Addis Ababa University

College of Business and Economics

School of Commerce

Department of Logistics and Supply Chain Management Graduate Program

Assessment of Challenges of Pharmaceutical Supply Chain in Public Hospital and Health Center in Addis Ababa, Ethiopia

BY

Mekuwanint Nega Fiseha

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Assessment of Challenges of Pharmaceutical Supply Chain in Public Hospital and Health Center in Addis Ababa, Ethiopia

By: Mekuwanint Nega

Advisor: Teklegiorgis Assefa (Ass.Prof)

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Approved By Board of Examiners

Berhanu Denu (PhD)		
Internal Examiner	**Signature** _____	**Date** _____
Delessa Daba (PhD)		
External Examiner	**Signature** _____	**Date** _____

Declaration

I MekuwanintNega declare that this study in titled as Assessment of challenges of Pharmaceutical Supply Chain in Public Hospital and Health Center in Addis Ababa, Ethiopia is my original work and has not been presented for the degree in any other university and that all sources of materials used for the study have been dully acknowledged.

Mekuwanint Nega	_____	_____
Name	**signature**	**date**

Letter of certification

This research projects has been submitted to Addis Ababa University, College of Business and Economics, school of commerce, department of Logistics and Supply Chain Management for examination with my approval as university Advisor

Advisor: **Teklegiorgis Assefa (Ass.Prof)** **Sig.** _____

Date_____

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List of Acronyms/ Abbreviation

ARV	Anti-Retroviral
CMS	Central Medical Store
EDHS	Ethiopian Demographic And Health Survey
EPI	Expanded Program Of Immunization
HF	Health Facility
IPLS	Integrated Pharmaceuticals Logistics System
LMIS	Logistic Management Information System
MCH	Maternal And Child Health
MDG	Millennium Development Goal
MOH	Ministry of Health
NPPL	National Pharmaceuticals Procurement List
PFSA	Pharmaceuticals Fund And Supply Agency
PLMP	Pharmaceuticals Logistics Master Plan
SCIS	Supply Chain Information Systems
SCM	Supply Chain Management
SKU	Stock Keeping Unit
SOP	Standard Operating Procedures
SSCM	Sustainable Supply Chain Management
WHO	World Health Organization

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ABSTRACT

The challenges of pharmaceutical supply chain developing an objective of challenges leading to stock out and what challenges are affecting the pharmaceutical supply chain activities for minimize the interruption of supplies that was important for health facility. Tracking challenges of the pharmaceutical supply chain is important. The aim of this study was to assess the pharmaceutical supply chain system of health centers and hospitals in Addis Ababa. The research conducted using both quantitative and qualitative approach of research methods and descriptive types of research using structured questionnaire collected data from sampled Addis Ababa health centers and hospitals. There are different challenges of pharmaceutical supply chain that lead for the stock outs. Integration of pharmaceuticals were no full supply from suppliers, forecasting disorganization for demand estimation, procurement poor coordination and there was stock out at least 12 months were high. LMIS was uncoordinated, no enough space of store capacity and problem of transportation those factors contribute for the stock out of pharmaceuticals. In pharmaceutical supply chain activities have different challenges for decreasing the interruption of pharmaceuticals. Challenges related to pharmaceutical supply integration of the health facility and the suppliers and planning the goals with suppliers and managing the supplier relation and develop capacity of supply planning from the production or manufacturer to the end user to facility. Forecasting process and acquiring of the pharmaceutical from the supplier in the requested quantity were challenging for the health facility and some information of the supply pipe line was not monitored and does not known so the probability of stock out were high. Decrease wastage of pharmaceuticals and prevent stock out in health facility it was one area of challenging that stock outs are occurred and emergency orders were placed decreasing those challenges increase the availability of pharmaceutical. Minimizing challenges of pharmaceutical activities of the supply chain improves the consistence of pharmaceutical supplies and decreases interruption of services in the health facility.

Key word: pharmaceutical stock out, pharmaceutical supply chain activities, challenges of pharmaceutical supply chain.

CHAPTER ONE: INTRODUCTION

1.1 Back Ground of the Study

The World Health Organization (WHO) defines access to medicine as a priority for citizens. It needs to be available at all times in adequate amounts, in appropriate dosage and quality and at an affordable price for individuals and communities. It is estimated that two billion people do not have access to medicines and four million lives per year could be saved in Africa and Southeast Asia with the appropriate treatment and medicine. With this estimate in mind, WHO and 192 states committed themselves to reaching eight Millennium Development Goals. The fourth millennium goal on the list is to reduce the child mortality rate; the fifth is to improve maternal health and the sixth, to combat HIV/AIDS, malaria and other diseases (WHO, 2012). WHO focuses on policies, access, quality and rational use, so as to ensure medicine availability? To ensure that people have access to essential medicines and to preserve the quality of the medicine, a functioning medicine supply chain is necessary, which includes procurement, appropriate warehousing and efficient transportation.

There are many cases of health problems in Ethiopia that are hurting the people increases, the risk of causing disease. The burden of different infections and non-infections disease that cause death in decreasing order are mentioned as HIV, TB, malaria Acute respiratory infections other infectious diseases Maternal, neonatal, nutritional Cardiovascular diseases and diabetes Cancers Chronic respiratory diseases.

Other services like family planning, maternal care, delivery, operation department and emergency service have needs of pharmaceutical supplies for improving the health care and treat the patients that are infected by those infections disease mentioned. The challenges of acquiring the supplies for health supplies without interruption is challenging because most of the pharmaceutical supplies are imported from other countries. The public hospitals and health centers buy most of the products from Pharmaceutical Fund and Supply Agency (PFSA) if the products are not available there are challenges to avail the pharmaceutical. A supply chain disruption occurs when supply falls severely short of supply. Such disruptions take place when

either the nominal supply capacity of a business process is greatly reduced for some period of time, or a sudden surge of demand manifests itself, or both. Disruptions in pharmaceutical/healthcare contexts upset the continuity of providing for patient needs, and can have particularly severe consequences.

1.2 Statements of the Problem

The challenges of pharmaceutical supply chain in public hospitals and health centers are different from one health facility to others, to identify the main challenges of the health facilities proposing these types of research are important. Interruption supply of pharmaceutical products in government hospitals and health center are frequent shortages, interruption of services in health institution, aggravation of infection, and not position to deliver better health care to patients. Lack of mechanisms and tools for proper forecasting and supply planning Poor, inadequate, or inaccessible data that makes it difficult to forecast and plan commodity needs Lack of coordination between supply planning and technical units lack of capacity for quantification, Existing tools that do not take local context into account, and therefore cannot be applied properly, Limited number of staff trained in proper quantification, forecasting, and supply planning processes ,Focus on public sector forecasting, rather than the whole market approach **,**Lack of understanding of the difference between quantification for budgeting and quantification for supply planning.

Inadequate information provided to the community on service delivery and product availability issues, leading to low or nonexistent community engagement and limited accountability, Poor conditions at health facilities, Lack of coordination in donor assistance that supports supply chain and health services.

The most prevalent challenges in the public procurement process is the selection of the most suitable procurement methods, with appropriate justifications, record keeping is also a major challenge in the sense that very few public entities have designated records management. Poor collaborative planning between quantification and procurement ,Unpredictable and long lead times for delivery of procurements, Lack of coordination and/or standardization of products to procure ,Lack of consideration of recommended case management products , Little use of procurement flexibilities, Insufficient use of master supply agreement with best price possible based on volume discount, Inconsistent flow of funds ,Lack of communication between the public and private sectors on changes in policy.

The long procurement cycle through which government purchasing is carried out can be initiated only after funds are disbursed from the ministry of finance, treasury or an international donor

agency to the ministry of health or the procuring agency. The timing of such funds disbursement is uncertain and highly variable, leading to delayed start of the procurement cycle. Given the long procurement cycles any delays in procurement initiation create a cycle of uncertainty in the system and result in system wide stock outs (Prashant, 2015).

In hospitals, patients have been asked to buy their medicine from private pharmacies. In an effort to stabilize the supply pharmaceuticals products, pharmaceutical fund and supply agency (PFSA) was set up by the government in the year Sept.2007 (EFDRE the proclamation No.553/2007the establishment of PFSA to procure and supply drug and pharmaceutical supplies to public, and private hospitals in the country.)

Several factors contribute to poor availability of medicines and health products at health facility in government systems. Why supply chains are underperforming leads to projects that address only the surface symptoms of the underlying structural causes. The root causes of stock outs at the health facility may be due to problems in procurement, forecasting and requisitioning by the region or district, tardiness in ordering or poor forecasting by the health facility, or lack of transport at any stage in the system. Often there is fragmentation of responsibility and governance between the ministry of health, the Central Medical Store (CMS), and health staff at the district and health facility. This creates a system of diffuse accountability where each actor can attribute the underperformance of the supply chain to other actors in the system. Such overall lack of accountability exacerbates the risks of corruption in procurement and distribution. Diffuse accountability and the inability to track flows through the supply chain often leads to diversion of products from public sector warehouses or health facility for sale in private clinics and pharmacies.

Stock leakage and security issues with low product traceability throughout the supply chain, Inadequate storage space and conditions, complicated by cold chain requirements for some temperature sensitive commodities and by infrequent distribution of large quantities to stores with limited storage capacity, Disposal policies absent or not followed, Poor adherence to inventory best practices stock rotation (first-to-expire, first-out [FEFO]), batch control, stock recall processes, Poor inventory management, Lack of capacity of those managing inventory ,

Administrative, rather than functional, positioning of warehouses, Very little knowledge of operational costs, cost of goods in public sector, Low skill levels for managing outsourced warehousing

This study explored challenges of pharmaceutical supply chain in government hospitals and health center in Addis Ababa in order to identify the cause for frequent shortages of pharmaceuticals in those hospitals and health center. Due to lack of constant supplies, most of the hospitals had been experiencing time-to-time shortages of pharmaceuticals therefore being not in a position to deliver better health care to patients. In most hospitals, patients had been asked to buy them from private pharmacy. The study points out that the city has challenging to gate proper pharmaceuticals from public hospitals and health centers so conducting such research was important.

1.3 Research Questions

The research will try to address the following questions:

i. What are the reasons for interruption/stock-out/ of pharmaceutical in health centers and hospitals happens?
ii. What challenges on the supply chain activities to achieve better supply chain?

1.4 General Objective

Identify challenges of pharmaceutical supply chain experience in public health center and hospital in Addis Ababa Ethiopia.

1.4.1 Specific objectives

i. To identify what challenges are leading to stock out in the health facility?
ii. To identify the challenges of pharmaceutical supply chain activities in health facility.

1.5 Significance of the Study

The study was made the challenges of the unstable supply chain of pharmaceuticals products in government hospitals and health centers. This study is significant at this time when the governmental hospitals are face with great challenge of handling huge city population who

require better services. In consideration to this, the results of this study are believed to be of great benefit to:

Management

The management shall be acquainted with major issues that affect the supply of pharmaceutical products in their hospitals and health centers, therefore be in a position to make sound judgments and decisions on how to counter them. In addition ensure smooth running of the hospitals/health center by ensuring all required pharmaceuticals are availed when needed hence no stock outs and unwarranted overstocking which can lead to expiry of products and increase best health care for the people.

The public

The public shall be informed of the causes leading to the unavailability of proper medical care in government hospitals and health centers and understand the challenges of the health institution and what opportunities are not done by the city government of Addis Ababa.

Government

The government being in charge of delivering proper medical care to its citizens; the finding of this research will facilitate in formulating and putting in place best practices to ensure all hospitals and health center receive supplies. Having deployed great effort to achieving better medication for all living in the city, the government will be able to assess its performance by planning for the challenges that face the stock out with coordinating other stakeholder and done for the options and opportunities that are increase the availability of pharmaceuticals.

1.6 Scope of the Study

The scope of the research will cover challenges of pharmaceutical supplies in the selected hospitals and health centers. Do not address all issues of pharmaceuticals challenges of the city, due to shortage of resources and time. The research covers only very small number of public health centers hospitals in the city but the challenges is throughout the country.

1.7 Limitations of the Study

Due to personal attitudes, individual values and organizational policies, practitioners' in the medical profession keep most of their undertaking secret. The researcher received minimal cooperation from some respondents. The unavailability of target respondents due to their busy schedules was a major challenge.

Resource constraints also posed a great limitation; with constrained finances and very busy schedules therefore having limited time to carry out the research and restricting the research areas in the city and due to short time of data collecting time no cover all heath facilities. Overcome the limitation the questioner was distributed to the respondents and given time to fill at list two days then collected but there were challenges of transportation using taxi and takes longer time to cover all sampled health facility.

1.8 Definition of Terms

Pharmaceuticals: A substance or mixture of a substance used in diagnosis, treatment, mitigation or prevention of disease and medical equipment and supplies.

Public Health center: an institution that gives health service for the community and governed by the government in primary health activities.

Public Hospitals: health institutions that give health service for the public and governed by government and give higher level and specialized forms of health service.

Health facility: are places that provide health care. They include hospitals, clinics, outpatient care centers, and specialized care centers, such as birthing centers and psychiatric care centers.

Essential medicine: are the medicines that "satisfy the priority health care needs of the population". These are the medications to which people should have access at all times in sufficient amounts.

Infectious disease: are disorders caused by organisms such as bacteria, viruses, fungi or parasites. Many organisms live in and on our bodies. They're normally harmless or even helpful, but under certain conditions, some organisms may cause disease.

1.9 Organization of the Study

Chapter one covers the introduction part that describe over all introducing the research back ground of the study ,statement of the problem, research question, research objective, specific research objective, significance of the study, scope of the study, limitation of the study, definition of terms and organization of the study.

Chapter two describes different condition of supply chain management literature review that includes different ideas of scholars that written about issues related with the research topic.

Chapter three includes research methodological perspective of this study, Description of the study area, Research approach, Research approach and design, Population and sample, Data source and type, Data collecting procedure, Ethical consideration and Data analysis.

Chapter four data analysis it include result of the research ,discussion depending on the result of research and what limitation are happened during activities of the research done and Chapter five it conclude about the research depending on the result and recommend .

CHAPTER TWO: LITERATURE REVIEW

2.1 Pharmaceutical Supply Chain Management

The global healthcare sector which is one the world's large stand fastest growing industries, comprising various sectors such as pharmaceutical, medical equipment and supplies and healthcare services, the management of its supply chain is as complex and important as the industry's size and velocity. Currently, in almost every country of the world, improving hospital supply chain performance has been seen by all healthcare organizations as an enabler for improving operational efficiency and reducing costs. Efficient logistics are increasingly becoming more important, even critical, in the performance of the healthcare sector. In a broader context, Supply Chain Management (SCM) systems are gaining an increasing importance due to globalization and strong competitive pressures. They represent a paradigm shift in conducting business in the modern era, where collaboration rather than conflict seems more important and rewarding among the firms operating in a networking environment (Alejandro, 2013)

Pharmaceutical Supply Chain is defined as the management of product supply from raw material sourcing to active ingredient manufacturing through formulation, packaging and distribution to the patient. It encompasses all related activities across the product lifecycle including clinical supply, scale-up and transfer as well as outsourcing and product discontinuation. A key requirement is the safe and reliable supply of quality medicines through a supply chain which is responsive to true demand and understands the voice of the customer.

The supply chain management in the healthcare system is being characterized "by the information, goods and money essential to purchase and transfer the goods and services from the supplier to the final user in order to control costs" In terms of projection, the healthcare supply chain management is always rated to spend hundreds of millions of dollars per year which suggests that hospital financial primacies must be redefined.

The healthcare supply chains are more composite and more unformed related to other industries this can be explained by different reasons. First, supply chain management has an impact on human health requiring adequate and accurate medical supply conforming to the patients' needs. If pharmaceutical supplies are out of stock, distributed to the wrong patient or are prepared

inadequately, patients may experience adverse events, and in some cases death. Certainly, they can request different kinds of products for patients undergoing the same treatment. Accordingly, several products, medicines and equipment are required; resulting in differentiated and complex health services and generating negative impacts on hospitals so, hospital operations must deal with a multifaceted distribution network composed of several storerooms and warehouses where different medical supplies are stored following a variety of regulations (John, et.al. 2015)

2.1.1 Responsive Supply Chain

The supply chain for pharmaceutical products is complex, and involves multiple organizations that play differing but sometimes overlapping roles in drug distribution and . An inefficient supply chain is associated with product discontinuity, product shortages, poor performance, lowered patient safety (WHO, 2008). Increasing the efficiency of Supply chain processes can contribute to building up of a smarter, safer and lower cost of pharmacy operations by optimizing the supply processes, reducing errors, improving patient safety and satisfaction the purpose of responsive supply chain is to react quickly to match the demand of the market. Producers are the source of prescription drugs in the pharmaceutical supply chain. Wholesale distributors purchase pharmaceutical products from producers and distribute them to a variety of customers, including pharmacies (retail and mail-order), hospitals, and long-term care and other medical facilities (e.g., community clinics, physician offices and diagnostic labs). Pharmacies are the final step on the pharmaceutical supply chain before drugs reach the consumer/patient. With respect to responsive supply chain the objective is to be responding quickly to unpredictable demand in order to minimize stock out, forced markdowns and obsolete inventory. Again companies must work aggressively to reduce their lead time as long as it doesn't increase their cost and generate high turns and minimize inventory throughout the chain (Johnet.al, 2015).

2.1.2 Supply Chain Risk

Supply chain risks occur owing to fluctuation in the prices of key raw materials and energy, poor environmental and social performance, natural disasters such as hurricanes. Legal liabilities due to harmful product, poor demand forecasting and failure to coordinate demand requirements across the supply chain lead to supply chain risks. Risks could be managed through contingency

planning and by designing resilient and responsive supply chain. Risk proactive involves planning for environmental waste, worker and public safety, child labor, scarcity in natural resources and raw material. Risk management requires swift response to efficiently and effectively recall and recover damage and faulty products as well as ability to notice likely problems before they occur (Gravesaet.al, 2009*)*.

Supply chain risk management is therefore a field of escalating importance and is aimed at developing approaches to the identification, assessment, analysis and treatment of areas of vulnerability and risk in SCs. Various trends that enhance exposure to risks, such as the increased use of outsourcing, globalization, reduction of the supplier base; reduced buffers, increased demand for on-time deliveries or shorter product life cycles are increasing the importance of SCRM.

2.1.3 Supply Chain Disruption

Disruptions in pharmaceutical/healthcare contexts upset the continuity of providing for patient needs, and can have particularly severe consequences. Indeed, when other supply chains are disrupted, companies typically merely lose revenue and potential market share, whereas disruptions to pharmaceutical/healthcare supply chains can put the lives of large numbers of men, women, children and senior citizens in jeopardy occur (Gravesa et.al,*2009).*

2.1.4 Stock Outs

Poor supply chain management also results in late deliveries and large stock-outs. Fundamentally, these effects are caused due to an inability of the firm to predict the requirement for raw material and equipment capacity together with the uncertainty associated with obtaining deliveries of products on time from its suppliers (Lauren and Jayashankar, 2015).

Inventory positioning for short shelf-life products in general, adequate safety stocks can protect a supply chain against potential disruptions, and improve customer service levels. However, in the pharmaceutical industry, pharmaceuticals have a limited shelf life, with many drugs having a short expiration date. This fact imposes severe constraints on safety stock management, thereby increasing management complexity (Gravesa et.al, *2009).*

2.2 FORECASTING AND PROCUREMENT

The procurement process is inherently complex because it involves the coordination of ministry of health (MOH) agencies, funding sources, suppliers, and manufacturers. In low income countries, the process is often constrained by limited human resources, inadequate financing, an absence of information on prices and suppliers, a lack of awareness of government and donor regulations, overlapping systems, and unsynchronized or outdated rules and guidelines. These constraints can contribute to delayed shipments, high prices, and, ultimately, reduced access to essential medicines for consumers. The lack of capacity to select, forecast, and quantify product requirements, and to manage the procurement process, disrupts the distribution of health commodities to the client. In this context, commodity security cannot be strengthened unless procurement functions are made more effective (USAID, 2006).

The procurement of pharmaceuticals is unique when compared with procurement of other commodities or capital goods. Pharmaceuticals, which provide both therapeutic and curative value, contribute to decreased morbidity and mortality. Pharmaceutical supply systems are also susceptible to corruption because they are highly regulated. Powerful government regulatory authorities can make discretionary decisions in selecting products and suppliers that circumvent statutory regulations**.**

2.2.1 Procurement and Healthcare Delivery

the differences between healthcare and other services, long waiting times are not affordable in healthcare systems because patient condition may worsen substantially during the waiting .This therefore calls to duty all functions including procurement which must ensure that medical supplies are always available.

Regarding the impact of procurement on healthcare delivery costs to the customer suggest that inefficient purchasing as well as any advances in efficiency will eventually be passed along to the patient as additional costs or lower costs respectively. In addition, notes that inadequate and tedious procurement procedures and practices are responsible for rising costs and inefficiencies in healthcare systems. Procurement practices affect inventory levels and ultimately the service provided to the consumer or patient in the case of hospital. There is high risk therefore, that

erroneous decisions in SCM can culminate into stock-outs and total failure of healthcare delivery (Kizito& James, 2013).

2.2.2 Challenges in Procurement in Public Sector

Efficiently handling this size of procurement outlays has been a policy and management concern as well as a challenge for public procurement practitioners. Secondly, public procurement has been utilized as an important tool for achieving economic, social and other objectives. Legislations and guidelines and this present a challenge. Another challenge is that, due to many reasons (including greater scrutiny of taxpayers and competing vendors), public procurement has been perceived as an area of waste and corruption.

A regional and or global economy, public procurement practitioners face another challenge that is, how to comply with their government's procurement regulations and social and economic procurement goals without violating regional and/or international trade agreements.

Furthermore, in developed as well as developing countries, disregarding their economic, social, and political environment, a sound procurement system has to accomplish two sets of requirements: management requirements and policy requirements. The procurement management requirements normally include quality, timeliness, cost (more than just the price), minimizing business, financial and technical risks, maximizing competition, and maintaining integrity. The procurement policy requirements normally include economic goals (preferring domestic or local firms), environment protection or green procurement social goals and international trade agreements. It is very difficult for policy makers and public procurement practitioners to make an optimal decision, as there are always tradeoffs among these goals.

Finally, facing the challenges above and others, including rapid developments in technology public procurement cannot be perceived as a mere 'clerical routine,' as procurement practitioners are and should be involved in strategic procurement planning .In recent years, public procurement practitioners have forcefully challenged the perceived clerical task of public procurement. Thus, making public procurement a recognized profession is another challenge. Each country has its own economic, social, cultural and political environment, and each

country's public procurement practitioners face different types of challenges, or the same types of challenges but at different levels from their counterparts in other countries (Michael, 2013).

2.2.3 Procurements by Hospitals

A list of the medicines and quantities needed may be drafted by the hospital's chief pharmacist and the hospital director. Or, the hospital may have a special review board created for the purpose of reviewing and approving the list. The list, along with quantities of each medicine, is drafted into tender documents, which are signed by the director and published in the state newspaper and at least one daily newspaper, as well as sent to the public register. The actual purchase price of drugs; hidden costs due to poor product quality, poor supplier performance or short shelf-life; inventory holding costs at various levels of the supply system; and operating costs and capital loss by management and administration of the procurement and distribution system **(WHO , 1999).**

2.3 Inventory and Distribution Management

2.3.1 Supply Chain Integrity

The goal of good distribution practices is to encourage sound business practices that help deter interference and manipulation by bad actors and also to provide effective means to detect adulterated drug components and drug products to prevent them from entering the supply chain. The global supply chain for pharmaceuticals and medical devices is complex, with many components of a medicine now typically arriving at the point of manufacture from other countries.

Operating supply chains is challenging due to the heterogeneous system characteristics, the diversified product and material flow structure, the trade-off situations, and the conflicting interests and goals of the participants. Products vary in value, volumes and shelf life. Offering high customer service either means maintaining a high inventory level or frequent deliveries. In order to deal with these trade-off situations and challenges, and to be able to adjust the supply chain according to customer demand, supply chain approaches have become more focused on utilizing real-time information and modern information and communication technology .

Structure of Health Product Supply Chains in Low-Income Countries Most governments in low-income countries, especially in sub-Saharan Africa, choose a distribution model where the government procures drugs and distributes them to health clinics using a publicly run Central Medical Store (CMS)and a government-owned transport fleet(Prashant, 2015) .

Unlike other industries where an inventory stock out results in lost revenue, the ramifications of a stock out in a hospital setting are far more severe. It is critical for hospitals to maintain a sufficient level of inventory at all times to ensure the needs of their patients are always met. Failure to do so could result in the loss of life. To this end, many hospitals are beginning to abandon the just-in-time methodology in favor of using remote warehouses and managing their own inventory distribution. The result has been significant cost savings for hospitals who implement this type of system. “Those that have done it have seen high single to low double digit impacts on their hospitals bottom lines (**Karthikeyan**, 2014**).**

2.3.2 Challenges for Order Fulfillment

Order fulfillment is defined by the allocation and distribution of stock based on the order request/requirements. Could follow the push or pull strategy. The push strategy al locates stock to lower levels with centralized planning and forecasting. In a pull system each health facility estimates required quantities and requests stock from higher levels. The choice of the system depends on the maturity of the supply chain, stock planning and forecasting capacities and available consumption data. Quantification could be based on minimum/maximum quantities, where health facility (HF) orders medicine up to maximum levels, when drugs reach minimum levels. There are other approaches for quantification such as the kit system, where products are packed in predetermined quantities and are distributed to health facility the two-bin system consists of two bins with equal quantities, whereas a replacement bin is distributed when the first bin is empty (Allan, 2013).

2.3.3 Inventory Management Systems and Forms

Managing inventory can be a daunting task, and if it is could not done properly it could cost the company thousands of money. There are several software solutions available for inventory management. Use inventory control techniques like ABC and VEN analysis as they are vital to

the company's performance by helping to determine the importance of inventory items based on sales, usage or costs criteria. This method would help the health facility to give different levels of inventory control to different stock keeping unit (SKU) based on their relative importance. Efforts should be made to control the costs without affecting patient care and safety. In order for the healthcare supply chain or for that matter any supply chain to be effective, information has to be shared between manufacturers and distributors. Customers demand has to be shared with the suppliers.

All the factors affecting the forecasting should be looked into and checked if they still influence the demand forecast. Improved forecasts can benefit all trading partners in the supply chain. It can result in lower inventory levels, reduced stock outs and higher customer satisfaction (**Karthikeyan,** 2014)**.**

Data collection consists of information about actual consumption, demand, stock levels, adjustments and losses and is necessary for resupply planning. Entirely paper-based approaches such as in Kano State in Nigeria are straightforward and don't require expensive software implementation (Allan, 2013).

In order to develop an appropriate inventory control, demand forecasting is highly needed. The major forecasting techniques in healthcare settings such as historical data analysis which employ analysis from previous data to determine future demand. Although to do forecasting the accurate demand for drugs is difficult. One of the problems regarding this situation is difficultness to have a correct data for drugs consumption. Moreover, different drugs brand preference of physicians creates additional uncertainties for predicting the demand (**Ilma and Mursyid,** 2013)

2.4 Information Technology

2.4.1 New Technologies Impacting Supply Chains

In the last two decades, digital technologies have had a lasting impact on how supply chain activities are conducted. According to a recent study by Intermec, a leading supply chain solutions provider, the top 10 technologies that have the most impact on supply chain operations include: (1) comprehensive connectivity – from 802.11 wireless LAN technologies, cellular

networks, and Bluetooth; (2) voice and GPS communication integrated into rugged computers; (3) speech recognition; (4) digital imaging; (5) portable printing; (6) 2D & other bar coding advances; (7) RFID (radio-frequency identification); (8) RTLS (real-time locating system); (9) remote management; (10) wireless and device security(Lauren et.al 2015) .

SCISs (supply chain information systems) are used to coordinate information between internal and external customers, suppliers, distributors, and other partners in a supply chain. The most important sign for the success of any installed information system in a supply chain is how well this system has been able to support the activities of that supply chain, reduce buffer inventory stocks, reduce lead times, increase sales and improve customer services In order to achieve the highest performance level, supply chain strategies should be aligned with information systems strategies (Nazilaand et.al., 2015*)*.

2.5 Distribution and Transportation Strategies

There are competing interests between low distribution costs and high service quality. If distribution frequency is high, transportation costs are high, but in a more reliable demand planning horizon with less tock out situations. Last mile distribution is usually on a collection basis, meaning HFs pick up orders at warehouses via bicycles, public transport or vehicles, of which some are often used for several different purposes and bring the commodities back to the facilities. Collections often occur in an ad-hoc manner and HFs need funds for transportation. Furthermore, collection of medicine by HFs could mean that health workers need to travel long distances and close the HF due to a lack of human resources (Allan, 2013).

2.5.1 The Role of Transportation in Service Quality

The role that transportation plays in logistics system is more complex than carrying goods for the proprietors. Its complexity can take effect only through highly quality management. By means of well-handled transport system, goods could be sent to the right place at right time in order to satisfy customers' demands. It brings efficacy, and also it builds a bridge between producers and consumers. Therefore, transportation is the base of efficiency and economy in business logistics and expands other functions of logistics system. In addition, a good transport system performing

in logistics activities brings benefits not only to service quality but also to company competitiveness.

A well -operated logistics system could increase both the competitiveness of the government and enterprises transportation is the highest cost, which occupies 29.4% (one-third) of logistics costs, and then in order by inventory, warehousing cost, packing cost, management cost, movement cost and ordering cost. The transportation cost here includes the means of transportation, corridors, containers, pallets, terminals, labors, and time. Transport system makes goods and products movable and provides timely and regional efficacy to promote value-added under the least cost principle. Transport affects the results of logistics activities and, of course, it influences production and sale.

2.6 Pharmaceutical Supply Chain in Ethiopian Context

To solve these problems in public health facilities, Pharmaceuticals Fund and Supply Agency (PFSA) was established in 2007 by Proclamation No. 553/2007 based on the Pharmaceuticals Logistics Master Plan (PLMP). The Agency is mandated to avail affordable and quality pharmaceuticals sustainably to all public health facilities and ensure their rational use. So as to execute its mandate in the area of pharmaceuticals supply in an efficient and effective manner, integrated pharmaceuticals logistics system (IPLS) was developed and it is under implementation, currently.

IPLS is the term applied to the single pharmaceuticals reporting and distribution system based on the overall mandate and scope of the PFSA. It aims to ensure that patients always get pharmaceuticals they need. To be successful, the system must fulfill the six rights of supply chain management by ensuring the right products, in the right quantity, of the right quality, at the right place, at the right time and for the right cost.

The IPLS integrates the management of essential pharmaceuticals including the following pharmaceuticals that were used to be managed vertically: HIV/AIDS, Malaria, TB and Leprosy, EPI, MCH and purchased essential drugs. It is the primary mechanism through which all public

health facilities obtain essential and vital pharmaceuticals. Products included on the National pharmaceuticals procurement List (NPPL) are supplied and managed through the IPLS.

The provision of complete health care necessitates the availability of safe, effective and affordable drugs and related supplies of the required quality, in adequate quantity at all times. Despite this fact, in the past, the pharmaceutical supply Chain management system of the country had several problems including non-availability, un affordability, poor storage and stock management and irrational use **(**F.D.R.E PFSA, 2014).

In Ethiopia the trained are to maintain adequate stock levels, the maximum months of stock, minimum months of stock and an emergency order point have been established for each health facility in the system. The maximum months of stock is the largest amount of each pharmaceutical a facility should hold at any one time. If a facility has more than the maximum, it is overstocked and risks having stocks expire before they are used. The minimum months of stock is the level of stock at which actions to replenish inventory should occur under normal conditions. The emergency order point is the level where the risk of stocking out is likely, and an emergency order should be placed immediately.

The inventory control system for the IPLS is a Forced Ordering Maximum/Minimum inventory control system. This means that all facilities are required to report on a fixed schedule (monthly at health posts, every other month at health centers and hospitals) for all products. In addition, all products are re-supplied each time a report is completed. In emergencies, an emergency order can be placed.

The pharmacy store manager and pharmacy head in collaboration with staffs in dispensing units will establish a re-supply schedule for the dispensing units. For example, each dispensing unit will have one day per week/ per 2 weeks designated for re-supply. On that day, dispensing unit staff will complete an Internal Facility Report and Resupply Form; the Pharmacy Store manager will use the information to determine the re supply quantity needed to serve clients until the next scheduled re supply day. For example, every Monday (on a weekly or twice monthly basis), the MCH service provider reports data to the pharmacy store and receives enough product to serve clients during the week or next 2 weeks. This system ensures that the dispensing units are not

overworked with pharmaceuticals management responsibilities and that the quantities issued to the dispensing units from the pharmacy stores reflect actual consumption by the clients.

There are only three activities that happen to pharmaceuticals within a logistics system: they are stored in inventory, moved between facilities, and used to provide health services to patients. A well-designed logistics management information system will include records and forms that collect and report the three essential data items as they relate to these three activities.

Records and forms have been designed for the Integrated Pharmaceuticals Logistics System (IPLS) and are included in this SOP Manual along with step by step instructions on how to complete them.

The roles and responsibilities of key personnel in the system were highlighted in the previous section, and these same people are responsible for completing these LMIS forms. In case of Addis Ababa the supply chain was done as above in case of program pharmaceutical but in case of budget pharmaceutical the health facility pharmacy collect the products by direct requesting and take that they gate during the period of visit.

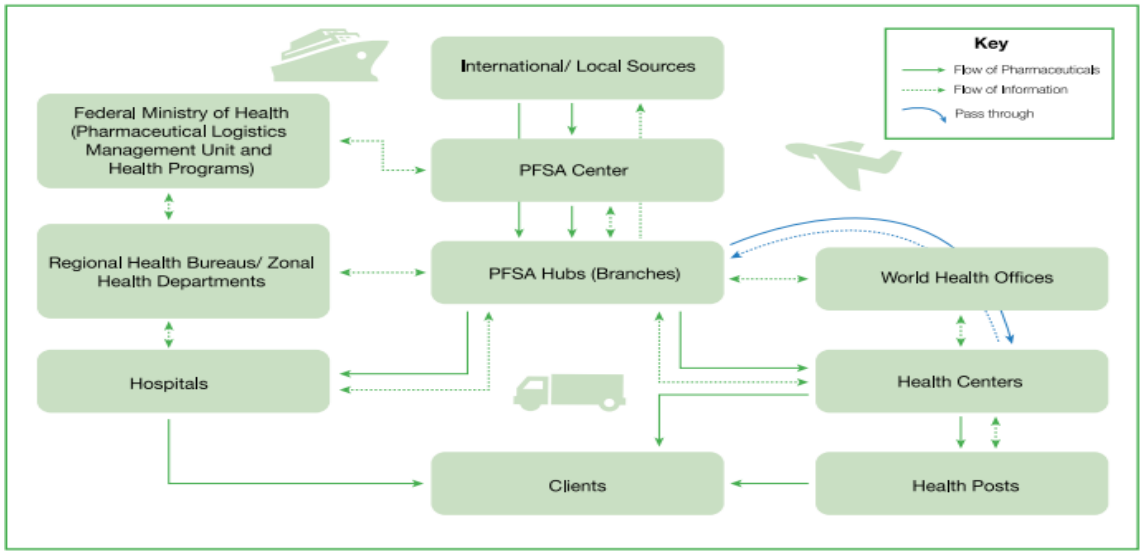

Figure 2.2:1: pharmaceutical and information flow of Ethiopian context Source:

standard operating procedures (SOP) manual for the integrated pharmaceuticals logistics system in health facilities of Ethiopia first edition page 3

2.7 Conceptual Frame Work

Based on the existing literature conceptual frame work is developed to show the relationship between the variables. Conceptual frame work provides a network of inter linking concepts that together provide a comprehensive understanding of phenomena. Conceptual frame work is a set of broad ideas used to explain the relationship between the objective of the research and variables used or factors. Conceptual frame work is a structure of concepts which are put together as a map for the study and it shows the relationship of research variable. Conceptual frame work provides the link between the research title, the objectives, methodology and literature review.

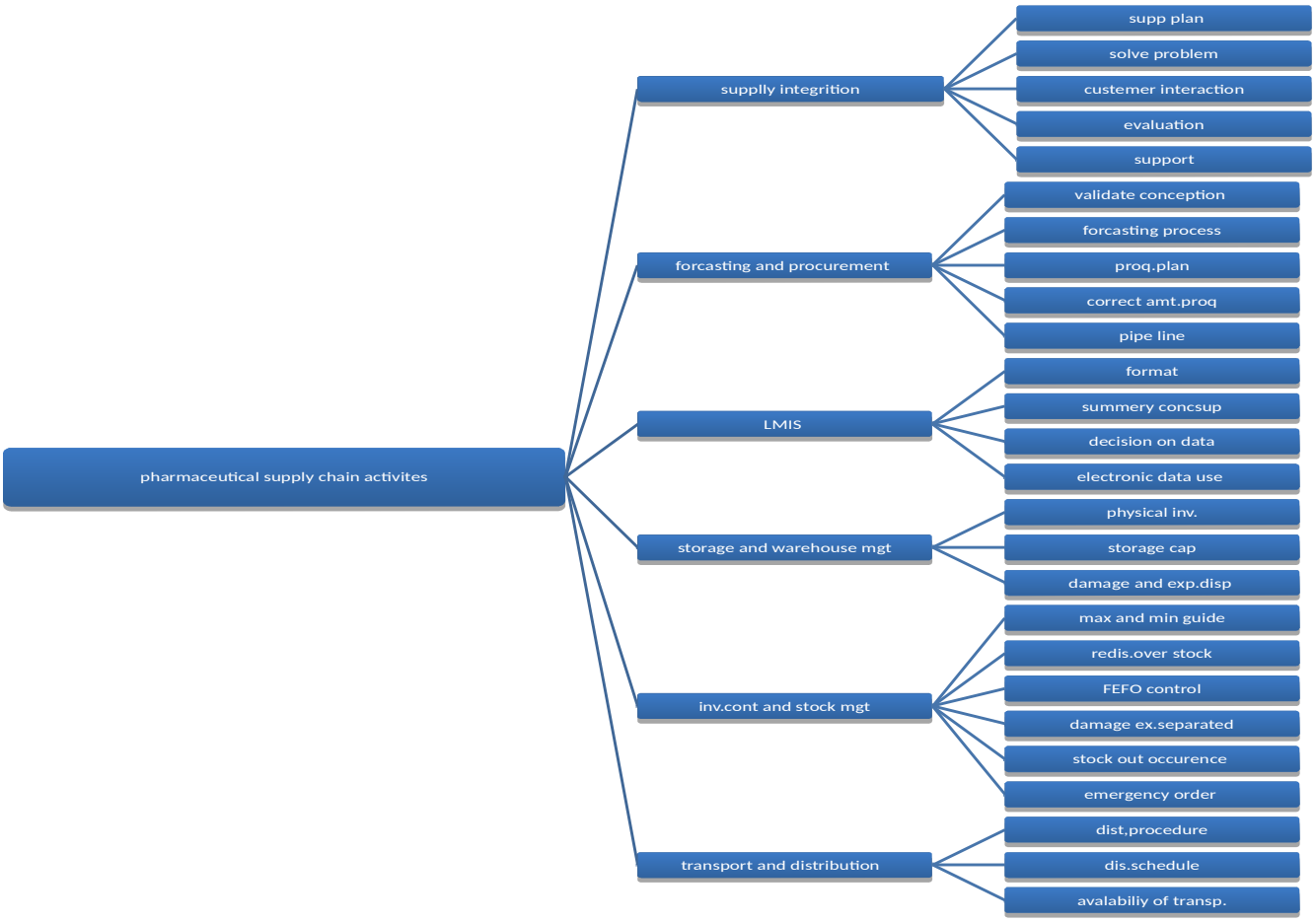

Fig.2.7.1Conceptual Frame Work of the pharmaceutical supply chain activities

Source: survey questionnaire (April, 2017).

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Description of Study Area

Addis Ababa is the capital city of Ethiopia ,the city was administratively divided in to 10 sub cities and 116 woredas .Based on the projection of Ethiopian statistic agency the population was around 3.434 million in 2009 EC /2017 GC/projected population. The city has 6 hospitals and92 health centers that are governed by the city health bureau and the others 5 hospitals are governed by the federal ministry of health. Federal hospitals gives health service for the population of the city and to others population outside the city that need higher health service by specialist physician .The health facilities get their main supply of commodities from PFSA that was given responsibility to avail the supplies. Other than this the health institutions buy products from other suppliers.

3.3 Research Approach and Design

Quantitative approach and the qualitative approach were used in this research. Quantitative research is based on the measurement of quantity or amount. It is applicable to phenomena that can be expressed in terms of quantity. Qualitative research, on the other hand, is concerned with qualitative phenomenon, i.e., phenomena relating to or involving quality or kind. The approach of this research was structured questionnaire of health facilities and considering each department that uses the pharmaceutical supplies.

A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure.In fact, the research design is the conceptual structure within which research is conducted; it constitutes the blueprint for the collection, measurement and analysis of data. As such the design includes an outline of what the researcher will do from writing the hypothesis and its operational implications to the final analysis of data (Kothari, 2004).

Data was collected from different health center and hospitals about how to gain pharmaceutical supply ,what influence happens when shortage of supply occur and how to gain the supplies

from internal store or from supplier and challenging during operating supply process and opportunities that are not used .

The research covers only some health facility due to time and resource limitation. If the study coves large population , it can indicate all challenges of the country that are different in geographic location and constraints of professional workers in the health institution as goes to farther from Addis Ababa.

3.4 Population and Sample

3.4.1 Population

There are 92 health centers that are function in Addis Ababa City Administration Health Bureau.

Table: 3.4:1number of public health facility

No	Names of sub city	Number of health center	
1	Addis Ketema	10	
2	AkakiKaliti	7	
3	Arada	9	
4	Bole	9	
5	Gulele-	10	
6	Kirkos	8	

7	KolfeKeraniyo	11	
8	Lideta	6	
9	Nefas Silk-Lafto	9	
10	Yeka	13	
	total	92	

There are 11 public hospitals in Addis Ababa city from those 5 are federal hospitals, those are Black lion specialized hospital, St.Paulos hospital millennium medical college, St.Petershospital, Amanuel Mental specialized hospital, ALERT Specialty center /ALERT hospital/and Addis Ababa city administration health bureau have 6 hospitals those are Zewditu H/L,Yekatit 12 H/L,Menillik II H/L, RasDesta H/L, Gandi Memorial H/L and TiruneshBejing H/L.

3.4.2 Sampling procedure

Sampling was taken by cluster sampling techniques; the sample population is grouped as health center, federal hospitals and Addis Ababa City Administration health bureau hospitals. Health centers are clustered as sub city then sampled simple random sampling.

The health services need pharmaceutical commodities for serving the population health. different departments like pharmacy out patient ,wards and emergency pharmacy, laboratory ,Nursing department ,Operational area, Anti retro virus /ARV/,Family planning, TB/tuberculosis/ treatment, vaccination commodities, are departments that use pharmaceuticals so, the research focuses on all the departments that uses pharmaceuticals. The respondents were sampled 8 department from each health center and 12 respondents from each hospitals. The research questionnaire was collected from those departments to overcome the research objectives.

Table: 3.4:2 List of sampled health facility

S.No	Institution type	Total population	Sample taken	
1	Federal hospitals	5	4	
2	AARHB hospitals	6	4	
3	Health centers	92	19	

3.5 Data Sources and Type

The data sources are structured questionnaire that are adopted from USAID DELIVER used for assessing logistic activities of LSAT and LIAT types of standard questioners for accessing the pharmaceutical supply activities and collect data from the health centers and hospitals.

3.6 Data Collection Procedure

Questionnaire - The procedure for the data was collected using questionnaires. First the respondents are communicated to get their consent. Once their consent was known, the prepared questionnaires were distributed to each participant by appreciating their participation and devoting their precious time for the research. The questionnaires collected by checking the completeness of the data. Finally the activities accomplished by appreciating the respondents.

3.7 Ethical Consideration

The research is conducted only when there is willingness of the health institution workers and letters given from the school to cooperate for the research.

3.8 Data Analysis

The quality of data were analyzed using different types of data analysis especially by frequency counting ,mean media and finally the data will processed using SPSS version 23 and Microsoft Excel then the data will be displayed in percentage, graphs, mean and standard deviation of conditions.

Validity and reliability of the questionnaire

Validity implies the degree to which a question measures what it was intended to measure. To assure the validity of the study, questionnaires were developed on the bases of previous studies and review of related literature. The questionnaire was used to monitor and evaluate the performance of pharmaceutical supply chain practice by USID deliver in different assessments.

CHAPTER FOUR RESULT AND DISCUSSION

4.1 Introductions

This chapter presents the data analysis and interpretation of the findings that are based on the data collected using questionnaire to Assess challenges of Pharmaceutical Supply Chain from sampled public health centers and hospitals in Addis Ababa Ethiopia. The analysis was performed around the objective of this study and some relevant details were added for better presentation of finding.

4.2 Response Rate

The researcher made every effect to reach all the respondents of the selected health center and hospitals. 248 copies questionnaires were distributed to the respondents from those 152 questionnaires to health centers and 96 questionnaire given to the respondent for hospitals ,from those 145 questionnaires (94.4%) response rate were collected from health centers and 40(83.33%) and 39 (81.25%)questioners were collected from federal hospitals and AARHB hospital respectively.

Table: 4.2:1 **Types of health facility**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	AAHB Hospitals	39	17.4	17.4	17.4
	health center	145	64.7	64.7	82.1
	Federal Hospitals	40	17.9	17.9	100.0
	Total	224	100.0	100.0	

Source:-survey questionnaire (April, 2017).

17.4 % of the respondents were participated from AARHB hospitals, 64.7% from health center and 17.9% were federal hospital participants, so that the supply chain was contributes all types of health facility.

4.3 Socio Demographic Characteristics of Respondents

Include sex, profession, work experience, department of the respondents. Socio demographic characteristics aspect of the analysis deals background of the respondents that given response to questionnaire.

Sex of respondents

Table: 4.3:1 **Sex of respondents**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	113	50.4	50.7	50.7
	female	110	49.1	49.3	100.0
	Total	223	99.6	100.0	
Missing	System	1	.4		
Total		224	100.0		

Source: - survey questionnaire (April, 2017).

50.7%of the respondent was male and 49.3% was female, so health workers that participating on the research has contribution of both sex and involvement in the supply chain managements of pharmaceuticals.

Respondent's profession

On the table below indicates that the contribution different health professionals for managing pharmaceuticals activities and health service in health facility.37.2% and 16.1% of respondents were pharmacist and druggist respectively those have more contact with pharmaceutical management. different professionals manage supply chain activities in the service giving department, such as Nurses contribute 18.8% and others 11.7%,6.7%,4.9%,0.4%and 4% were health officers, laboratory, midwife ,doctor and others respectively .

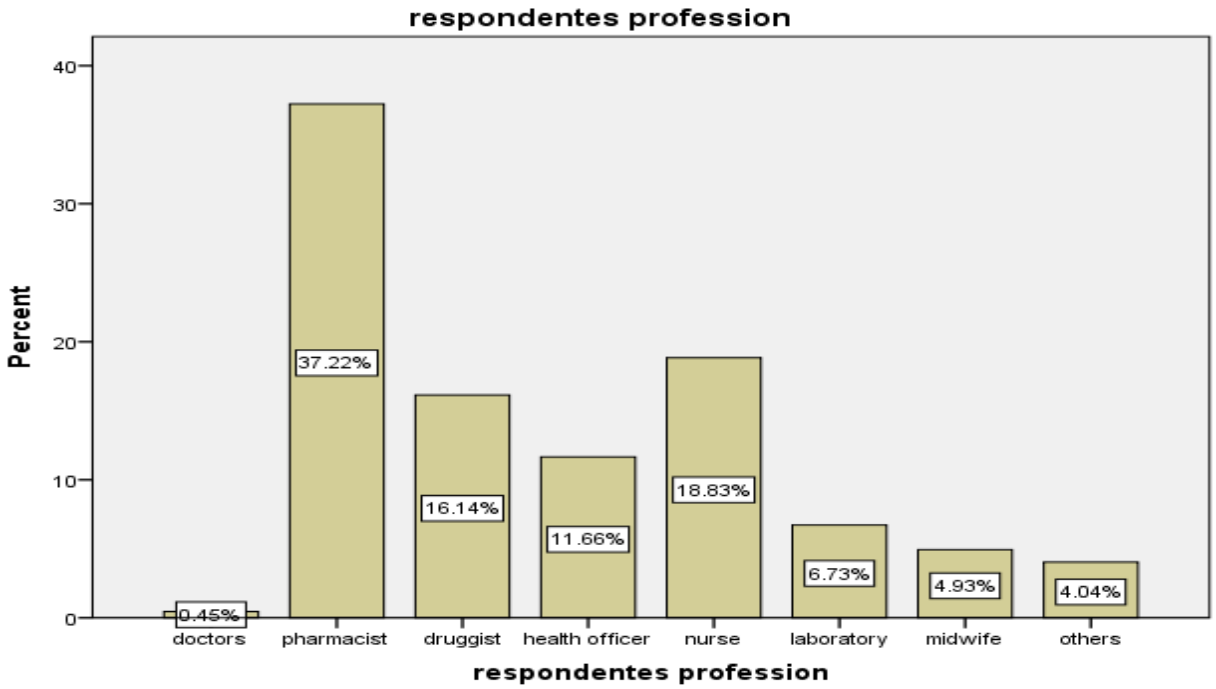

Figure: 4.3.:1 **Respondent's profession**

Source: survey questionnaire (April, 2017).

Work experience

The respondent work experience were different on work managing pharmaceuticals and other health services for their clients, so most of the respondents work experienced above 5-10 year that was 32.3% ,0-2 year was 15.9%,2-3 years 16.8%, 3-5 years27.3% , and above 10 years 7.7%. the contribution of those health works by their experience was important for managing pharmaceuticals because supply chain managements needs the experience of managing and understanding of past experience and some professionals also works in different department by shift.

Table: 4.3:3**Work experience**

Work experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-2 year	35	15.6	15.9	15.9
	2-3 year	37	16.5	16.8	32.7

	3-5 year	60	26.8	27.3	60.0
	5-10 year	71	31.7	32.3	92.3
	above 10	17	7.6	7.7	100.0
	Total	220	98.2	100.0	
Missing	System	4	1.8		
Total		224	100.0		

Source: - survey questionnaire (April, 2017).

Department of respondent

Different departments of the respondents were participated for the research. Supplies are important for the department to give services for their client or patient and have contribution in the management of different pharmaceuticals. Overall contributions of most departments have an impact on the supply chain outcome of the facility performance and quality of pharmaceutical management.

OPD pharmacy 21%,OPD 8%.in patient pharmacy 6.7%,store 11.2%,family planning 5.8%, delivery,9.4%,TB 5.8%, ART pharmacy 8.5%,emergency 8.9% and others 14.7%.were participated on the research.

Table: 4.3:4 Department of respondent

department of respondent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	OPD	18	8.0	8.0	8.0
	OPD pharmacy	47	21.0	21.0	29.0
	inpatient pharmacy	15	6.7	6.7	35.7
	store	25	11.2	11.2	46.9
	family planning	13	5.8	5.8	52.7
	delivery	21	9.4	9.4	62.1
	TB	13	5.8	5.8	67.9
	Arv pharmacy	19	8.5	8.5	76.3
	emergency	20	8.9	8.9	85.3
	others	33	14.7	14.7	100.0
	Total	224	100.0	100.0	

Source: - survey questionnaire (April, 2017).

No of employees done in that department

The numbers of health professionals done are; that health facility decides giving service for the customer in the department.

Table: 4.4:1**No of employees done in that department**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-2	80	35.7	36.0	36.0
	3-5	62	27.7	27.9	64.0
	above 5	80	35.7	36.0	100.0
	Total	222	99.1	100.0	
Missing	System	2	.9		
Total		224	100.0		

Source: - survey questionnaire (April, 2017)

Staff for the Department and Work Plan

The number of staff in one department are varies depends on the work condition of the department. From 1-2 employ in that department was 35.7%, 3-5 employees were 27.7 % and 35.7% was above five employees are done in the department. Some departments were disagree the number of staffs are not sufficient that was 28.5% and others have agree 47.5% to enough number of staffs in that department. Department that have division of work plan 62.9% agree.

Table: 4.3:2 staff for the department and work plan

		Percentage					Mean	St.div.
		Strongly Agree	Agree	Undecided	Disagree	Strongly disagree		
	Are sufficient staff for the department	13.6	47.5	2.3	28.5	8.1	2.70	1.24
		19.9	62.9	5.9	9.5	1.8	2.10	.89

	Have you division of work plan							

Source: - survey questionnaire (April, 2017).

4.4 Pharmaceutical Supply Chain Activities

4.4.1Pharmaceutical Supply Chain integration

The pharmaceutical supply chain of the health facility was displayed in table depending on the respondent's response

Table: 4.5:1**Pharmaceutical supply chain integration**

Pharmaceutical supply chain practice	Percentage of response					Mean	Std.deviation
	Strongly Agree	Agree	Undecided	Disagree	Strongly disagree		
Your organization includes its key suppliers in its planning and goal setting activities.	16.1	58.3	11.2	13.0	1.3	3.74	.92
Your organization certify its suppliers for quality	14.4	44.6	18.0	18.0	5.0	3.45	1.09
Your organization regularly solve problems jointly with its suppliers	11.3	47.3	13.1	24.3	4.1	3.37	1.09
Your organization frequently interacts with customers to set its reliability, responsiveness, and other standards	20.0	48.6	13.6	15.0	2.7	3.67	1.04
Your organization has frequent follow-up with its customers for quality/service feedback	16.7	47.5	16.3	16.7	2.3	3.59	1.02
Your organization periodically evaluates the importance of its relationship with its customers	18.1	43.5	20.4	15.3	2.3	3.58	1.02

Your organization pushes suppliers for shorter lead times	13.2	44.6	25.0	16.2	1.0	3.50	.92
Your organization gain ordering, receiving and other paper work from its suppliers?	20.5	55.7	16.4	5.5	1.8	3.88	.85
Your supply chain members are actively involved in standardizing supply chain practices and operations	19.1	52.7	19.5	6.8	1.4	3.80	.86
Firms in your supply chain establish more frequent contact with each other	13.2	47.3	24.5	12.7	1.8	3.56	.93
Ability to respond to and accommodate demand variations, such as seasonality	11.2	49.8	22.9	14.3	1.8	3.54	.93
Ability to respond and accommodate the periods of poor supplier performance	8.2	48.4	25.6	14.6	3.2	3.43	.94

Source: - survey questionnaire (April, 2017).

The pharmaceutical supply chain practice of the respondent show that mean 3.74 and std.div .92 shows most of the respondent that practice include its key suppliers in planning and goal setting activities of managing supply chain activities. Gain ordering, receiving and other paper work from its suppliers the response was mean 3.88 and std.div 0.85, supply chain members are actively involved in standardizing supply chain practices and operations mean3.80 and std.div . 86.Activities organization frequently interacts with customers to set its reliability, responsiveness, and other standards mean 3.67 std.div1.04 that indicate there is relationship and some support of reporting and standardizing of reporting and requesting for information sharing and standardizing the supply chain .

John, Jonathan and Devid, (2015)said that healthcare supply chains have an impact on human health requiring adequate and accurate medical supply conforming to the patients' needs. If medical supplies are out of stock, distributed to the wrong patient or are prepared inadequately, patients may experience adverse events, and in some cases death. Certainly, they can request different kinds of products for patients undergoing the same treatment. Accordingly, several

products, medicines and equipment are required; resulting in differentiated and complex health services and generating negative impacts on hospitals so, hospital operations must deal with a multifaceted distribution network composed of several storerooms and warehouses where different medical supplies are stored following a variety of regulations.

4.4.2Forecasting and Procurement Practice of the Health Facility

Table: 4.6:1 Forecasting and procurement practice of the health facility

	Percentage					Mean	St.div
	Strongly	Agree	Undecided	Disagree	reeStrongly		
Are forecasts validated by comparing previous estimated consumption with actual consumption?	18.7	61.2	8.7	10.5	.9	3.86	.87
Are forecasts updated at least annually?	25.7	56.8	12.2	4.1	1.4	4.01	.81
Are forecasts prepared on a schedule coinciding with local budgeting and procurement cycles?	23.7	48.9	16.4	10.5	0.5	3.85	.92
Are there challenges during forecasting process	20.0	52.7	19.5	6.6	0.9	3.84	0.85
Are short term procurement plans based on forecasted needs?	12.9	51.2	21.5	12	1.9	3.70	1.57
In general, are the correct amounts of all products procured and obtained in an appropriate time frame at all the suppliers	5.5	31.8	24.4	30.9	7.4	2.97	1.07
Is pipeline status regularly monitored so that procurement decisions can be made and actions can be initiated in time to avoid stock outs?	9.2	45.0	20.6	22	3.2	3.35	1.02

Source: - survey questionnaire (April, 2017).

Forecasts validated by comparing previous estimated consumption with actual consumption mean 3.86and std.div .87 , forecasts updated at least annually mean 4.01 and std.div .81 and forecasts prepared on a schedule coinciding with local budgeting and procurement cycles3.85

and std.div.0.92 .Those respondents answer show most of the respondent are agree on those activities done. This is important that before procure pharmaceuticals there should prepare valuable data that coinciding the capacity of budget of health facility. But there were problems of suppliers to supply all the requested amount of the pharmaceuticals; the respondents gave response shows the correct amounts of all products procured and obtain in an appropriate time frame at all the suppliers was mean 2.97 and s.div 1.07 this shows most of the respondents have no confidence on suppliers to availed all the requested amount.

The impact of procurement on healthcare delivery costs to the customer suggest that inefficient purchasing as well as any advances in efficiency will eventually be passed along to the patient as additional costs or lower costs respectively. In addition, notes that inadequate and tedious procurement procedures and practices are responsible for rising costs and inefficiencies in healthcare systems. Procurement practices affect inventory levels and ultimately the service provided to the consumer or patient in the case of hospital. Therefore, those erroneous decisions in SCM can culminate into stock outs and total failure of healthcare delivery (Kizito& James, 2013).

Forecasting requires access to accurate data and a high level of programmatic knowledge. It also needs a solid foundation in quantification methodology, the ability to apply programmatic considerations to morbidity and consumption data, and the ability to make educated assumptions about commodity utilization and need. Forecasting functions best when there is a high level of coordination among supply chain personnel, program staff, commodity coordinating committees, and other relevant stakeholders.

The supply plan is the link between forecasting and procurement in that it defines what products will be procured, how much it will cost, how much to procure, and how long it will take. Supply planning is best carried out by logistics staff with knowledge of the entire supply chain as they must be able to factor in the capabilities and limitations of each supply chain function. Once finished, the supply plan should be shared with key stakeholders, including ministry of health (MOH) personnel, supply chain personnel, program managers, policy makers, and funders (USAID Deliver 2015)

4.4.3Inventory Control Procedures and Stock Management

Table: 4.7:1 Inventory control procedures and stock management

	percentage					mean	St.div
	Strongly Agree	Agree	Undecided	Disagree	Strongly disagree		
Are there guidelines and established policies for maximum and minimum stock levels at which full supply Products should be maintained.	24.4	49.8	13.1	10.4	2.3	3.84	0.98
If no guidelines, would you develop procedures or guides for stock management?	10.1	40.4	30.9	16	2.7	3.39	0.96
Are there written provisions for the redistribution of over-stocked supplies?	13.2	46.1	23.3	16.0	1.4	3.54	0.96
Does the program have a policy of storing and issuing stock according to first expiry/first out inventory control procedures at all levels?	33.9	51.4	10.6	3.2	0.9	4.14	0.81
Are damaged/expired products physically separated from inventory and removed from stock records at all levels?	46.4	42.3	7.7	3.6	0	4.3	0.76
Does the program have a system for tracking product Losses and other adjustments?	25.5	51.9	15.3	6.0	1.4	3.94	0.88
Have stock outs occurred for any product in the last 12 months at your levels.	28.4	48.6	12.8	8.7	0.9	4.14	2.86
Are there established procedures for placing	24.4	59.9	9.7	5.1	0.9	4.01	0.79

emergency orders?							

Source: - survey questionnaire (April, 2017).

program have a policy of storing and issuing stock according to first expiry/first out inventory control procedures at all levels has a mean of 4.14 and std.div 0.81. The respondents were agreeing that first expiry first out should be done as supply management to prevent wastage and damaged/expired products. physically separated from inventory and removed from stock records at all levels mean 4.3 and std.div0.76 most respondents were agree because mixing each other may leads to medical error or miss of products. program have a system for tracking product Losses and other adjustments mean 3.94 and std.div 0.88 this was to track resources that have moved to other health institution, lost by damage ,wastage and expiry and by other mechanism. Stock outs occurred for any product in the last 12 months at your levels 4.14 and 2.86 the occurrence of stock outs in health facility was high and the established procedures for placing emergency orders mean 4.01 and std.div 0.79. So there was immediate stock outs were occur or may not acquire sustainable supply.

4.4.4Logistic Management Information System

Table: 4.8:1Logistic management information system

	Percentage					mean	St. div
	Strongly Agree	Agree	Undecided	Disagree	Strongly disagree		
Requisition and issue records (e.g., bills of Lading, shipping records, requisition/issue vouchers) at all levels/departments?	25.8	51.1	14.9	7.7	0.5	3.94	0.87
Dispensed-to-user records at service delivery points?	24.9	57.6	10.1	5.5	1.8	3.98	0.86

Summaries of consumption data at levels above service delivery points (e.g., dispensary, inpatient, service record, etc.)?	25.5	51.4	13.6	7.3	1.4	4.30	3.96
Your departments have inventory balance (stock on hand) record information.	33.9	54.8	8.1	3.2	0	4.19	0.72
Would you prepare report of Quantity dispensed or issued during a specified reporting period?	32.3	50.5	7.3	9.1	0.9	4.04	0.92
Would you report Losses and adjustments quantity?	29.8	46.8	14.7	8.7	0	3.98	0.89
Are decisions based on information system reports?	18.7	43.9	26.2	9.8	1.4	3.69	0.93
Are logistics data used at each level of the system as appropriate for: continuous monitoring of stock balances?	21.2	52.4	16.0	8.0	2.4	3.82	.094
Do you use electronically record keeping method?	23.3	25.1	20.5	21.5	9.6	3.31	1.30
Are challenges using logistic data?	16.2	41.2	26.4	12.0	4.2	3.53	1.03

Source: - survey questionnaire (April, 2017).

Products vary in value, volumes and shelf life. Offering high customer service either means maintaining a high inventory level or frequent deliveries. In order to deal with these trade-off situations and challenges, able to adjust the supply chain according to customer demand, supply chain approaches have become more focused on utilizing real-time information and modern information and communication technology to facilitate the supply chain so the respondents that gave response were uses of information and responds on user records at service delivery points most of them are agree that was 57.6% and mean 3.98 and std.dv 0.86 and summarized consumption data at levels above service delivery points are respondent agree on the information that was 51.4% and strongly agree 25.5% so information are important for the health facility

There are problem that information systems are used mostly by manual and difficult to operate and takes longer time to aggregate and use that was use electronically record keeping method are not more applicable the respondents response that most responds as mean of 3.31 and std.deviation 1.3 that was low applicability in all health facility and challenges using logistic data was high that was respondent give challenge to use by agree that 41.2% and mean of 3.53 and st.div 1.03 that was problems of using logistic data in health facility.

Supply chain management information system used to coordinate information between internal and external customers, suppliers, distributors, and other partners in a supply chain. Most important sign for the success of any installed information system in a supply chain is how well this system has been able to support the activities of that supply chain, reduce buffer inventory stocks, reduce lead times, increase sales and improve customer services in order to achieve the highest performance level, supply chain strategies should be aligned with information systems strategies (Nazilaand et.al., 2015).

4.4.5Warehouse Management and Storage

Table: 4.9:1Warehousing Management and Storage

	Percentage					mean	St.div
	Strongly Agree	Agree	Undecided	Disagree	Strongly disagree		
Is there a policy that requires at least one physical inventory of all products per year at each storage facility?	40.7	46.6	9.0	3.6	0	4.24	.76
Is the existing storage capacity adequate to handle the current quantities of products at the following levels:	23.2	45.0	11.8	13.6	6.4	3.65	1.16

In practice, are damaged and expired products destroyed according to the program's disposal guidelines?	25.5	37.3	15.5	17.3	4.5	3.62	1.17
Are visual quality assurance inspections of products conducted at the storage facility or receiving products	27.6	46.6	18.6	5.0	2.3	3.92	0.93

Source: - survey questionnaire (April, 2017).

Warehousing management and Storage the respondents agree that 46.6% and strongly agree 40.7 % the mean was 4.24 and std.dv 0.76 that was most of the respondent have experience on the physical year count at least per year and visual quality assurance inspection practice was response as agree 46.6% and 27.6 % strongly agree mean of 3.92 and std.0.93 so the practice was good on the quality checking by visual and physical year stock checking.

The storage capacity was respondent agree 45% and mean of 3.65 and std.div 1.16 that indicate most of them have no problem of space but some department have problems, also the damage and expired separation have also factors for storage that was respondent gave response mean 3.62std.dv 1.17 that was different conditions of the health facility that have not separate the expiry from usable stock.

4.4.6Transport and Distribution System

Table: 4.10:1 Transport and distribution system

	Percentage					Mean	Std.d
	Strongly Agree	Agree	Undecided	Disagree	Strongly disagree		
Do written procedures specify what type of distribution system is to be used to distribute	20.0	44.5	22.7	11.4	1.4	3.7	0.96

products between each level/department?							
Is there a documented distribution schedule for all levels/department?	31.2	49.8	12.7	5.9	0.5	4.05	0.86
Are there a sufficient number of functioning vehicles with available petrol/drivers, porter at appropriate levels, to meet the desired distribution schedule?	6.3	20.8	17.3	33	22.6	2.55	1.23

Source: - survey questionnaire (April, 2017).

On transport and distribution system the respondents agree that 44.5% of the respondents there was written procedures specify what type of distribution system is to be used to distribute products between each level/department and have documented distribution schedule for all levels/department responds agree 49.8% so most of them were agree on the presence of procedure and schedule of distribution, but number of functioning vehicles with available petrol/drivers, porter at appropriate levels, to meet the desired distribution schedule there was problem indicating because 33% was Undecided and 22.6% disagree on the availability of transporting supply from supplier and within the departments.

CHAPTER FIVE SUMMERY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter presents a summary of key data findings, conclusions draws from the findings highlighted and recommendations for the readers and further researcher on this health supply chain areas. The conclusion and recommendation drawn focused on the assessment on the challenges of supply chain management in public health centers and hospitals.

5.2 SUMMARY OF FINDING

5.2.1 Challenges leading to stock out in the health facility

There are different challenges of pharmaceutical supply chain that lead for the stock outs.The result shows different factors contributing on integration of pharmaceuticals were no full supply from suppliers. There was difficulties of forecasting and disorganization of procurement and there was stock out at least 12 months were high. LMIS was uncoordinated, no enough space of store capacity and problem of transportation those factors contribute for the stock out of pharmaceuticals.

5.2.2 Pharmaceutical supply chain activities

The pharmaceutical supply chain activities includes Pharmaceutical Supply Chain integration, Forecasting and Procurement, Inventory Control Procedure and Stock Management, Logistic Management Information System, Warehouse, Storage, Transport and Distribution System facilitating those supply activities minimize the challenges on the occurrence of stock out and services interruption.

5.2.2.1 Pharmaceutical Supply Chain integration

From the study 58.3% of the respondents were agree on supply chain planning and goal setting of the supplier was important for the health facility and certified their suppliers product on quality of services and products not to buy counterfeited pharmaceuticals from supplier. Generally most of the respondents are agree on the supply chain practices questions are important for their solving their supply chain challenges. The percentage respondent answers 43.6% up to 58.3 %were agree.

5.2.2.2Forecasting and Procurement

Most of the respondents agree 61.2% on validate and estimate their needs for the future use depending on the conception of the actual data and updates the data at least annually that 56.8 % of the respondents were agrees and consider the budget of the health facility but have challenges

on forecasting process of the activities that was 52.7% was agree that there was challenge. On the suppliers side the amount of pharmaceuticals were not supplied fully.

5.2.2.3Inventory Control Procedure and Stock Management

About 49.8% of the respondents have agree on there was policies for adjusting the stock level in maximum and minimum stocks to prevent stock out pharmaceuticals and there is also stock redistribution of pharmaceutical supplies the respondents agree 46.1%. managing the pharmaceuticals depending on their expire date and separation of the expired pharmaceuticals were agreed by the respondents 51.4% and 42.3% and strongly agree 33.9% and 46.4% respectively.

But there were problem of stock outs of pharmaceutical supplies that was agree 48.6% say there was stock out in the last 12 months due to this problem there was place emergency order and interruption of services may happen that needs pharmaceutical supplies.

5.2.2.4 Logistic Management Information System

The logistic information system was important for supply chain management because of facilitating the information sharing and decision making on the activities .the respondents were agree 51.1% that they have requisition and issue records and reports their conception data to the respective body and uses the data for decision making of supply chain management but have challenges to use the logistic data that was agree 41.2 % have challenge on it this may depends on the use of data without electronic technologies.

5.2.2.5 Warehouse, Storage, Transport and Distribution System

Most of the respondent agree 46.6 % and strongly agree 40.7% there was at least one physical inventory at each storage and the storage capacity was also defers from the respondents but most have agree 45 % no problem but have some respondents have disagree that was 13.6% not have enough space . There were procedures distribute pharmaceuticals for the departments agree that 44.5% and strongly agree 20% and have distribution schedule for departments agree the respondents 49.8% and strongly agree 31.2% but to facilitate the distribution of the pharmaceuticals through the departments there were problem of transporting vehicle or porter that was most respondents disagree that 33% for the sufficient number of the vehicle 22.6% also responds strongly disagreed.

5.3 Conclusion

Based on the assessment on the challenges of pharmaceutical supply chain of health centers and hospitals there are different condition of the challenges were investigated and important issues were raised. Pharmaceutical practice of different departments supply chain needs planning with different stakeholders like suppliers other health institution, donors and other institutions that have contribution for supply chain management of the health facility. Control and follow the flow of products from the supplier to the end user, faster lead time and experience on actual activities. Forecasting and procurement activities that was important to solve challenges of pharmaceutical supply chain management with fast, cost effective and responsive system of acquiring pharmaceuticals for all the department if not achieved there would challenges to give services for the clients.

The inventory and stock management of the health facility in different department practice was how to manage their stocks, manage expiry of pharmaceuticals to decrease some challenges occurrence of stock out. Storage areas that the health facility considers should be enough space to accommodate the inventory and some challenges of health facility that have shortage of spaces to accommodate and separate usable stock from unusable or expired and damaged pharmaceuticals.

Information systems uses hard copy and electronic records materials for reporting, requesting and issue supplies and decisions was given depending on the data but have also challenges use of information by electronic information management. Logistic information systems are a key for supply chain management some problems that respondents not using electronic data capturing so most of uses hard copied of data processing material. Problem of transportation of some health facility have problem related to moving pharmaceuticals from supplier to the HF and within the facilities for refilling and redistribute and transfer pharmaceuticals.

5.4 Recommendation

There were many challenges related to managing the pharmaceutical supplies. Forecasting and procuring the pharmaceuticals using the accurate data that facilitate the forecasting process of the health facility and monitoring of the pipe line supplies also disclose from the supplier was important this prevents the occurrence of the stock out of pharmaceutical and use updated

logistic management information system. Decide based on that data and facilitate the storage areas and transportation of products from one area to other or department to department.

In pharmaceutical supply chain many challenges in health facility label acquiring supplies from different suppliers so there should be facilitated by health bureau and MOH to increase integrating of the supplier and health facility to increase the availability of pharmaceutical. Efficiency of supply chain practice and develop coordinated procurement were important to decrease the cost of pharmaceuticals and prevent stock out. The integration of the HF with information with the supplier and the control authority to evaluate performance and trace the gap of supplies and exchange of products to prevent wastage by expire or redistribution of products that was over stocked.

Lastly but not the least the challenges pharmaceuticals supply chain identify the factors that affects supply chain of the HF for the availing products. Coordinate and increase use of data and integration of supplies to decrease the challenge.

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Appendix

Questionnaire

First of all I would like to thank all of you for your willingness to participate in the responding of questioner for the research.

I am **Mekuwanint Nega** a final year master of arts in logistic and supply chain management (MA LSCM) Student at Addis Ababa University College of Business and Economics school of commerce department of Logistics and Supply Chain Management Graduate Program.

.

I am conducting a research on my final thesis entitled "challenges of pharmaceutical Supply Chain in public health center and public hospital in Addis Ababa Ethiopia. The purpose of this study is to investigate the challenges and opportunities of the supply chain management of your organization. Since you are experienced of your institution, your ideas and information are crucial for the research. The information you are giving will be used for the partial fulfillment for the master's thesis.

This research addresses the supply chain management of commodities that are used in your organization for the public health care purpose. Challenges and opportunities of Pharmaceutical Supply chain management is get higher attention by different department since it is used by different service as one of the core things for giving service for the public.

Name of health facility ----------

1. **Respondents information**

No	**Questionnaire**	Respondent answer	Additional Discussing ideas
1	Sex	1.Male 2. Female	
2	Profession	1.Doctor 2.Pharmacist 3.Druggist 4.Health officer 5.Nurse 6.laboratory 7. Mid wife 8.Other…….	
3	Your Work experience	1. 0-2year 2. 2-3year 3. 3-5 year 4. 5-10 year 5. Above 10	
4	Types of department that you done	1.OPD 2.OPD pharmacy 3.Inpatient Pharmacy 4.Store	

		5.Familyplanning 6.Delivery 7.TB 8.Arv pharmacy 9. Emergency 10.other …….	

5	Types of health facility	1.Hospital 2.Health center	
6	No of employees done in that department	1. 1-2 2. 3-5 3.above 5	
7	Are sufficient staff for the department	1. Strongly agree 2. Agree 3. Undecided 4. Disagree 5.Strongly disagree	
8	Have you division of work plan	1. Strongly agree 2. Agree 3. Undecided 4. Disagree 5.Strongly disagree	

2. **Pharmaceutical supply chain integration**

		Strongly Agree	Agree	Undecided	Disagree	Strongly disagree
9	Your organization includes its key suppliers in its planning and goal setting activities.	5	4	3	2	1
10	Your organization certifies its suppliers for quality	5	4	3	2	1
11	Your organization regularly solve problems jointly with its suppliers	5	4	3	2	1
12	Your organization frequently interacts with customers to set its reliability, responsiveness, and other standards	5	4	3	2	1
13	Your organization has frequent follow-up with its customers for quality/service feedback	5	4	3	2	1
14	Your organization periodically evaluates the importance of its relationship with its customers	5	4	3	2	1
15	Your organization pushes suppliers for shorter lead times	5	4	3	2	1

16	Your organization gain ordering, receiving and other paper work from its suppliers?	5	4	3	2	1
17	Your supply chain members are actively involved in standardizing supply chain practices and operations	5	4	3	2	1
18	Firms in your supply chain establish more frequent contact with each other	5	4	3	2	1
19	Ability to respond to and accommodate demand variations, such as seasonality	5	4	3	2	1
20	Ability to respond and accommodate the periods of poor supplier performance	5	4	3	2	1

3 .**Forecasting and procurement**

		Strongly Agree	Agree	Undecided	Disagree	Strongly disagree
21	Are forecasts validated by comparing previous estimated consumption with actual consumption?	5	4	3	2	1
22	Are forecasts updated at least annually?	5	4	3	2	1
23	Are forecasts prepared on a schedule coinciding with local budgeting and procurement cycles?	5	4	3	2	1
24	Are there challenges during forecasting process ?	5	4	3	2	1
25	Are short-term procurement plans based on forecasted needs?	5	4	3	2	1
26	In general, are the correct amounts of all products procured and obtained in an appropriate time frame at all the suppliers	5	4	3	2	1
27	Is pipeline status regularly monitored so that procurement decisions can be made and actions can be initiated in time to avoid stock outs?	5	4	3	2	1

4. Inventory control procedures Stock management

28	Are there guidelines and established policies for maximum and minimum stock levels at which full supply Products should be maintained.	5	4	3	2	1
29	If no guidelines, would you develop procedures or guides for stock management?	5	4	3	2	1
30	Are there written provisions for the redistribution of over-stocked supplies?	5	4	3	2	1
31	Does the program have a policy of storing and issuing stock according to first expiry/first out inventory control procedures at all levels?	5	4	3	2	1
32	Are damaged/expired products physically separated from inventory and removed from stock records at all levels?	5	4	3	2	1
33	Does the program have a system for tracking product Losses and other adjustments?	5	4	3	2	1

34	Have stock outs occurred for any product in the last 12 months at your levels.	5	4	3	2	1
35	Are there established procedures for placing emergency orders?	5	4	3	2	1

5. **Logistic management information system**

36	requisition and issue records (e.g., bills of Lading, shipping records, requisition/issue vouchers) at all levels/departments?	5	4	3	2	1
37	Dispensed-to-user records at service delivery points?	5	4	3	2	1
38	Summaries of consumption data at levels above service delivery points (e.g., dispensary, inpatient, service record, etc.)?	5	4	3	2	1
39	Your departments have inventory balance (stock on hand) record information.	5	4	3	2	1
40	Would you prepare report of Quantity dispensed or issued during a specified reporting period?	5	4	3	2	1
41	Would you report Losses and adjustments quantity?	5	4	3	2	1

42	Are decisions based on information system reports?	5	4	3	2	1
43	Are logistics data used at each level of the system as appropriate for: continuous monitoring of stock balances?	5	4	3	2	1
44	Do you use electronically record keeping method?	5	4	3	2	1
45	Are challenges using logistic data?	5	4	3	2	1

6. Warehousing and Storage

46	Is there a policy that requires at least one physical inventory of all products per year at each storage facility?	5	4	3	2	1
47	Is the existing storage capacity adequate to handle the current quantities of products at the following levels:	5	4	3	2	1
48	In practice, are damaged and expired products destroyed according to the program's disposal guidelines?	5	4	3	2	1
49	Are visual quality assurance inspections of products conducted at the storage facility or receiving products	5	4	3	2	1

7. Transport and distribution system

50	Do written procedures specify what type of distribution system is to be used to distribute products between each level/department?	5	4	3	2	1
51	Is there a documented distribution schedule for all levels/department?	5	4	3	2	1
52	Are there a sufficient number of functioning vehicles with available petrol/drivers, porter at appropriate levels, to meet the desired distribution schedule?	5	4	3	2	1

If you have problems in completing this form, please do not hesitate to contact me at

A phoneNo0911742635 MekuwanintNega**Thank you**
Email mekuanega12@gmail.com