

OPTIMIZING MEDICINE SUPPLY: AN ECONOMIC ORDER QUANTITY APPROACH

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ABSTRACT

Pharmacy service provides important and crucial support, while also acts as one of main revenue centers for hospitals. Mistakes in inventory indexation, will surely leads to greater problems for hospital management and financial aspects. Pagelaran Hospital is a hospital that remains practicing conventional methods to manage their medicine supply. The situation has brought inefficient medicine stock in Pagelaran Hospital, especially on medicine turnover ratio and purchase quantity. This study utilizes quantitative descriptive method, with medicine planning and procurement data of 2021. The obtained data were further analyzed by using EOQ method, which then compared with data before EOQ is implemented. After a careful EOQ calculation, it was identified that 19 A category medicines with a total of 3-65 items for each order. After the implementation of EOQ method, the study resulted inventory value decrease by IDR 409,914,601 and improvement on turnover ratio by 8 times. Based in the results of this study, it was indicated that the implementation of EOQ on medicine procurement will improve hospital financial efficiency, lower possibility of losses caused by low medicine turnover ratio, and improve profitability of the hospital by lowering holding cost due to inefficient stock management.

Keyword: Inventory Control, ABC Analysis, EOQ, Inventory Value, TOR

1. INTRODUCTION

The primary objective of hospitals is to provide high quality, secure, and trustable healthcare services for the society. To maintain its reputability, it is vital for hospital to ensure that every aspect of its management activities can be impeccably implemented [1]–[3]. One of hospital services that provides vital role in shaping hospital profitability is the pharmacy unit. The ability of hospital pharmacy unit to ensure hospital profitability is mainly driven by the capacity of the unit to optimize its inventory effectiveness and efficiency [4]. It is possible for hospital to run out of medicines, which would lead to profit loss or the decrease of trust level achieved from their patients. The inability to provide the required medicine would also decrease the accuracy and pace of service delivery [5], [6]. Based on its function and capabilities, hospital pharmacy unit is a facility that provides a direct service and takes full responsibility for the safety of its patients, because the accuracy of the service provided will affect patients' quality of health, while also act as one of the main revenue centers of hospitals.

Pagelaran Regional General Hospital in Cianjur, is a government-owned hospital built to provide healthcare service needed by the people of Southern Cianjur region. The goal of the facility establishment is to provide responses on the healthcare challenges faced by the people in the area compared to any other areas in West Java Province. Pagelaran Regional General Hospital is the first D Class hospital in South Cianjur area. The hospital can house up to 70 inpatients on a number of room types. Similar as any other hospitals, Pagelaran Regional General Hospital highly dependent on its pharmacy unit to produce cash as their main source of revenue generation. Most of hospital revenue (40% to 50%) is produced by pharmacy unit [7]. That is why, without proper pharmacy management and responsibility, it is difficult to maintain hospital profitability [8]. One general mistake in pharmacy management is inaccurate medicine procurement that often leads to excessive accumulation of unused medicine stocks and increased storage costs [9]. On the other hand, it is vital to ensure that hospitals can provide their patients with the

necessary and accurate medicine. Based on that, the optimization of management functions regarding pharmacy medicine procurement namely planning, procuring, distribution, storing, and medicine utilization are crucial.

Table -1: Expired and Damaged Medicine Values in Pagelaran Regional General Hospital for The Last Four Years

No	Year	Expired and Damaged Medicine Value (IDR)
1	2019	115,161,536,00
2	2020	65,192,379.76
3	2021	125,317,812,00
4	2022	35,060,000.00

The Pharmacy Installation at the Pagelaran Regional General Hospital is part of the supporting service unit, which consists of an outpatient pharmacy installation and an inpatient pharmacy installation. In carrying out its activities, it is supported by a workforce of 10 people consisting of 2 pharmacists, 6 pharmacist assistants and 2 administrative staff. In the last three years the value of medicine supplies has fluctuated, the use of medicine in hospital pharmacy installations has decreased every year because they are used by patients. However, the level of inventory value of medicine in the Pharmacy Installation of Pagelaran Regional General Hospital turned out to be quite significant. As shown in Table 1, the value of expired or damaged medicine in Pagelaran Regional General Hospital is highly fluctuated. It is reasonable to suspect that the hospital lacks a proper medicine inventory control model which resulted to excessive expired and damaged medicine losses. It is also indicated that there is an irregular utilization of certain types of medicine, which leads to ineffective procurement activity practiced by the hospital. Based on our interview with the head of pharmacy installation and storage in Pagelaran Regional General Hospital, we also discovered that the hospital has not implement specific method to produce medicine requirements and demands as basis of medicine procurement action. The procurement is implemented based on weekly or monthly usage, which leads to high frequency unscheduled procurement.

Table -2: Number of Stock Out Medicine in 2019-2022

No	2019		2020		2021		2022	
	Month	Item	Month	Item	Month	Item	Month	Item
1	Januari	23	Januari	45	Januari	34	Januari	79
2	February	45	February	23	February	25	February	56
3	Maret	31	Maret	67	Maret	46	Maret	34
4	April	15	April	15	April	35	April	27
5	May	26	May	23	May	78	May	25
6	June	56	June	43	June	23	June	25
7	July	43	July	25	July	17	July	14
8	August	27	August	16	August	15	August	17
9	September	28	September	9	September	28	September	23
10	October	14	October	15	October	18	October	26
11	November	28	November	14	November	23	November	16
12	December	19	December	23	December	16	December	15

In addition to the existing expired and damaged medicine, Pagelaran Regional General Hospital also seem to be familiar with stock out. It could occur due to slow medicine management, inaccurate procurement preparation, and high risk of procurement mistakes. When pharmacy installations are facing stock outs, cost will significantly increase while also lower healthcare supply chain efficiency [10], [11]. The goal of medicine procurement management is to achieve balance between supply and demand, to ensure high quality medicine management efficiency and effectiveness [12]–[15]. In Pagelaran Regional General Hospital, stock out occurs on different medicine each month, depends on the length of procurement process and payment. Table 2 describes the number of medicine stock out for each month in the last 4 years.

Table 3 shows that the value of medicine supply in Pagelaran Regional General Hospital is not carefully planned. The stock seems to be stagnantly arranged instead of dynamically adjusting to the requirement and number of

usages. The supplying policy often leads to over stock situation, where the number of medicines in storage are higher than the number of used medicines. The imbalance of medicine supply and demand is driven by the inaccuracy of medicine stocking activities, which leads to higher expenses on storage facilities, expiration treatment, and damages. Stock calculation is also conducted manually instead of computerized, accumulated by unstandardized prescription issuance by doctors. Patients tend to access their medicine from other sources outside of the hospital because the medicine is unavailable.

Table -3: Value of Pharmacy Installations Medicine Supplies in 2019-2021

2019			2020			2021		
Month	Item	Total Value (IDR)	Month	Item	Total Value (IDR)	Month	Item	Total Value (IDR)
1	357	2,057,575,835	1	367	2,435,220,543	1	349	2,356,789,230
2	357	2,351,246,367	2	367	2,456,789,879	2	349	2,103,245,678
3	357	2,146,579,234	3	367	2,357,567,900	3	349	2,203,456,723
4	357	2,063,457,298	4	367	2,235,673,457	4	349	2,203,478,290
5	357	2,109,347,845	5	367	2,570,278,437	5	349	2,398,734,500
6	357	2,198,476,237	6	367	2,437,679,340	6	349	2,109,823,479
7	357	2,439,769,203	7	367	2,653,789,634	7	349	2,198,652,300
8	357	2,048,934,576	8	367	2,464,879,456	8	349	2,498,534,890
9	357	2,221,376,908	9	367	2,356,793,463	9	349	2,356,309,831
10	357	2,108,345,800	10	367	2,103,897,246	10	349	2,108,752,300
11	357	2,089,345,789	11	367	2,018,973,456	11	349	2,298,737,689
12	357	2,012,675,400	12	367	2,108,675,230	12	349	2,198,734,239

With the current problems faced by Pagelaran Regional General Hospital Pharmacy Installation, it is vital to implement medicine supply management that involves information regarding medicine stock, medicine grouping, and the exact amount required for each medicine procurement. One method that can be implemented to optimize medicine supply management is known as Economic Order Quantity (EOQ) method. By identifying medicines with abilities to produce 70-80% profit of the inventory value and implementing EOQ, there is a great potential for Pagelaran Regional General Hospital to minimize loss and improve its profitability.

2. THEORETICAL REVIEW

In addressing the challenges within the pharmacy setup at Pagelaran Regional General Hospital, there's a clear need to enhance the efficiency of inventory management and control. The current system falls short in fully optimizing inventory, leading to significant issues like frequent medicine shortages and the accumulation of expired medications. To rectify this, the authors propose a set of improvement strategies aimed at optimizing pharmacy supplies and bolstering the overall operational effectiveness of the installation.

The researchers' conceptual framework revolves around the depiction of medicine supply management as a cohesive system. In this framework, inventory control is intricately woven into a cycle of interdependent managerial functions. These functions encompass essential activities such as planning, budgeting, procurement, storage, distribution, and write-off, collectively shaping the intricate fabric of effective inventory management.

This study places a concentrated emphasis on medicine planning and the procurement process, as these pivotal aspects are instrumental in attaining an optimal and streamlined inventory quantity. Crafting an effective medicine procurement plan necessitates the utilization of a precise calculation methodology, thereby ensuring the efficacy and efficiency of the procurement process. A judicious orchestration of inventory planning and control becomes imperative, facilitating the determination of optimal order quantities for cost-effectiveness, the provisioning of adequate safety stock, and the establishment of reorder points. By strategically managing these variables, the study aims to enhance supply availability, thereby fostering a heightened level of operational efficiency [15]. Medicine supply stands as a paramount asset within a hospital environment, carrying significant weight as it constitutes up to 40% of the hospital budget. Striving for cost reduction, pharmacy installations often aim to curtail inventory levels.

However, this approach walks a delicate balance, as patient satisfaction can be undermined due to instances of inventory stockouts. The challenge lies in harmonizing the financial imperative of inventory reduction with the imperative of ensuring an uninterrupted supply to meet patient needs and expectations [4], [12], [16]. Hence, pharmacy installations face the critical task of achieving equilibrium between investing in supplies and prudent cost

management, with the ultimate aim of nurturing patient satisfaction. This entails the company's adeptness in maintaining an optimal inventory level, ensuring seamless operational flow with the right quantity and quality of resources while mitigating costs to the fullest extent feasible. In essence, success hinges on the organization's finesse in harmonizing these facets to uphold operational efficiency, customer contentment, and financial prudence [17].

To craft a well-suited strategy, the utilization of an appropriate inventory calculation method is imperative. In this endeavor, researchers employ the ABC method for planning calculations. The envisaged role of the ABC method is to effectively categorize medicines based on their inventory values. This categorization is paramount, with medicines in category A denoting those possessing substantial inventory values. Shortages or excesses of medicines in this category could potentially lead to detrimental losses for the hospital. As such, the application of the ABC method enables a meticulous analysis that empowers precise decision-making to mitigate potential losses and optimize resource allocation [8], [18].

To achieve an efficient inventory management, the adoption of an appropriate calculation method is pivotal. Among these methods, the Economic Order Quantity (EOQ) model emerges as a robust option. This model hinges on the assumptions of consistent demand, uniform waiting time, fixed order costs, instantaneous replenishments, absence of stockouts, and a predictable demand devoid of uncertainties. Despite its merits, the full integration of the EOQ model into hospital pharmacy installations remains incomplete. The EOQ model serves as a tool for calculating orders with cost optimization in mind. It diligently strikes a balance between inventory costs and additional expenses, thereby safeguarding against occurrences of shortages or excessive orders. This application aids in curbing operational inefficiencies and resource misallocation [19], [20].

Process control emerges as the linchpin of effective procurement procedures. Within this framework, one prominent facet is the purchasing process, encompassing decisions on product quality, quantity, timing of procurement, pricing considerations, and selection of suppliers. Once acquired, diligent management of the inventory becomes paramount. A focal challenge manifests in the determination of optimal order timing and quantities for medicines.

In this context, the Economic Order Quantity (EOQ) method surfaces as a valuable tool. Leveraging the EOQ approach aids pharmacy installations in calculating optimal order quantities, thereby mitigating the risk of inventory overaccumulation or shortages. The precision offered by EOQ calculations empowers installations to align their inventory levels with demand, striking a harmonious balance between efficient stock maintenance and resource optimization. By facilitating informed decision-making, the EOQ model enhances inventory control and bolsters the overall efficacy of pharmacy operations.

Within this context, a recurring issue has surfaced—inventory value reports consistently exhibit annual increments, apparent through the escalating accumulation of pharmacy items within the warehouse. This trend particularly pertains to category A medicines, characterized by their substantial volume. This accumulation raises concerns about potential medicine expiration, posing a financial threat to the hospital.

The inventory turnover ratio emerges as a crucial metric for evaluating the velocity of inventory movement within a specific timeframe. Notably, a low inventory turnover rate can signify an excessive allocation of resources in inventory holdings. This scenario implies that a significant portion of the invested funds remains immobilized, hindering the potential for optimal resource utilization. Consequently, this underlines the importance of proactive inventory management strategies to avert overinvestment, prevent losses due to medicine expiration, and ensure efficient financial resource allocation [17]. Conversely, a high turnover rate signifies a swift utilization of capital within a defined timeframe, minimizing the duration for which funds remain tied up in inventory holdings.

Guided by the aforementioned perspective, the researchers implemented the EOQ method specifically to category A medicines. This intervention aimed to intercede between investment value and inventory turnover. The assessment involved a comparative analysis before the application of the EOQ method and subsequent to its implementation. This enabled the researchers to gauge the impact of the EOQ method on inventory management dynamics, shedding light on any potential improvements in investment efficiency and inventory turnover patterns [21], [22], [22]–[26].

Based on the comprehensive literature review and the insights presented earlier, the researchers arrived at conclusions that closely align with both their investigative pursuits and the prevailing challenges within the hospital. The research commenced with an ABC analysis conducted on available data, illuminating the medicines that accounted for the most substantial budget allocation within the Pharmacy Installation [21]. Subsequent to this classification, the medicines were categorized into groups A, B, and C. The focus then shifted to an in-depth examination of class A medicines, aligned with the EOQ standardization process. Subsequent steps encompassed data analysis and comprehensive testing, encompassing a span of 4 weeks.

The computation of Inventory Value was a pivotal component of the analysis, derived from the product of the ultimate medicine stock quantity and its corresponding price for each individual medicine item. Concomitantly, the evaluation included the Inventory Turnover Ratio (ITOR) for the same 4-week duration. This evaluation

encapsulated the period preceding the intervention and the subsequent phase after its implementation, facilitating a comparative assessment of the impact on inventory dynamics.

3. METHODS

In this research endeavor, a quantitative descriptive methodology was employed to investigate and gain insights into the intricacies of medicine planning and procurement for the year 2021. The primary objective was to comprehensively analyze the data pertaining to these processes and subsequently employ the Economic Order Quantity (EOQ) method for a more in-depth examination. The study delved into the intricate details of medicine procurement, aiming to optimize the process and enhance efficiency.

The dataset gathered for the year 2021 was subjected to a rigorous analysis using the EOQ method, a well-established technique in inventory management. EOQ takes into consideration factors such as demand, ordering costs, and holding costs to determine the optimal order quantity that minimizes overall costs. This quantitative approach enabled a meticulous assessment of the medicines' procurement strategies.

One of the key outcomes of this study was the identification of 19 medicines categorized as 'A' category items. Each of these medicines exhibited unique characteristics and varying levels of demand. Consequently, the study found that the optimal order quantities for these 19 medicines ranged from 3 to 65 items for each order. This variance in optimal order quantities underlines the complexity and diversity of the pharmaceutical procurement landscape.

Furthermore, the study did not stop at merely calculating the EOQ values. It also involved a comparative analysis with data collected prior to the implementation of the EOQ method. This comparison shed light on the tangible benefits and improvements achieved through the application of EOQ principles in medicine procurement.

In summary, through the meticulous utilization of quantitative descriptive methods and the EOQ technique, this study unearthed valuable insights into the medicine planning and procurement processes of 2021. The identification of optimal order quantities for the 19 'A' category medicines and the comparative analysis underscored the potential for enhanced efficiency and cost savings in pharmaceutical procurement practices. These findings serve as a significant contribution to the field, offering practical recommendations for optimizing the management of medicine inventories in healthcare systems.

4. RESULTS AND DISCUSSION

When it came to medicine ordering at the Pagelaran Hospital pharmacy warehouse, the ordering process lacked a systematic consideration of order quantity. The findings from interviews with the warehouse head indicated that the volume of orders was predominantly contingent upon the daily medicine consumption requirements. However, this approach has the potential to lead to inefficiencies, giving rise to waste. This is due to the possibility of escalated ordering costs when conducted in minimal quantities or the elevation of storage costs if orders are placed in excessive quantities. The absence of a balanced and optimized ordering approach underscores the need for a more structured and data-informed methodology to ensure cost-effective procurement and streamlined inventory management.

Insights garnered from interviews with the procurement department at Pagelaran Hospital have shed light on their procurement practices, primarily employing e-purchasing and direct spending approaches. Nonetheless, these methods occasionally encounter challenges, causing disruptions in the timely availability of necessary medications. The identified issues encompass lengthy delivery periods, instances of medicine shortages impacting urgent requirements, and incomplete order fulfillment due to payment-related influences on distributor cooperation.

Several recurring procurement problems have surfaced, including the unpredictability of delivery schedules, instances where medicines listed in the e-catalog are out of stock at the factory, resulting in procurement values differing from planned estimates. Prolonged response times from providers during the ordering process have also been noted. Additionally, challenges arise from medicines not being listed in the e-catalog, as well as a deficiency in pharmacy personnel dedicated to the procurement role.

These findings collectively underscore the need for enhancements in the hospital's procurement strategies. Addressing the uncertainties in delivery schedules, optimizing e-catalog accuracy, streamlining provider communication, and augmenting the pharmacy procurement workforce are crucial steps towards improving the efficiency and effectiveness of the hospital's medicine procurement practices. [15].

The inventory control practices at Pagelaran Hospital currently incorporate a 2-month buffer stock, primarily aimed at averting shortages. However, the determination of this buffer stock size lacks a comprehensive rationale beyond

ensuring supply continuity. This highlights the necessity for precise calculations to ascertain the most advantageous ordering quantities.

In light of the proposed inventory control framework for Pagelaran Hospital, the researchers advocate for the implementation of two key metrics: the Economic Order Quantity (EOQ) and the Turn Over Ratio (TOR). The underlying objective of this approach is to furnish the pharmacy with data-driven insights for optimal order decision-making. The aim is to strike a balance where excessive capital doesn't remain immobilized in inventory while simultaneously safeguarding against supply deficits.

Among these metrics, the Economic Order Quantity (EOQ) holds a prominent position due to its widespread adoption and simplicity. Its application within the hospital's inventory control scheme can catalyze improved decision-making, resource optimization, and enhanced operational efficiency. (Ristono, 2013). Certainly, the application of the Economic Order Quantity (EOQ) method serves the purpose of determining the most economically viable number of orders for Pagelaran Hospital. This involves a meticulous consideration of both ordering costs and storage costs. The EOQ model carefully weighs the expenses associated with placing orders against the costs incurred from storing inventory over time. Through this analysis, the method aids the hospital in identifying the order quantity that minimizes overall costs, thus achieving a harmonious balance between efficient resource allocation, streamlined procurement, and effective inventory management [4].

The Economic Order Quantity (EOQ) method is implemented with the primary goal of attaining the most efficient order quantity. This objective is contingent upon the availability of an information system capable of accurately gauging the usage of each medicine. However, the existing information system at Pagelaran Hospital encounters limitations that hinder its optimal functionality, resulting in an inability to furnish precise data on medicine consumption for the pharmacy department. This deficiency subsequently impedes the pharmacy warehouse department's ability to make informed order decisions, compelling them to rely on estimations.

Current observations indicate that Pagelaran Hospital's pharmacy installation determines medicine requirements without employing a dedicated calculation approach for order quantities. Instead, these orders are based on historical consumption trends. This practice inherently carries a risk of escalating ordering costs if orders are placed in insufficient quantities, or conversely, increasing storage costs if orders are made excessively large.

To mitigate these challenges and optimize procurement strategies, the implementation of accurate calculations is imperative. The Economic Order Quantity (EOQ) calculation method emerges as a solution, providing a systematic framework to identify the optimal order quantity for medicines. This method ensures a balanced equilibrium between efficient inventory management and cost-effectiveness, thereby enhancing the overall operational efficiency of Pagelaran Hospital's pharmacy processes.

The EOQ calculation relies on data specifically derived from the consumption of medicines within category A. This category is of particular significance due to its substantial investment value, making the accumulation of excess stock potentially detrimental to the hospital's financial health. The potential for losses arising from stockpiling necessitates a careful approach to managing these medicines.

Conversely, the risk associated with medicine shortages extends beyond financial implications. The hospital's service quality could be compromised, resulting in suboptimal patient experiences. This, in turn, may lead to a decline in patient satisfaction levels and subsequently, a decrease in the hospital's revenue. By considering the EOQ and its implications for category A medicines, Pagelaran Hospital strives to strike a delicate balance between efficient resource utilization, maintaining satisfactory service quality, and safeguarding the hospital's financial viability [27].

Absolutely, the Economic Order Quantity (EOQ) serves as a strategic tool to streamline the procurement of goods or medications, with the ultimate aim of minimizing inventory-related expenses and achieving higher efficiency. This method facilitates the determination of the optimal order quantity, striking a balance between the costs associated with ordering and those linked to inventory holding. By calculating the EOQ, organizations like Pagelaran Hospital can make informed decisions about the quantity of items to order. This prevents both excessive accumulation of inventory, which could lead to financial losses, and shortages that might compromise service quality and patient satisfaction. Ultimately, the EOQ methodology empowers efficient resource allocation, cost reduction, and overall enhancement of operational performance [21]–[23]. The calculation of the Economic Order Quantity (EOQ) necessitates specific data inputs to derive accurate values. These inputs include the annual demand for medicines, the expenses associated with ordering medicines, and the costs linked to storing medicines. The process of ordering medicines typically involves requisition forms, stationery, and communication resources like telephones.

In the EOQ formula, these variables play a pivotal role. The medicine demand data, reflecting the rate of consumption, is critical for determining the appropriate order quantity. Ordering costs, encompassing expenses related to requisition and procurement processes, and storage costs, reflecting the financial impact of holding inventory, complete the equation. By integrating these factors into the EOQ calculation, pharmacy installations like

the one at Pagelaran Hospital can strategically optimize their ordering decisions, effectively balancing the costs and benefits of ordering and inventory management.

In this research endeavor, the inventory value indicator was adopted as a means of gauging the anticipated impact of medicine efficiency resulting from the application of the Economic Order Quantity (EOQ) method. This approach aims to quantify the extent to which the EOQ methodology can influence and enhance the efficiency of medicine management within the context of inventory control. By utilizing the inventory value indicator, the study seeks to provide tangible insights into the effectiveness of implementing the EOQ method in optimizing medicine procurement, resource allocation, and overall inventory management practices [22].

In this study, the primary emphasis was directed towards category A medicines, concentrating on the implementation of the Economic Order Quantity (EOQ) method. Preceding the intervention, the focus was on refining procurement strategies for category A medicines through EOQ application. This involved considering the existing medicine stock levels and the subsequent reduction in inventory value post-intervention.

Notably, the study doesn't explicitly state that the efficacy of the hospital pharmacy installation's medicine budget can be assessed by evaluating the elevated inventory value. However, it is implied that the inventory value assumes importance as a parameter to gauge the efficiency of the inventory management process. A higher inventory value can indeed signal the successful application of inventory control methods such as EOQ, which ultimately contributes to optimized procurement, resource utilization, and operational efficiency within the hospital's pharmacy domain. [18].

In this study, the cumulative inventory value is computed by multiplying the concluding medicine stock quantity with the corresponding medicine price. The research design encompasses a timeframe spanning 4 weeks before the intervention and another 4 weeks after the intervention. Throughout the intervention phase, medicine orders were executed in accordance with the EOQ calculation derived from the analysis. The underlying aspiration behind this approach is to mitigate the risk of stock shortages during the ongoing service operations, ensuring a seamless service delivery process. The calculated EOQ values were employed as a strategic guide for making more informed and efficient medicine procurement decisions, ultimately enhancing the continuity and quality of service provision.

Table -4: Medication Inventory Value Per Week Before and After Intervention

Situation	Stages	Inventory value (IDR)	Average Inventory Value/Week	Total Inventory Value (IDR)
Before Intervention	I	198,179,000	182,108,938.00	728,435,751.00
	II	181,761,751		
	III	179,563,000		
	IV	168,932,000		
After Intervention	I	89,022,150	79,630,287.50	318,521,150.00
	II	81,355,300		
	III	55,457,680		
	IV	92,686,020		

Based on the data presented in Table 4, the inventory value prior to the intervention, without implementing the Economic Order Quantity (EOQ) method, was calculated by multiplying the remaining stock at the end of each week by the corresponding selling price. This computation resulted in an average inventory value of IDR 182,108,938 over the span of 4 weeks. In contrast, post-intervention, the EOQ method was applied. The inventory value was calculated similarly by multiplying the remaining stock by the selling price, leading to an average inventory value of IDR 79,630,287 over the same 4-week period. Notably, the application of the EOQ method to category A medicines showcased a reduction in the average inventory value by IDR 102,478,651. This outcome demonstrates the tangible impact of employing the EOQ method in curbing inventory value.

The utilization of EOQ involves tailoring orders to the smallest packaging unit of the medicine, thereby minimizing costs associated with procurement and storage. This strategic approach engenders cost efficiency, as evident from the substantial reduction in average inventory value. In essence, the EOQ method optimizes resource allocation, reduces excessive stockpiling, and fosters a streamlined approach to inventory management, ultimately enhancing operational effectiveness.

In this study, the t-test was employed to gauge the extent of influence that individual independent variables have on explaining the dependent variable. This method aimed to rigorously test the hypotheses that were previously formulated. It also served as a means of comparing inventory values between different groups before and after the intervention. The application of the Economic Order Quantity (EOQ) method to inventory control led to a

significant outcome. The t-test results indicated a noteworthy disparity between the groups' inventory values prior to and after the intervention, yielding a p-value of 0.002. This outcome substantiates the efficacy of employing the EOQ method, as it demonstrates a statistically significant difference in inventory values, further supporting the notion that EOQ implementation has led to a tangible impact on inventory management practices.

Absolutely, the efficiency of inventory management can be quantified through the Inventory Turnover Ratio (ITOR), which denotes the frequency of fund turnover for each medicine type within a specified period. This metric provides a measure of the efficacy of medicine supply management within an organization. In the context of this study, the Turnover Ratio (TOR) measurement was employed as a benchmark to assess the efficiency of medicine ordering within inventory control. The underlying principle is that the TOR value should exhibit an upward trend over time, indicating improved efficiency in the utilization of resources.

Moreover, the utilization of the Inventory Turnover Ratio (ITOR) indicator in measuring performance aligns with International Financial Reporting Standards (IFRS) principles. The ITO serves as a valuable performance metric, reflecting financial proficiency through the lens of inventory management. By evaluating the TOR and ITO indicators, the study seeks to not only gauge efficiency but also capture the broader financial implications of effective inventory control practices.

Table -5: TOR Value of Category A Medicines using the EOQ method

Situation	Stage	ITOR	
		Week (%)	Month (%)
Before Intervention	I	5.7	6
	II	5.0	
	III	5.9	
	IV	5.8	
After Intervention	I	8.4	8.38
	II	8.0	
	III	8.5	
	IV	8.6	

The provided Table 5 indicates that prior to the intervention, the Turnover Ratio (TOR) for category A medicines stood at 6 times. Post-intervention, this value increased to 8 times. Furthermore, the context of the hospital's performance is reflected by the Inventory Turnover Ratio (ITOR) indicator, which ranges from 8 to 12 times. TOR, representing the inventory turnover rate, signifies the frequency at which inventory is cycled through purchases and sales. A higher TOR value denotes a more efficient medicine management system, which in turn can boost the hospital's profits. Conversely, a low TOR value signifies a surplus of unsold medicine stocks, leading to accumulation and subsequently affecting the inventory value in medicine stock reports. In this context, the increased TOR value after the intervention suggests an improved efficiency in medicine turnover, contributing to enhanced inventory management and potentially leading to increased financial gains for the hospital.

5. CONCLUSIONS

Based on the application of the Economic Order Quantity (EOQ) method to Category A medicines at Pagelaran Regional General Hospital Pharmacy Installation, the results reveal that there are 19 distinct types of Category A medicines with varying order quantities, ranging from 3 to 65 medicine items per order. The EOQ approach has effectively led to a reduction in medicine inventory value at the hospital's pharmacy installation. Prior to intervention, the inventory value of Category A medicines totaled IDR 728,435,751, which then decreased significantly to IDR 318,521,150 after the intervention. This reduction translates to a substantial decrease of IDR 409,914,601 in medicine inventory value. This outcome underscores the influence of the EOQ method in driving down inventory value, highlighting its positive impact on the hospital's inventory management practices. Furthermore, the application of the EOQ method to Category A medicines has a discernible effect on enhancing the Turn Over Ratio (TOR) in the Pharmacy Installation of Pagelaran Regional General Hospital. The TOR value increased from 6x rotations before intervention to 8x rotations after intervention. This higher TOR value indicates a more frequent turnover of medicines, effectively reducing the accumulation or risk of medicine expiration. This outcome is particularly pertinent for Category A medicines due to their elevated investment value. The findings

affirm that the EOQ method plays a pivotal role in optimizing inventory management, cost efficiency, and overall operational performance in the context of Pagelaran Regional General Hospital Pharmacy Installation.

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