



LEAN APPROACH: EVALUATION OF THE USE OF A MODULAR SHELF SYSTEM IN A PHARMACY SETTING IGD

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ABSTRACT

The lean hospital approach can be used as a reference for improving the hospital pharmacy installation service process. The research aims to use the lean hospital approach as a reference for improving the service process which focuses on outpatient pharmacy satellites and inpatient pharmacy satellites at X Private Hospital Yogyakarta. This research uses a non-experimental research design with a qualitative approach. Value data was obtained using questionnaire measuring instruments, direct observation, in-depth interviews, unstructured interviews and review of related documents. The effort taken by researchers to maintain data validity is data triangulation. The data obtained was analyzed using descriptive analysis. The results show that reducing activities that do not provide added value for customers results in a decrease in the value of waste (Non Value-added Activity) by 49.87%, Optimizing inventory control reduces 23.83% (Rp. 55,210,830.45) and increases the efficiency of taking pharmaceutical supplies is 4.8 hours.

INTRODUCTION

Hospitals as a health facility must be able to improve and maintain the quality of health services that are oriented towards achieving stakeholder satisfaction (Bhati et al., 2023). Waste can be defined as anything that does not add any value to the final product or is not need (Evode et al., 2021). Hospitals can also improve patient safety by eliminating activities that constitute waste (Lee & Lee, 2022) and realizing that the ultimate goal is to provide better health services to patients (Kruk et al., 2018).

One way to eliminate waste or non-value added activities and increase patient safety is to implement lean hospital concepts and principles (Prado-Prado et al., 2020), and there are many success stories as learning material (Scoville & Little, 2017). In 2002, Virginia Mason Medical Center (VMCC) in Seattle, Washington became the first hospital in the United States to implement lean tools and techniques by adopting the Toyota Production System (TPS) (Williams, 2017). VMCC utilizes lean tools such as Kaizen events, and continuous improvement (Bhati et al., 2023). Other findings: The results of research by (Tawakal, M. A. P., Peranginangin, J. M., dan Widodo, 2022) provide information that in the drug management process there is still a fairly high waste value, namely in drug procurement activities (96.07%); in the activity of receiving procured medicines (62.59%); in drug storage activities (53.39%); as well as drug use activities (36.22%). Research by Sari et al. (2021) obtained information that critical waste in outpatient pharmacy services is waiting with a percentage of 19%. The main waste in outpatient drug services in the form of waiting is also supported by research results from (Nina, Y. dan Hakim, 2020).

In contrast to the results of research by (Sari, B. S. K., Marwati, T. A., dan Hidayat, 2021) and (Nina, Y. dan Hakim, 2020), research results by (Rochimah, S. F. dan Mudayana, 2022) show that the critical

waste of outpatient pharmaceutical services with the highest percentage is extraprocessing, namely 26%.

From several studies, it is necessary to eliminate waste in pharmaceutical services in hospitals because the pharmacy is the main support unit for patient care which has the highest inventory value in hospitals. In the era of National Health Insurance (JKN), hospitals must also increase efficiency and productivity so that service quality and patient safety are guaranteed according to accreditation demands. In this way, customer (patient) loyalty will increase and hospital stakeholders will be satisfied with the achievement of unit performance indicators.

The Emergency Room Pharmacy Satellite at the Central General Hospital in Klaten Regency is the only pharmacy satellite with 24 hour service which has very limited space for storing pharmaceutical supplies needed to serve emergency patients, outpatients (false emergency), CITO surgery patients, and inpatients. Therefore, it is necessary to optimize the arrangement of stored pharmaceutical supplies so that space utilization can be efficient. Apart from that, the limited number of human resources in the Pharmacy Installation means that the maximum number of duty officers in the IGD Pharmacy Satellite is only 2 people per duty shift with the task of managing pharmaceutical supplies and serving prescriptions, both for emergency patients, outpatients (false emergency), CITO surgery patients, as well as inpatients for 24 hours. Therefore, it is necessary to optimize the arrangement of stored pharmaceutical supplies so that the movement of officers can be efficient which can be seen from the duration or time needed for officers to pick up pharmaceutical supplies (picking) from the storage shelves..

In achieving performance indicator targets, the Pharmacy Installation takes a lean approach, one of which is in storing pharmaceutical supplies, namely by using modular shelves to support the implementation of 5S in the IGD Pharmacy Satellite. The use of modular shelves as an effort to eliminate waste in storing pharmaceutical supplies needs to be evaluated in order to achieve optimal effectiveness and efficiency.

LITERATURE REVIEW

Rack Modular

Based on the PT Product Information sheet. Multi Sinar Adamar (2021), modular shelves are a means of storing pharmaceutical supplies in the form of BHP medicines and medical equipment that are effective, efficient, flexible and ergonomic. Using modular shelves in storing pharmaceutical supplies has the following advantages: 1) Has a large storage capacity and saves space; 2) Each storage basket can be divided into small compartments according to the size and number of pharmaceutical supplies stored; 3) The position of the storage basket can be adjusted flat or tilted so that the FIFO system can run well; 4) Storage of pharmaceutical supplies in a neat and orderly manner so that they are easy to control and reduce losses due to damaged or expired medicines; 5) Make it easy to monitor and replenish stock accurately and quickly (real time inventory control); 6) Solid and compact storage of goods so as to create free space that can be used for other purposes; 7) The resulting free space can reduce employee stress levels. This is because employees do not need to do a lot of movement just to take and monitor stock

Non Value-added Activity

In research by (Rochimah, S. F. dan Mudayana, 2022), it is stated that in the pharmaceutical service process, there are activities that have value for customers (Value-added Activity), do not have value for customers but need to be carried out (Necessary but Non Value-added Activity), and activities that have no value for customers (Non Value-added Activity). By eliminating non-value-added activities and minimizing activities that are necessary but non-value-added activities, the lean goal will be achieved, namely increasing the value obtained by customers (Iswanto, A. H. dan Rosady, 2020). Because it is waste, non-value-added activities must be eliminated. The waste that occurs in patient care according to (Suryani, R., Ciptono, W. S., 2017) include: defects, overproduction, waiting, non-utilized talent, transportation, inventory, motion, and extraprocessing.

Inventory Value

According to research by (Iswanto, A. H. dan Rosady, 2020), implementing lean in pharmacy can increase inventory accuracy and reduce stock of pharmaceutical supplies resulting in a significant reduction in inventory value. This can be achieved by implementing lean using effective tools as an effort to overcome the problems faced. One of the tools in implementing lean is 5S (Sort, Set in order, Shine, Standardize, Sustain) whose implementation can provide various benefits, one of which is reducing inventory value and costs of providing goods (Iswanto & Koesoemo, 2019).

Officer Movement

In their research, (Putri, 2017) found that the critical waste in pharmaceutical services that most often occurs is motion, namely activities or movements of staff that are less effective and have no value for customers, thereby hampering the service process and resulting in long waiting times. Meanwhile, research results from (Nina, Y. dan Hakim, 2020) stated that excessive movement of officers when taking medicine due to the storage area being difficult to reach as well as limited room space and inefficient use of it so that officers cannot move freely are the main problems causing high waste in pharmaceutical services.

RESEARCH AND METHODOLOGY

The design of this research is a quasi-experimental quantitative comparison where the researcher provides treatment to the test subjects and compares the consequences/impacts of the treatment given to the initial conditions before the treatment was given to the test subjects. Research has indicators.

No	Name Variabel	Definition	Indicator
1.	Rack Modular	Modular shelving is a means of storing pharmaceutical supplies in the form of medicines and BHP medical equipment that is effective, efficient, flexible and ergonomic.	Indicators (Iswanto & Koesoemo, 2019): 1. Effective and efficient shelf placement 2. Flexible and ergonomic shelf characteristics 3. Arrangement/placement of goods on the shelves
2.	<i>Non Value-Added Activity</i>	<i>Non Value-Added Activities are activities of pharmacy staff that have no value for customers (patients).</i>	Indicator-indicator (Suryani et al., 2017): 1. <i>Defect</i> 2. <i>Overproduction</i> 3. <i>Waiting</i> 4. <i>Non-utilized talent</i> 5. <i>Transportation</i> 6. <i>Inventory</i> 7. <i>Motion</i> 8. <i>Extraprocessing</i>
3.	Inventory Value	Inventory value is the stock value of BHP medicines and medical equipment stored at the IGD Pharmacy Satellite at the end of the month.	Indicators (Iswanto, A. H. dan Koesoemo, 2019): 1. Fast moving category pharmaceutical supplies 2. Slow moving category of pharmaceutical supplies
4.	Officer Movement	Officer movement is the time needed by pharmacy officers to pick pharmaceutical supplies from storage shelves to then be mixed (dispensing) or packaged (packing).	Indicators (Nina & Hakim, 2020): 1. Place items within easy reach 2. Efficient use of space 3. 3. Duration of taking goods from the shelf (picking)

The sampling technique in this research is purposive sampling. The population in this study were all pharmaceutical supplies stored in the Central General Hospital Emergency Room Pharmacy Satellite located in Klaten Regency, Central Java. Where the hospital is a type A vertical hospital under the Ministry of Health of the Republic of Indonesia. The IGD Pharmacy Satellite is the only pharmaceutical satellite that provides 24-hour pharmaceutical services and has the widest service coverage because it includes emergency patients, operating room patients (for CITO operations), outpatients (false emergency), and inpatients (for during the night shift/Inpatient Pharmacy Satellite is closed).

Determining the test sample in this study used purposive sampling with prospective data collection at month 0, month 1 to month 3. For data on the speed of taking goods in the officer movement variable, sampling was carried out because not all pharmaceutical supplies were prescribed during the research period. The sample determined was fast moving category pharmaceutical supplies from the BHP medicine and medical equipment group so that the average data on the speed of picking up goods obtained was more representative of the population because of the high frequency of picking up. Analysis method with a comparison of waste identification results (Non Value-added Activity) in pharmaceutical services at the

IGD Pharmacy Satellite obtained through Focus Group Discussion (FGD) and Univariate Analysis.

The concept of this research is based on the results of previous studies. (Tawakal et al. 2022; Nina & Hakim 2020; Iswanto & Rosady 2020; Iswanto & Koesoemo 2019)

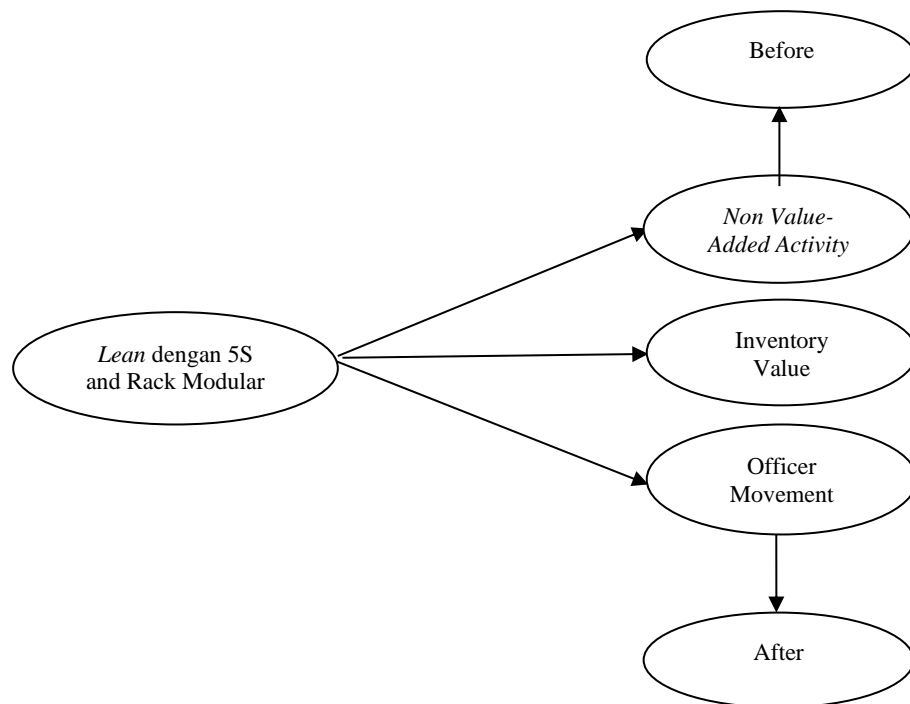


Figure 1. Conceptual Model of the Study

Source: Tawakal *et al.* 2022; Nina & Hakim 2020; Iswanto & Rosady 2020; Iswanto & Koesoemo 2019

RESULT AND DISCUSSION

Result

The Central General Hospital Pharmacy Installation in Klaten Regency has identified waste in pharmaceutical services in the IGD Pharmacy Satellite in 2020 with critical waste in the form of motion. This critical waste is in line with the results of research by Putri and Susanto (2017) which shows that the highest ranking of critical waste in pharmaceutical services is motion with a percentage of 19%. After analyzing the root causes of critical waste using the 5 Why method, it was discovered that the cause of waste in the form of motion was the storage of goods that were not neat so that the movement of officers was less than optimal. The results of this analysis are in accordance with the research results of Nina & Hakim (2020) who reported that less efficient arrangement of medicines causes waste in the form of motion where officers have to make greater efforts to reach the medicines, as well as less efficient room arrangement/layout for placing medicine storage shelves. so the room became full and the officers did not move freely.

In Nina and Hakim's research (2020), where from the Fuzzy-FMEA results it was discovered that there was a risk of drugs being difficult to reach so that officers had to make excessive movements in taking the drugs due to the location of the drug storage based on its use, it was recommended that improvements be made in the form of grouping and placing drug storage based on characteristics. (fast moving, slow moving, death stock) each type of drug and its use. Apart from that, in this research it was also discovered that there is a risk of insufficient room space and less efficient use of room space so that staff cannot move freely due to poor layout of pharmaceutical supplies, so improvement efforts are recommended in the form of implementing a 5S culture..

Based on recommendations for improvement efforts in Nina and Hakim's research (2020), the Pharmacy Installation of the Central General Hospital in Klaten Regency formulated several efforts that will be made to increase the efficiency of officers' movements in retrieving pharmaceutical supplies from storage shelves by implementing 5S (Sort, Set in Order , Shine, Standardize, Sustain) and proposes the

procurement of modular medicine shelves in 2022 to increase the efficiency of room space utilization so that it can increase the efficiency of movement of officers so that the small area of the Emergency Room Pharmacy Satellite becomes more spacious and the storage of pharmaceutical supplies becomes neater . Improvement efforts to eliminate the root causes of critical waste motion by applying the 5S method are also in accordance with recommendations for improvement in Putri and Susanto's (2017) research..

To optimize the use of space in storing pharmaceutical supplies, ergonomic and flexible modular shelves are used, where the height of medicine storage baskets can be adjusted to suit the dimensions of the pharmaceutical supplies being stored, as well as being flexible in setting the size of the storage compartments in each basket. Apart from that, modular shelves also have a compact shape and can be disassembled and assembled according to the available room space, as well as transparent baskets, making it easier for officers to see the contents/items stored in the baskets and reducing the risk of errors in taking pharmaceutical supplies (increasing patient safety). . The differences in the use of conventional medicine shelves and modular shelves in storing pharmaceutical supplies are as shown in Figure 1.



Image of Conventional Medicine Shelf



Gambar Rack Modular

Figure 1 Comparison of Medicine Storage with Conventional Shelves and Rack Modular

Discussion

Activities in pharmaceutical services at the IGD Pharmacy Satellite after implementing 5S and using modular shelves, the results of identifying activities that provide added value for customers/patients (Value-added Activity/VA) increased to 3.60%; activities that do not provide added value for customers/patients but need to be carried out (Necessary but Non Value-added Activity/NNVA) increased to 24.37%; and activities that do not have added value for customers/patients (Non Value-added Activity/NVA) decreased to 72.03%. Even though the NVA ratio value based on Table 4.3 is still more than 30% (still not reaching lean conditions) there has been a decrease in waste value (NVA) of 49.87% as shown in Table 1.

Table 1 Comparison of Waste Identification Results

	Number of Processes	Number of Activities	Average Time (minutes)	VA	NNVA	NVA
Before	5	15	242,6	5	37,9	199,8
After	5	14	139	5	33,9	100,1
Change	0	-1	-103,6	0	-4	-99,6
Percentage	0%	-6,67%	-42,70%	0%	-10,56%	-49,87%

From the explanation above, it can be seen that the lean approach with 5S tools and the use of modular shelves can reduce the value of waste (Non Value-added Activity/NVA) for pharmaceutical services in the IGD Pharmacy Satellite by 49.87%. The results of this evaluation are in line with the results of research by Nunuhitu et al. (2017) who reported that the lean approach can eliminate waste in the process of storing pharmaceutical supplies thereby reducing Non Value-added Activity by 69%.

Value of Pharmaceutical Supplies Inventory

Inventory	Month -0 (Rp)	Month to-1 (Rp)	Month to-2 (Rp)	Month to-3 (Rp)
<i>Fast Moving</i>	49.042.986,22	47.304.918,52	43.941.818,20	47.050.375,64

Inventory	Month -0 (Rp)	Month to-1 (Rp)	Month to-2 (Rp)	Month to-3 (Rp)
<i>Slow Moving</i>	182.786.977,73	124.738.369,47	124.153.205,99	142.668.712,69
Total	231.829.963,95	172.043.287,99	168.095.024,19	189.719.088,33
Changes in Inventory Value to Month 0		(59.786.675,96)	(63.734.939,76)	(42.110.875,62)
Persentase		-25,79%	-27,49%	-18,16%

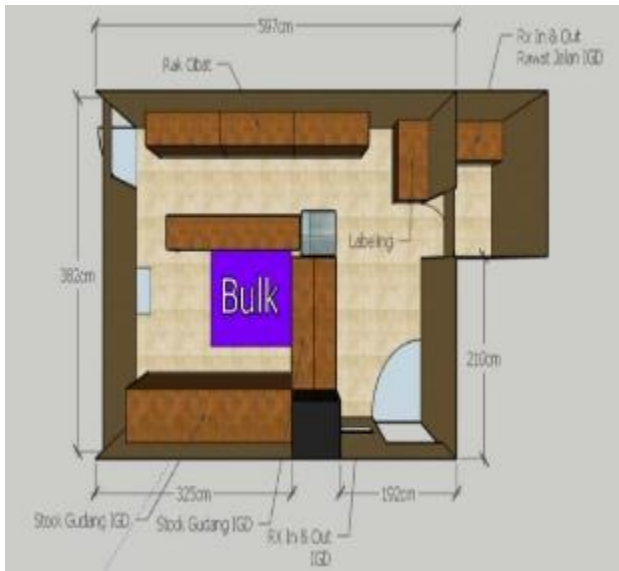
Based on Table 2, information is obtained that the inventory value in the IGD Pharmacy Satellite in the 0th month was Rp. 231,829,963.95 with the proportion of supplies in the fast moving category being 21.15% (Rp. 49,042,986.22) and the slow moving category being 78.85% (Rp. 182,786,977.73). Inventory value data in month 0 becomes a benchmark for evaluating the impact of using modular shelves and implementing 5S as a lean approach tool. From the results of observations of inventory values during the 1st to 3rd months, it is known that there was a decrease in inventory value with an average of 23.82% or IDR 55,210,830.45. This decrease in inventory value occurred due to a reduction in the number of smallest units of supplies stored in the IGD Pharmacy Satellite.

The decrease in the average value of inventory in this study was still below the research results of Iswanto and Rosady (2020) which showed that the average value of inventory in pediatric pharmacy units after three months of implementing lean had successfully decreased by 49%, as well as the research results of (Merguerian, P. A., Grady, R., Waldhausen, J., Libby, A., Murphy, W., Melzer, L., Avansino, 2015) which states that implementing lean in pediatric pharmacy units can reduce costs by 41%. This is possible because both studies were carried out in pediatric pharmacy units where the types of pharmaceutical supplies stored were more specific so that the inventory efficiency achieved could be more optimal. Meanwhile, in this study, the research location was the IGD Pharmacy Satellite which has a wider service coverage with a wider variety of cases and emergency conditions which require that vital category pharmaceutical supplies (emergency pharmaceutical supplies) must always be available at the IGD Pharmacy Satellite so that they cannot be eliminated even if falls into the death stock category.

However, the average decrease in inventory value in this study was higher than the research results of Iswanto & Koesoemo (2019) which stated that the implementation of 5S caused a decrease in the value of pharmaceutical supplies of 13.01%. It should be noted that Iswanto & Koesoemo's (2019) research was conducted in the operating room pharmacy unit where the conditions of pharmaceutical services are not significantly different from the Emergency Room Pharmacy Satellite because pharmacy officers in both locations must ensure the availability of emergency pharmaceutical supplies to ensure patient safety if at any time a condition occurs. Emergency. The difference in research results in the form of average inventory value after implementing lean may be caused by the use of modular shelves as a storage facility for pharmaceutical supplies in this research so that it can optimize the impact of implementing 5S because it provides the following benefits: 1) It is easier to monitor stock because of the storage baskets that transparent, making it easier for officers to see the contents of the basket; 2) Stock control is more optimal, because the size of the pharmaceutical supplies storage compartment can be adjusted to the maximum stock volume (Smax) according to calculations, thereby preventing overstock and running out of stock which can be seen easily due to the transparent basket; 3) Pharmaceutical supplies that are experiencing death stock can be identified immediately, identified by the low frequency of staff accessing the location where the supplies are stored so that they can be eliminated from the IGD Pharmacy Satellite stock by being returned to the Pharmacy Warehouse or transferred to another pharmaceutical satellite that is more needed or promoted to doctors so that prescriptions are increasing.

Apart from that, there was a decrease in inventory value for 3 months after the implementation of 5S as a lean approach tool and the use of Rack modular.

In arranging pharmaceutical supplies using modular shelves, fast moving supplies are stored in baskets on shelves that are located closest to the pharmacy officer's work desk and are easily accessible, namely in the direction of the counter for supplying supplies to the emergency room nurse and in a row parallel to the position of the officer's hand so that the officer Those who pick things up (picking) do not need to stand on tiptoes, bend their bodies, or even kneel to pick up the goods. By positioning the storage of pharmaceutical supplies as mentioned above, the speed of retrieving pharmaceutical supplies from the storage shelves will be faster than before using modular shelves..



Initial layout of the IGD Pharmacy Satellite room (before)



Storage of Pharmaceutical Supplies (before)

Figure 2 Room Layout and Storage Conditions Before Using Rack Modular



Layout awal ruangan Satelit Farmasi IGD (sesudah)



Penyimpanan Perbekalan Farmasi (sesudah)

Figure 3 Room layout and storage conditions for goods using Rack modular

Measuring the speed of taking pharmaceutical supplies from storage shelves (picking) was carried out by sampling a number of fast moving medicines and BHP medical equipment representing 3 shelf positions, namely the shelf for the tablet preparation group, injections, as well as the shelf for the BHP medical equipment group with 4 types in each group. supplies. The number of samples taken was very small (12 types or 2% of the total types of supplies stored in the IGD Pharmacy Satellite) because the number of officers on duty per shift was only 1-2 people so that if the number of samples were more it would potentially disrupt the smoothness of patient care due to speed data recording. Taking supplies (picking) is still done manually. Apart from that, the twelve types of pharmaceutical supplies sampled are supplies with the highest frequency of use (classified as very fast moving) so that they can provide an idea of the value of saving time in taking medicines (picking) which is more representative of the population because the frequency of taking them is high. Data on the speed of retrieval of pharmaceutical supplies from storage shelves was measured at month 0 as a baseline (before using modular shelves) and at months 1 to 3 after using Rack modular.

By shortening the duration of time for collecting pharmaceutical supplies from storage shelves (picking), there is a savings in the time for collecting pharmaceutical supplies from storage shelves during the first 3 months after using modular shelves compared to before using modular shelves as storage facilities for pharmaceutical supplies (0th month) as per the data which is shown in Table 3.

Table 3 Savings in Picking Time for Pharmaceutical Supplies from Storage Shelves

Storage Shelf Group	Baseline	Time Savings Compared to Month 0			Unit
	Month 0	Month 1	Month 2	Month 3	
Tablet	9.740	2.824	3.770	4.545	Second
Injeksi	20.968	3.860	6.688	9.468	Second
Alkes BHP	23.224	776	7.012	12.708	Second
Total	53.932	7.460	17.470	26.721	Second
	14,98	2,07	4,85	7,42	Hours

From Table 3 it is known that after using modular shelves as a storage facility for pharmaceutical supplies and implementing 5S as a lean approach tool in the IGD Pharmacy Satellite, the time for picking up goods became faster resulting in savings in time for picking pharmaceutical supplies from the storage shelves. Of the 12 types of pharmaceutical supplies sampled, the total duration of time for retrieving pharmaceutical supplies from storage shelves during month 0 (before implementing 5S and using modular shelves) was 53,932 seconds or 14.98 hours. In the 1st month after implementation, there was a saving in time for collecting supplies of 7,460 seconds or 2.07 hours compared to the 0th month. And in the 2nd and 3rd months, time savings in retrieving pharmaceutical supplies from storage shelves increased, namely 17,470 seconds (4.85 hours) during the 2nd month and 26,721 seconds (7.42 hours) during the 2nd month. Thus, the average savings in time for retrieving pharmaceutical supplies from storage shelves was 17,217 seconds (4.78 hours) after using modular shelves and implementing 5S as a lean approach tool in the IGD Pharmacy Satellite.

The significant efficiency (savings) in time for retrieving pharmaceutical supplies from storage shelves can be utilized to carry out clinical pharmacy services in wards, complete administrative work related to prescription services, stock monitoring, preparation of surgical packages, as well as prescription services for inpatients and outpatients (false emergency) so that HR efficiency can also be achieved

CONCLUSION

The lean approach with 5S tools and the use of modular shelves as storage facilities for supplies in the IGD Pharmacy Satellite has had the following impacts: 1) Reducing activities that do not provide added value for customers resulting in a decrease in the value of waste (Non Value-added Activity) by 49.87% ; 2) Optimizing inventory control resulting in a decrease in the average inventory value of 23.83% (Rp. 55,210,830.45); 3) Increase the efficiency of officer movement (motion) resulting in savings in picking time for pharmaceutical supplies (picking) with an average of 4.78 hours.

Suggestions and Implications: Eliminating waste through implementing 5S can increase time efficiency, human resources and inventory value. The lean approach can be optimized through investment in modular racks as storage facilities for pharmaceutical supplies so that efficiency is achieved which has an impact on improving the quality of hospital services. Apart from the IGD Pharmacy Satellite, the lean approach with 5S tools and the use of modular shelves as a storage facility for pharmaceutical supplies can also be implemented in other pharmacy satellites that have high waste values such as the Inpatient Pharmacy Satellite and the Outpatient Pharmacy Satellite..

So that the concept of kaizen (5S) can be implemented optimally, there needs to be supervision/monitoring and evaluation from the hospital management regarding the sustainability of the lean approach in eliminating waste because in principle lean is cultivating performance without waste (waste) at every stage. In this way, efficiency will be achieved, service quality will increase and this will be followed by increased satisfaction of hospital customers (patients).

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