# Analysis of Inventory Management for Medical Mask During the Covid-19 Pandemic at X Pharmacy in Yogyakarta

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## ABSTRACT

Medical masks are the main personal protective equipment that must be owned by the general public and medical personnel for daily use during the COVID-19 pandemic. Thus, the problem of shortage of medical masks in pharmacies arises because of the high demand among medical personnel and the public. The research objectives are to analyze the inventory management of medical masks, and the impacts, obstacles, and solutions that X Pharmacy has implemented during the COVID-19 pandemic. This research used a qualitative method with pharmacy managers and health workers as research informants who were directly involved in pharmacy during the pandemic. The data analysis technique in this research used content analysis to make a summary and to create an overview of the characteristics of the meshat have been delivered by informants. The research shows that X Pharmacy experienced a shortage of medical mask stocks at the beginning of the pandemic and made efforts to restore the stocks of medical mask to fulfill consumer needs. Pharmacy also use the Pareto ABC method to determine inventory levels and to make it easier for pharmacy to replenish medical mask stocks.

**Keywords:** Inventory Management, Medical Mask, Pharmacy, COVID-19, Stock Levels, Replenishment Orders, Pareto Analysis.

## INTRODUCTION
### Background

Medical masks are one of the most important tools today to prevent the transmission of the corona virus. One of a series of prevention and control measures that can limit the spread of certain respiratory viral diseases, including COVID-19, is the use of masks (World Health Organization, 2020). Masks can be used either to protect a healthy person (worn to protect oneself when in contact with an infected person) or to control the source by wearing a mask by an infected person to prevent further transmission. Therefore, medical masks are the main personal protective equipment that must be owned by the general public and medical personnel for daily use.

The lack of availability of masks was a critical problem for WHO. Doctors, nurses and other frontline workers are badly prepared to treat COVID-19 patients, due to limited access to supplies such as gloves, medical masks, respirators, goggles, face shields, gowns and aprons (World Health Organization, 2020). Those limitations are caused by increased demand, panic buying, hoarding and abuse, which can put lives at risk of the novel coronavirus and other infectious diseases. Problems related to the lack of availability of personal protective equipment and medical masks are also experienced in Indonesia. The Indonesian Doctors Association or often referred to as IDI also complained about the lack of medical masks for health workers (Republika.co.id, 2020).

The scarcity of medical masks has also occurred in a number of shops selling medical equipment and medicines by displaying large signs that the masks are out of stock. Even if they are still available, the masks are sold at very unaffordable prices, between Rp300.000,00–Rp450.000,00 per box (BBC News, 2020). This happened because of panic buying that occurred on a large scale. Meanwhile, at the K-24 pharmacy company, the demand for masks by the public has skyrocketed. (Kontan.co.id, 2020). Mask sales at PT K24 Indonesia increased by 4 times in February 2020 compared to normal days. In addition, there are four X network pharmacies in North Jakarta, Central Jakarta and South Jakarta running out of masks and hand sanitizers (tirto.id, 2020).

From the description of the problem described above, the main purpose of this study is to analyze the management of medical mask supplies in Pharmacy. Focusing on how inventory management can have an impact on meeting consumer needs, this research discusses in depth inventory management strategies, constraints, as well as efforts and solutions to control them. In this study, researcher will outline the inventory strategies during the ongoing COVID-19 pandemic by using qualitative research.

### Theoretical Framework
#### Inventory

According to Waters (2017), inventory is actually a list of items that are kept in stock, but most

people use it to mean the list of items and inventory itself. And there is also a statement from Ballou (2004) that inventory can be defined as the supply of raw materials, suppliers, work in process, components, and finished goods that appear at various points during the company's production and logistics processes. Meanwhile, according to Sharma & Viviek (2016), inventory is a list of goods and materials available in inventory for business and in inventory accounting is considered an asset. The company must have a product inventory level that is in accordance with market needs, that is, with an estimated demand for a certain period (Stojanović & Regodić, 2017).

According to Sohail (2018), the definition of inventory is as a stock of goods maintained by businesses in anticipation of some future demand by consumers. Inventory can be in the form of raw materials, partly finished goods called work in process and finished goods, which an organization maintains to meet its operational needs. When the amount of inventory drops, it is a signal that orders must be placed to restock an item.

Therefore, from the understanding that has been described, we can conclude that inventory is a current asset which includes goods belonging to the company for sale in a normal business period. Raw materials, work in progress, and finished goods are examples of inventories. They are considered part of the business assets that are or will be ready to be sold. Thus, from these actions, the company is able to meet customer needs and is able to make efficient use of resources.

**Inventory Management**

According to AI Ogbo, and WI Ukpere as quoted by Ndlala & Mbohwa (2017), inventory management is a consistent way to run the operations of an organization smoothly while ensuring that customers are satisfied, goods are delivered on time, and loss of goods is minimized. Most of the company's funds are invested in inventory, so efficient inventory management must be implemented. Every company should be able to ensure their inventory is maintained at the desired level (Gokhale & Kaloji, 2018). The precise and timely determination of the optimal inventory control strategy allows the company to be free from large assets which in turn can improve the efficiency of resource use.

Inventory management is defined as an ongoing "process of planning, organizing, and controlling inventory" that aims to minimize investment in inventory while balancing supply and demand (West, 2009). While maintaining an effective stock of products to meet customer and prescriber demands, this process aims to reduce procurement and transport costs. On the other hand, mismanagement of inventory leads to unnecessary increases in procurement and storage costs and imbalances in the supply and demand equation.

Researchers Bloomberg, Lemay and Hanna (2002) have identified two related inventory classification models. One of them will be discussed to provide background information on inventory classification.

**ABC Analysis**

All three researchers claim that ABC analysis classifies products based on interest. Interest may come from cash flow, lead time, out of stock, out of stock costs, sales volume, or profit. After the completion method factor is selected, breakpoints are selected for A, B, C and so on. In addition, Ballou (2004), states that another use is always the 80-20 concept and ABC classification is to collect products in warehouses, or other stocking points, at one finite quantity category where they are then managed with varying levels of stock availability. Not all product items should be taken on the same logistics care. The 80-20 percentage of concepts with product classifications generated provide a scheme, based on sales activity, for determining which products will receive different levels of logistical treatment.

According to Stanger, Yates, Wilding, & Cotton (2012), there are several inventory management indicators which are divided into four components:

**1. Stock Levels**

This indicator will find out about the processes, models and tools used to capture and determine stock levels. Safety stock policies, safety stock levels in operation, and methods used to regulate and adjust stock levels will also be analyzed. It aims to identify how target stock levels are set and adjusted and appropriate monitoring methods, tools and processes are used.

**2. Replenishment Orders**

The process for refilling medical masks and how decisions are made in this context have been discussed. These actions include the methods used to calculate order quantities and how these methods are reviewed and adjusted over time. Refill order-related questions also investigate order patterns, review periods, and triggers for placing orders.

**3. Inventory Management Principles**

Questions focused on standard operating procedures (SOPs), staff training, and the use of specific initiatives at controlling the supply of medical masks. This section will review the process from receiving medical masks from suppliers to selling them to consumers.

**4. Inventory Management Tools and Equipment**

Researcher will analyze the equipment and techniques used to manage and monitor inventory at X Pharmacy including how medical mask units are tracked or how medical masks can be monitored remotely.

**Previous Research**

This research will focus on the management of medical mask inventory at X Pharmacy located in Yogyakarta. The previous finding was researched by Stanger, Yates, Wilding, and Cotton (2012) in their journal "Blood Inventory Management: Hospital Best Practice." This article aims to manage the red blood cell inventory in a hospital transfusion laboratory in order to obtain best practice principles and make recommendations that will ensure losses due to expiry time are kept to a minimum. To conduct this research, the literature was reviewed by researchers to identify available models for perishable inventory management. The researchers revealed six key themes that together drive good performance in blood stocks inventory management. These themes are human resources and training, stock levels and order patterns, transparency of inventories, simple inventory procedures, focus on freshness, and internal collaboration within the hospital. All of these themes highlight the importance of having high quality, trained, and experienced staff.

Many previous studies related to inventory management have been carried out, including the following:

*Table 1: Previous Research*

| No | Researcher | Research Title | Research Finding |
|----|-----------|---------------|-----------------|
| 1 | Stanger, Yates, Wilding, & Cotton, (2012) | Blood Inventory Management: Hospital Best Practice | Good blood stock management performance is driven by six themes. The themes are human resources |
| | | | and training, stock levels and ordering patterns, inventory transparency, simple inventory procedures, focus on freshness, and internal collaboration within the hospital. All of these themes highlight the importance of having high-quality, well-trained and experienced staff |
| 2 | Basha, S, Wani, & Gogi , 2020 | Study of Inventory Management in Pharmaceuticals: A Review of COVID-19 Situation | This study uses a lot of literature with various inventory management methodologies such as ABC, VED, EOQ, JIT, etc. Pharmaceutical Inventory Management will be optimal if the above mentioned methodological principles are applied. The results of the literature review show that the methods most frequently used by pharmacies are the ABC and VED methods. Also assisted with automated assistance such as VHP (Virtual Hospital Pharmacy), which can help maintain inventory at optimal levels. |
| 3 | Ali (2011) | Inventory Management in Pharmacy Practice: A Review of Literature | There are influencing factors when evaluating pharmacy inventory management, such as product type (generic and brand), inventory size, product returns policy, unclaimed prescriptions, inventory shrinkage, and use of formulary. With the help of technology, inventory management methods and inventory management evaluation methods become more efficient, more precise, and more accurate. |
| 4 | Singh, Singh, & Singh (2015) | Drug Inventory Management of A Pharmacy Store by Combined ABC-VED Analysis | According to the researchers, combined ABC-VED analysis is useful for controlling drugs that require high attention and close supervision for effective and optimal use of funds and preventing drug stock-outs in pharmacies. Scientific inventory management tools are needed for optimal drug management with efficient |
| 5 | Maharaj, D'Souza, Doodh, Kissoon, Mohammed, & Sooklal (2012) | Inventory Management Practices In Pharmacies Across Trinidad And Tobago | prioritization, proper purchasing, and strict supervision of drugs belonging to important categories. Participants in this study considered inventory management to be important for the smooth operation of the company. Smooth inventory management is able to facilitate ordering to be efficient and ensure that the existing stock will be sufficient to serve the needs of the pharmacy. Inventory management can also minimize stock losses due to expiration, monitor consumption patterns and to ensure customer satisfaction. The results of the study also show that inventory management is related to personnel responsibilities, with ordering goods by pharmacists (in most cases senior pharmacists) in all pharmacies. |

**Research Design**

This research will be conducted at X Pharmacy by analyzing how inventory management of medical masksfocuses on the COVID-19 pandemic. The research design carried out in this study is as follow:
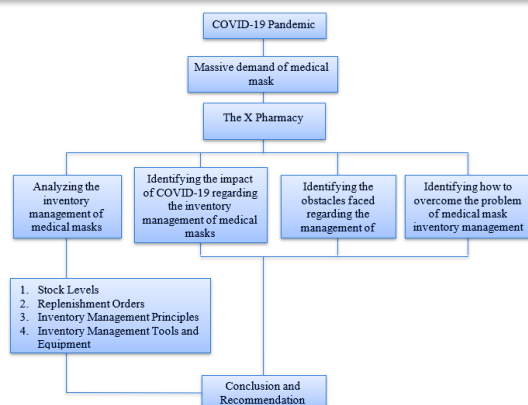
Based on the research design listed above, this research starts with the topic of the COVID-19 Pandemic. This pandemic has caused a huge demand for medical masks. So that researchers intend to conduct research in X Pharmacy. Then the researcher tries to conduct research based on the problems that have been formulated and to meet the research objectives. Not to forget that this research is supported by inventory management indicators as the basis for questions that will be addressed to informants. And in the end, the researcher will conclude and provide recommendations.

**RESEARCH METHOD**

This study uses primary data with a qualitative approach. Data collection techniques in this study using interviews, observation, and documentation. The sampling method used in this research is purposive sampling, which the researcher selects the samples based on consideration and certain specified criterion. The sampling technique of the in the research is based on the following criteria: pharmacy manager and staffs of the pharmacy who work at X pharmacy minimum for two years or have started working since the COVID-19 pandemic began to spread in Indonesia. The data analysis technique in this study uses content analysis. Content analysis is a systematic technique for analyzing the meaning of the message. Content analysis is an analysis that is used to look at all the characteristics of the content, whether visible content or not (Krippendorff, 2004). Usually, content analysis is made to make a summary and to create an overview of the characteristics of a content or message. Testing the Quality of Qualitative Research has been carried out with activities of credibility tests, dependability and confirmability tests, and triangulation sources.

**RESEARCH RESULTS AND DISCUSSION**

In this study, the researcher tried to combine several findings through interviews that had been conducted with three informants from the Pharmacy and two informants from the X Jogja Business Manager. The researcher then made and perfected the coding results through checking by the supervisor to compare and connect the findings to be presented in the formulation of the problem. Researchers also found out more about the management of medical masks at X Pharmacy during the COVID-19 pandemic using the indicators that the researchers referred to from previous research by Stanger, Yates, Wilding, and Cotton (2012). The following are the results of the research discussed for each problem formulation.

**1. Inventory management of medical masks at X Pharmacy during the COVID-19 pandemic**

To answer the formulation of the first problem, the researcher uses four indicators, namely Stock Levels, Replenishment Orders, Inventory management principles, and Inventory management tools and equipment. These four indicators make it easier for researchers to find out how to manage medical masks at X Pharmacy during the pandemic. Researchers will discuss each answer starting from the Stock Levels indicator.

**a. Stock Levels**

The level of inventory that researchers want to know more deeply can be known through the safety stock that is set and the appropriate monitoring methods, tools, and processes used. The following are answers from three pharmacy informants regarding inventory levels.

*Table 1: Safety Stock applied by Pharmacies*

| Question | Coding |
|---|---|
| Is there a safety stock prepared by the pharmacy? | **Informant 1** There is a safety stock prepared by the pharmacy based on Pareto expenditure |
| | **Informant 2** There is a safety stock set at the pharmacy as many as 1-2 boxes. |
| | **Informant 3** There is a safety stock set at the pharmacy |

Medical masks at Pharmacy are often kept in stock. So that in pharmacies, safety stock is applied, especially to medical mask products. Informant 1 says that safety stock is set on the basis of Pareto expenditure. Pareto is used to determine the priority of items used in pharmacies by looking at the cumulative percentage of total usage (use value), cumulative percentage of total investment (investment value), and the total score of use value and investment value (critical index value).

The application of safety stock was also confirmed by Informant 2 and Informant 3. Both informants said that the safety stock on medical masks also serves to supply health workers on duty in pharmacy. This is because health workers themselves get a share of medical masks from X pharmacy. Informant 2 said that the number of safety stock is one to two boxes containing 50 pieces of medical masks.

Table 1: Physical Medical Mask Inventory Checks to be Adjusted to the System at the Pharmacy

| Question | Coding |
|---|---|
| Is there a physical check on the amount of medical mask inventory based on existing records in the system? | **Informant 1** |
| | There is stock sampling and stock opname that is applied |
| | **Informant 2** |
| | There is stock sampling and stock opname that is applied |
| | **Informant 3** |
| | There is stock sampling and stock opname that is applied |

The researcher also found from the answers of the three informants, that there was an examination of the amount of physical medical mask supplies. In pharmacy, there are two methods applied to check the stock of medical masks. The first method is stock sampling. Stock sampling is a physical inventory check to be matched with existing records in the system. Physical examination by the medical mask method is carried out every day. While stock opname is an examination of the amount of mask inventory based on records in the system which is carried out every three months.

Table 1: Sales Model to Manage Medical Mask Inventory at Pharmacy

| Question | Coding |
|---|---|
| Is there a model used in the sales system to manage the supply of medical masks? | **Informant 1** |
| | The medical mask management method is FIFO |
| | **Informant 2** |
| | The medical mask management method is FIFO |
| | **Informant 3** |
| | The medical mask management method is FIFO |

The three informants from the Pharmacy stated that the method of managing or selling medical masks used was FIFO (First In First Out). First In First Out is a product management method for selling the first goods in as the first goods out. For a wider scale, the stock of goods that are received first is a priority that needs to be sold or marketed first compared to the stock of goods that come in later. Even though medical masks are not commodities that have an expiration date, such as medicines, the first medical mask received remains a priority to be issued first.

Table 5: Method to Adjust Stock Levels in Pharmacy

| Question | Coding |
|---|---|
| What are the methods used to set and adjust stock levels? | **Informant 1** |
| | Using the Pareto method |
| | **Informant 2** |
| | Using the Pareto method |
| | **Informant 3** |
| | Using the Pareto method |

The method used to adjust and adjust stock levels at X pharmacy is Pareto ABC. This is based on the answers from the three informants of the pharmacy. Pareto ABC is a method of classifying items according to their relative importance. Group A usually accounts for 10-20% of the total elements and represents 60-70% of the total value. Group B accounted for 20% of the total items and represented 20% of the total score. Group C usually accounts for 60-70% of the total elements and represents 10-20% of the total value. Informant 1 states that medical masks are in Pareto A. Pareto A indicates that the demand for this item is high. Because medical masks are included in Pareto A, more medical masks will definitely be ordered.

Informant 2 also added that the Pareto method can be analyzed by looking at the amount of stock issued last month, then adjusting how much is needed for the coming month. The stock ordered also needs to be adjusted to the remaining medical masks that are still available. So that later there will be no overstock and expiration on products that have a period of consumption.

### b. Replenishment Order

Table 6: Replenishment of Medical Mask Stock at the Pharmacy

| Question | Coding |
|---|---|
| How to replenish the supply of medical masks at the pharmacy? | **Informant 1** |
| | • Customer request |
| | • Decision of the system (minmax turnover) |
| | **Informant 2** |
| | • Through the Pareto method |
| | • Through the CITO method |
| | **Informant 3** |
| | Through the Pareto method |
| | **Informant 4** |
| | • Regular order from the system (minmax turnover) |
| | • CITO method |
| | • Spreading Method |
| | **Informant 5** |
| | Minmax Turnover |

Replenishment of medical mask supplies is made based on several things. Informant 1, Informant 4 and Informant 5 stated that the refilling of medical masks was carried out based on the system that came out through the minmax cycle. The number, type of masks, as well as who the supplier will supply medical masks to have been determined through the minmax cycle. The researcher got more detailed information regarding minmax turnover from Informant 4 and Informant 5. Both informants said that the central office of X pharmacy had the authority to rotate data every two weeks for the last three months. Playback of data can classify a product including medical masks in a pharmacy into what type of Pareto and determine the amount of stock that must be replenished. The results of data playback from the center will appear in the pharmacy POS system.

Data plays are counted within the last 90 days. In the playback of the data, the calculation of the number of masks that will be refilled is by reducing the remaining stock per time of play. For example, there is a product stock that needs 1000 per month. If the playback is counted for the last 90 days then the total demand is 3000. If the product is Pareto A, it will be ordered to fulfil the 45 days requirement. But if the Pareto is included in Pareto B, then the product is ordered for the needs of 30 days.

In addition, replenishment can also be made or based on customer requests if there are orders in large quantities. Medical masks can also be ordered if the stock of masks is running out before the

routine order schedule is carried out. This method is called CITO or urgent. Informant 4 added that there is another method called Spreading. Spreading is a method of replenishing inventory by taking stock from other pharmacy outlets as well. If at other outlets medical masks are not sold while they are sold at other outlets, then X Pharmacy can request supplies from by placing orders to those other outlets. The order will be submitted to the supplier and will still be connected to the system. Meanwhile, according to Informant 2 and Informant 3,

Medical Mask Stock Procurement Flow

Researcher finds out how the flow of medical mask procurement is applied to X pharmacy. Informant 4 describes how the flow of goods procurement.



*Figure 1: Purchasing Flow*
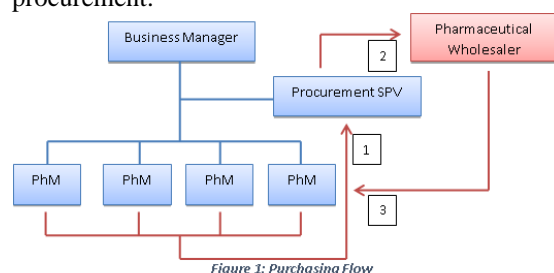
Starting in process 1, where Pharmacy Managers send Orders through the system and will be received by the Business Manager, namely the procurement supervisor. Procurement supervisors have an important role in negotiating or offering prices, as well as asking suppliers for discounts on goods to be ordered. Through this activity, there is a second process, namely the procurement supervisor will determine the supplier selected to supply the medical masks ordered by PhM. When the supplier has been selected, the 3rd process will take place. In this stage, the supplier will process and prepare the order and then it will be sent to X pharmacy.

*Table 1: Frequency of Ordering Medical Masks to Suppliers*

| Question | Coding |
|---|---|
| What is the frequency of ordering medical masks from suppliers in the 2020-2021 period? | **Informant 1**<br>Once every two weeks<br>**Informant 2**<br>• Once every two weeks<br>• Early and Mid-Month<br>**Informant 3**<br>Once every two weeks |

According to informants in this study, pharmacy place orders for medical masks from suppliers once every two weeks. Informant 2 added that these regular orders are usually made at the beginning and the middle of the month.

*Table 1: Types of Medical Masks Sold During a Pandemic at Pharmacy*

| Question | Coding |
|---|---|
| What types of medical masks are sold during the pandemic during this pandemic? | **Informant 1**<br>Surgical masks and N95<br>**Informant 2**<br>• Surgical masks, N95 and KF<br>• Brands that are selling well are Sensi and One Med<br>**Informant 3**<br>Surgical mask, N95, KF94, cloth mask |

Researchers want to find out more about what types of masks are being sold during the pandemic. At the beginning of the pandemic, the most sought after masks were surgical masks and N95. Because there was a shortage of medical masks, cloth masks became another choice for consumers and were quite sought after in pharmacy. Then, for how long the pandemic has lasted, the KF94 mask has many enthusiasts and is much sought after by consumers.

*Table 1: Pharmacy Medical Mask Supplier*

| Question | Coding |
|---|---|
| How many suppliers of medical masks? Where do they come from? | **Informant 1**<br>• The total of suppliers about 5 or 6<br>• Suppliers from Yogyakarta and Jakarta<br>**Informant 2**<br>Suppliers from Yogyakarta and Bandung<br>**Informant 3**<br>Supplier from Yogyakarta |

To meet the stock of medical masks, pharmacy have collaborated with several suppliers. Based on the results of the interview, the supplier came from Yogyakarta. Apart from Jogja, there are also suppliers who come from Jakarta according to Informant 1, and from Bandung according to Informant 2. In addition, Informant 1 says that there are five or six suppliers who always supply medical masks to pharmacy.

The researcher was given the name of the company that became the supplier of the X Business Manager. Companies that supply medical masks under the Onemed brand are Intisumber Hasil Sempurna, and Tugu Andalan Mandiri. In addition, the company Diva Sumber Berkat also supplies medical masks with the Sensi brand. Sensi brand masks are also supplied by the company Antar Mitra Sembada.

*Table 8: Lead Time for Ordering Medical Masks to Suppliers*

| Question | Coding |
|---|---|
| How long is the lead time in ordering medical masks from suppliers during the pandemic? | **Informant 1**<br>• Lead time supplier from Jogja is two days<br>• Lead time supplier Jakarta is one week<br>**Informant 2**<br>Lead time supplier from Jogja is one-three days<br>**Informant 3**<br>Lead time supplier from Jogja is one-three days |

The waiting time for ordering medical masks by suppliers is different based on the origin of the supplier. According to Informant 1. The supplier of medical masks from Jogja has a waiting time of two days. Meanwhile, according to Informant 2 and Informant 3, the waiting time for suppliers from Jogja is one to three days. In addition, Informant 1

added that suppliers from Jakarta have a waiting time of one week.

### c. Inventory Management Principles

Table 9: SOP applied to the Supply of Medical Masks at the Pharmacy

| Question | Coding |
|---|---|
| Is there an SOP that is applied regarding the supply of masks during COVID-19? | **Informant 1** |
| | There is a SOP for the procurement of medical masks |
| | **Informant 2** |
| | Restrictions on purchasing medical masks at the beginning of the 2020 pandemic |
| | **Informant 3** |
| | Restrictions on purchasing medical masks at the beginning of the 2020 pandemic |

During the pandemic, Informant 2 and Informant 3 stated that there were rules applied regarding the provision of medical masks. The regulation is in the form of limiting the purchase of medical masks at the beginning of the 2020 pandemic. This has been in effect for almost a month. On the other hand, Informant 1 revealed that there are SOPs related to the procurement of medicines and medical devices, including medical masks. The series of activities from the SOP for procurement of goods by making and checking the Letter of Order or SP (Surat Pesanan). The letter needs to be signed by the Pharmacy Manager who made the request. After that, the pharmacy sends the SP to the supplier. From the SP, the goods that have just arrived need to be checked whether they are in accordance with the pharmacy's request or not. If not, the item will be rejected. If it is according to the order, the new pharmacy can accept the item.

Researchers received additional information related to the procurement SOP carried out by X Pharmacy. This information was obtained directly from the PIC Operational at Business Manager Jogja, namely Informant 4. She described a chart containing the procurement process until distribution to consumers. The following is a procurement chart applied by X Pharmacy.
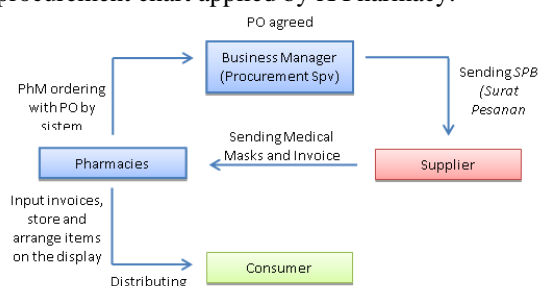


Figure 1: Procurement Flow

The chart above explains how to procure medicines and medical devices including medical masks at X Pharmacy. The first stage begins with activities at the pharmacy, namely ordering goods through the Smart Stock system. The order also needs approval from the Pharmacy Manager in advance. After that, the PO will be received by the Procurement Supervisor from the Business Manager. The procurement supervisor will check the PO. If it has been approved, the supervisor will send a Goods Order Letter to the Supplier. The supplier will condition it first, if the ordered item is in accordance with the available stock, then the supplier will approve the order request. After the goods have been prepared, the medical masks will be sent to the pharmacy. The shipment must also attach an invoice that serves to match the order with the goods that have arrived. Then, when the goods have arrived, the goods will be checked by health workers at the pharmacy. Then they will input the invoice into the system as a record. Newly arrived medical masks will be stored in the warehouse and will be arranged on display shelves. The final stage of all these processes is the distribution of medical masks to consumers.

### d. Inventory Management Tools and Equipment

Table 10: The System Used To Manage and Monitor Inventory at the Pharmacy

| Question | Coding |
|---|---|
| What are the techniques and use of tools used to manage and monitor inventory in pharmacy? | **Informant 1** |
| | Use of computer systems |
| | **Informant 2** |
| | Use of POS system |
| | **Informant 3** |
| | Use of POS system |

X Pharmacy has a system to manage and monitor inventory in pharmacy. Based on the results of interviews conducted by researchers, Informant 1 said that to manage the stock of medical masks in pharmacy, is by using a system. Through this system, pharmacy can see how much inventory they have left. If stock is running low, pharmacy will place their own orders outside of routine orders which are usually done every 2 weeks. Informant 2 added that it was clear that the system used was POS or an acronym for Point Of Sales. According to Informant 2 and Informant 3, the function of POS is to check inventory, as well as to order new stock for replenishment. The POS system also functions to conduct sales transactions and store consumer data.

Researchers get clearer information regarding what systems are used by X Pharmacy. This information was obtained from Informant 5 from the Business Manager of other outlet that has the same network with X pharmacy. Informant 5 said that there are two systems in a pharmacy outlet. These systems are POS (Point Of Sales) and SS (Smart Stock). POS serves to facilitate transactions and storage of sales data. Every transaction made must issue a receipt from the POS system. The POS system at a X pharmacy outlet can be accessed by all employees who are on duty at the pharmacy. Health workers at pharmacy who are working can also check POS system data from other pharmacy but cannot make transactions on these other outlet accounts.

While the Smart Stock system functions to manage and control inventory based on needs, namely the Pareto method. The Smart Stock system contains reports and recaps of transaction data such as prescriptions and credits from a pharmacy. Each pharmacy has a Smart Stock system that can only be accessed by the Pharmacy Manager at that outlet.

Table 11: Handling of Medical Mask Stock at the Pharmacy

| Question | Coding |
|---|---|
| What about the handling of medical mask stocks? What kind of place and room, optimal temperature, equipment, and what kind of lighting? | **Informant 1**<br>• A place that is not humid<br>• Not exposed to direct sun<br>• Placed not directly on the floor<br>• Room temperature<br>**Informant 2**<br>• Room temperature<br>• Not exposed to direct sun<br>**Informant 3**<br>• Room temperature<br>• Not exposed to direct sun<br>• A place that is not humid |

Handling of medical masks at pharmacy does not have special criteria and is treated like medicines in general. Informant 1, Informant 2, and Informant 3 have almost the same answers. For storage of medical masks, masks should not be placed directly on the floor and should be placed on a shelf. Medical masks should also be placed at room temperature and should not be exposed to direct sunlight. Because if exposed to direct sunlight, the box of medical masks will fade and get damaged quickly. Masks are placed and stored in the same warehouse with other medicines. In addition, medical masks should not be stored in a humid place and should be kept away from leaky ceilings.

**2. The Impact of COVID-19 pandemic regarding the inventory management of medical masks at X Pharmacy**

Table 4.23: Impact of COVID-19 on Medical Masks Availability

| Question | Coding |
|---|---|
| What is the impact of COVID 19 regarding the supply of medical masks at X pharmacy, especially at the Tajem outlet? | **Informant 1**<br>• Mask stock is not available in March-April 2020<br>**Informant 2**<br>• Mask stock is not available in March-April 2020<br>**Informant 3**<br>• Many medical masks were exported before the pandemic in Indonesia<br>• Short stock of medical masks |

The stock of medical masks turned out to be unavailable for a month at X Pharmacy. The stock vacancy occurred in March-April 2020 based on Informant 1 and Informant 2 said. This is supported by the recommendation from the Ministry of Health to always use masks, consumers are competing to find and buy masks at pharmacy. The occurrence of panic buying among the public, made supplies of medical masks unavailable. Before the pandemic, people did not use medical masks except when needed. But after the pandemic hit, not a few people became very rash by buying medical masks in large quantities. So, many people also don't get medical masks when trying to buy at pharmacy.

In addition, the vacant stock of medical masks was also caused by the supplier's inability to meet the demand for pharmacy at the beginning of the pandemic. Official suppliers or those who already have cooperation with pharmacy have run out of medical masks to supply pharmacy. Thus, pharmacy cannot sell medical masks to serve consumer demand.

Due to the COVID-19 pandemic, the price of medical masks set by suppliers has also increased. This is due to high consumer demand as already mentioned above. In addition, rising raw material prices are also a reason for suppliers. Thus, making medical masks sold by pharmacy is also more expensive. The price of medical masks sold is very much different from before the pandemic. Informant 1 revealed that before the pandemic, masks with the Sensi brand could still be purchased at a price of Rp18.000,00/box. But currently, the supplier sets a price of around Rp140.000,00.

Because medical masks are a daily necessity in their activities, this is also a business opportunity for a few people. So, when there is a shortage of medical masks, many new suppliers appear. Even this new supplier has a stock of medical masks to sell to pharmacy. However, this is actually a big consideration for pharmacy. Besides the desire of pharmacy to meet the prices they offer, they are certainly much more expensive than the prices that pharmacy usually buy with official suppliers.

**3. The Obstacles Faced Regarding the Inventory Management of Medical Mask at X Pharmacy during the COVID-19 Pandemic**

Table 13: Constraints Caused by COVID-19 on Medical Mask Supplies

| Question | Coding |
|---|---|
| What are the problems or obstacles that have occurred regarding the availability of medical masks when the COVID-19 pandemic began until now? | **Informant 1**<br>• Highest Retail Price masks set by the government<br>• The supplier's inability to meet the pharmacy's request<br>**Informant 2**<br>The supplier's inability to meet the pharmacy's request<br>**Informant 3**<br>The supplier's inability to meet the pharmacy's request<br>**Informant 4**<br>• Prices for masks vary<br>• Expensive mask prices from suppliers |

According to Informant 1, at the beginning of the 2020 pandemic, the obstacles that occurred were caused by the HET mask price set by the Minister of SOEs. The SOE Minister's order is contained in a circular letter number SE-1/MBU/03/2020 regarding vigilance against the spread of Corona Virus Disease 19. This makes it difficult for pharmacy to sells masks. In fact, the price of masks sold by official suppliers has also become more expensive. If the pharmacy sells medical masks

above the price of Rp2.000,00 per sheet, the pharmacy will be suspended. With government monitoring of X Pharmacy, it finally decided to withhold sales and did not have a stock of medical masks while looking for medical masks that cost under Rp2.000,00 per sheet. Informant 4 also said that the obstacle experienced was the variable price of masks in circulation which was very varied. The prices of masks offered are low and some are high. However, the price of masks offered by suppliers has increased so that it becomes very expensive than usual.

Another obstacle faced by pharmacy according to Informant 1, Informant 2 and Informant 3 is that suppliers are unable to meet the demand for pharmacy. This happened at the beginning of the pandemic which caused a shortage of medical mask stocks at pharmacy. This makes it difficult for the pharmacy to be unable to meet the high consumer demand for medical masks. However, as April 2020 progressed, pharmacy has received a supply of medical masks again, although at a much higher price.

**4.    Actions to Overcome the Problem of Medical Mask Inventory Management During the COVID-19 Pandemic at X Pharmacy**

Eventhough COVID-19 has had a bad impact and the obstacles faced by X pharmacy. The pharmacy continues to carry out various solutions and innovations to meet consumer demand. The following table relates to what solutions the pharmacy has done through the answers of informants 1, 2, and 3.

**Table 4.25: Solutions to Restore Medical Mask Supplies at Pharmacy**

| Question | Coding |
|---|---|
| What solutions, innovations, and efforts have been made by X pharmacy in handling and restoring supplies of medical masks during this pandemic? | **Informant 1**<br>• Looking for new suppliers<br>• Limiting the time of purchase and the number of medical masks for consumers<br>• Consumers may pre-order<br>**Informant 2**<br>• Looking for new suppliers<br>• Consumers may pre-order<br>• Increase the number of suppliers, types and brands of masks<br>**Informant 3**<br>• X pharmacy produces its own medical masks<br>• Limiting the sale of the number of medical masks to consumers<br>**Informant 4**<br>• X pharmacy produces its own medical masks |

From the table, the researcher formulated several solutions and innovations that have been carried out by pharmacy to restore supplies of medical masks during the COVID-19 pandemic. Informant 1, Informant 2, and Informant 3 revealed that they are always trying to find new suppliers. Despite the fact, many other suppliers do not have much stock of medical masks. Informant 1 said that the Business Manager got a new supplier from Jogja. However, the supplier also asked to limit the sale of medical masks to consumers. In addition, Informant 2 said that they would order a certain amount of stock owned by the supplier or which was allowed to be purchased from the supplier.

The three informants also shared the same statement that at the beginning of the pandemic, they had restricted the sale of medical masks to consumers. Informant 1 also revealed that there were restrictions on the selling hours of medical masks. Pharmacy only sell for two to three hours in the morning. This is intended so that all consumers who visit pharmacy can get medical masks when they are sought after by them. In addition, consumers also need to provide their personal data when buying medical masks. At that time, X Pharmacy sold masks at a price of Rp2.000 per sheet. Meanwhile, at the same time, many other medical mask sellers are selling at a higher price. Several irresponsible people emerged, reselling the medical masks they got at low prices.

Another innovation made by X pharmacy is to produce medical masks with their own brand. The brand of the mask. This statement was explained when the researchers interviewed Informant 3 and Informant 4. At a time when the price of circulating medical masks soared very high, X pharmacy issued medical masks and cloth masks at more affordable prices. The production of cloth masks by X pharmacy is also supported by an appeal from the government. Due to the scarcity of medical masks, the government urges the public to use cloth masks. Ofcourse this is able to help people who want to buy masks at that time.

Through the results of interviews with Informant 2, an additional solution made by X Pharmacy is to increase the number of suppliers, types and brands of masks. Before the pandemic occurred, examples of mask brands commonly sold by pharmacy were nexcare, sensi, and onemed. The brand of masks sold in pharmacy also increased when the pandemic emerged. Examples of these new mask brands are Winstar and Evo. The types of masks sold are also increasingly diverse with the emergence of the KF94 type of medical mask.

**CONCLUSION**
Based on the analysis of the research results and the discussion that has been described in the previous chapter, in the study entitled "Analysis of Medical Mask Inventory Management for Medical Mask during the COVID-19 Pandemic at X Pharmacy in Yogyakarta, the researcher concluded that:
1.    During the pandemic, the management of medical masks at X Pharmacy can be concluded through four indicators. To maintain the level of supply of medical masks, the method used to adjust and adjust stock levels at X pharmacy is Pareto ABC. The pharmacy also establishes safety stock in

its inventory management. In addition to maintaining the availability of medical masks to serve consumers, safety stock also serves to supply health workers on duty at pharmacy. At the research pharmacy, there is also an examination of the number of physical medical masks in stock. The inspection uses two methods, namely stock sampling and stock opname. The method of managing or selling medical masks used is FIFO. As for refilling the stock of medical masks, Pharmacy perform minmax screenings as an analytical tool to determine the number, type of masks, and who will be the supplier who will supply medical masks to pharmacy. X Pharmacy uses two systems that are integrated with the central of the network pharmacy. The system is a Point of Sales that functions in terms of transactions and a Smart Stock system that functions to control inventory based on needs.

2. The impact caused by the COVID-19 pandemic has a very bad influence on the availability of medical masks at pharmacy. In March to April 2020, pharmacy do not have stock of medical masks due to the scarcity of these products.

3. X pharmacy face obstacles such as the highest retail price for masks. The government's policy not to sell medical masks above Rp2.000,00 makes it difficult for pharmacy to sell medical masks. In fact, the price of masks sold by official suppliers has also become more expensive. With government monitoring of X Pharmacy, it finally decided to withhold sales and did not have a stock of medical masks while looking for medical masks that cost under Rp2.000,00 per sheet. In addition, the obstacle faced by pharmacy during the pandemic is that suppliers are unable to meet the demand for pharmacy. This happened at the beginning of the pandemic which caused a shortage of medical mask stocks at pharmacy.

4. The pharmacy is always trying to find new suppliers to keep the stock of medical masks available during the pandemic. In addition, pharmacy limits the hours of selling medical masks. Pharmacy only sells for two to three hours in the morning. This is intended so that all consumers who visit pharmacy can get medical masks when they are sought after by them. Another innovation made by X pharmacy is to produce medical masks with their own brand. X Pharmacy has also implemented a Pre Order sales system. Consumers who visit may make a PO first. With this PO system, pharmacy will prioritize the demands of consumers who have made PO purchases.

**RESEARCH LIMITATIONS**

This research was attempted and carried out in accordance with scientific procedures, but in reality this research still has limitations, as follows:

1. This research only focuses on the management of medical mask supplies at X pharmacy, Yogyakarta, during the COVID-19 pandemic.

2. Researchers only interviewed three informants from the pharmacy studied and two informants from the Business Office Managers.

**SUGGESTION**

1. X Pharmacy

Pharmacy is expected to be able to determine stock levels carefully. Considering that the stock of masks does not have an expiration date, it is hoped that the stock can be increased because there is no need for such a large capital; Pharmacy is expected to be able to maintain long-term relationships with suppliers; Pharmacy is expected to improve communication and use of IT to communicate with suppliers.

2. Supplier

Suppliers are expected to provide more optimal stock during the current pandemic to avoid a shortage of medical masks in pharmacies; Suppliers are also expected to take lessons to be more anticipatory to immediately produce medical masks in the event of a pandemic in the future; Suppliers are expected to have a commitment and maintain the trust of partners, in this case the Pharmacy; Suppliers are expected to establish long-term relationships with partners.

3. Consumer

Consumers are expected to be wiser in buying medical masks during a pandemic to avoid a shortage of medical masks. It is hoped that consumers can buy medical masks according to their needs.

4. For Further Research

For further research, it is expected to increase the number of respondents for pharmacy, so that the information obtained will be wider and can obtain more specific data; For further research, it is expected to be able to collect data during the corona virus pandemic with the Omicron variant. This is in order to compare the management of medical masks during the COVID-19 pandemic and the Omicron variant pandemic; For further research, it is hoped that research in pharmacies will not only focus on medical masks, but also on medicines and medical devices needed during a pandemic.

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