INVENTORY CONTROL OF DISPOSABLE MEDICAL MATERIALS AT THE BALI MANDARA EYE HOSPITAL

Menilik Pengendalian Persediaan Bahan Habis Pakai Farmasi di Rumah Sakit Mata Bali Mandara

*Ni Wayan Yuli Yudianti*, Putu Nina Eka Lestari, Gde Sri Darma, IB Raka Suardana

1 Undiknas Graduate School, Bali, Indonesia

Abstract

**Background:** As a health service institution, hospitals have characteristics and management complexities which have an impact on their financing aspects. Controlling the supply of pharmaceutical supplies aims to create a balance between supply and demand in order to realize effective and efficient health services.

**Aims:** This study aimed to design a method for controlling the optimal supply of disposable medical materials at the Bali Mandara Eye Hospital, Bali.

**Methods:** This is a qualitative study based on in-depth interviews with three informants, and involving 11 doctors (users) to determine the critical value of disposable medical materials.

**Results:** ABC analysis was used to classify all types of goods based on their importance to determine priorities based on the value of use. The budget allocation was dominated by only a small portion or only a few types of pharmaceutical supplies. The results show that there was a decrease in the total cost of inventory by 19.14% after the application of the EOQ method. The application of the reorder point (ROP) method can anticipate the occurrence of stock outs or vacancies.

**Conclusion:** The EOQ method is more efficient than the conventional method applied at the Bali Mandara Eye Hospital Pharmacy Installation. The EOQ and ROP methods greatly affect the efficiency and effectiveness of controlling the inventory of medical disposable materials at the Bali Mandara Eye Hospital.

**Keywords:** inventory control, effective and efficient, medical disposable materials.
Introduction

Throughout the COVID-19 pandemic across the world, for more than three months the public stayed at home. Working, studying, and most other daily activities are being done from home. Many changes have occurred, not only in the fields of education and economics, but also in the environmental field, especially in regards to the problem of solid waste. According to the Indonesian Ministry of Health and the Healthy Living Community Movement has guidelines for managing hospital waste in referral hospitals, emergency hospitals, and community health centers. They state that materials categorized as COVID-19 waste include goods or materials that will not be reused and are left over from activities wherein they were potentially contaminated by infectious substances, patients, and/or officers in health care facilities that handle COVID-19 patients. These include used masks, used gloves, used bandages, used tissue, used food and beverage plastic, used food and beverage paper, used syringes, used infusion sets, used personal protective equipment, and patient food scraps from service activities in the ER, isolation room, ICU room, treatment room, and other service rooms. It can be seen that COVID-19 waste is included in the category of solid medical hazardous and toxic waste (B3) (Gurumurthy et al., 2020). As health service institutions, hospitals have characteristics and management complexities which have an impact on their financing aspects (Ballou, 2004). The procurement of pharmaceutical supplies in the form of drugs and consumables represents a large portion of the costs in the health industry, particularly hospitals. The provision of quality pharmaceutical supplies is very important in supporting health services in hospitals, and this activity cannot be separated from the hospital supply management. Proper pharmaceutical supply management is essential to ensure the availability of adequate drugs and consumables for health services to patients and as a source of income for hospitals (Dewi et al., 2020).

Transportation and inventory costs are interrelated and comprise the greatest portion of total logistics costs (Ballou, 2004). Controlling the supply of pharmaceutical supplies is one part of logistics management. It aims to manage the availability of pharmaceutical supplies according to needs in order to ensure that there is no shortage or excess supply. Shortages cause disruption of service activities to patients. On the other hand, excessive inventory causes cost overruns and restrained capital, which, if the turnover is not achieved, will cause losses for the hospital. Stock of consumable medical materials is considered to be good when the availability of consumable medical materials is at an optimal amount, not less than the safety stock, and not more than three times the monthly use. Stagnant conditions lead to negative impacts such as increased expiration of medical consumables, lost opportunities, and lost revenue for clinical pharmacies. Conditions of deprivation not only causes a decrease in income but also contributes to higher mortality and morbidity for patients in critical condition. Lost opportunities and lost revenue occur in a stagnant state because inventory costs, ordering costs, and handling costs are increasing (Essam et al., 2020; Hales et al., 2017; Minken and Johansen, 2019).

According to Satibi (2014), a good supply of pharmaceutical supplies is when the availability is at an optimal amount, not less than the safety stock and no more than three times the monthly usage. Controlling the supply of pharmaceutical supplies aims to create a balance between supply and demand in order to realize effective and efficient health services. Good inventory management will be able to increase hospital revenue while still ensuring quality health services for patients (Rochmah, 2019). The results of Octaviany’s (2018) study state that economic order quantity (EOQ) is highly recommended in controlling drug supplies in hospitals. Hartih et al. (2013) stated that the EOQ and ROP methods can reduce the value of regular drug supplies in hospitals. The same thing is also shown in a study by Dewi et al. (2020), which states that EOQ is an
Effective and efficient method of inventory control to prevent drug vacancies and stagnation. An inventory control system is needed to maintain the availability of optimum pharmaceutical logistics in order to meet the needs in the right quantity, quality, and time, as well as minimize cost. Inventory control activities can achieve budget efficiency and minimize risks arising from excess or under-stock (Akhmad, 2018). Management of drugs and medical consumables that are effective and efficient is an important factor in hospital management. This ensures optimal availability of drugs and medical consumables in terms of quality, type, amount, time, and rational use. This allows for the available funds to be used as effectively as possible for health services (World Health Organization (WHO), 2014).

The expenditure budget for drugs and medical consumables at the hospital is the largest component of hospital expenditure. In many developing countries, spending on medicines and medical consumables in hospitals accounts for about 40% to 50% of the total hospital budget. This large budget must be managed effectively and efficiently in order to meet the needs of healthcare for patients. Efficient use of medical consumables can be realized through a good inventory planning and control system. Inefficient management of drugs and consumable medical materials will have a negative impact on hospital costs and patient recovery rates (Indonesian Ministry of Health, 2019).

The Bali Mandara Eye Hospital is a special type A hospital owned by Bali’s provincial government which provides eye health services. Similar to service companies in general, the Bali Mandara Eye Hospital also needs supplies to support its operational activities. This study focuses on the supply of disposable medical materials because they take up more of the budget than any other supply, and they are a vital element for the implementation of health service activities at the Bali Mandara Eye Hospital. All pharmaceutical supplies at the Bali Mandara Eye Hospital are managed one door under the Hospital Pharmacy Installation (IFRS). The IFRS is a unit in the hospital that is fully responsible for managing the logistics at the hospital.

Based on a preliminary study conducted at the Bali Mandara Eye Hospital Pharmacy Installation, planning for the need for pharmaceutical supplies is carried out using the consumption method based on historical usage in the last three months. Additional orders are made with an estimate of 20%-25% of the average usage. The calculation of needs is still done manually, even though there is a hospital information system to manage supplies. Currently the hospital information system is only used to record incoming and outgoing supplies, but cannot provide information about the optimal quantity to be ordered or when these items should be ordered.

Planning is carried out using the consumption method based on the average usage of the last three months adjusted to the remaining stock in the warehouse. The procurement of drugs and consumable medical materials is carried out directly by the provider (distributor) by taking into account the ease of orders, the availability of goods from the distributor, and the capacity of the drug warehouse. In addition, at the Bali Mandara Eye Hospital Pharmacy Installation, there has never been a method of controlling drug supplies/consumables through inventory classification to facilitate supervision. This needs to be done because the number of supplies of drugs/consumables in the IFRS Bali Mandara Eye Hospital Drug Store is very large, namely 672 items. Thus, it is necessary to group according to the level of importance to determine the types of drugs/consumables that need to be prioritized. Based on this phenomenon, the researcher wanted to help develop a control system for the supply of pharmaceutical supplies at the Bali Mandara Eye Hospital to fulfill the role of the Pharmacy Installation as one of the hospital’s revenue centers. Planning with the consumption method becomes inaccurate when there is an increase in cases. There are still frequent purchases of cito outside of planning, meaning the service is less effective and efficient. This shows the need for good management of pharmaceutical supplies, especially disposable medical materials. It is necessary to implement proper planning; therefore, an adequate analysis is required.
such as ABC, EOQ, or ROP. Sensitivity analyses are conducted based on the parameters including truck loading capacity, inventory carrying cost percentages, unit shortage costs, unit ordering costs, and unit transport costs to support optimal distribution system design (Lin and Lin, 2019). This is consistent with research by Chang et al. (2008), Fan et al. (2009), Hales et al. (2017), Tongzon et al. (2009), and Ugboma et al. (2006), who examined other objects, namely port selection, influenced by several factors in accordance with Buffa’s (1986) theory of restocking inventory in groups, which supports this study. Researchers wanted to get an overview of the process of controlling pharmaceutical supplies at the Bali Mandara Eye Hospital, before and after the application of the EOQ and ROP methods, to produce a solution for controlling hospital supplies, especially pharmaceutical supplies.

Method

This study used a quantitative research design. A qualitative approach was used to describe the process of controlling consumable supplies at IFRS Bali Mandara Eye Hospital. Data collection was carried out via in-depth interviews with four informants, as well as through observation. Meanwhile, operational research was done by involving users or doctors to determine the critical value of disposable medical materials by filling out a Google Form questionnaire. In addition, secondary data processing was also carried out by obtaining a list of consumable pharmaceutical supplies for the period of January 2019-December 2019, which was analyzed using the ABC method. This research was also conducted by comparing the total inventory cost before and after the application of the EOQ and ROP methods to see whether the application of these methods can increase the efficiency and effectiveness of the inventory of disposable medical materials at the Bali Mandara Eye Hospital Pharmacy Installation.

Result and Discussion

Inventory control at the Bali Mandara Eye Hospital

Based on the results of in-depth interviews with the four informants, it is known that the planning process for the supply of disposable medical materials at the Bali Mandara Eye Hospital Pharmacy Installation is done with the consumption method. This method calculates the need for disposable medical materials based on the average usage for the last three months adjusted to the budget available, as well as based on the remaining stock at the hospital. The selection and planning process for disposable medical materials at the Pharmacy Installation is guided by the Bali Mandara Eye Hospital Formulary and the National Formulary. The method used for the inventory planning system and the procurement of consumables is the consumption method and hospital needs. According to the informant, the consumption method has several obstacles, one of which is when there is an increase in cases, the demand from the unit also increases, and as a result the drug warehouse cannot meet the demand. The first informant stated that the use of the consumption method was not very accurate. Ideally, planning for drugs/consumables is done using several methods such as ABC, VEN, and adjusting to conditions in the field to further validate planning data. Planning is ideally done using a method that can be accounted for and the basics of planning that have been determined, including consumption, epidemiology, and a combination of consumption and epidemiology. Planning must also include consideration of available budget, priority setting, remaining inventory, previous period usage data, order waiting time, and development plans. Eissa et al. (2020) evaluated suppliers in a healthcare facility by applying statistical process optimization tools in managing the inventory of products’ quality. They selected random records of container deliveries from three different suppliers and analyzed products’ characteristics using statistical process control (SPC) tools. The
results indicated that most dominant manufacturers supplied the product having specifications close to the target values, whereas the least contacted vendor revealed the highest precision.

The availability of medical disposable materials at the Bali Mandara Eye Hospital was monitored through stock cards and the Hospital Information System (SIMRS). However, the data on the use of medical disposable materials from SIMRS are historically inaccurate, forcing manual usage calculations to still be carried out based on the amount of expenditure on the card and stock of goods. The combination of the FIFO (first in first out) and FEFO (first expired first out) methods is used at the time of releasing goods to prevent damaged and expired goods. This evaluation is carried out every quarter, namely in March, June, September, and December. In addition, an evaluation of the expired date of medical disposable materials is also carried out at the time of stock-taking to find out which items will expire in the next year. Physical checks are also done every day to ensure that the items recorded on the stock card match their physical quantities. Overall, the obstacles faced in controlling the supply of medical disposable materials at the Bali Mandara Eye Hospital Pharmacy Installation, according to the informant, were when there is an increase in cases and inadequate procurement planning using the consumption method, which led to an increase in the demand for consumables. As a result, there are frequent cito (immediate) orders from distributors, and inventory control becomes ineffective and inefficient. The purchase of cito or small purchases is not in line with the purpose of inventory control as expressed by Satibi (2015). In addition, the calculation of needs based on hospital policy is still not optimal where there are still excess orders for certain items. This means that there is excess stock which, if not properly supervised, will accumulate and expire. Products that have piled up in the warehouse will become retained capital for the hospital and will increase storage costs. In addition, vacancies in distributors or factories and late delivery also often make it difficult to procure medical disposable materials supply.

ABC Usage Analysis

Based on Table 1, from 174 items of analyzed medical disposable materials using the ABC analysis, it is known that the Group A is the consumable material with the highest usage. Group A had a usage of 64,802 or takes up 69.19% of the total usage, consisting of 12 items or 6.89% of the total items of disposable medical materials. Group B had consumables with moderate use, namely 19,168 or 20.46% of the total usage, consisting of 25 items or 14.37% of the total items of disposable medical materials. Group C had consumables with low usage, namely 9,693 or 10.35% of the total usage, consisting of 137 items or 78.74% of the total items of disposable medical materials.

The results of the calculation of the value of use from the ABC analysis show that the percentage composition of drug items for groups A, B, and C was inversely proportional to the percentage of total use. Group A, as opposed to groups B and C, should have tighter physical inventory control, and the accuracy of inventory records on item A should be verified more frequently (Heizer et al., 2017). The calculation results also show that group C used as much as 10.35% of the drug supply, but covered 78.74% of all drug items. This indicates that there were many items in group C with low movement. The existence of this calculation can be used to select which disposable medical materials really need to be procured and which ones do not need to be re-stocked because too many low-moving items will make monitoring difficult and risk expiration. ABC analysis was used to classify all types of goods based on their importance to determined priorities based on the value of use. In fact, the budget allocation was dominated by only a small portion or only a few types of pharmaceutical supplies.
Types of pharmaceutical supply can be budget-heavy because of their many uses. This is in accordance with the Pareto principle stated in the theory of Heizer et al. (2017). This theory states a small proportion of goods are the same types of items as those in group A, which is very important because they have the greatest use value. This means they require strict attention in controlling inventory, where it can be monitored within a fixed and strict time period (e.g. every month) using the EOQ order model. The attention given to control group B is not too strict, unlike group A. Evaluation can be done within a period of 6 months or 3 months. Whereas for group C, inventory control in this group was carried out very loosely compared to groups A and B. The evaluation could be carried out in a period of one year or every 6 months.

**ABC Analysis of Investment Value**

There were 174 items of disposable medical materials. After being analyzed with the ABC Investment analysis, it is known that Group A consisted of 12 items or 6.90% of the disposable medical materials with an investment value of Rp 3,110,809,628.00 or a share of 68.28% of the total investment value. Group B consisted of 22 items or 12.64% of the total items of disposable medical materials with an investment value of Rp 977,726,591.93 or a share of 21.46% of the total investment value. Group C consisted of 140 items or 80.46% of the total disposable medical materials with an investment value of Rp 467,416,118.71 or 10.26% of the total investment value.

This shows that Group A absorbed very high investment; therefore, it is necessary to regulate the inventory. This is especially important to avoid stockpiling because disposable medical materials with high investment value also cause high storage costs. To reduce storage costs, periodic small orders can be made. However, it should also be noted that there is no stock out because the cost of purchases outside of planning is also high due to the high value of drugs. Through the ABC analysis of investment value, it was found that Group C had many types of consumables that were barely used between January 2019-December 2019. Thus, it is necessary to evaluate the types of consumables that currently exist, whether they need to be procured or can be arranged for procurement according to orders. This is to eliminate the need for inventory that is at risk of damage, expiration, and increased storage costs. To reduce storage costs, periodic small orders can be made. However, it should also be noted that there is no stock out because the cost of purchasing outside of planning is also high due to the high value of goods.

**ABC Critical Index Analysis**

Group A of the ABC critical index analysis consisted of 11 items, or as much as 6.32% of the total disposable medical materials. Group B consisted of 105 items, or as much as 60.34% of the disposable medical materials.

Group C consisted of 58 items, or as much as 33.33% of the total disposable medical materials. Inventory classifying is a must when it comes to large quantities of products. Consumable medical supplies were classified using the ABC analysis of critical index to see the level of criticality based on the clinical importance of each item. There were 11 medical consumables included in Group A. These items included medical consumables which need attention in procurement. This is because, in addition to having high use value and investment value, they also have a high level of criticality due to their use which cannot be postponed to avoid vacancies. In addition, fund management can be allocated to ensure the availability of critical index Group A consumables to meet demand. In other words, monitoring of Group A critical index needs to be done strictly to provide optimal service for patients. The ABC analysis of the critical index shows that the critical value was two times the value in use and the value of investment. In other words, the priority of procurement was not based on the value of the investment or the value of use, but rather on how important the goods were based on their use. For example, Rohtovisc and ophthalmic drape cannot be suspended even though they...
have small investment values because Rohtovisc is a viscoelastic fluid which functions to protect intraocular tissue during cataract surgery. Meanwhile, the ophthalmic drape functions to absorb fluid during eye surgery.

The ABC critical index analysis showed that the critical value was twice the value in use and the value of investment. In other words, the priority of procurement is not based on the value of the investment or the value of use, but rather on how important the goods are based on their use. Based on the research results, there were 11 disposable medical materials included in the critical index group A. These eleven items include items that need attention in procurement because they have high use value and investment value, but also have a high level of criticality because their use cannot be postponed so that no vacancies may occur. In other words, the priority of procurement is not based on the value of the investment or the value in use, but rather on how important the consumables have important value. In addition, fund management can be allocated to ensure the availability of critical index group A medical disposable materials to meet demand. Monitoring of group A critical index needs to be done strictly so that patients can get optimal care. By selecting the appropriate inventory method, the total cost of supplies can be reduced while maintaining the level of service for patients. With the selected inventory method, it will be known when to place an order (reorder point) and the recommended amount of purchases (EOQ).

**EOQ of Group A Medical Disposable Materials, ABC Analysis of Critical Index**

When calculating the EOQ for each order, data were required regarding the number of requests per year, ordering costs, and carrying costs. The number of requests per year was determined based on the results of document review. Ordering fees and storage costs were obtained through in-depth interviews with the pharmacist coordinator of procurement at the pharmacy warehouse. According to informants in the interview, ordering goods has never taken these costs specifically. In this study, researchers used the theory from Heizer and Render (2017) where for storage costs the percentage of costs in general is 26% of the unit cost or price per item of goods. Gurumurthy et al. (2020) stated that a deep dive into the A-class items revealed that some of the medical supplies fell under both vital and scarce categories. Hence, it was recommended that the case hospital should follow the economic order quantity (EOQ) with the safety stock approach, as these items were to be shipped from other states in India. Subsequently, the focus should be on developing a local supplier and attempts should be made to establish a kanban system with adequate information sharing.

When placing an order with a distributor, the procurement coordinator pharmacist uses the WhatsApp (WA)
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service. The data package used every time you order with the WhatsApp call service for 1 minute is 0.2 MB, at a cost of Rp. 1/KB (m.industry.co.id). If the WA call duration for each order is 5 minutes, then the data package used is 1 MB, equivalent to 1,000 KB. If calculated in rupiah, it becomes Rp. 1,000 per order.

EOQ calculation data showed that items with high prices (example: Cons comb vit pro pack 23 GA), although high in usage, were low in EOQ because storage costs were quite high (26% of the unit cost). Storage costs will be high if the medical supply provider stores large amounts of it and also risks increasing costs due to expiration, damage, and loss. Meanwhile, EOQ items with cheaper prices, such as Rohtovisc, were relatively higher in EOQ because their storage costs were not too high and it was not too risky storing a considerable amount of them. Overall, the application of the EOQ method had an impact on reducing the total cost of inventories by 19.14%. This is in line with research which states that the EOQ method can help companies minimize inventory costs (Dewi et al., 2020). Planning with the EOQ method in a company will be able to minimize the occurrence of stock out, prevent interference with the processes within the company, and allow the company to save on inventory costs. This is also in line with Ercis' (2013) research, which states that the EOQ and ROP analyses are some of the strategies that can be adopted in an effort to control costs and increase efficiency both in terms of quantity and time of ordering. Hospital operational costs will be more efficient with cost efficiency in inventory management. Both ordering and storage costs must be balanced to avoid losses. If one of them swells, there will be a problem and this will hinder service to patients. If the number of orders during a certain period increases, the annual order fee will also increase. Conversely, if the number of orders is reduced, the ordering costs will also be reduced. Meanwhile, the storage fee depends on the size of the order. The bigger the order size, the higher the storage cost and vice versa. EOQ is the point where there is a balance between ordering costs and storage costs. Minken & Johansen (2019) propose an EOQ model incorporating detailed transport costs. This considers not only the transportation costs but also loading and unloading costs. They argue that a policy measure that reduces expected transport time and its uncertainty would enhance firms to reduce their safety stocks while maintaining the same service levels (or improve service levels with the same level of safety stock).

Table 2. Comparison of total inventory cost with EOQ method and conventional hospital method

<table>
<thead>
<tr>
<th>Name of medical disposable materials</th>
<th>Average Procurement Per Month</th>
<th>EOQ</th>
<th>Total Cost Before EOQ Implementation (Rp)</th>
<th>Total Cost After EOQ Implementation (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rohtovisc</td>
<td>227</td>
<td>24</td>
<td>2,715,577</td>
<td>744,910</td>
</tr>
<tr>
<td>Ophthalmic Drape Hijau OM</td>
<td>201</td>
<td>34</td>
<td>1,036,742</td>
<td>366,133</td>
</tr>
<tr>
<td>AOK Microknife 15.0 deg str</td>
<td>202</td>
<td>17</td>
<td>3,801,548</td>
<td>1,029,263</td>
</tr>
<tr>
<td>Cassette Phaco infiniti (Ultrasound FMS Basic)</td>
<td>17</td>
<td>2</td>
<td>1,744,513</td>
<td>1,486,116</td>
</tr>
<tr>
<td>Centurion ACT IRR FMS Pack 0.9 Ultra Bal</td>
<td>15</td>
<td>2</td>
<td>2,571,440</td>
<td>2,286,408</td>
</tr>
<tr>
<td>Cons comb vit pro pak 23 GA</td>
<td>15</td>
<td>1</td>
<td>12,790,260</td>
<td>11,374,322</td>
</tr>
<tr>
<td>Probe Icare TA 03</td>
<td>142</td>
<td>41</td>
<td>382,839</td>
<td>206,145</td>
</tr>
<tr>
<td>Arciolane 1300</td>
<td>4</td>
<td>1</td>
<td>1,123,940</td>
<td>1,857,755</td>
</tr>
<tr>
<td>Arciolane 5500</td>
<td>7</td>
<td>1</td>
<td>2,397,367</td>
<td>3,018,829</td>
</tr>
<tr>
<td>Grieshaber Rev ILM</td>
<td>5</td>
<td>1</td>
<td>1,657,276</td>
<td>1,810,689</td>
</tr>
<tr>
<td>OPO 71-Next Generation Pheco DP-Pack</td>
<td>12</td>
<td>2</td>
<td>1,582,921</td>
<td>1,536,493</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>31,804,423</td>
<td>25,717,062</td>
</tr>
<tr>
<td>Efficiency (%)</td>
<td></td>
<td></td>
<td></td>
<td>19.14%</td>
</tr>
</tbody>
</table>

This is also in line with Ercis' (2013) research, which states that the EOQ and ROP analyses are some of the strategies that can be adopted in an effort to control costs and increase efficiency both in terms of quantity and time of ordering. Hospital operational costs will be more efficient with cost efficiency in inventory management. Both ordering and storage costs must be balanced to avoid losses. If one of them swells, there will be a problem and this will hinder service to patients. If the number of orders during a certain period increases, the annual order fee will also increase. Conversely, if the number of orders is reduced, the ordering costs will also be reduced. Meanwhile, the storage fee depends on the size of the order. The bigger the order size, the higher the storage cost and vice versa. EOQ is the point where there is a balance between ordering costs and storage costs. Minken & Johansen (2019) propose an EOQ model incorporating detailed transport costs. This considers not only the transportation costs but also loading and unloading costs. They argue that a policy measure that reduces expected transport time and its uncertainty would enhance firms to reduce their safety stocks while maintaining the same service levels (or improve service levels with the same level of safety stock).
Table 3. Results of ROP calculation for medical disposable materials for Group A ABC analysis of critical index

<table>
<thead>
<tr>
<th>Name of medical disposable materials</th>
<th>1 year usage (D)</th>
<th>EOQ average usage per day (d)</th>
<th>L</th>
<th>ROP (d x L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rohtovisc</td>
<td>2,741</td>
<td>9.26</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>Opthalmic Drape Hijau OM</td>
<td>2,443</td>
<td>8.25</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>AOK Microknife 15.0 deg str</td>
<td>2,378</td>
<td>8.03</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Cassette Phaco infiniti (Ultrasound FMS Basic)</td>
<td>199</td>
<td>0.67</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Centurion ACT IRR FMS Pack 0.9 Ultra Bal</td>
<td>171</td>
<td>0.58</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Cons comb vit pro pak 23 GA</td>
<td>168</td>
<td>0.57</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Probe lcare TA 03</td>
<td>1,786</td>
<td>6.03</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Arciolane 1300</td>
<td>49</td>
<td>0.17</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Arciolane 5500</td>
<td>88</td>
<td>0.30</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Grieshaber Rev ILM</td>
<td>33</td>
<td>0.11</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>OPO 71-Next Generation Phaco DP-Pack</td>
<td>143</td>
<td>0.48</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Overall, the application of the EOQ method has an impact on reducing the total cost of inventories by 19.14%. This is in line with Dewi's (2019) research which states that the EOQ method can help companies minimize inventory costs. This is also in line with Ercis' research (2013) which states that EOQ and ROP analysis is a strategy in an effort to control costs and increase efficiency both in terms of quantity and time of ordering, so that with cost efficiency in inventory management, hospital operational costs will be more efficient.

ROP (Reorder Point) of Medical Disposable Materials Group A ABC Analysis of Critical Index

The calculation of the reorder point (ROP) requires an average number of usage per day, lead time, and safety stock. The average number of usage per day can be calculated based on document review. Based on the results of in-depth interviews with the second informant, it is known that the waiting time required from the time of ordering until the goods are received (lead time) is usually one day because almost all distributors are in the city. Meanwhile, information was also obtained that the safety stock policy was not enforced, because it is included in the calculation of the addition every time planning is 20-25%.

From the calculation of ROP without using a safety stock policy, it was found that four items had an ROP value equal to zero. This is also due to the optimal amount in each order (EOQ) being one. In other words, it can be assumed that the hospital will place an order when the inventory level for the item reaches zero, and the company will immediately receive the item. However, this has the risk of hindering service activities, especially if there is a lack of goods or late delivery from the distributor. According to the Heizer and Render Operations Management theory (2017), the calculation of safety stock (safety stock) can help reduce orders outside of planning due to stock outs which result in additional costs. With the results of the calculation of safety stock, officers at the logistics warehouse can be helped to determine when to place an order. This can be especially helpful if there is a delay in delivery from distributors who are outside the area and during certain periods in the year such as religious holidays and national holidays. This way, the availability of medical disposable materials is maintained and does not interfere with service to patients.

Conclusion

The Bali Mandara Eye Hospital is a special type A hospital owned by the Bali government which provides eye health services. The EOQ method is more efficient than the conventional method applied at the Bali Mandara Eye Hospital Pharmacy Installation, where there was a decrease in the total cost of supplies by 19.14% after...
implementing this method. The application of the ROP method can anticipate the occurrence of stock outs or vacancies. These two methods greatly affect the efficiency and effectiveness of controlling the inventory of disposable medical materials at the Bali Mandara Eye Hospital. The Bali Mandara Eye Hospital Pharmacy Installation does not yet have an adequate pharmaceutical supply control system. Planning and procurement are still carried out conventionally based on the historical usage of the last three months and are carried out by manually checking which items will or have run out. The Bali Mandara Eye Hospital Pharmacy Installation has carried out accurate records of the entry and exit of goods and the expiry date of pharmaceutical supplies manually with a stock card, which can become a reference in implementing the EOQ and ROP methods in the future. ABC analysis serves to determine inventory priority. Inventory items with high investment value require a more stringent control system than those with low investment value.

**Suggestion**

Based on a preliminary study conducted at the Bali Mandara Eye Hospital Pharmacy Installation, planning for pharmaceutical supplies is currently carried out using the consumption method based on historical usage in the last three months, with additional orders made with an estimate of 20%-25% of the average usage. The calculation of needs is still done manually, even though there is a hospital information system to manage hospital supplies. To properly control the inventory of disposable medical materials, it is recommended that Bali Mandara Eye Hospital apply the EOQ and ROP methods because they have been tested to be more efficient than conventional methods applied in hospitals. Ordering costs and storage costs for pharmaceutical supplies should be calculated in real time, in order to produce a more accurate EOQ calculation to increase the efficiency of hospital operational costs.

Accurate calculation of the safety stock of pharmaceutical supplies cannot be based on estimates, especially if there is a delay in delivery from distributors who are outside the region and during certain periods of the year such as religious holidays and national holidays.

Development of a hospital information system (SIMRS) is necessary to the inventory process. It plays a part in creating an integrated system that can support logistics management tasks in pharmaceutical installations in the planning and procurement process.

**Conflict of Interest**

The authors state that there is no conflict of interests in this research.

**References**


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