

Designing the Demand Process and Distribution of Pharmaceutical Product of Public Health Centers in Surabaya

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Designing the Demand Process and Distribution of Pharmaceutical Product of Public Health Centers in Surabaya

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Abstract

On healthcare industries, supply chain activity that related with pharmaceutical product (drugs and medical consumables) was very important to ensure high standard treatment for patient and provide sufficient pharmaceutical product supply to drugstore. The purpose of this research was to depict mapping process of internal inquiry and distribution for pharmaceutical product evolving between Pharmaceutical Unit of Health department of Surabaya, Health Pharmaceutical warehouse, and Public health centers along with the issues then formulate a design for process flow to reduce the issues.

The research method based on cross sectional case study scheme exert descriptive analysis then utilized with analytical method either quantitative or qualitative. All data collected and analyzed based on mapping process concept Data Flow Diagram (DFD) as a suitable supply chain mapping process for pharmaceutical product.

Research result shown that there were four issues on pharmaceutical product supply chain process, first, pharmaceutical product stock availability in Health Pharmaceutical warehouse, second, pharmaceutical product supply ability from Health Pharmaceutical warehouse. Third, the accuracy of pharmaceutical product planning from Public health centers, and finally pharmaceutical product deficit at public health center.

Pharmaceutical product supply chain process in public health center at Surabaya need to be remodel and improved. Data and information integration then exchange between Pharmaceutical Unit of Health department of Surabaya, Health Pharmaceutical warehouse and public health centers is the main key and focus to reduce or minimize current issues problems on pharmaceutical product supply chain process.

Keywords: Mapping Process, Pharmaceutical Product (drugs and medical consumables), Public Health Centers, Healthcare Supply Chain

BACKGROUND

Indonesia is one of the countries in the world with the largest population. Increasing population requires more health services centers. Increasing the number of health services centers makes the problem become more complex, especially in the distribution of drugs. So that the supply chain for drug distribution becomes longer and dynamic. Therefore, the activity of forecasting and demand planning becomes very important (Mustamu, 2007). Surabaya, is the second biggest city in Indonesia with around three million of population. The health services in Surabaya managed by the Surabaya City of Health department, and technical unit consists of public health centers and health pharmaceutical warehouse. As a technical unit and health administrative, the unit have an authority to purchase all of medicines needed and also the medical devices. More over the health department of Surabaya have an obligation to manage the inventory of drugs and the medical device.

The inventory management used by the department of health in Surabaya is the pull system, using the data of drugs needed from the society to fulfill the purchase quantity of drugs. The problems come from the distribution of drugs from the health pharmaceutical warehouse to the public health centers and also internal demand. Shah, 2004 illustrate the path of pharmaceutical supply chain in Figure-1 below.

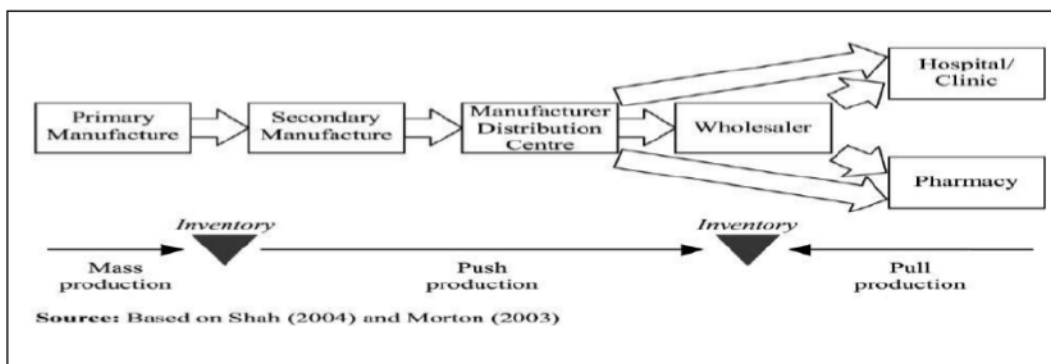


Figure- 1. Pharmaceutical Supply chain in health service
Shah, 2004

The aims of this research is describing the obstacle in the internal demand process and the distribution of pharmaceutical inventory that involving the department of health city of Surabaya specially in pharmaceutical unit and the health pharmaceutical warehouse and also public health centers. More over this research will generated solutions for the problems and obstacles above.

Healthcare supply chain management

In health service supply chain management is more complex, since the need of drugs in the area of public health centers have a variability one from another depend on the disease of the

diseases suffered by the community. (Beier, 1995). Nevertheless, there is still a chance to improve the overall performance of the supply chain (Mekone-Sweet et al., 2005). A number of different techniques of supply chain management has been adopted in recent years, but the obstacles in implementing the concept is still happen. The health sector have a uniqueness specially in the implementation of supply chain management concepts. The obstacle like the support from the executive, conflict of interest, the need of data collection and the performance measurement. Another obstacle such as conflict of objective, the lack of skill and knowledge about supply chain management, information technology and the lack of code of standart and the lack of information sharing. (Callender dan Grasman, 2010). Figure -2 below illustrate the relationship among unit, concerning the health service supply chain.

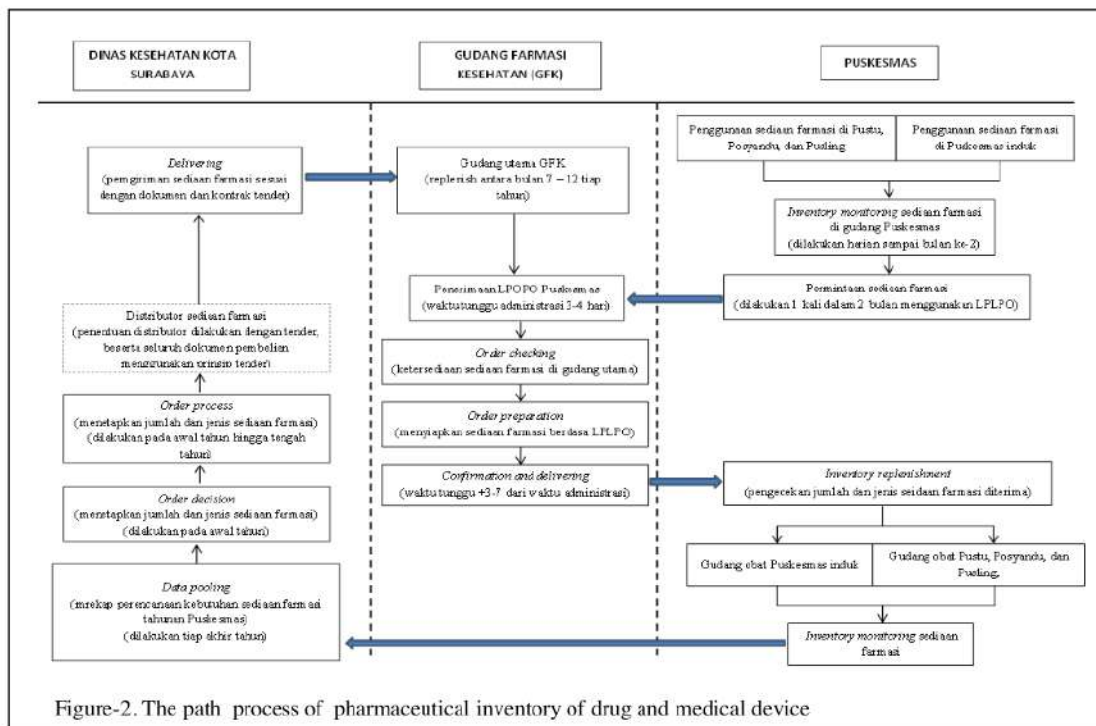


Figure-2. The path process of pharmaceutical inventory of drug and medical device

Shah (2004), stated that in the implementation of supply chain in health service, there were some elements, based on the study from researchers such as, product life cycle, profit margin, forecasting demand, and supply chain education.

Research Method.

This is descriptive research using the self report. Data collected by observation done by researcher. The observation done directly from the field, such as departemen of health city of Surabaya, pharmaceutical warehouses, and the public health centers. The method of analysis used are both qualitative and quantitative approach. The quantitative analysis used to support data triangulation for the qualitative analysis. The primary data collected by semistructured interview and structured. Semistructured interview for the stakeholder of

pharmaceutical unit of health departement such as the head of pharmaceutical unit and the sub unit of planning and purchasing of pharmaceutical inventory. Another interview is for the pharmacists of the public health centers as a responsible person of the pharmaceutical inventory in the public health center. Structured interview is conducted for the staff to make a confirmation of the information give by the head of unit and sub unit of departement of health. Secondary data collectid from the report of pharmaceutical inventory. Data were taken from three locations namely Department of health city of Surabaya, health pharmaceutical warehouse and the public health centers. From the public health center secondary data is collected, the data is about the form of order and the form of the drugs used for third year (2012-2014). Another data source are the work procedure, the work instruction. Data collected then analysed to formulate the improvement of the path of supply chain in the distribution of drugs from the pharmaceutical health warehouse to several public health center. Figure-3 below illustrate the stages of the research process.

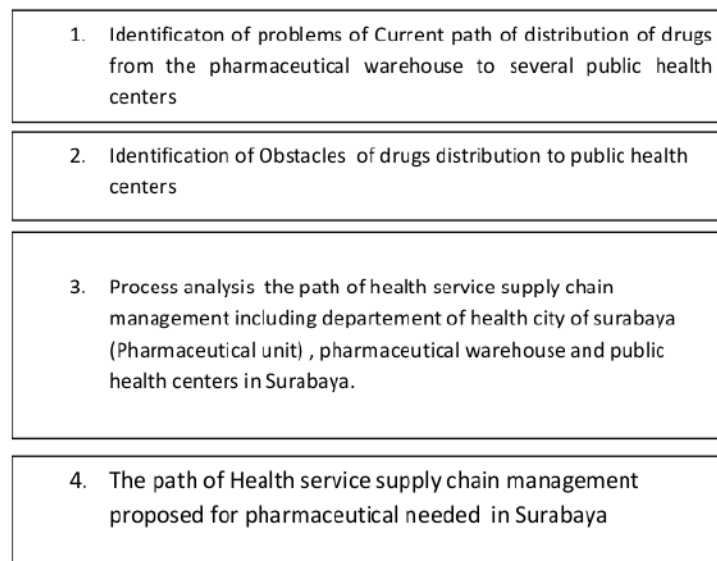


Figure-3: Stage of the research

Processing and analysing quantitative data

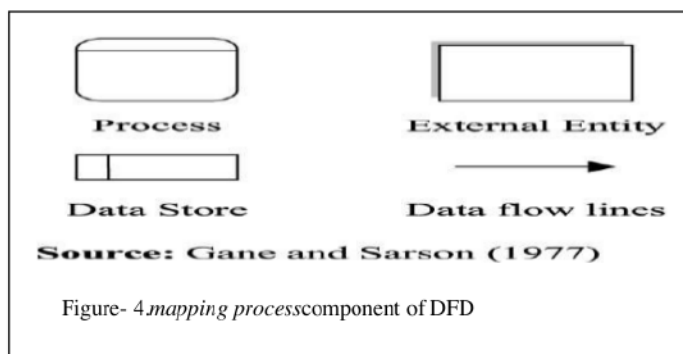
Processing and analysing quantitative data conducted to analyse the influence of the service performance of pharmaceutical unit to the public health center and the health pharmaceutical warehouse. Cut of point method is used to analyse the quantitative data. Tam et al (2001) make a method to make sure the level of need criterias. The questioner of those criteria distribute to the relponden that have experience and skill in the inventory. The score are range from 1 to 3. Not importance (1); somewhat importance (2) and very importance (3). The average value of every elements are sorted from the high to the low to find the cut off. The formula below is for the cut off calculation:

$$\frac{\text{Maximumvalue} - \text{Minimumvalue}}{\text{numberofthecategory}}$$

Number of category is the four scale in the questioner

Processing and analysing the qualitative data

The approach of qualitative data using the flowchart that illustrate the drugs distribution start from the ordering of drugs to delivery of drugs to the buyer. The flowchart will make easier to find the point that make an obstacle in the distribution of drugs from the department of health to the health pharmaceutical warehouse and finally to the public health centers. Here are some symbols for the flowchart.



2
Mapping process is the technique to business process flow model in graphic to visualize the process in the organization and to find the improvement of the process to make it more effective. (Paper et al., 2001).

Aguilar-Save'n (2004) give an illustration about the tools of mapping process. In this research will use Data Flow Diagram (DFD) technique in modelling both management process of inventory for the current and the future of organization. Becker et al. (2006) concluded that the DFD is one of the best methods of representing the structure of the system. DFD is a process map that uses four different symbols and represents a major component that includes (1) an external entity, (2) data stored and saved, (3) the flow of data and (4) process.

Analysis and description

The results of field studies indicate the existence of inequality during the period of 3 years to the needs of the amount sent. This shows that there is disharmony flow of information and data exchange between public health centers and health pharmaceutical warehouse as a supplier of drugs. This indicates that there needs to be improvement in terms of the exchange of data and information that exists between the health center Health Pharmacy Warehouse (GFK). The graphic below shows the comparison number of drug used and received in 2014.

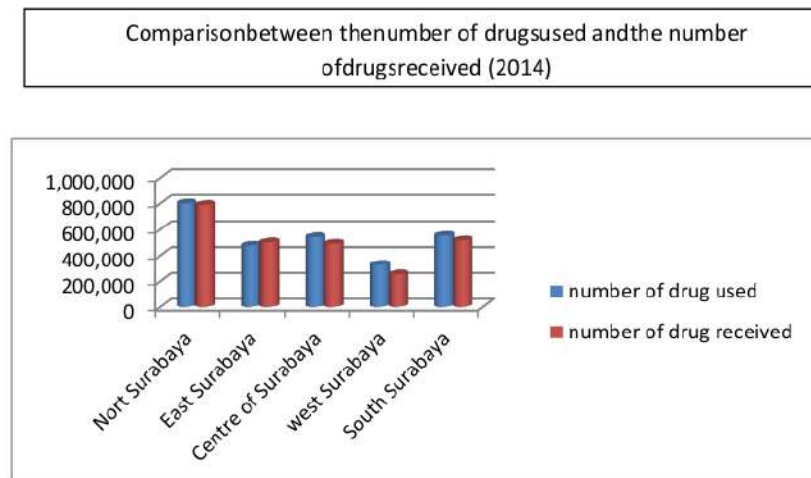


Figure -5 . Comparison between the number of drugs used and the number of drugs received (2014)

Indirectly, this condition indicates a relationship disharmony exchange of data and information between public health centers and the health pharmacy warehouse. So it is need to be improve the process of supply from the health pharmacy warehouse to those 62 public health center in Surabaya. Therefore a relationship that support the exchange of data and information between health center Health Pharmacy Warehouse that minimize the drawback of the drug phenomenon in the public health centers.

Appendix-1 illustrate the supply chain process of pharmacy inventory (drugs and medical supply) that involving three entity, public health centers, health pharmacy warehouse, and health department of Surabaya specially pharmacy unit, based on mapping process Data Flow Diagram (DFD). The process involving 19 activities and 11 data stores. The supply chain process formulate considering the data triangulation of interview result from the three entities. The process of supply chain in the last three years (2012-2014) remain the same. Briefly the ninth process and the eleven data source will summarize into seven supply chain activities below :

1. *Pooling data*

Supply chain process starts from the data poll conducted by the City Health Office of Surabaya, where data pooling combine all demand, pharmaceutical (drug and medical supplies) in 62 health centers Surabaya. Pooling the data will be used as a benchmark for the Department of Health to determine the number and type of pharmaceutical preparation for ministry fulfillment pharmacy at the health center for 12 months.

2. Order decision

Data pooling process are taken 2-3 months for health center to recapitalize the number and types of pharmaceutical needs (medicines and medical supplies) needed for 12 months will be the main criterion for the City Health Office to order decision. The output of the order decision is mapped amount and type of pharmaceutical preparations (medicines and medical supplies), where the latter decision-making of the order will be translated by the procurement. Parts procurement is an external entity of City Health Department where the procurement is an entity belonging to city officials in charge of organizing the mechanism of the auction bidding all activities in city government agencies.

3. Order process

Order process is a series of activities in which the longest series of the order process takes between 5-6 months. Order process of pharmaceutical (drug and medical supplies) involving external parties for the fulfillment of the procurement pharmaceutical (drug and medical supplies), which is a distributor of pharmaceuticals. The results of the order fulfillment process is the amount and type of pharmaceutical preparations (medicines and medical supplies) in accordance with the contract documents procurement, whereas the items pharmaceutical (drug and medical supplies) will be delivered directly by the distributor of pharmaceuticals to the Warehouse for Health Pharmacy.

4. Receiving LPLPO of Public health center

Acceptance LPLPO Health Center Health Pharmacy Warehouse to a monthly routine activities undertaken by Health Pharmacy Warehouse. In LPLPO there recap the amount of usage of pharmaceutical preparations (medicines and medical supplies) public health centers, the number and types of pharmaceutical preparations (medicines and medical supplies) are required, and the remaining stock of pharmaceutical (drug and medical supplies) in the public health center. LPLPO given to Health Pharmacy Warehouse become the main criterion for Health Pharmacy Warehouse to determine the number and types of pharmaceutical preparations (medicines and medical supplies) that will be delivered to the public health center.

5. Order checking and order preparation

Order checking and order preparation are the pair process in the health pharmacy warehouse which determines the fulfillment of the amount and type of pharmaceutical preparations (medicines and medical supplies) to the public health center. Order checking emphasis on demand the amount and kind of pharmaceutical preparations (medicines and medical supplies) in the main warehouse with LPLPO, while the order preparation emphasis on the determination of the sheer number and types of pharmaceutical preparations (medicines and medical supplies) are required in LPLPO to be met the health Pharmacy warehouse based on the availability of pharmaceutical preparations (medicines and medical supplies) in the main warehouse.

6. Confirmation dan delivery

Confirmation dan delivery is the final stage in the health pharmacy warehouse where management of health pharmacy warehouse finishes the process of inventory and drugs and medicine supply and ready to take by public health centers

7. Inventory replenishment and inventory monitoring

Inventory replenishment and inventory monitoring is a series in which the aim is to control pharmaceutical preparations (medicines and medical supplies) in public health centers. Monitoring the number and types of pharmaceutical preparations used and issued by the health center every day that recapitulated up to a month. Thus inventory monitoring can produce the output of the data usage of pharmaceutical preparations (medicines and medical supplies) health center, where the data will be used by the health center to determine the number and type of pharmaceutical preparation will be required to Warehouse Pharmacy Health to do an inventory replenishment.

Issue- 1. Availability of Pharmaceutical Products Stock (Drugs and Medical Supplies) in Health Pharmacy Warehouse

Pharmacists and pharmacist assistants of public health centers have provided a statement that the stock in the Health Pharmacy warehouse are not fulfilling the needs of the pharmaceutical for monthly usage in all public health centers in Surabaya. Consequently pharmacist of public health centers were often replacing an empty drug with other drugs that have similar, though contrary to the prescription given by a health center doctor. Or if it can not be replaced by other types of pharmaceutical preparations and unfortunately the health center patients have to purchase independently in public pharmacies. Availability of stock of drug and medical supplies in Health Pharmacy Warehouse is the value obtained by calculating the percentage of the revenues of drug and medical supplies of public health centers of Health Pharmacy Warehouse within 12 months of preparation needs of drugs and medical supplies of public health Center for 12 months.

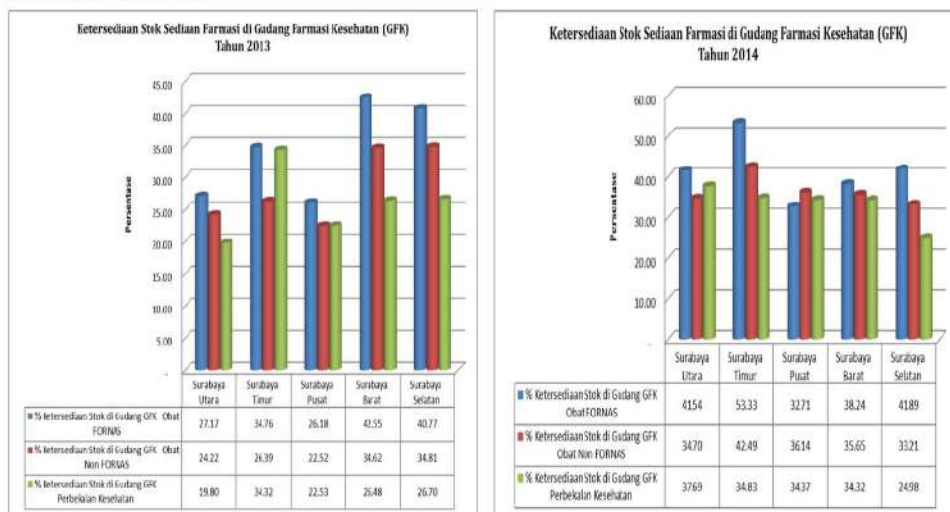


Figure-6 . Percentage the availability of pharmaceutical stock in the health Pharmacy warehouse in 2013-2014

Based on the availability condition stocks of pharmaceutical (drug and medical supplies) in Health Pharmacy Warehouse for 3 years obtained an average availability of stock of pharmaceutical (drug and medical supplies) in Health Pharmacy Warehouse less than 50% for both pharmaceutical drugs belonging and non-drug. Lack of availability of stocks of pharmaceutical (drug and medical supplies) to reach half of the amount that should have been available in the main warehouse and health pharmacy warehouse.

Issue- 2. Supply Ability of Pharmaceutical Products (Drugs and Medical Supplies)

The issue of the ability to supply of pharmaceutical in inability issue Health Pharmacy Warehouse in supplying pharmaceutical inventories to each public health center in Surabaya. Often City Health Pharmacy Warehouse reducing the supply of pharmaceutical without informing to the public health center, so that the public health center have no certainty of type and number of pharmaceutical inventories which are not able to be supplied by the Health pharmacy Warehouse. This condition make the public health center stock out before the end of the period (month).

The ability to supply pharmaceutical inventories Health Pharmacy Warehouse is the value obtained by calculating the percentage of the revenues of pharmaceutical inventories of public health centers of Health Pharmacy Warehouse within 12 months with the use of pharmaceutical preparations (medicines and medical supplies) estate at the health center within 12 months.

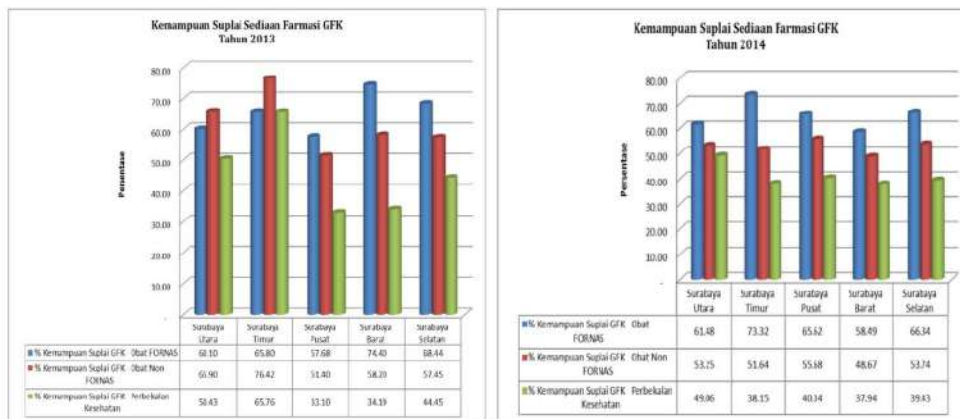


Figure 7. The percentage of availability of supply of pharmacy warehouse 2013-2014

Based on the results of the trend for the next 3 years concluded that the ability to supply pharmaceutical Health Pharmacy Warehouse (GFK) to all health centers in Surabaya has decreased, so that the supply of pharmaceutical preparations (medicines and medical supplies) will certainly run out before the next request. This shows that in each year the main warehouse conditions are not able to supply the needs of medicines and medical supplies.

Mustafa and Potter (2009) emphasized that similar issues also occur in the scope of health services supply chain in Malaysia, they said that the pharmaceutical inventory at a wholesaler can run a deficit and not capable of supplying to several clinics.

Issue- 3. The accuracy of Pharmaceutical Product Planning

The accuracy of the planning of pharmaceutical inventory needs to get more attention. Because the report planning needs of pharmaceutical inventories annual health centers and use of pharmaceutical inventories monthly computerized health centers all input and reported to the Health Office of Surabaya. Therefore, the use of planning models and trends of use of pharmaceutical preparations (medicines and medical supplies) must be finalized in order to accurately and detail are applied to all health centers. Because the report planning of the inventory needed yearly of public health center and the usage of the drugs and medical supplies monthly all input computerized and reported to the health department of Surabaya. So the implementation of good planning is needed for all of public health centers in Surabaya. Accuracy of inventory planning in public health center is the percentage of the real usage in 12 months.

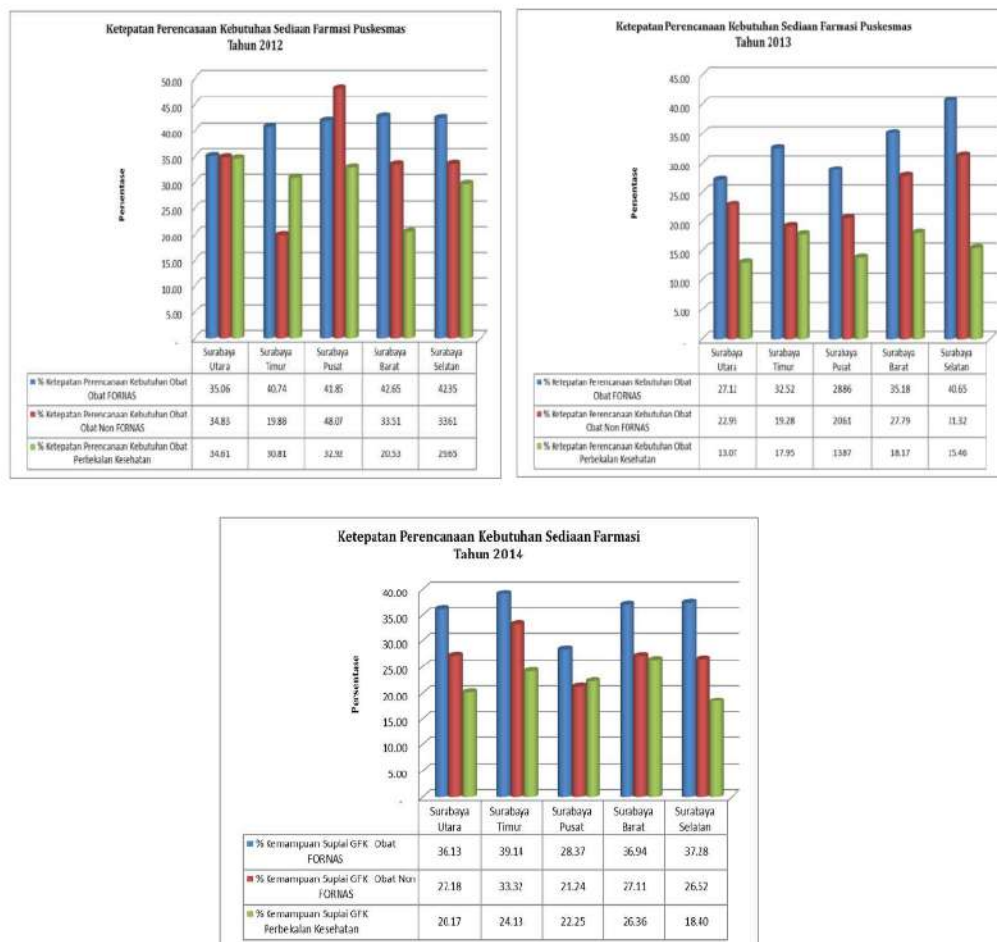


Figure 8. the percentages of inventory planning and the inventory - 2014

Based on the analysis for 3 years concluded that the accuracy of inventory planning is not effective and efficient.

Issue- 4. Defisit of inventory (drugs and medicine supplies)

Deficit of the inventory in the public health center must be reduced, because its make several negative impacts like, decreasing performance of unit, substitute of drugs become very often, reducing the number of medicine for the patient, and procurement of drug done by public health centers.



Figure 9. The percentage of pharmacy inventory deficit in public health centers.

Based on the 3 years data of inventory deficit, concluded that the inventory of drugs and medical supplies are finish berfore the next order schedule, this condition make the public health center make the urgent order to the health pharmacy warehouse. Mustafa Potter (2009) state thae the urgent order status have a different treatment, it must be processed and deliver as soon as possible. Based on research mostly 30% of order is a urgent order. This fact shows that there is a problems concerning the demand of drugs stock that need tobe solved specially about the inventorty information of drugs availability.

The Improved Design of Suppy Chain Process

The Supply chain process fo health service in Surabaya involve three different organizations, namely, departement of Health city of Surabaya, Warehous and public health center. The lack of integration and communi aton among them arise the suppy chain process problems. Sytch and Gulati 2008, stated that the interdependency among the stakeholer can make a benefit in value creation. The success of collaboration realize by sincronize among the member of supply chain in orge to efficient of decision making (Stadler, 2009).

Data Flow Diagram (DFD) of supply chainprocess in helath service of Surabaya city shows the communication obstacle. The new design of DVD give the solution that minimize the communication obstacle, by adding information system that integrate the communication fo drugs needeb by public health center to th departement of health and to warehouse als Minimize the first issue (the problem of stock availability in Health Pharmacy Warehouse, is done by checking the inventory status thate connected the warehouse and the every public health center. Right now the information flow between pharmacy warehous and the departement of health is not good. So its need to developpt the information gate between the departement of health to the pharmacy warehouse.

The second issues is the supply availability of the pharmacy inventory. This issues arise as an impact of the gap of information about inventory status in administration unit of pharmacy warehouse. The administration unit is the unit who determined the quantity of drugs will distributed. This gaps give an impact to the drugs received by the public health center. There were seven data of the supply chain process in the public health center and pharmacy warehouse that need to be improve to became better manage.

The third issue is the inventory planning problem. The new design give a formulation of inventory planning in a year a month time horizon, that will stabilize the planning in order to make the inventory more close to the need of public health center. The new design that proposed is adding the

The last issues is the deficit of inventoryare experienced for almost all of public health center in Surabaya every month in the lasg three years. The issue arise as an impact of unknown or the lack of coordination between public health centers and the pharmacy warehouse. The continuous information of the montly inventory deficit will be the source of evaluation for the departement of health in determaning the variety and quantity of drugs procurement policy.

CONCLUSION

Based on the primary and secondary data analysis the new design proposed in fulfilling the demand of pharmacy inventory for the public health centers as follows :

1. Pharmacy inventory Supply chain process in health service in Surabaya involved three entities namely, departement of health city of Surabaya, Health pharmacy warehouse and public health centers. Supply chain process design with Data Flow Diagram Approach. The inventory supply chain process involve 19 process activities start from public health centers to the departement of health city of Surabaya (pharmacy unit). The supply chain process invoved 11 data store start from the public health centers to the departement of health city of Surabaya (pharmacy unit)
2. The prople of supply chain process in pharmach inventory can be describe as follows: For three years the availability of inventory stock in health pharmacy warehouse in average 30% to 43,3% for Fornas drugs and 26,7% - 40,0% for NON Fornas drugs. The availability of inventory supply in average 63,3% - 73,3% for FORNAS drugs and 50,0% - 70,0% for non FORNAS, and 33,3% - 63,3% for non drugs. The inventory planning of public health centers 31,7% - 41,7% for FORNAS, 18,3% - 38,3% for FORNAS, and 15,0% - 26,7% non drugs. From the data shows that there were gabs between the inventory stock and the demand planing of the public health centers.
3. The supply chain process design of pharmacy inventory that minimize the problem above are describe as follows:
 - a. By making the data storage like inventory status file of health pharmacy warehouse reported weekly or montly to the departement of health city Surabaya, pharmacy unit, can minimize the inventory stock problem.
 - b. Developing the data storage about the quantity and variety of drugs used and the availability of inventory in the warehouse and in delivery process to public health can minimize the inventory planning problem. More over by updating the calculation or formulation of the inventory demand montly and annually gived by the departement of health, pharmacy unit to each of public health in accordance with the current condition of every public health.
 - c. Develup the data storage about the deficit varety and quantity of pharmacy inventory before the next demand to the departement of health city of Surabaya, pharmacy unit, can minimize the deficit of pharmacy inventory (drugs and medicine supplies).

Practical implication

Improving the supply chain process and the development of information system that support the entities collaboration is an importance aspect to solve the supply chain process inefficiency problems. Coordinating and sharing the role of inventory procurement between

the department of health and the pharmacy warehouse. Determine the indicator performance to public health centers, Warehouse and pharmacy unit as a tools for performance evaluation. Finally redesigning the supply chain process of pharmacy inventory by integrating three entities .

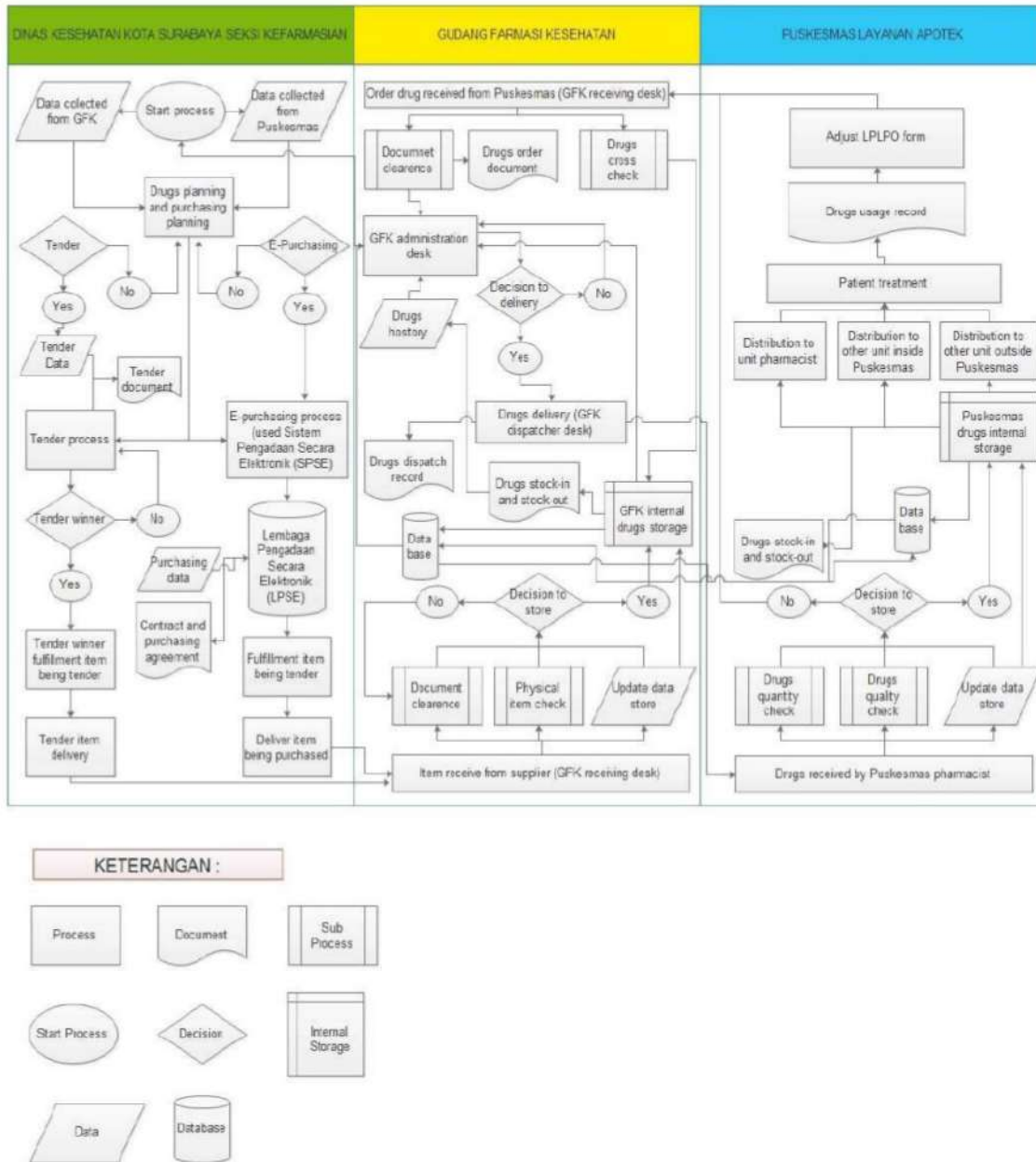


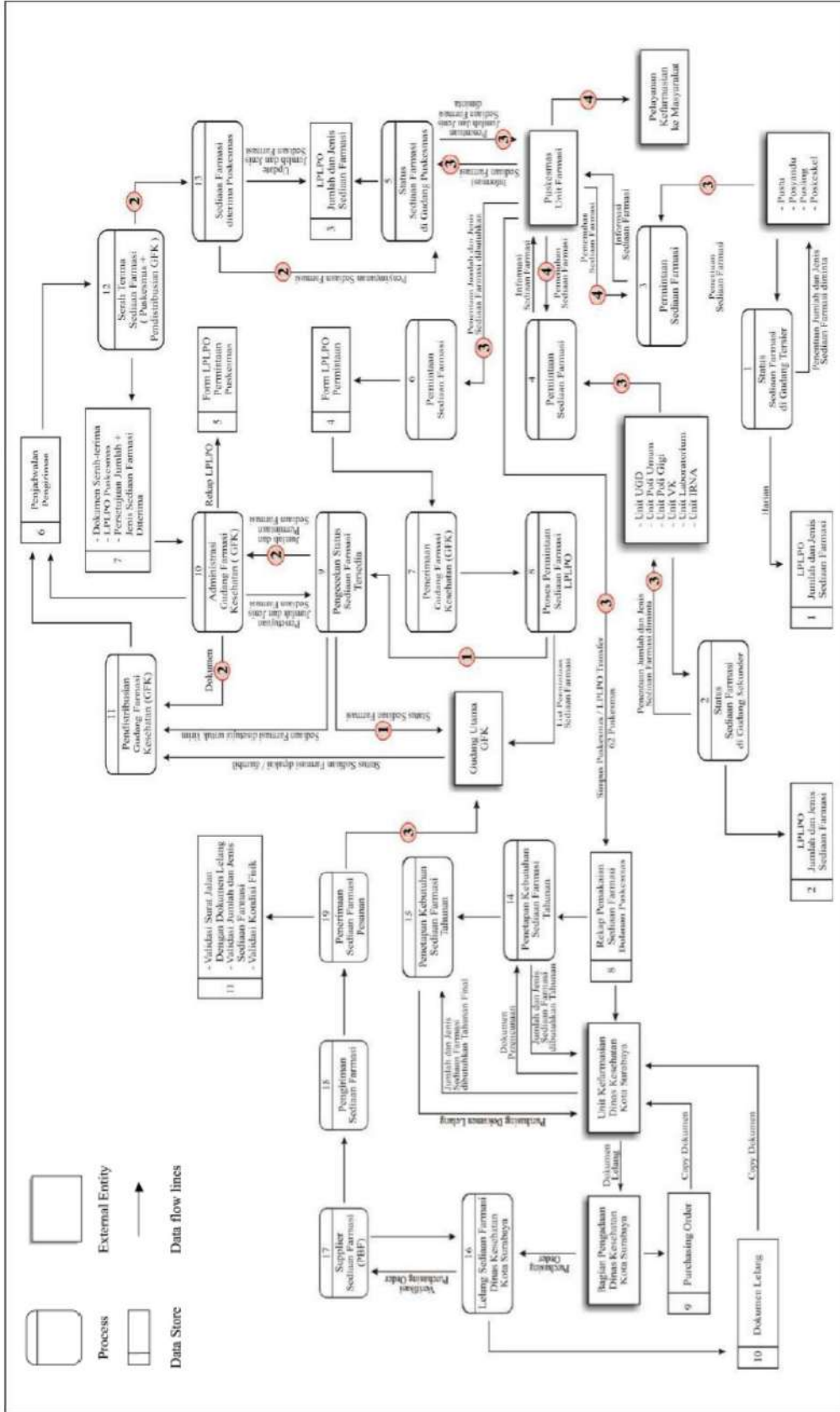
Figure 10. The proposed design of pharmacy inventory supply chain city of Surabaya

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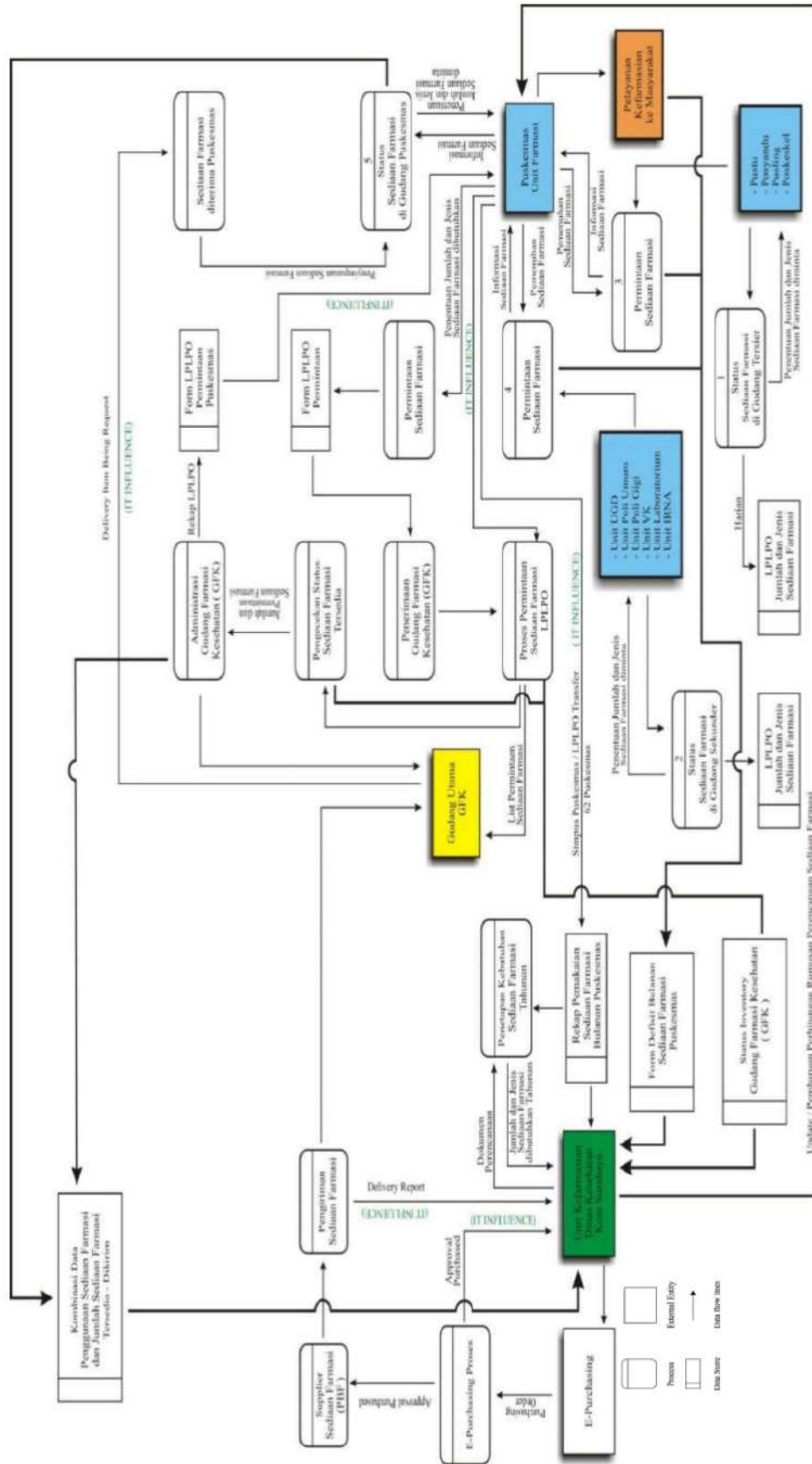
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Appendix 2. The problem issues in pharmacy inventory supply chain



Appendix 3. The revised design of pharmacy inventory supply chain of Surabaya



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