarding the impacts caused by the COVID-19 pandemic on the pharmaceutical/healthcare products supply chain; however, it was associated with certain limitations. For instance, this study considered the abrupt changes in demand during one year of COVID pandemics, that means this study is using a retrospective data. Furthermore, the proposed model in this study considered the pandemic condition; however, expanding the model to the post-pandemic could provide much more practical solutions to the decision makers. Future studies should be conducted to create a supply chain system to control the management of drug for pandemic era particularly.

Conclusions

Based on the research findings involving 1,413 drug items and focusing on the description of drug planning and procurement at Hospital "X" in Jakarta during the COVID-19 pandemic era, it can be concluded that drug management is not 100% effective. This conclusion is substantiated by the presence of indicators with results falling below the effective range. These indicators include the percentage of drug items available according to the National Formulary (FORNAS), the percentage of available drug items according to the Hospital Formulary, the percentage of conformity between drug planning and reality, and the lead time of drug orders. In light of these results, it is recommended that every hospital, especially those in Jakarta, should develop a specialized system for drug management tailored to pandemic situations. This comprehensive approach should cover the selection stage, procurement stage, and distribution stage to enhance the effectiveness of drug management during challenging times such as the COVID-19 pandemic.

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Table 1. Drug management at the selection stage.

Indicator	**Comparison value**	**%**
Compatibility of drug items with National Formulary	100%	14.15%
Compliance of drug items with Hospital Formulary	80%	68.15%

Table 2. Drug management at the procurement stage.

Indicator	**Comparison value**	**Score**
Percentage of allocation of funds for drug procurement	30-40%	70.5%
Frequency of incomplete SP/invoice	1-9 times	5 times
Percentage of compliance with drug planning	100-120%	99.61%

Table 3. Procurement stage (frequency of procurement of each drug item per year).

Indicator	**n**	**%**
Low <12x/year	614	43.45
Moderate 12-24x/year	408	28.88
High >24x/year	391	27.67
Total	1,413	100

Table 4. Lead time of drug order.

Month	Target (days)	Actual (days)
January	5	6.75
February	5	4.25
March	5	5.5
April	5	3.75
May	5	3
June	5	3.25
July	5	6.5
August	5	7
September	5	5.75
October	5	4.5
November	5	5.25
December	5	5.5
Average	5	5.08

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