Determination of Inventory Policy based on ABC Classification

I Rizkya*, R M Sari, Erwin, R F Sari
Departement of Industrial Engineering, Faculty of Engineering, Universitas Sumatera Utara
*e-mail: indahrizkya@usu.ac.id

Abstract. Inventory control is very necessary to prevent supply shortages. The right policy in managing inventory will reduce inventory costs. The type of inventory classification is needed to carry out appropriate handling in managing inventory in both the manufacturing and service industries. Drug inventory classification is done by ABC analysis to manage inventory so that no stock out occurs. ABC analysis tends to profit oriented product because it is based on the funds needed from each type of supply. From the results of data processing analysis, in category A (Always) were 46 types (10.8%) with the annual investment of drugs 70.39%, category B (Better) as many as 74 types (17.3%) with the annual investment is 19.99%, and category C (Control) as many as 307 types (71.9%) with of the total annual investment is 9.61%.

1. Introduction
Logistics management is very important in managing inventory in both the manufacturing and service industries including health services (1). One factor that contributes to the quality of health services is drug management. A drug stock that is too large or too small will increase hospital operating costs. Management of drugs supply needs to be done to prevent shortages. If the patient does not receive proper treatment because of the drugs availability are always absent, it makes the patient feel dissatisfied and has a negative impact on the hospital image.

The planning of drugs supply has been carried out is seen based on diseases often occur in hospitals, the quantity of Drug stocks, usage in the previous year, and seasonal outbreaks. However, data on diseases are difficult to obtain with certainty as well as recording and reporting are not good cause the planning of drugs supply to be not good enough. This condition lead to stock out of Drugs and Drugs are not available must be purchased accidentally to other distributors and the purchasing cost Drugs increase. For this reason, it is necessary to manage the drugs supply.

Inventory management can be done using various methods, one of them Always, Better, and Control (ABC) method. Analysis of ABC, also known as Pareto Analysis is one of the methods used in logistics management to classify a category of Goods into three categories (category A, B and C) [2]. The ABC analysis is the "Inventory categorization method" which requires items to be divided into three categories, A, B and C. A is the most valuable item and C is a less valuable item, whereas B contains items that range between A and C. It aims to focus on a few critical (A-item) and not on many trivial (C-item) [3]. In the ABC analysis, items in category A contributed to the majority (70-80%) of the total inventory value of the item. Category B contributes (10-15%) And category C consists of 5% of the total inventory value of the item. However, it is not appropriate for one criterion now one day. The inventory
of companies depends on various criteria, such as unit price, annual demand rate, critical nature, scarcity, endurance, and etc [4].

ABC analysis or classification methods are commonly used in supply control for companies have various types of materials in inventories have different usage values [5]. For example, ABC analysis is also used for the analysis of inventory management of sponge iron plant [6]. ABC analysis can also be implemented in managing spare parts inventory in one of the printing industries in Pakistan. The result is ABC analysis showed that 15% items were from each category A and category B, remaining 70% items were from category C accounting for around 66%, 15% and 19% of total annual expenditure of technical store respectively [7].

ABC analysis is also applied in inventory control of consumables in the service industry. This is done to find out the inventory of consumables become categories A, B, and C based on ABC analysis of usage, investment, and critical index. The results obtained indicates that the the inventory control of consumables in one of the study programs is sufficient.

Based on previous research, it is known that the application of ABC analysis can be done on any product, including Drugs. Control of drug supplies to a clinic or hospital is required to fulfill orders in the right amount and time so that the total inventory cost can be reduced by the optimal order quantity and period [8]. This research was conducted to manage drugs supplies in hospitals to avoid stock outs. ABC analysis is used to identify the drugs types that require the greatest cost because of the high level of usage and/or high prices by grouping.

2. Methodology

This study was conducted at one of the hospitals in the Medan city, especially in pharmaceutical installations. The object under study is in the form of data on medication needs in the hospital. Research begins with observations directly to the pharmaceutical installation department. Activities carried out at this stage are observing the conditions occur in pharmaceutical installations. After observation, the topic and purpose of the study are determined according to the conditions of the installation. After that, data collection is needed to analyze the supply of drugs in the pharmaceutical installation. Data collection in the data form on drug needs and the cost of ordering drugs.

Based on these data, an analysis of the management of drug supplies was carried out. The analysis was carried out using ABC Analysis. ABC analysis is a technique for prioritizing the management of inventory [9]. The ABC Inventory Control technique is based on the principle that a fraction of the items may typically represent most of the use of the total material of the total inventory in the process, while a relatively large number of items may be from a fraction of the value of money [10]. Drug grouping is based on 3 categories, namely:

a. Category A is a drug group to absorb 70% of the budget with the quantity of drugs not more than 20%. Drugs belonging to the category A are very critical drugs category need to be tightly controlled, and continuously monitored. Category A orders can be done with a small quantity but the order frequency is more often and because the investment value is quite large has the potential to provide a large profit for the hospital, this category requires strict drug monitoring and monitoring, accurate and complete record.

b. Category B absorbs the budget of 20% with the quantity of drug around 10-80%. Drugs belonging to category B, inventory control are not too strict as category A, but reports on their usage and the remaining drugs must be reported and inventory control always be controlled.

c. Category C absorbs the 10% budget with the quantity of drug around 10-15%. Category C has more medicinal items but has no impact on warehouse and financial activities because the cost is cheap and usage less. Monitoring of this category can be more relaxed, for example, done six months or once a year.

Drug supply classification with ABC analysis begins by determining the total annual investment value of each type of drug based on the total demand in a year and the purchase value of each type of drug. Then the percentage of annual investment absorption is calculated for each type of drug. The
percentage of investment absorption is determined by the annual investment absorption of each type of drug to the total annual investment for procurement of all drugs in the hospital.

The next step is to sort the drugs based on the percentage of annual investment absorption, starting from the largest to the smallest percentage. Then calculate the cumulative percentage of annual investment absorption of each type of drug. The final step classifies each drug types in categories A, B, or C based on the cumulative percentages. Drugs type with cumulative percentage of 1-70% included in category A, 71-90% included in category B drugs and 91-100% included in category C.

3. Result and Discussion
This research was conducted by collecting the required data in the form of the drugs quantity, the drugs purchase cost, and the total usage of generic Drugs during the months of January-March 2019 as many as 427 types. The Drug price is taken based on the purchase transaction of drugs supply to the distributor and the usage quantity based on the drug usage for 3 months in one of the hospital in Medan City.

Most companies use the annual inventory of goods usage rankings in the application of the ABC principle, namely how much annual investment for inventory procurement is on the ABC classification [11]. The results recapitulation of the ABC Drugs classification in one of the government hospitals in Medan is as follows:

| Category of Drugs Supply | Investment Value | Percentage | Quantity of drugs type |
|--------------------------|------------------|------------|------------------------|
| A                        | 1.048.207.800    | 70,39%     | 46                     |
| B                        | 297.740.400      | 19,99%     | 74                     |
| C                        | 143.150.500      | 9,61%      | 307                    |
| Total                    | 1.489.098.700    | 100,00     |                        |

Based on the table above, it can be seen that drugs including category A only accounted for 44 of drug types, but this drug absorbed the largest hospital budget, which was 70,39% compared to drugs type in category B and category C. Drugs type in category B accounted for 74 types and category C accounted for 307 types. Drugs type in category A must have stricter inventory control, more accurate records verification, and stricter physical supervision carried out every month.

![Figure 1. Classification of Drug Types](image)
Based on Figure 1, it can be seen that category A only consists of 11% (10.8%) of drugs types, category B is 17% (17.3%) of drugs types and category C is 72% (71.9%) of drugs types. The drugs type included in category A with the highest investment value must be a concern for the hospital. Category A is a drugs type that need to be controlled carefully, because the quantity cost and the Drug usage in category A is the highest compared to the other category of Drug, which is 35.1%, and it needs strict control. Category B and C drugs type have a small impact on warehouse and financial activities but must still get good monitoring and control. Pharmacy installations must be able to overcome not to run out of stock for this category A, because this will affects patient satisfaction. This category requires close attention and monitoring in inventory control, by carrying out careful calculations in needs determination, requires a complete and accurate recording system, as well as evaluations carried out every month.

Drug supply policy in category B is not as strict as Category A. However, drug inventory levels must still be controlled and recorded. The amount of drug used and drug stock must be reported so that inventory control can always be controlled. There are more items in category C drugs but they do not have an impact on warehouse and financial activities because they are cheap and use less. The inventory policy for this category can be done every six months or once a year. Orders for drugs in this category can be done once or twice a year. In the drugs supply management in hospitals not only is the money issue as priority but the urgency of drugs usage. For this reason, this article can be deepened by adding the urgency of the drugs usage in the future.

4. Conclusion
Based on ABC analysis, Drugs included category A (Always) were 46 types (10.8%) with an investment of 70.4% of total Drug usage, category B (Better) as many as 74 types of Drugs (17.3%) with total investment of 20% of total Drug usage, and category C (Control) as many as 307 types of Drugs (71.9%) with an investment of 9.6% of total Drug usage. The results of this study indicates that the application of ABC analysis can help in Drug management supply effectively. This will help to understand the problems occurring due to purchase, inventory and stock safety.

Acknowledgement
Authors would to thank to Universitas Sumatera Utara for its financial support in the 2019 TALENTA program so that this research can be published. The author also thanks all the participants who helped carry out this research.

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