

The Roots Cause of the Drug Shortage and Expired Drug Problem at Hospital X

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ABSTRACT

Good drug management in the Hospital Pharmacy Installation is the key to the smooth running of pharmaceutical services. The availability of the necessary drugs at the right time and place affects patient safety and satisfaction. Empty drugs and expired drugs are problems in drug management, mainly Hospital X. Empty drugs result in the replacement of drugs in prescriptions, thus increasing the burden on pharmaceutical services and creating risks for patient safety. Expired drugs cause hospital losses. This study aims to describe the root cause of drug shortages and expired drugs in Hospital X. The research used a qualitative approach to dig deeper into these complex problems—elicitation of data using semi-structured interviews supported by secondary data from the hospital. Data were analyzed using a Fishbone diagram to get a systematic overview of the root causes of problems based on specific domains. The root causes of expired drug problems and empty drug substitution in Hospital X are materials/inputs, methods, people, machinery/equipment, measurement (process evaluation), and the pharmacy facility environment domains.

Kata kunci:

Obat kosong;
Obat kadaluarsa;
Diagram tulang ikan;
Instalasi farmasi
rumah sakit;
Wawancara

Manajemen pengelolaan obat yang baik di Instalasi Farmasi Rumah Sakit merupakan kunci kelancaran pelayanan kefarmasian. Ketersediaan obat yang diperlukan pada waktu yang tepat dan tempat yang tepat mempengaruhi patient safety dan kepuasan pasien. Kekosongan obat dan obat kadaluarsa merupakan permasalahan yang sering terjadi dalam pengelolaan obat, terutama di Rumah Sakit X. Obat kosong mengakibatkan penggantian obat dalam resep sehingga menambah beban pada pelayanan kefarmasian dan menimbulkan risiko bagi keamanan pasien. Obat kadaluarsa menimbulkan kerugian bagi rumah sakit. Penelitian ini bertujuan untuk mengetahui akar permasalahan kekosongan obat dan obat kadaluarsa di sebuah rumah sakit pemerintah. Sebuah pendekatan qualitative research digunakan untuk menjelaskan penyebab permasalahan yang kompleks tersebut secara mendalam. Data diambil melalui wawancara terstruktur yang didukung oleh data sekunder rumah sakit. Data dianalisis menggunakan Fishbone diagram untuk mendapatkan gambaran akar permasalahan yang sistematis berdasarkan kategori tertentu. Akar permasalahan obat kadaluarsa dan penggantian obat yang diakibatkan oleh obat kosong terdapat pada domain material/input, metode, sumber daya manusia, mesin/peralatan, pengukuran (evaluasi proses), dan lingkungan IFRS.

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INTRODUCTION

Pharmacy Installation is a function-implementing unit that organizes all hospital pharmaceutical service activities (Indonesian Ministry of Health, 2016). More than 90% of hospital health services require pharmaceutical supplies (Susanto et al., 2017). In addition, the hospital budget for drugs and medical devices managed by pharmaceutical installations reaches 50-60% (Kusmini et al., 2016; Susanto et al., 2017). Pharmaceutical services are essential for hospitals to maintain service quality and increase patient satisfaction (Himawan



et al., 2018; Nina & Hakim, 2020). Additionally, hospitals must deliver quality services to established standards (Pratomo et al., 2018).

Rational use of resources is an essential aspect of hospital management (Yigit, 2017). Drug management effectiveness and service quality have a significant relationship (Liska Marlindasari et al., 2020; Mahmodabadi et al., 2019). Drug management is a dynamic process and must be regulated appropriately (Daina et al., 2019; Kusmini et al., 2016; Mauliana et al., 2020). Inventory is a current and most significant liquid asset in pharmaceutical practice. The inventory values continue to increase due to the growth in the variety and price of pharmaceutical products (Eme et al., 2018). Inefficiency in drug management will harm pharmaceutical service activities (Mauliana et al., 2020). Patient counseling, appropriate medication administration, and other efforts to implement patient-centered care can be appropriately managed by improving Pharmacy Installation management (Saha et al., 2018). High-quality medicines must be provided continuously at the right time and amount for better and more effective service management. Efficient inventory management will lead to excellent service (Bachtiar et al., 2019; Ceylan & Bulkan, 2017; Eme et al., 2018). Efficient and effective inventory management prevents overstocking, understocking, and stockouts (Gizaw & Jemal, 2021).

Understocking and stockouts are problems that often occur and will affect many aspects (Phuong et al., 2019). Drug shortages harm patient services (Bachtiar et al., 2019; Bowles, 2019; Mauliana et al., 2020) because the patient's drug needs are unmet. Thus, rational treatment will not be achieved and will ultimately affect the outcome of patient care (Bachtiar et al., 2019; Bowles, 2019). Using unknown drugs or drugs with different strengths, concentrations, and formulations, which may occur during drug shortages, increases the risk of medication errors (Bowles, 2019). Drug shortages lead to 1% to 5% error rates in hospitals and create unsafe conditions for patients and staff (Caulder et al., 2015).

Besides burdening human resources for the mitigation process, drug shortages also result in patients experiencing increased medical costs (Bowles, 2019; Phuong et al., 2019). Drug shortages increase medication errors, side effects, deaths, and complaints (Phuong et al., 2019). Medicine shortages can result in treatment delays, harming patients, especially those with critical conditions, when no alternative drugs are available (AlRuthia et al., 2017). In addition, the unavailability of drugs can negatively affect the institution's image and result in reduced patient visits. Dissatisfied patients will convey their dissatisfaction to others (Ceylan & Bulkan, 2017). Drug shortages reportedly have negative economic, clinical, and human impacts on patients (AlRuthia et al., 2017; Bowles, 2019; Phuong et al., 2019).

Conversely, oversupply also creates problems, and this occurs in many places (Kamba et al., 2017). Expired drugs pile up every year around the world. The accumulation of pharmaceutical waste creates ecological, economic, social/ethical (Alnahas et al., 2020), and health (Kamba et al., 2017) burdens. The existence of damaged or expired drugs is a loss for the hospital (Dyahariesti & Yuswantina, 2017). The large percentage of expired drug value reflects the lack of supervision in inventory storage (Purwidyaningrum, 2011). Expired drugs must be reduced by improving inventory control and optimizing procurement (Kamba et al., 2017).

The shortage of supplies and expired drugs indicated drug management problems in the Pharmacy Installation of Hospital X, Bali. Preliminary observations indicated frequently

prescribed drug replacement. Based on drug replacement records from June 2020, 80% of drug replacements were due to a medication shortage. There was a shortage of fast-moving generic drugs in the first quarter of 2020. Based on the stock-taking at the end of 2019, it was also known that the hospital suffered losses due to expired drugs, which amounted to 2.44% of the inventory value recorded in stock-taking activities. As much as 63.7% of the expired drugs were in Pareto class A.

Many researchers have studied stockout and expired drugs in hospitals, especially in Indonesia. The research primarily discusses the evaluation of drug management implementation and strategies to address the issue of empty stock (Batari & Amir, 2021; Hariani et al., 2022; Siswihanto et al., 2022). According to Poulsen et al. (2022), various factors may influence stockouts. There are several approaches to solving the problem of stockouts. Even so, the effectiveness of the chosen method depends on an institution's conditions. It may be beneficial to trace the root of the problem in each hospital to describe the issues. Precise descriptions of the issues can enable effective and efficient implementation of mitigation plans and system improvements. Besides that, qualitative and quantitative research has been used to investigate the problem of empty drugs and their mitigation methods (Dave et al., 2018; Poulsen et al., 2022; Vogler & Fischer, 2020; Zwaيدا et al., 2021). The authors chose qualitative studies using individual interviews because they effectively collected data with complex variables (O'Brien et al., 2014). Also, respondents can express their experiences as broadly as possible (Poulsen et al., 2022). Therefore, this study aims to describe the root causes of empty and expired drugs in Hospital X through qualitative research. The themes generated in the research are presented in a fishbone diagram as decision-making considerations to improve the quality of drug management in Hospital X.

RESEARCH METHOD

This study uses a qualitative approach—data collected through semi-structured interviews supported by secondary data from pharmacy installation. Semi-structured interviews were conducted using interview guidelines that were prepared based on the six domains of the fishbone diagram (Boboia, 2019; Liliana, 2016) and the drug management cycle in the hospital (Indonesian Ministry of Health, 2016). Two pharmacists with experience in qualitative research reviewed the interview guide to ensure the face and construct validity of the instruments used. The research was conducted at pharmacy installation Hospital X in Bali from July to September 2020.

The population of this study was all health workers involved in the drug management cycle of Hospital X. The sample was drawn using a purposive sampling technique. Informants were selected if the informant is a hospital employee involved in managing and dispensing pharmaceutical dosage forms and giving informed consent. Informants are excluded if they are not able to complete the interview process. The recruitment process is carried out after obtaining research approval and ethical clearance. The Health Research Ethics Committee of Wangaya Hospital, Denpasar, approved the research by ethical clearance No. 059/IX/KEP/RSW/2020. Research members (IGWS, NWRPS, NF, NLD) who previously knew informants selected them based on their position in the pharmacy installation's organizational structure. Ten participants were involved by the end of the study. The participants comprised one pharmacy director, eight pharmacy staff, and one prescribing

physician. Data collection ended after reaching data saturation, and the research questions were answered (Seetharaman, 2016).

At least two members of the research team analyzed the interview transcripts. The research team compiled and categorized the interview results supported by secondary data. According to O'Brien et al. (2014), the analysis of interview data is conducted by more than one person to ensure the triangulation process. Data was analyzed using thematic analysis. The interview themes were grouped systematically into the research domain using a fishbone diagram. The fishbone diagram was matched again with the interview transcripts to review the research results.

Fishbone diagrams are called "Ishikawa" or "cause and effect" diagrams. The fishbone diagram represents the relationship between effects (problems) and potential causes based on the type of category (Al-Dosaari et al., 2016; Nina & Hakim, 2020) and provides a pictorial representation of the causes of a problem (Boboia, 2019). Byrne (2022) states that thematic analysis ends with retrieving themes and reporting the analysis results. The analysis report is generally made descriptively based on the themes that were obtained. Ishikawa diagrams can describe research results systematically. Researchers use Ishikawa diagrams to group the themes obtained to more systematically describe the root causes of empty and expired drugs in the Pharmacy Installation. In addition, the fishbone diagram is one of the most commonly used tools in quality assurance.

RESULTS AND DISCUSSION

Interviewees comprised the head of pharmaceutical installation, drug procurement division, quality management division, pharmaceutical technical staff in administration, pharmacist in administration, general practitioner prescribing, and pharmacist in charge of the service department.

The interview findings are grouped into external and internal problems in six domains: Material/input, Method, Machine/Equipment, Human Resources, Method, Measurement, and Environment, summarized in a fishbone diagram (Figure 1). Domains were determined based on the appropriateness of the themes obtained with the following considerations (Liliana, 2016). People are all those involved in the process. Methods refer to the mechanics of a process, the things needed to carry out the process, such as policies, procedures, and regulations. Machines are all the equipment, computers, tools, and other things needed to do a job. Materials are the raw materials needed to make the final product. Measurements are data obtained from the process and used to evaluate quality. The environment is the conditions such as location, time, temperature, and culture in which the process occurs.

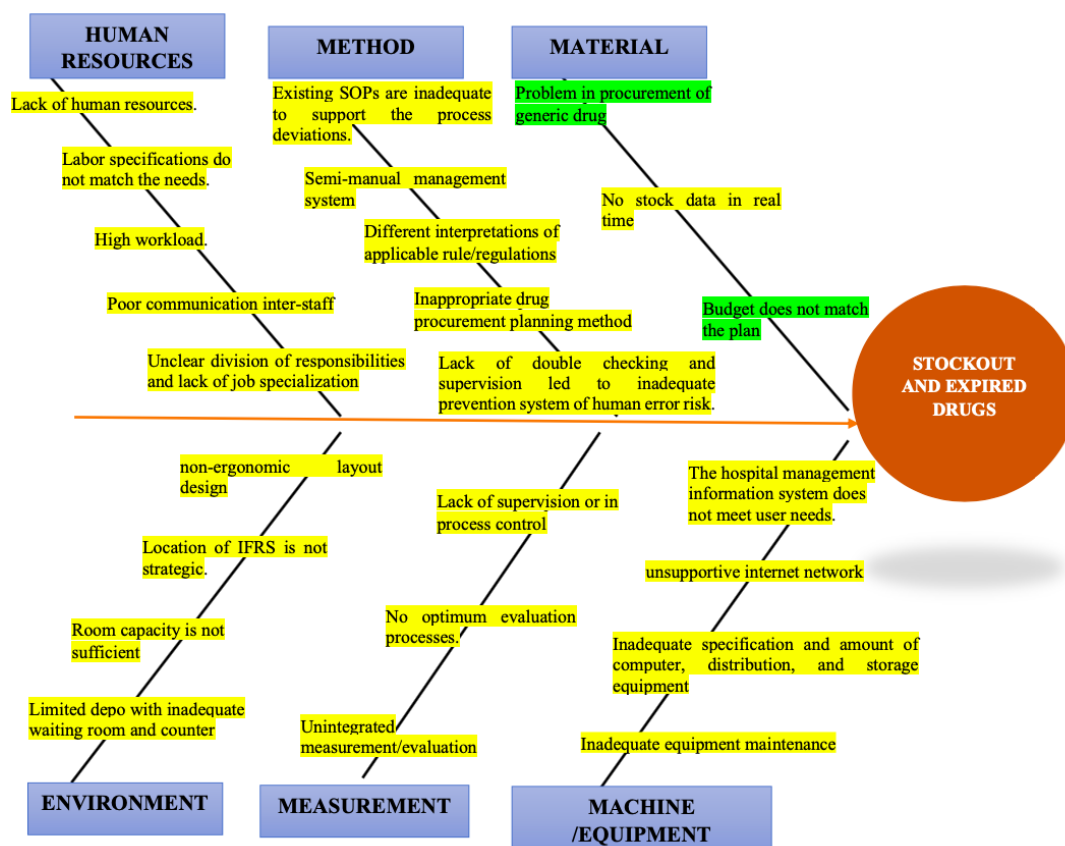
A. Internal Issues

Internal Issues are problems that originate from the internal management of the Pharmacy Installation Hospital X. The problems found fall into six domains as follows.

Materials or input domains. The drug procurement planning process could have gone better due to constraints in the availability of supporting data. Valid stock data is unavailable in real time because of poor record-keeping in hospital information systems. The informant states that a lack of supporting data also interferes with distribution and administration activities.

Every medical device package taken must have a complete identity (registered), but because it is an emergency, sometimes the patient's identity (one or more of the identities needed) is not complete, so recording (entry) on the computer cannot be done” (Informant B)

A qualified management information system is needed to provide real-time data to support drug management activities. According to (Mahdiyani, 2018), the main factor causing the scarcity of drugs in medical institutions occurs in the process of purchasing drugs. The effectiveness and efficiency of drug inventory management activities affect stagnant events and drug stockouts (Febreani & Chalidyanto, 2016). Drug scarcity caused by internal management can be reduced by building a platform for drug information management, optimizing drug purchase plans, and improving budget management (Mahdiyani, 2018).



*Internal factors are drawn with a yellow background, while external factors are drawn with a green background.

Picture 1. Fishbone diagram of the problem of drug shortages and expired drugs in pharmacy installation Hospital X

Method domains. The available SOPs (standard operational procedure) provide detailed drug management instructions. However, the SOPs do not anticipate the occurrence of errors. So, there is no risk prevention of errors in the management system. The SOP has not given instructions on how to prevent expired drugs. There are also no SOPs for retrieved drugs without prescriptions, causing problems in administrative activities and delays in the provision of real-time data for the drug procurement planning process.

"There is no special SOP for drug recording" (Informant H)

"It is necessary to make an SOP if an error occurs during recording" (Informant D)

Semi-manual drug management methods are also a problem, so some vital information to make a decision is unavailable on time. Doctors prescribe manually, meaning pharmacy staff must input prescription information into the hospital management information system. Certain drugs still use stock cards. However, stock card use resulted in ineffective management due to the high workload. Generally, the hospital management information system cannot support all the needs of pharmacy installation, especially in inventory management.

"Not using electronic prescriptions is our limitation, so we still have to read the recipes more carefully" (Informant B)

"Perhaps what is needed is data of drug lending (drug without prescription) because all this time, the data has not been in the system. It has only been recorded manually" (Informant H)

Manual inventory management takes a lot of time and is prone to errors. Failure to carry out inventory management can lead to ordering errors (Boboia, 2019). Inventory control must be computerized, and system software must maintain all systems. Any authorized person can track the drug and stock availability at any time. Patient history, prescribed medication (prescription), and diagnostic data should be stored in the computer system. Therefore, pharmacists can get information about the disease and its diagnostic patterns (Eme et al., 2018; Saha et al., 2018). A computerized inventory management system also helps to monitor inventory regularly and is a recommended mitigation measure for a global drug shortage (Chen et al., 2021).

The pharmacy management of Hospital X plans drug procurement using the consumption method. Drug procurement planning is made using the calculation of drug consumption in the previous year plus a 5-10% stock buffer. Frequent changes in prescription patterns make the method inflexible. Prescribing patterns typically change due to shifts in national health insurance drug policies and disease patterns. A common understanding of a standard is essential. Therefore, continuous adjustment to the latest policy and socialization of the policy to related parties is necessary. Different perceptions among the parties involved in the drug management cycle can lead to misunderstandings so that drug management cannot function properly.

"The rules of the BPJS (national health insurance agency) are not read and understood by all officers (Informant B)."

According to (Fatima & Khaliq, 2017), a planning system based on disease events and an integrated drug management system can fundamentally help to reduce the problem of drug shortages in the future. EOQ (Economic Order Quantity) and MMSL (minimum-maximum stock level) are proven to be effective inventory planning methods, especially for

controlling stagnant and empty drugs (Dewi et al., 2020; Indarti et al., 2019). Inventory control techniques can improve patient services and allow for more optimal use of resources (Ceylan & Bulkan, 2017).

Due to limited human resources, the process supervision and crosschecking system in receiving, storing, and recording have yet to be implemented. Therefore, risks arising from human error are not prevented. A system that can simplify the drug management process is needed.

“goods receiving is checked by one person, so there is no crosschecking by another officer.”
(Informant E)

Sometimes, the conformity between several drugs listed on the mutation invoice and physical stock is not appropriately checked because of limited time and busy services” (Informant F)

Matrix analysis ABC (Always Better Control/Pareto)-VED (Vital, Essential, and Desirable/Non-Essential)-FNS (Fast moving, Normal moving, Slow moving) can help inventory control. The matrix also narrows the inventory, which requires much monitoring and control, facilitating the arrangement of storage locations to minimize time, costs, and labor for drug management (Gizaw & Jemal, 2021). Analysis of the ABC-VED/VEN matrix can control the use of the budget and prevent stock shortages, especially in secondary-level healthcare facilities. Medicines that fall into category I (AV, AE, AD, BV, and CV) require the most stringent inventory control, followed by categories II (BE, CE, and BD) and III (CD). Category I supplies require top managerial control and must be readily available for smooth service. Categories II and III require middle and lower managerial control (Ceylan & Bulkan, 2017; Taddele et al., 2019; Yigit, 2017).

Human resources domain. In general, more human resources are needed, both in terms of quantity and quality. The number of staff (Table 1.) shows that human resources must still be adjusted according to the applicable regulations (Indonesian Ministry of Health, 2014). The number and specifications of existing human resources have yet to be able to handle work that requires particular competencies in the pharmacy field. Additional training is still needed to support their performance. Education and training of all health professionals is one solution to overcome shortages of supplies (Shukar et al., 2021). Table 1 describes the number and specifications of human resources in the Pharmacy Installation.

Table 1. Number and specifications of human resources in the Pharmacy Installation

NO	Type of Staff	Number		Education
		2019	2020	
1	Pharmacists	11	9	Bachelor in Pharmacist
2	Pharmaceutical technician	24	23	Diploma III Pharmacist
3	Administration staff	5	5	Bachelor
4	Assistant	3	3	Senior High School
	Total	43	40	

"Not yet sufficient. Human resources still vary in pharmacy installation, so there are general staff (not personnel with pharmaceutical expertise).

Ideally, according to regulation, the general staff has no authority" (Informant B)

Need procurement training (informant C)

There is no work specialization, which causes a high workload that results in pressure and human error. Therefore, reward and compensation systems must be built according to employee performance (Antari et al., 2021; Obeidat et al., 2017) to compensate for the high workload. Other studies also mention the problem of shortage of quality and quantity of human resources. The limited pharmaceutical staff as drug procurement officials and unclear coordination due to the absence of a drug procurement organizational structure chart are internal problems (Saputra et al., 2019). It is only possible to run and manage a hospital pharmacy installation with adequate personnel and appropriate competencies. Human resources are also one of the main problems in Bangladesh (Saha et al., 2018).

"Because one person holds the responsibility and the excessive workload, it is not focused"(Informant G)

" Because the service was so crowded, that we missed it and the drugs/tools taken we forgot to input while the physical stock of drugs has decreased " (Informant F)

In addition, the shortage of drugs creates new problems that increase the workload of health workers. Drug shortages cause many challenges for doctors and pharmacists (Fatima & Khaliq, 2017). Communication between health workers, patients, and health professionals is needed to inform drug shortages (Kuruc Poje et al., 2021). Many healthcare facilities recognize the indirect effect of drug shortages on increased staff workload. Hospital pharmacists spend an average of 109 minutes a week dealing with drug supply issues, with a minimum of 40 minutes per week and a maximum of 216 minutes per week. About a third of the total time spent is used to gather information about the causes of the problem (De Weerd et al., 2017). Drug shortages require implementing mitigation strategies, operational costs, increased patient safety risks, and the emergence of service quality issues (Shaban et al., 2018).

"For example, if the doctor is difficult to contact when there is a stockout, difficulty in checking drug interactions when the internet connection was poor. " (Informant I)

the design of the pharmacy depot is not yet organized, so pharmacy staff cannot work together because they are blocked (Informant H)

There is a need for more effective communication both with internal pharmacy installation and with other units outside of the pharmacy installation. This issue is also related to the spatial design that results in a pharmacy installation work environment.

Company management must provide employees with the necessary training and instructions to strengthen communication and establish effective coordination.

Machine or equipment domain. In general, the equipment that is the root of the problem in pharmacy installation is information system software that does not meet user needs. In addition, internet networks often have problems. Some hardware, such as computers, storage, and distribution tools, must be improved in quality and quantity. Improvement in equipment maintenance is also still needed.

It needs to be supported by a qualified SIM RS (hospital management information system), which can display the real-time movement of generic drugs, bring up a warning/notification of drugs that are about to run out, side effect information that is not there yet" (informant B)

"When we input the data to the system, errors were usual, and we have to repeat the process from the beginning" (Informant F)

"Well, this has not been well maintained. Computers and systems are sometimes unresponsive, slow, and sometimes fail. The computers used are, on average, more than five years old. They need to be updated " (informant B)

"The space of the office room is inadequate; the drug shelf is small and too much. Likewise with pallets, and the air circulation is not good" (Informant G)

A management information system is one of the organizational resources to support the decision-making process at various levels of management. The existence of an information system will be a stimulus and a challenge for individuals in the organization to work better, which impacts organizational performance (Advistasari et al., 2015; Eme et al., 2018). An excellent management information system will eliminate the need for stock cards. Patient counseling, appropriate medication administration, and other efforts to implement patient-centered care can be managed appropriately with a sound hospital pharmacy management system (Saha et al., 2018).

The lack of medicine racks and pallets resulted in a faulty goods turnover system. Disorderly placement due to the accumulation of goods may result in hidden goods, so they cannot be taken according to the first in, first out, first expired, or first out regulations. Storage must guarantee the quality and safety of pharmaceutical preparations, medical devices, and medical consumables following pharmaceutical requirements (Indonesian Ministry of Health, 2016). Good storage (temperature, humidity, light, atmospheric air, etcetera), according to requirements, can guarantee the quality of medicines and reduce hospital losses caused by damaged medicines (Boboia, 2019; Saha et al., 2018; Susanto et al., 2017). Medical devices lose their efficiency if they are not stored properly. Thus, pharmacy installation requires proper storage conditions and facilities (Saha et al., 2018).

Measurement domain (process evaluation). The root cause of the stockout and expired drug problem in the measurement domain is lack of supervision (in process control), nonoptimal evaluation, and unintegrated measurements. The lack of supervision while the

process runs (in process control) results in an undetected deviation from the expected process or SOP implementation. New error events are only detected when problems arise.

The supervision might need to be more emphasized (Informant D)

The evaluation of the suitability of the SOPs is carried out every three years. Inventory is taken at the end of each month, and sampling for inventory adequacy is performed daily. In addition, the performance of the pharmaceutical facility is evaluated by distributing patient satisfaction questionnaires and waiting time measurements. The evaluation process could be more optimal, especially when implementing stock-taking. Although a meeting has been held regarding the stock-taking results, the frequent occurrence of problems also indicates the need for more optimal evaluation.

"We have not used detailed calculations (measurements) but a simple method. Stock-taking every month. Workflow every day check inventory stock (Informant B)

"Conducting regular meetings after stock-taking to discuss the results obtained to evaluate the next recording" (Informant G)

"So far, the stock-taking process is carried out during service time, so there are mobile drug stocks, resulting in not optimal stock-taking" (Informant F)

The monitoring and evaluation results still need to be followed up to improve the system. Nonintegrated evaluation sometimes becomes an additional burden for officials. Nonintegrated evaluation indicates no trace of the root of the problems, so system improvements cannot be carried out as a whole.

"The need for an integrated and collaborative system, not only in the pharmacy, means that the pharmacy and related units both carry out the monitoring process" (Informant B).

Several research results show that monitoring performance indicators makes better hospital management. Monitoring hospital pharmacy services results in reduced drug side effects, increased cost-effectiveness of drug management, and better management of hospital pharmacies (Mahmodabadi A. et al., 2019). Medication errors occur at various scales in each step of the drug use process, namely drug selection and procurement, storage, distribution, administration, and monitoring and evaluation (Al-Zaagi et al., 2015).

Environmental domains. The root of the environmental problems includes the non-ergonomic layout design of pharmacy installation, nonstrategic location, inadequate room capacity, limited outpatient service counter, and uncomfortable waiting rooms.

"The design of our pharmacy depot is still very unergonomic, meaning that our movement is not good, first, in terms of depot design, secondly regarding facilities and infrastructure, whether it is a shelf storage system, arrangement, and other facilities" (Informant B)

Inadequate room capacity disrupts air circulation and reduces work comfort. Therefore, drug storage does not comply with the SOP. Improper storage increases the incidence of damaged drugs due to drug instability or expired drugs due to being out of sight when needed.

"The design of the pharmacy counter needs to be more optimally arranged, starting from the location of drug storage such as not piling up drugs, make it easier when searching" (Informant F)

"Very necessary, of course, design or location issues that are strategic in nature. The counters are still opposite each other" (Informant B)

A part of the warehouse drug warehouses is not integrated with the service area, which adds to the officers' workload. Limited outpatient counters, waiting rooms, and uncomfortable counters make it difficult for officers to work and carry out services and stock-taking.

Inefficient drug distribution causes drug availability to decrease. There are drug vacancies, many drugs accumulate, and many expired/damaged drugs (Mauliana et al., 2020). The dominant problem in the service environment is queues caused by a lack of human resources in taking or dispensing drugs, a lack of arrangement of storage shelves based on categories, and inefficient use of space in pharmaceutical installations (Nina & Hakim, 2020).

B. External Issues

External issues are problems that originate from outside of the Hospital Pharmacy Installation. The root of the problem that belongs to external issues is the procurement system of generic drugs and budget availability.

The procurement process for generic drugs uses an electronically regulated government catalog (e-catalog) prepared by the Public Procurement Policy Agency. Public Procurement Policy Agency (*Lembaga Kebijakan Pengadaan Barang/Jasa Pemerintah* or LKPP) is an agency outside the hospital tasked with developing and formulating public procurement policies. As a government-owned hospital, RS X must purchase generic drugs through the Public Procurement Policy Agency. The root of the procurement system of generic drugs is frequent delays in e-catalog publishing, some generic products not listed in the e-catalog, items listed in the e-catalog being empty, and delays in invoices from providers due to invoice errors. The root cause of budget availability in drug procurement is that the budget is often unavailable as planned. The hospital pharmacy installation is obligated to prepare a drug purchase plan, but the budget provided requires government approval.

"The e-catalog is late, then the availability of medicine in the e-catalog is often empty, so that is what hinders drug procurement" (Informant A)

"We sometimes have difficulty when E-Purchasing at its LKPP (Public Procurement Policy Agency) because there are some generic drugs that are available in the E-catalog" (Informant A)

Barriers that occur in procurement using e-catalogs are mentioned in several studies. Sometimes, providers only approve part of orders due to limited stock or production capacity constraints (Kusmini et al., 2016). The pharmaceutical industry providers refuse orders because the stock is unavailable (Karimah et al., 2020; Kusmini et al., 2016; Saputra et al., 2019). The provider's pharmaceutical industry has approved orders, but the drugs are only partially or not sent (Kusmini et al., 2016; Mahdiyani, 2018). The pharmaceutical industry providers do not respond to requests (Kusmini et al., 2016) or long responses (Karimah et al., 2020; Saputra et al., 2019). Lead times vary widely, and there are delays (Karimah et al., 2020; Kusmini et al., 2016; Saputra et al., 2019). The needed drugs are unavailable in the e-catalog (Karimah et al., 2020; Saputra et al., 2019). Slow system loading, some essential information on the system sometimes does not appear (Karimah et al., 2020). Some providers require purchases with a minimum amount, so they do not match the plan that has been prepared (Saputra et al., 2019).

Barriers to using e-catalogs reduce drug availability by 64% (Kusmini et al., 2016) and reduce drug cost efficiency (Karimah et al., 2020; Saputra et al., 2019). Meanwhile, implementing a smooth e-purchasing contributes to a potential saving in drug costs of 19.1% (Kusmini et al., 2016). Often, the budget is not available as planned when procuring drugs. After the hospital makes and submits a budget, the local government has the authority to approve or reject the proposal. The budget preparation also depends on the availability of data from the e-catalog. A more flexible budget management policy is needed to adjust problems quickly during drug procurement.

"Yes, because this is a government hospital, of course, the funds are limited, so we apply as needed, then the disbursement fund will be adjusted later ... so yes, it is not 100% available"(Informant A)

"Well... that is the impact that the generic drug cannot be on time, because it (e-catalog) only comes in month 3rd to 4th. After we have the data, we synchronize it with the history of our expended drug data, and after we compare it, we will draw up a plan for drug needs" (Informant B)

The external problem that results in drug scarcity can be improved by building communication between stakeholders and a real-time information system that all hospitals can access (Chen et al., 2021; De Weerd et al., 2017; Fatima & Khaliq, 2017; Saputra et al., 2019; Shukar et al., 2021). The national drug scarcity problem is usually caused by insufficient raw materials (Phuong et al., 2019; Saputra et al., 2019), manufacturing problems, and regulatory issues. The problem also comes from discontinuing products from the market, making business decisions, and dealing with natural disasters (Phuong et al., 2019) so that the possible scarcity of certain drugs can be predicted. Thus, the government can develop regulations requiring pharmaceutical companies, importers, and distributors to report possible shortages of certain drugs (Alruthia et al., 2018; Shukar et al., 2021). Collaboration is needed between related institutions at the national and international levels to overcome drug scarcity (Alruthia et al., 2017; Chen et al., 2021).

Medicine supply problems are common and continue to increase (Shukar et al., 2021). Drug shortages are experienced by many hospital pharmacy installations, resulting in delays or rejection of requests for vital drugs, diversion to other therapeutic alternatives, and medication errors (AlRuthia et al., 2017; De Weerd et al., 2017; Said et al., 2018). Sustainable solutions are required to solve stockouts and ensure appropriate patient care (Said et al., 2018). Expired drug problems also occur in various places (Alnahas et al., 2020). The results of the previous study (Dyahariesti & Yuswantina, 2017) described the percentage of expired and damaged drugs as 0.5%, while the percentage of dead stock was 2.7%.

The management of pharmaceutical dosage forms, medical devices, and medical consumables must be carried out in a multidisciplinary manner, and an effective process must be used to ensure quality control and cost control (Indonesian Ministry of Health, 2016). Hospital drug shortages involve multifactorial causes. There are vendor inventory problems (Alruthia et al., 2018), miscommunication, regulatory issues, inventory management errors, and price issues (Fatima & Khaliq, 2017). However, the true causes of drug supply disruptions and shortages are often unknown (De Weerd et al., 2017). Expired drugs are potentially toxic materials that must be managed effectively to avoid accumulating potentially toxic drugs in the environment (Michael et al., 2019). Thus, it is vital to trace the causes of problems in each health service center so that efforts to solve the problem can be carried out effectively and efficiently.

The root causes that have been arranged systematically help the management to find the right solution, but some weaknesses in the fishbone diagram are the limitations of this research. A fishbone diagram cannot show how fundamental or general the particular problem is, so it cannot help determine the level of urgency of the solution to be taken. In addition, this diagram uses a retrospective approach, an analysis of causes that have produced effects in the past (Al-Dosaari et al., 2016). Qualitative studies are also not generalized in nature; another place might have different patterns of problems. So, studies that can dig deeper into the cause of the problem need to be done for each study site.

CONCLUSION

The occurrence of drug shortages during services and expired drugs is an effect that arises due to various problems that exist in managing hospitals' internal and external supplies. These problems are described systematically in fishbone diagrams. The root causes of drug shortages and expired drugs in Hospital X can be divided into several domains: materials/inputs, methods, human resources, machines/equipment, measurement (process evaluation), and the environment.

The author declares that there is no conflict of interest in this research. Although the triangulation process has been carried out to ensure the validity of the data obtained, the description of the problems found is strongly influenced by the culture and perspective of each informant towards the workload they feel. In addition, it is necessary to measure the effect of the problems to provide solutions according to the level of urgency.

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