

Addis Ababa University

School of Commerce

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Pharmaceutical Store Management Practice in Public Health Facilities, North  
Shoa, Amhara Regional State

A Thesis Submitted to the School of Graduate Studies of Addis Ababa University  
in partial fulfillment of the requirements for The Degree of Master of Arts in  
Logistics and Supply Chain Management

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## Declaration

I, Yehun Telila declare that this work entitled “**The pharmaceutical store management practices in public health facilities, North Shoa, Amhara State**”, is the outcome of my own effort and study and that all sources of materials used for the study have been duly acknowledged. I have produced it independently except for the guidance and suggestion of the research advisor.

This study has not been submitted for any degree in this University or any other University. It is offered for the partial fulfillment of the degree of Master’s Art in Logistics and Supply Chain Management (MA) at Addis Ababa University.

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**Addis Ababa University School of Graduate Studies MA Program**

**The Pharmaceutical Store Management Practices in Public Health Facilities, North  
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## **List of Abbreviations**

AAU Addis Ababa University

DACA Drug Administrative and Control Authority

AIDS Anti Immune deficiency Syndrome

ARV Anti Retro Viral

DU Dispensing Unit

ED Essential drug

EPI Expanded Program for Immunization

FEFO First Expired First Out

FIFO First in First Out

FPC Finite Population Correction

FMHACA Food, Medicine and Health Administrative and Control Authority

FMOH Federal Ministry of Health

HCMIS Health Commodity Management Information System

HC Health Center

HF Health Facilities

HIV Human Immune Virus

IFRR Internal Facilities Report and Resupply

IPLS Integrated Pharmaceutical Logistics System

JSI John Snow Incorporation

LIAT Logistics Indicator Assessment Tool

LSAT Logistics System Assessment Tool

LMIS Logistics Management Information System

MCH Mother and Child Health

MOH Ministry of Health

MSH Management Science for Health

NPPL National Pharmaceuticals Procurement List

PFSA Pharmaceutical Fund and Supply Agency

RHB Regional Health Bureau

RPM Rational Pharmaceutical Management

SCMS Supply Chain Management System

TB Tubercles Bacilli

USAID United States Agency for International Development

WoHO Woreda Health Office

ZHD Zonal Health Department

## ABSTRACT

*The paper has made a study on the pharmaceutical store management practices in public health facilities, North Shoa, Amhara State with regard to pharmaceutical stock record, arrangement and organization, handling and disposal of expired items, facility and storage condition activities. Pharmaceutical logistics management especially pharmaceutical store management is a challenge for store managers. Since absence of proper storage conditions for pharmaceuticals is leading to loss of potency of drugs, damaging and out of stock for essential drugs. Health facility based descriptive cross-sectional study both qualitative and quantitative study was conducted in 36 public health centers and 5 hospitals. Data was collected using a structured questionnaire from March 14 to April 20, 2018. Data was entered by EPI INFO version 3.1 and exported and analyzed with SPSS statistical software version 20. Frequencies were used to express the assessment on arrangement and organization, stock record, storage and facility conditions of store management practice of pharmaceuticals. The result indicates majority health facilities were arranged their products with pharmaco-therapeutic order, however health facilities were not stored and organized their pharmaceuticals in a manner accessible for first to expire first out (FEFO) principles, bin card was updated on average 56.2% of which almost half of health facilities matching with the physical count at the time of visit, majority of health facilities were separated expired/damaged items from usable stock. Bin-card updating, storage conditions, availability of equipments and lack of adequate space at health facilities were major problems in practicing pharmaceutical store management.*

*Keywords: pharmaceutical, health facilities, pharmaceutical storage, storage conditions*

# **CHAPTER ONE**

## **INTRODUCTION**

### **1.1 Back ground of the Study**

Pharmaceutical warehousing or warehouse management is “the physical movement of stock into, through, and out of a medical store warehouse.” Warehousing is a key element of pharmaceutical supply chain management. It ensures the constant availability and flow of essential quality health commodities, in appropriate quantities, in a timely and cost-efficient manner, through the supply chain system. Key warehousing functions include receiving and storing stock, inventory management, and distribution management (USAID| Deliver Project, 2015).

The warehouse is a key component of the supply chain for health commodities. This is especially true in resource poor environments where they act as buffers against uncertainties and breakdowns within the supply chain. When properly managed and appropriately stocked, the warehouse provides a consistent supply of products as they are needed. For many years, the private sector has taken a professional, systematic approach to warehousing; recognizing its importance to overall cost, customer satisfaction, and performance of the business. In turn, organizations involved in public health in the developing world have started to focus more attention on commodity warehousing, realizing its role as a critical resource for improving public health.

Pharmaceuticals store management is very different from any store management due to its peculiar characteristics that help to maintain the efficacy, quality and safety of the medicines in addition to the facilitation of supply chain and keeping the pharmaceuticals safe like other stores. This Pharmaceuticals store management practice is implemented through inventory control and store management systems, which may be manual or computer based. A well-functioning logistics system is dependent upon well-trained staff members with the knowledge and skills to use logistics forms and reports correctly.

Pharmaceuticals require standard operation procedures and conditions for safe storage that protect their integrity and effectiveness, maximize their shelf life, and make them readily available for distribution. The procedures should include about the dimensions and design of the storage space, appropriate conditions for storage of drugs, and the importance of stock rotation and systematic arrangement and organization of stock, as well as attention to pharmaceutical store equipment, and security within the store. The storage environment should possess adequate temperature, sufficient lighting, clean conditions, humidity control, cold storage facilities, adequate shelving to ensure integrity of the stored drugs (MSH, 2012).

Inventory management is the process of maintaining of stock properly at all levels of the supply chain and at all times whereas storage is the management of storehouses and stock cards, the operation of holding and storage of pharmaceuticals and the safe custody and protection of stock. After pharmaceutical is selected and procured, it must be stored until use. As the quality of pharmaceuticals is very dependable on the storage conditions, a pharmaceutical logistics system should include standard inventory management that provides pharmaceuticals to be stored and distributed on the right conditions. The goals of inventory management are to protect stored items from loss, damage, theft, or wastage, and to manage the reliable movement of supplies from source to user in the least expensive way. Bin cards and stock record cards are used to account for products held in storage, including their receipt and issue. Valuable information used to make re-supply decisions is recorded on the bin card and stock record Card; data from these records are used in reporting, calculating reorder quantity (MSH, 2011)

Storage areas should be designed or adapted to ensure good storage conditions and of sufficient capacity to allow the orderly storage of the various categories of materials and products. The primary purpose of a pharmaceutical store is to receive, hold and dispatch pharmaceuticals. It ensures the physical integrity and safety of products and their packaging, throughout the various storage facilities, until they are dispensed to clients (PFSA, 2014).

The researcher is motivated to conduct this research because of pharmaceutical store management practices in the public health facilities did not meet the pharmaceutical store management standard operational procedure criteria and thus the need to identify the

challenges and facilitators and produce a report with a purpose to make appropriate store management practices.

## **1.2 Statement of the problem**

Lack of effective pharmaceutical logistics system not only affects the availability of essential drugs, but also significantly affects efficiency. Deficiencies in selection, quantification, storage, as well as high prices, poor quality, theft, expiration of drugs, irrational prescribing, and incorrect use of medicines by patients cause losses totaling 70% of the original expenditure (MSH, 2011).

To achieve its objectives and to fulfill the patient care and satisfies its customers, pharmacy department received and manage different health commodities which procured from both domestic and foreign sources. Those of all assets are gained from the nation's economy. As we know until now the health budget is allocated from national income as others national minister offices, which mean all of health facilities pharmaceutical consumptions is depended on the country economy. Thus, every health commodities which are purchased from local or abroad must be kept in proper store with a complete store management system.

According to a national survey conducted in Ethiopia in 2015, the storage condition for a significant percentage of health facilities did not meet the standard criteria. Among various challenges the pharmaceutical store management practice is one of them. Some of the storage issues could also be addressed by reinforcing good logistics management practices and maintaining key storage conditions, such as first-to-expire, first out (FEFO) and visibility of identification labels and expiry dates(JSI./DELIVER, 2015).

Accidental dispensing of expired drugs is also possible if they are not collected and stored in separate place until disposal. Moreover, accumulated pharmaceutical wastes that are not disposed at appropriate time interval may lead to inefficient use of storage space in health facilities, limiting available space for inventory of usable pharmaceutical supplies (PFSA, 2015).

One of the major reasons that medicines are wasted is that they may have expired without anyone noticing that the shelf life date was approaching. This type of lose, however, is not acceptable to pharmaceuticals such as ARV medicines, which are very expensive. Besides, due

to poor handling of the available medicines and other pharmaceutical products by the patients and professionals, there is also a great loss of resources (RPM Plus, 2006).

The problem of ineffective pharmaceutical stock records system may be attributable to the failure to give a deserved attention to the function of pharmaceutical store. It is through an effective stock record system health facilities can regulate the flow of products in such a way that the right quantity is available when required to meet patient needs and also to access information to assist in making future decisions in relation to quantification, price and source of supply (PFSA, 2015).

In a study conducted on public health facilities in Addis Ababa, fifty percent (50%) of the assessed hospitals and 54% of health centers were currently using stock/bin cards for all HIV/AIDS and TB laboratory commodities in main pharmacy store, among these only 25% and 20.8% of them were updated with accurate information matching with the physical count done at the time of visit for hospitals and health centers respectively (Desale, 2013).

Proper storage facility for drugs ensures the effectiveness, safety, strength, and quality of drugs. Unless the drugs are segregated from other non-pharmaceutical items and stored properly, long shelf life of the drugs are not guaranteed. Medicines need to be stored to maintain in the intended quality and prevent damages while handling until it reaches the consumer (PFSA, 2015).

Failure to consider pharmaceutical storage requirements during construction of health facilities, while huge government budget is spent on pharmaceuticals much less attention is given to investment on pharmaceutical store (John Snow Inc., 2014).

Storage space limitation made picking, cleaning difficult and also enforced the store persons to stack medicines over one another without any space till it touched the roof which in turn limited air circulation within the store. Pharmaceuticals should be stored in a specially designed secure area or space of a building in order to avoid contamination or deterioration, avoid disfiguration of labels, maintain integrity of packaging and so guarantee quality and potency of drugs during shelf life (USAID| Deliver Project, 2015).

Therefore, studying the current pharmaceutical store management practice in public health facilities North Shoa, Amhara Regional State is very essential to make improvements on the

existing poor storage conditions, stock management, handling of expired items practices, and to add information for further researches.

### **1.3 RESEARCH QUESTIONS**

The following research questions are the main objectives of the study to answer with an appropriate study design using the statistical tools mentioned in the data analysis section (method).

1. How effective are stock management techniques used to control the pharmaceuticals in the store?
2. How are pharmaceuticals storage conditions against the standards in the guidelines of good storage practice?
3. How is handling of expired items and institutional unit in charge for disposal?

### **1.4 OBJECTIVES**

#### **1.4.1 General objective**

To assess the pharmaceutical store management practice in Health centers and Hospitals of North Shoa, Amhara Regional State.

#### **1.4.2 Specific Objectives**

- To identify storage conditions of pharmaceuticals
- To identify pharmaceutical stock management
- To assess the handling of expired items and its disposal management

#### **1.5 Significance of the study**

The findings of the research are expected to contribute a lot for different stakeholders. The primary significance of this study was to regional health bureau (RHB) and to pharmaceutical fund and supply agency (PFSA) in providing an information about the current status of health facilities' (HF's) on pharmaceuticals store management practice.

The research findings of this thesis will help the Ministry, PFSA, RHB's, Zonal health Department's, Woreda Health Office's, health institutions and Non-governmental organizations working in the area to identify the gap in Practicing appropriate pharmaceuticals store

management for the existence of uninterrupted steady supply of pharmaceuticals in Ethiopia. It will also help to design a general framework for appropriate pharmaceuticals store management improvement on the identified factors to strengthen the system and come up with a better system strengthening and the provision of better health care service.

### **1.6 Scope of the study**

The geographical location of the study is delimited to North Shoa, Amhara Regional State. Specifically the study has been undergone on public health facilities that practice pharmaceutical store management activities.

### **1.7 Limitation of the study**

The first limitation of the study was its coverage of only public health facilities found at North Shoa, Amhara Regional State and the study did not include private pharmacies due resource constraints. The second limitation of the study was difficulty of getting respondents of the study at time of data collection due to time constraints. The third limitation of the study was shortage of secondary data sources regarding to warehouse management practices. Lack of localized previous research papers in the area of the study were also major constraints in this study.

### **1.8. Organization of the study**

This research study was organized in to five chapters. The first chapter has been deals with introduction which includes background of the study, statement of the problem, research questions, objectives of the study, scope of the study, limitations of the study, significance of the research, and organization of the study. The second chapter has contained related literature review which focuses on theoretical framework and conceptual issues of warehouse management. The third chapter has contained research methodology which is incorporated study area description , study design; data collection methods and instruments; study population, sample size and sampling, methods of data analysis used, and ethical considerations. Chapter four has contained findings of the study including data presentation and analysis of the findings. The last chapter would be provided discussion, implication and conclusion of the study. If it is necessary, a recommendation of the study has been also assessed based on heir relevancy priority.

## **1.9 Conceptual Definitions**

**Pharmaceuticals:** are all medicines, laboratory reagents, medical supplies and medical Equipments.

**Health Facilities:** are hospitals and health centers that store and manage pharmaceuticals.

**Pharmaceutical store:** A store within a health facility where all the pharmaceuticals are stored and stock management technique takes place.

## **CHAPTER TWO**

### **LITRATURE REVIEW**

#### **2.1. Theoretical frameworks of store management practice**

In this chapter, theories related to the research issues which are relevant to the present thesis work are describe. The theoretical framework for storing practice is briefly set up discussing all the important factors related to storing. The purpose of this part of the thesis work is to set up a basis for theoretical frame of storing practice concepts and investigate whether the store gap and the theoretical benefits are likely to create some impact on the efficiency of the pharmaceutical store management practice and also to find out whether they create some gaps real added value for the pharmaceutical store management practice.

##### **2.1.1 Pharmaceutical Logistics System in Ethiopia**

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, unaffordability, poor storage and stock management and irrational use. Integrated pharmaceutical logistics system (IPLS) is the term applied to a single pharmaceuticals reporting and distribution system. It integrates the supply chain management of all types of pharmaceuticals (medicines, medical supplies and equipment, and laboratory chemicals and reagents) in the public health sector, in Ethiopia. The IPLS has three main components including the policies and guidelines for logistics management information system (LMIS), inventory control and pharmaceuticals storage management at all levels of the supply chain system throughout the country 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 (PFSA, 2015).

## **2.1.2 Overview of pharmaceutical store management**

The warehouse is a key component of the supply chain for health commodities. This is especially true in resource poor environments where they act as buffers against uncertainties and breakdowns within the supply chain. When properly managed and appropriately stocked, the warehouse provides a consistent supply of products as they are needed. For many years, the private sector has taken a professional, systematic approach to warehousing; recognizing its importance to overall cost, customer satisfaction, and performance of the business. In turn, organizations involved in public health in the developing world have started to focus more attention on commodity warehousing, realizing its role as a critical resource for improving public health. The professional and systematic approach used by the private sector is directly applicable to the challenges public health warehousing face in countries around the world. Challenges, such as the increase in variety of products in the public health system, or stock keeping units, and the demand for reduced processing time, can be addressed by improving inventory management; and, in some cases, using technologies, such as automated data collection tools.

### **2.1.2.1 Storage condition of pharmaceuticals**

Pharmaceuticals require standard operation procedures and conditions for safe storage that protect their integrity and effectiveness, maximize their shelf life, and make them readily available for distribution. The procedures should include about the dimensions and design of the storage space, appropriate conditions for storage of drugs, and the importance of stock rotation and systematic arrangement and organization of stock, as well as attention to pharmaceutical store equipment, and security within the store. The storage environment should possess adequate temperature, sufficient lighting, clean conditions, humidity control, cold storage facilities, adequate shelving to ensure integrity of the stored drugs (MSH, 2012).

#### **2.1.2.1.1 Storing pharmaceuticals**

Pharmaceutical warehousing or warehouse management is “the physical movement of stock into, through, and out of a medical store warehouse.” Warehousing is a key element of pharmaceutical supply chain management. It ensures the constant availability and flow of essential quality health commodities, in appropriate quantities, in a timely and cost-efficient manner, through the supply chain system. Key warehousing functions include receiving and storing stock, inventory management, and distribution management. While storing stock is a key

function of warehousing, the need for large warehouses and large holdings of stock may reflect inefficiency in the supply chain. In an ideal supply chain, large warehouses storing large volumes of products are unnecessary because products enter and exit the warehouse quickly and efficiently on their way to the service delivery point. The task before all supply chain practitioners is to determine how much storage space is truly necessary if operations are as sufficient as possible. The warehousing domain of the supply chain faces problems created higher up the chain, such as poor quantification leading to incorrect stock procured, mistakes in orders, and insufficient financing. In addition, warehouses are challenged by insufficient human resources, poor physical infrastructure, and a lack of good systems to effectively track products throughout the system. These barriers lead to stock-outs, overstocking, and wastage of health resources. These are major problems in low-income country settings where resources for health are already limited. A well-functioning warehouse has a strong governance structure, a smooth operations management system, sufficient and qualified human resources, and the ability to monitor performance. Pharmaceuticals have a shelf life which is specified by the manufacturer. When pharmaceuticals reach the end of their shelf, it has expired and should not be distributed to patients. Some health products have short shelf lives. Because of these short shelf lives, it is important that proper storage procedures are followed, so that the shelf life is protected (MSH, 2011).

#### **2.1.2.1.2 Conducting Visual Inspection**

To protect the quality of pharmaceuticals, it is important to conduct visual inspections of the products. A visual inspection should be completed each time products are handled: when receiving, issuing or dispensing supplies, or when conducting a physical count. In a perfect pipeline, all products would be stored under ideal temperature and humidity conditions, and according to proper storage guidelines. In the real world, the quality of storage conditions may vary widely from place to place. You may want to verify the quality. Visual inspection is the process of examining products and their packaging to look for obvious problems with product quality of some products. In a warehouse facility, storekeepers can best verify quality by visually checking the condition of all products in their facility on a regular schedule. Products may have two basic types of damage during shipment and storage that affect their quality either mechanically or chemically. Mechanical damage is caused by physical stresses, such as crushing or tearing when the products are loaded, off-loaded, or when cartons or inner boxes are stacked.

This kind of damage is usually limited to crushed or torn parts. Chemical damage is more difficult to detect and is usually not obvious during a visual inspection. Laboratory testing is usually required. Some indications of chemical damage may include changes in the color, odor, or consistency of the product (USAID/DELIVER, 2014).

#### **2.1.2.1.3 Stock rotation**

In order to avoid accumulation of expired and obsolete stock, items should be stored and issued on a FIFO (First in First out) or FEFO basis. FEFO (First Expired, First Out) is a method of arranging drugs in a storage facility where the drugs are managed by their expiry date. Drugs that will expire first are issued first, regardless of when they were received at the health facility. The stock control system must record the expiry date and the date of receipt. Stock must be stored so that earliest- expiring or first-delivered batches can be picked and issued first. When small quantities are involved, this goal can be achieved by placing the newly received stock at the back of the shelf behind the existing stock. When larger quantities are involved for example, several pallet loads the newly received items can be placed on the upper levels of the pallet racking. They remain there until the older stock has been issued. The picking stock is kept in an accessible position, assuming that orders are picked by hand in relatively small quantities (USAID/DELIVER, 2004).

#### **2.1.2.1.4 Pharmaceutical organization and arrangement**

Pharmaceutical stores must have a system for classifying or organizing pharmaceuticals, and must ensure that all store managers know the system being used. Some common systems for arranging pharmaceuticals include: Alphabetical order by generic name, often seen in both large and small health facilities. When using this system, the labeling must be changed when the essential medicines list is revised or updated. Pharmaco-therapeutic category: Most useful in small storerooms or dispensaries where the store manager is very knowledgeable about pharmacology and use of the therapeutic/pharmacological classification produces good results, perhaps because it provides a frame of reference within which store managers can easily recognize individual products. Dosage form: medicines come in different forms, such as tablets, syrups, injectables, and external use products such as ointments and creams. In this system, medicines are categorized according to their dosage form. Within the area for each form, a fixed,

fluid, or semi-fluid system is used to store items. Any of the other methods of categorizing can be used to organize the items more precisely (WHO, 1998).

If using pallets, stack cartons on pallets, at least 10 cm (4 inches) off the floor at least 30 cm (1 foot) away from the walls and other stacks no more than 2.5 m (8 feet) high. A well-arranged store enables easy identification of drugs and saves time when picking a drug from the shelves. The following procedure will facilitate managing the drugs in the store. Put drugs on the shelves in alphabetical order corresponding to the essential drug list. This helps remove drugs quickly and makes for easy inventory control. The rule of first in first out (FIFO) should be applied always. So, drugs that were received first should be used first, except where the new stock has shorter expiration dates than the old stock. In this regard the principle of first to expire first out (USAID| Deliver Project, 2005).

#### **2.1.2.1.5 Pharmaceuticals which need special requirements**

##### **2.1.2.1.5.1 Cold storage**

Most public health warehouses need to have cold storage for certain products. Pharmaceuticals which need cold chain temperature are to be stored in their original packaging at between 2°C and 8°C and protected from light, as exposure to ultraviolet light will cause loss of potency. The original packaging is printed with the expiry dates and batch numbers. It protects the product from light, and damage and helps to maintain a consistent temperature. It also contains a patient information leaflet or a summary of product characteristics. Some pharmaceuticals have fairly short expiry dates, so do not over-order or stockpile. Cold chain items are sensitive to some extent to heat and cold. Heat speeds up the decline in potency of most s, thus reducing their shelf life. Effectiveness cannot be guaranteed for Cold chain items unless they have been stored at the correct temperature (WHO, 1998).

Temperatures in the refrigerator are to be monitored and recorded at least once each working day, preferably twice a day and documented as maximum reading, minimum reading and actual reading. The maximum and minimum functions must be reset after each temperature reading. Thermometers will identify when the temperature may have been outside the recommended range. Digital thermometers are the most reliable, preferably those with a probe that goes into the centre of the load. Thermometers, where used, are to be reset and replaced according the

manufacturer's guidance in the centre of the refrigerator. Refrigerators that have an external electronic display still need an additional digital thermometer in case of failure of the built-in thermometer or loss of power to the refrigerator (WHO, 2013).

Specialized refrigerators are available for the storage of pharmaceutical products. Ordinary domestic refrigerators must not be used. Food, drink and clinical specimens must not be stored in the same refrigerator as vaccines. Opening of the refrigerator door should be kept to a minimum in order to maintain a constant temperature. Products needing a cold chain should be stored in a refrigerator (between 2-8 °C): vaccines, immune globulins, serums, insulin, Ergometrine, oxytocin, dinoprostone, certain laboratory tests, (WHO, 1998).

#### **2.1.2.1.5.2 Flammable Storage practice**

Some flammable liquids commonly found in public health storing include acetone, anesthetic ether, and alcohols (before dilution). Flammables must be stored in special buildings or rooms. A separate building is best because it greatly reduces the risk of a fire's spreading to the main store. The flammables store must be well ventilated and fireproof. It must be fitted with an "explosion hatch," which may be part of the roof or part of wall. Never store large supplies of flammables in the same areas as medicines. Firefighting equipment should be easily available. Flammable liquids each have a flash point, which is the minimum temperature at which the liquid gives off vapor in sufficient concentration to form an ignitable mixture with the air near the surface of the liquid. The flash point indicates the susceptibility to ignition. Combustibles such as alcohol, ether, and fuels must be stored in special rooms. A small, separate out-building is preferable since it virtually guarantees that fire will not spread throughout the warehouse. If a special building is not available, the room used to store these supplies must be fireproof and well-ventilated (WHO, 2004).

#### **2.1.2.1.5.4 Secure storage**

Some categories of supplies require special storage conditions. Narcotics and other controlled substances should be kept in secure locking rooms with only one entrance. The keys should be kept in a secure place, preferably a safe. Only the store manager and one other person should have access to them. A locked cabinet or cupboard may be sufficient for some facilities, while other facilities may require a larger vault or cage (WHO, 2013).

### **2.1.3 Pharmaceutical stock management**

The problem of ineffective pharmaceutical stock records system may be attributable to the failure to give a deserved attention to the function of pharmaceutical store. Stock records are therefore used to track down the movement of the items from the time they enter the store to the time of issue to users for the intended purpose. It is through an effective stock record system health facilities can regulate the flow of products in such a way that the right quantity is available when required to meet patient needs and also to access information to assist in making future decisions in relation to quantification, price and source of supply. A proper stock recording system helps in deriving the benefits of perpetual stock verification system and indications about the right time, right quality, and right quantity. For the records to provide accurate up-to-date information which is useful to the stock controller, it requires that every transaction of receipt or issue of a particular item is recorded promptly and accurately. Bin Cards and stock record cards are used to account for products held in storage, including their receipt and issue. In the IPLS valuable information used to make re-supply decisions is recorded on the bin Card and stock record card; data from these records are used in reporting, calculating reorder quantities and for monitoring stock levels. The bin Card is used at all health facilities; the stock record card is used only at the health centres and hospitals. It is essential that personnel responsible for the management of pharmaceuticals maintain upto-date and accurate (PFSA, 2015).

#### **2.1.3.1 Electronic health commodity management information system (eHCMIS)**

The information system must include data on products entering and leaving the warehouse, products in stock, products on order, and ways to monitor the progress of orders in the supply pipeline. Key elements of the system are well-designed forms, computerized information systems, and clearly defined procedures. Two decades ago, most public supply systems relied completely on manual stock records, but now, many programs have changed to computerized systems. Even with computerization, however, many countries still maintain a manual system, such as bin cards, as a backup, especially during the transition to computerization. There is a widely held belief that computerization solves the problem of inventory control. This belief is misguided. A computer is not a substitute for trained staff; it is simply an additional tool for staff to use. Both manual and computerized systems perform the same fundamental information-processing tasks: data input, data storage, data processing, data retrieval, and data dissemination. The difference is that a computerized system enables some tasks to be

accomplished more rapidly, accurately, economically, and flexibly. Even with a computerized system, data must be entered, manipulated, and interpreted by skilled and knowledgeable staff (MSH, 2012).

The HCMIS Facility edition, manages transactions for issuing commodities to dispensing units within the facility, capturing consumption, stock balance, and losses and adjustments to calculate issue quantity. With automated calculations and data checks, arithmetic errors are eliminated and data entry errors are significantly reduced. The use of Pharmaceutical Information Management System also improved health facilities' reporting levels. The HCMIS automatically receives and issues reports and orders, manages inventory, and produces a variety of commodity reports for store managers, pharmacy head, and facility heads (JSI /DELIVER, 2011).

#### **2.1.4 Equipment available for pharmaceuticals**

Warehouse managers are responsible for all aspects of materials management, including a total systems approach to plan, acquire, store, move, and control the inventory of materials. To complete these essential warehouse operations, materials must be well-organized, including equipment, such as racking systems and material handling tools. The main justification for storage systems pallet racks, shelving/bins, etc. is to make optimum use of the building space. Whatever type of measurement is used, incorrectly calculated storage space requirements can contribute to poor utilization and result in space shortages and increased warehousing costs. Conversely, creating a more compact area for warehouse operations usually reduces picking and traveling time, as well as energy costs related to lighting and climate control. In addition to making optimum use of space, racking and shelving systems also provide simplicity and organization of materials and warehouse operations. Pallets are used to store bulk items and larger cartons. They keep things off the floor and can be used with forklifts to move around groups of larger items. Pallets are generally used only in larger facilities because storing and moving pallets can be expensive. Smaller facilities might have a few pallets left in place to ensure air circulation and keep products off the floor (MSH, 2012).

### **2.1.5 Pharmaceutical store standard**

To provide clients with high-quality products, each facility must have safe, protected, and well organized storage areas that will prevent damage. Pharmaceutical warehouse is very different from any warehouses due to its peculiar characteristics that help to maintain the efficacy, quality and safety of the product in addition to the facilitation of supply chain and keeping the product safe like other warehouses. So, well-located, well-built, well-organized, well-ventilated and secure storage facilities are an essential component of the pharmaceutical supply system. Hence, the government of Ethiopia with its main controlling and administrative body, Food, Medicine and Health Administrative and Control Authority (FMHACA) developed standards of the pharmaceutical store for institutions that manage pharmaceutical. Accordingly the agency defined the minimum height of the given warehouse should not be less than 2.7m in highland and 3m in low land. Also, as per the study of July 2007 by Ministry of Health with technical assistant from John Snow Inc suggested that a facility serving 50,000 populations should have 180 m<sup>2</sup> of storage area which excluding bed net and office and docking space (USAID| Deliver Project, 2015).

Dimensions of warehouse are determined by storage needs, which depend on: the number of drugs and supplies to be stocked; the number and activities of facilities; distribution and receiving frequency: the lesser the frequency the greater the volume needed, thus the greater the space needed. It is better to have too much space than not enough: a cramped warehouse is difficult to work, and any increases in stock or activity are also difficult. For 1 m<sup>2</sup> of storage space count 3 m<sup>2</sup> of floor space. Solid and stable shelves are indispensable. In tropical countries where termites attack wood, metal structures are preferred. As they can be dismantled, it is easy to adjust spaces between shelves and alleys to better accommodate goods to be stored. Space between shelves and walls improves ventilation. No products or packaging, even large-sized, should be stored on the floor, but on pallets which permit air circulation and protect against humidity (USAID| Deliver Project, 2004).

### **2.1.6 Handling expired or damaged Stocks**

Logistics systems try to minimize the amount of damaged or expired stocks. However, if expired or damaged stocks are found at any time during a visual inspection or physical count, these stocks should be immediately removed from the inventory and be moved to a separate place and

keep them in an unused box or on an unused shelf., so that they cannot be dispensed or used. Later, they can be disposed of according to the established guidelines. Expired or damaged products that are discovered upon receipt of a consignment should not be accepted, but rather returned to the supplier for replacement (USAID| Deliver Project, 2013).

#### 2.1.7 Pharmaceutical waste management

Globally, there is a growing concern in the medical and environmental protection communities regarding the current handling and disposal methods for pharmaceutical waste and other waste materials from health facilities. For example, in Ghana, one study reported that pharmaceutical waste that is of the hazardous waste class in the hospital was mostly collected together with general hospital waste. Proper pharmaceutical waste management is a highly complex new frontier in environmental management for healthcare facilities. It needs trained persons and equipments for collecting, treating and disposal of pharmaceutical wastes. Practically, however, pharmacists and nurses generally do not receive training on hazardous waste management during their academic studies and safety and environmental services managers may not be familiar with the active ingredients and formulations of pharmaceutical products. Another survey made in South Sudan showed that only 19% of health facilities have pharmaceutical waste disposal equipment (DACA, 1996).

### 2.2 Empirical literature review

Certain previous researches have devoted deal of attention to the relationship of supply chain management practices and certain aspects of pharmaceutical store management practice from different perspective /dimension of supply chain. Some of the research findings discussed as follow.

#### 2.2.1 Storage conditions of pharmaceuticals

Lack of effective pharmaceutical logistics system not only affects the availability of essential drugs, but also significantly affects efficiency. Deficiencies in selection, quantification, storage, as well as high prices, poor quality, theft, expiration of drugs, irrational prescribing, and incorrect use of medicines by patients cause losses totaling 70% of the original expenditure (MSH, 2011).

Study conducted on public health facilities in East Shoa Zone, Oromia with respect to pharmaceuticals storage condition of the health facilities as per the good pharmacy practice standards for medicines storage condition. The study revealed that 75% of the study facilities did not fulfill the criteria of good storage condition, about 16 (80%) of the health facilities arranged and organized medicines according to a logical categorization e.g. zoning. Twelve (60%) of them updated their bin cards regularly, 17 (85%) of the facilities separated unwanted (damaged or expired) items in the store room from the usable medicines. Seventeen (85%) of them have properly arranged medicines. Fourteen (70%) of the facilities stored and organized in manner which facilitates use of first to expire, first out (FEFO). All of the surveyed facilities 20 (100%) had storage area which was visually free from harmful insects and rodents. However only 8 (40%) of the facilities had relatively sufficient space for medicines storage and free space for future expansion and failure to apply FEFO principles in some facilities (25%) were found to be the common problems leading to medicines wastage (Tadesse, 2016).

Study conducted on public health facilities in Addis Ababa. With respect to availability of standard storage space, 36.4% of medical store had adequate number shelving and boxes and standard storage space to store all available medical laboratory supplies (Desale, 2013).

Study conducted by Mejid Mudzteba on pharmaceuticals logistics system in health centers of Addis Ababa. In all 23 (100%) HCs security devices such as lock and key were in place, and only 8 (34.8%) of the HCs had sufficient store sizes while 5 (21.7%) of them store stacked drugs at least 30 cm away from the walls. Products in Health centers 18 (78.3%) were arranged systematically (pharmacological/ alphabetical) and the products were stored and organized in a manner accessible for first-to-expire, first-out manner 16 (69.6%). Available shelves and pallets were 100% and 82.6% respectively in Health centers (Mejid M., 2014).

Assessment done on the laboratory commodities storage condition practice at government hospitals in Addis revealed that Ten (91%) of the hospital's medical stores did not have frozen storage of  $-20^{\circ}\text{C}$  or  $-70^{\circ}\text{C}$  but all of the medical stores had cold storage  $2-80^{\circ}\text{C}$ . In this study four (36.4%) of all the medical stores did not have adequate number of refrigerators for storing cold chain items on the absence of thermometer in the rooms 3 (27.3%). Moreover, Only 4 (36.4%) of the hospital store rooms were separate flammable chemicals. All of the store managers who knew appropriate storage of cold chain items responded that cold chain items should be stored at 2-

80C. Among all store managers, less than half (45.5%) of the respondent answered that they had ever received training about storage of medical supplies (Kelemework, 2014).

According to an assessment result of the laboratory commodities supply chain in Lesotho, all laboratories reported that they had no written guidelines for storage of laboratory supplies according to their specifications. In most cases, the storage space had poor ventilation and was small, and there were no cupboards for flammable reagents. Thirty three percent of all laboratories reported that reagents were not stored according to the first expiring, first out (FEFO) practice. None of the laboratories practiced the separation of damaged/or expired supplies from usable products. Seventeen percent of the laboratories responded that cold chain items were not stored at appropriate temperatures due to refrigerators being too full and space not being available (Pharasi, 2007).

On pharmaceutical assessment in Rwanda, facilities were asked about the dimensions of storage space. While 56% of health facilities reported having storage spaces smaller than the standard requirement laid out at the national level for health, half of them expressed the need for additional storage space. In addition, 61% reported having separate storage areas for drugs and medical supplies. Dangerous and inflammable products were adequately stored in separate spaces in 43% of the facilities. About three-quarters of the sites (76%) were found to have independent storage and dispensing rooms. Maintenance of building infrastructure was found to be adequate in most of the stores (Lijdsman, 2003).

### **2.2.2 Pharmaceutical stock management**

Study conducted on public health facilities in Addis Ababa, fifty percent (50%) of the assessed hospitals and 54% of health centers were currently using stock/bin cards for all HIV/AIDS and TB laboratory commodities in main pharmacy store, among these only 25% and 20.8% of them were updated with accurate information matching with the physical count done at the time of visit for hospitals and health centers respectively. Among all store managers, less than half (45.5%) of the respondent answered that they had ever received training about storage of medical supplies (Desale, 2013).

Study conducted by Mezid Mudzteba on pharmaceuticals logistics system in health centers of Addis Ababa. Twenty one (87.5%) HCs used HCMIS software to manage NPDs in the store and

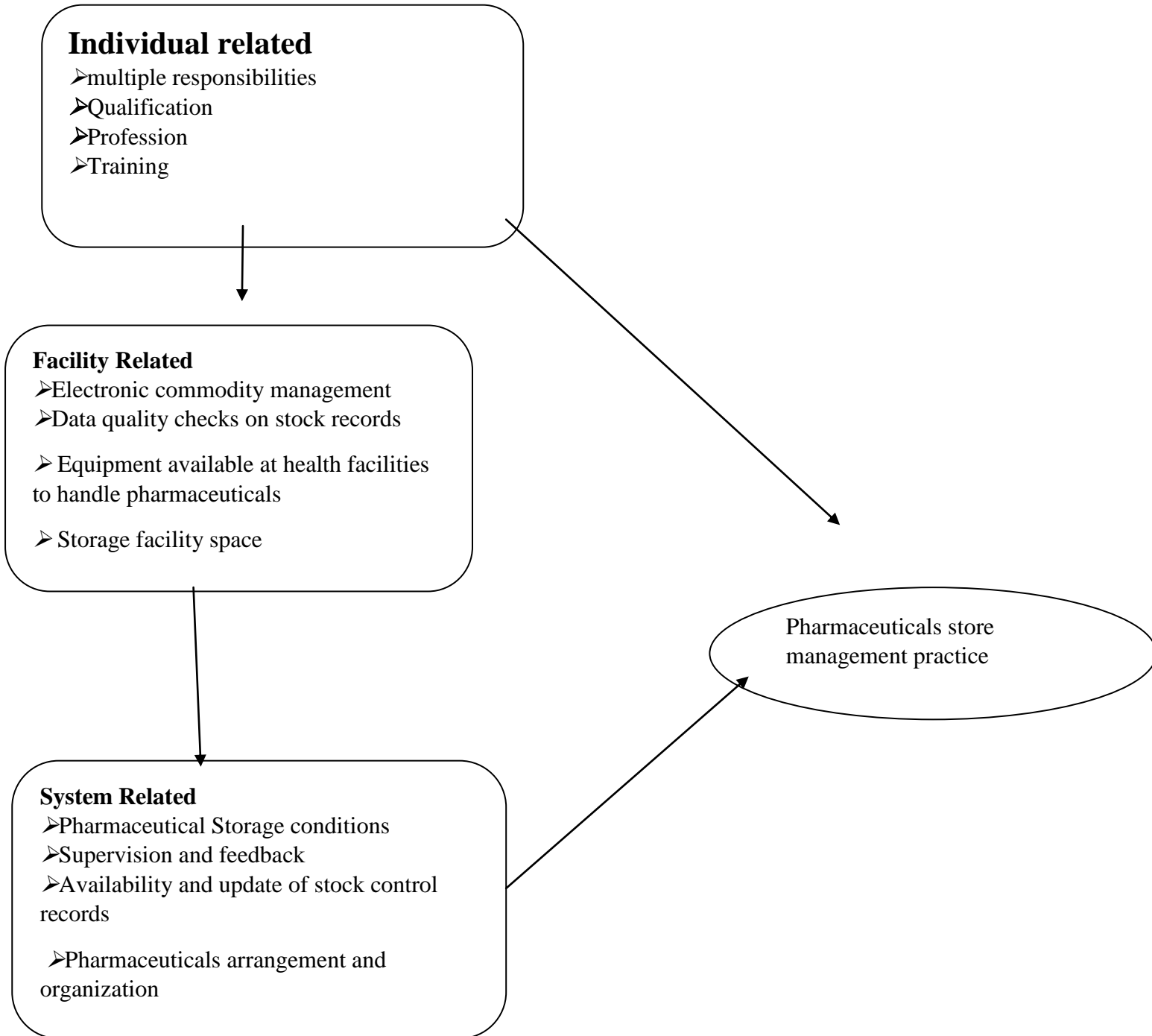
all of them were functional at time of survey. The HCs used the HCMIS mainly to trace expiry date of drugs 21(100%) and concerning supervision, majority 19(79.2%) of the HCs reported to have had supervision on the pharmaceutical logistics quarterly (Mudzteba, 2014).

### **2. 2.3 Pharmaceutical waste management**

Study conducted by Mezi Mudzteba on pharmaceuticals logistics system in health centers of Addis Ababa. This Study revealed that the pharmacy units in all surveyed HCs were responsible for pharmaceutical waste management, 24 (87.7%) documented policy or guideline for pharmaceutical waste management and, in all health facilities 24 (100%) have document for disposed drugs, majority 11(45.8%) of the HCs reported to usually store medicine wastes for 6 to 12 months, but as much as 16(66.7%) of the HCs reported that they disposed the medicine wastes more than a year ago (Mudzteba, 2014).

## 2.3 Conceptual framework

Figure 1: Conceptual framework developed from literature



Source: Developed by research based on literatures

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Study area and Period**

The study was carried out in public health facilities in North Shoa, Amhara Regional State that is consisted of 24 Woreda Health offices and 2 administrative town health offices. According to the 2017 data of Amhara Health Bureau, North Shoa zone has populations of about 2,263,325. Currently, study area has a total of 8 public hospitals and 95 health centers. The study was conducted from March 12/2018, to April 30/2018.

#### **3.2 Research design**

This study was used both quantitative and qualitative research methods through the facility based cross-sectional descriptive study design.

#### **3.3 Population**

##### **3.3.1 Source population**

All governmental Hospitals and health centers found at North Shoa, Amhara Regional State were considered as source population.

##### **3.3.2 Study population**

. All governmental Hospitals and Health centers which were randomly selected in the study were considered as study population.

. All respective store personnel of sampled facilities.

##### **3.3.2.1 Inclusion and Exclusion criteria**

###### **3.3.2.1.1 Inclusion criteria**

For quantitative and qualitative study all government Hospitals and Health centers which were governmental are included in the study. Individuals who have been working as store personnel at least for the last six months.

### 3.3.2.1.2 Exclusion criteria

Health facilities which are not government owned and store personnel who have been working for less than six months in the store. Involuntary refused study participants and incomplete information of charts/pharmaceutical records (if any).

### 3.4 Sample size determination

The sample size was determined using LIAT sampling guides by the following assumptions. From a total of 103 Health facilities which are found in North Shoa, Amhara Regional State, HF's which were not fulfill the inclusion criteria were excluded and deleted out of the complete list. The refined 74 HF's were sampling frame, of which 41 HF's were as study sample.

The general formula for calculating a sample size is:

$$n = t^2 * p (1-p) / m^2$$

Where: n = required sample size

t = the value of the confidence level have chosen (at 90 percent = 1.64,)

p = estimated outcome of interest. (The product of p and [1-p] is maximized when p = 0.5. Therefore, when occurrence is unknown, 0.5 should be used.)

m = margin of error you wish to allow in estimating the outcome of interest, expressed as a decimal (at 10 percent m = 0.1).

$$n = t^2 * p (1-p) / m^2 = \frac{(1.64)^2 * 0.5(1-0.5)}{(0.1)^2}$$

$$= \frac{1.64^2 * 0.5 * 0.5}{0.1^2}$$

$$n = 67$$

However, where there is a predetermined population (e.g., total number of facilities in the country), the sample size generated from the above equation needs to be multiplied by the **Finite Population Correction (FPC) factor**. For our purposes, the formula can be expressed as:

$$\text{New } n = n/1 + [(n-1)/N]$$

Where: New n = the adjusted new sample size

N = the population size =103

n = the sample size obtained from the general formula=67

$$\text{New } n = n/1 + [(n-1)/N]$$

$$\text{New } n = 41$$

### **3.4.1 Sampling technique**

To select study units, first a complete enumeration of all health facilities' (HFs) which are found in North Shoa, Amhara Regional State were listed. Health facilities' which were not fulfill the inclusion criteria were excluded and deleted out of the complete list. The refined health facility list was then served as a sampling frame. Later, stratification of the health facilities' according to administrative areas. Then, number of health facilities' included in the sample from each area (strata) was determined using proportional to size allocation technique. Finally, health facilities' were selected using simple random sampling technique.

## **3.5 Data collection procedures**

### **3.5.1 Data collection tool**

Different data collection tools were used to collect relevant information based on the study objectives. Semi-structured questionnaire was customized from tools for logistics system assessment developed by USAID/DELIVER. The qualitative section of the questionnaire was adopted from Logistics System Assessment Tool (LSAT) while the quantitative section was adopted from LIAT. On top of the information that were collected through interview using the structured questionnaire, check list that are part of the Logistics Indicator Assessment Tool (LIAT) was used to get additional information on the storage conditions.

The questionnaire used to collect the data was pretested in 5% of the study participants (4HFs) health facilities rendering the intended Pharmaceuticals store management practices. The tool was modified based on the feedback obtained during the pretest.

### **3.6 Data Collection**

Quantitative data were collected by using structured questionnaire, document review and structured observation method.

### **3.7 Data Collection Instruments**

A structured questionnaire adapted from Logistics Indicator Assessment Tool (LIAT) was used to collect quantitative data. LIAT is a tool developed by the USAID-funded DELIVER which is used to conduct a facility-based survey to assess health commodity logistics system performance and commodity availability at health facilities (John Snow Inc. /DELIVER, 2005). On top of the information that was collected through interview using the structured questionnaire, check list that are part of the LIAT was used to get additional information on the storage conditions.

### **3.8 Data processing and analysis**

#### **For Quantitative data**

Quantitative data was clean and enter in to Epi info data version 3.1 and the data was checked for completeness of information and entered into the Statistical package for Social Science (SPSS) programs version 20 and Excel spread sheet for analysis. Errors related to inconsistency of data was checked and corrected during data information cleaning. The Descriptive data findings were presented interms of percentages, frequency distributions and appropriate table presentations.

### **3.9 Ethical clearance**

The study was conducted after obtaining ethical clearance from AA University research review board of school of commerce. The necessary permission was obtained from HF's included in the data collection, the study participants were notified about their ethical issue. The study participants have a right to draw anytime during interview. During data collection personnel identification was not recorded to maintain the privacy of the study participants.

## CHAPTER FOUR

### DATA ANALYSIS, INTERPRETATION AND DISCUSION

#### 4.1 Characteristics of health facilities and respondents

A total of 41 health facilities were included in the study. Of the facilities studied, 36(87.8%) were health centers and 5 (12.2%) were hospitals. For those facilities included in the study, 36(87.8%) of the respondents were pharmacy professionals while 4(9.8%) of respondents were clinical nurses, and 1(2.2%) of the respondent was health officer, 40(97.6%) of the facilities had store personnel with qualification level of diploma and the rest had degree level of which 21(51.2%) males and 20 (48.8 %) females. Respondents were asked how many years they had been at facility. Of which 26 (63.4 %) respondents indicated that they had been at the facility for less than two years, 15 (36.6%) of the respondents served from 2 to 5 years in the facility including working in other assigned positions.

**Table 1: Summary of study participants**

<b>Type of facility</b>	<b>Frequency</b>	<b>Percentage</b>
Health center	36	87.8%
Hospital	5	12,2%
<b>Service year</b>		
< 2 years	26	63.4%
2-5 years	15	36.6%
<b>Sex</b>		
Male	21	51.2%
Female	20	48.8%
<b>Profession</b>		
Pharmacy	36	87.8%
Clinical nurse	4	9.8%
Health officer	1	2.4%
<b>Qualification</b>		
Diploma	40	97.6%
Degree and above	1	2.4%

Source: Own survey, 2018

## 4.2 Training of professionals in IPLS (Integrated Pharmaceutical Logistic System)

From a total of 41 professionals involved in pharmaceutical store management, 29 (70.7%) of the respondents took a 3 day Integrated Pharmaceutical Logistics System (logistics management information system, inventory control and pharmaceuticals storage management) training from which 26(89.7%) of the respondents had been trained in the last two years and 3(10.3) % of the respondents took the training 2 to 5 years. National IPLS survey reported that, for all facilities assessed, more than 84% of hospitals and 69% of health centre pharmacy personnel received IPLS training (USAID/DELIVER, 2015). This finding is higher than a study conducted in Addis Ababa which was 45.5% (Kelemework, 2014).The possible reason for the variation in proportion of training among store managers of trainings and follows up on the integrated pharmaceutical logistics system.

## 4.3 Multiple responsibilities

Respondents were asked about the responsibilities assigned to them in addition to the store management, majority of the respondents 38 (92.7%) were working in additional responsibilities, respondents who are pharmacy professionals are working in pharmacy dispensary and nurses were working in outpatient department diagnosis and emergency rooms.

One respondent said that,

*” In this facility I am serving as store man and also outpatient pharmacy dispensary and outreach activities when my colleague gets off day after duty, therefore when I can update my bin cards.”.*

**Table 2: Training and multiple responsibilities in the pharmaceutical store management**

	Frequency	Percentage
<b>Training IPLS(Variables N=41)</b>		
Yes	29	70.7%
No	12	29.3%
respondents who trained in the last two (Variables N=29)	26	89.3%
respondents who trained in the last two (Variables N=29)	3	10.7%
<b>Multiple responsibility</b>		
Yes	38	92.7%
No	3	7.3%

Source: Own survey, 2018

#### **4. 4 Stock management**

On average 56.2% facilities were updated their bin cards regularly. With regards to eHCMIS,13 (31.7 %) of the facilities implemented computerized pharmaceuticals management information system in their store in addition to the paper based implementation; whereas the rest 28 (68.3%) were having paper based implementation of the system. Majority of health facilities used eHCMIS mainly to trace expiry date and prepare reports.

Majority of health faculties were not updating bin cards regularly even if a stock record helps to prevent shortages, oversupply, and expiry of pharmaceuticals.

In this study, the update of bin cards on average in 56.2% of the Health facilities. This finding is in line with a study conducted in East Shoa,Oromia, Ethiopia where Health facilities updated their bin cards about 60% (Tadesse,2016). The utilization of bin cards were 80% and 48.9% in hospitals and health centers respectively in this study, where the finding of a study conducted on public health facilities in Addis Ababa, 50% in hospitals and 54% in health centers (Desale, 2013).Higher utilization of bin card in hospitals in this study might indicate better implementation of pharmaceutical stock keeping practice. This might be due to better implementation of automated health commodity management system which saves time in hospital pharmacy store; On the other hand, lower utilization rate of bin cards at health center could be: store managers assigned to work at dispensary, high turnover of trained pharmacy professional, less supportive supervision, less commitment of store manager, may be work load and low ownership by management unit. Even if updating of bin card becoming a tedious and time consuming exercise. Implementing automated system help store managers to perform their tasks to be accomplished more rapidly, accurately, economically, and flexibly (MSH, 2012).

This study revealed that only 13 (31.7 %) eHCMIS health facilities were implemented computerized pharmaceuticals management information system in their store in addition to the paper based implementation which was lower than the Study conducted by Mejid Mudzteba on pharmaceuticals logistics system in health centers of Addis Ababa (Mejid, 2014). The reason for this was health facilities did not well implemented integrated pharmaceutical logistics system (store management of pharmaceuticals, LMIS, and inventory control system) and well organized physical storage.

**Table 3: Availability and up-to-dateness of bin cards keeping logistics records**

Items	Bin card Available for Health center and Hospital (n=41)	Bin card Updated	
	Yes(%)	n	(Yes)(%)
Amoxicillin 500mg	41(100%)	41	35 (85.4%)
Paracetamol 500 mg	33 (80.5%)	33	15 (45.6%)
Depo provera 150mg/ml	30(73.2%)	30	16 (53.3%)
ORS	34(82.9%)	34	19 (55.9%)
Implananon 68 mg	17(41.5%)	17	7 (41.2%)
<b>Average</b>	<b>75.6%</b>		<b>56.2%</b>
Description	Bin card Available for Health center n=36	Bin card Updated	
		n	(Yes)(%)
Amoxicillin 500mg	36(100%)	36	30 (83.3%)
Paracetamol 500 mg	30(83.3%)	30	11 (36.7%)
Depo provera 150mg/ml	27(75%)	27	12(44.4%)
ORS	31(86.1%)	31	15 (48.4%)
Implananon 68 mg	14(38.9%)	14	3 (21.4%)
<b>Average</b>	<b>76.7%</b>		<b>48.9%</b>
Variables (N=41)	Frequency	Percentage	
the physical count for each of the selected products on the day of the visit matching with bin card balance with			
Yes	20	48.8%	
No	21	51.2%	
LMIS			
Computerized and paper based health facilities	13	31.7%	
Paper based facilities	28	68.3%	

Source: Own survey, 2018

#### 4.5 Practice of Organization and arrangement of pharmaceuticals

Majority of the health facilities, 29 (70.7%) were arranged their product pharmaco-therapeutic order and Only 6(14.6%) of the health facilities were placed bulky items on pallet, 5(12.2%) of health facilities were not properly labeled their shelves while 16 (39%) of them stacked products at least 10 cm off the floor.

The findings of this study indicated that 29 (70.7%) health facilities were arranged their products with pharmaco-therapeutic order though 27(65.9%) health facilities have sufficient shelves. The Study conducted by Mezyd Mudzteba on pharmaceuticals logistics system in health centers of Addis Ababa (Mezyd.2014), products were arranged systematically (pharmacological/ alphabetical) 78.3%, which is higher than this study and this could be due to health centers with higher availability of shelves 100% and pallet 82.6%. Pharmaceuticals should be clearly organized and arranged with each zone of the store to make it much easier for store personnel to control stock; take periodic stock inventory, pick orders, and time will not be wasted(WHO, 1998).

**Table 4: Practice of Organization and arrangement of pharmaceuticals**

Variables (N=41)	Frequency	Percentage
<b>Arrangement and organization of pharmaceutical products</b>		
Pharmacologic- therapeutic order/	29	70.7%
Alphabetical order	-	-
Pharmaceutical order	-	-
Mixed type	12	29.3%
Bulky package placed on pallets	6	14.6%
Properly labeled shelves	5	12.2%
Products stacked atleast 10 cm off floor	16	39%

Source: Own survey, 2018

#### 4. 6 Storage conditions of the facilities

The storage condition of the health facilities was assessed based on visual inspection (observation) using indicators as per good pharmacy practice standards for storage condition stipulated in logistic indicators assessment tool (LIAT).

Majority of the health centers and hospitals were having standard guideline for storage of Pharmaceutical items. All of the surveyed facilities 41(100%) store room have Placement of door /window/ grills or Iron bars for Security, 34(82.9%) health facilities separated unwanted items (damaged or expired, non-pharmaceutical items) in the store room from the usable stocks.

25(61%) health facilities were stored and organized their pharmaceuticals in a manner accessible for first to expire first out (FEFO) issuing, 31(75.6%) health facilities storage area was visually free from harmful insects and rodents. Only 1(2.4%) hospital was separated flammable chemicals stored in separate area. Availability of Fire extinguisher 8 (19.5%), ladder 13 (31.7%), wall thermometer 7 (17.1%) in the health facilities. However only 17 (41.5%) of health facilities had adequate space to accommodate the existing pharmaceuticals.

Many facilities reported that they were not practicing FEFO principles to prevent shortage, overstocking and to prevent expiry of pharmaceuticals.

One respondent said that,

*“We have been planned to purchase shelves for our store, till now woreda health office did not allocated budget... even I raised this issues in our annual review meeting, therefore how can I apply FEFO system”*

16(39%) of health facilities were not stored and organized their pharmaceuticals in a manner accessible for first to expire first out (FEFO) principles. This study in line with the study conducted in East Shoa,Oromia, Ethiopia, which was 25% of health facilities. This study identified some of the possible reasons health facilities failure to apply FEFO principles might be limitation of storage space, shortage of shelves and pallet, store mangers having multiple responsibilities, luck of commitment, lack of management ownership, inadequate supportive supervision and feed back and the facilities failed to adhere to the standard guidelines for storage

of pharmaceuticals. Failure to practice first to expire first out (FEFO) principles might be one of the possible causes for expiration of medicines in health facilities (USAID/DELIVER, 2004).

Many facilities reported that limitation of storage space became a major problem for proper storage of pharmaceuticals.

*“As you have seen our store is very narrow, which was not construct for the purpose of pharmaceutical store, therefore it a problem to arrange and organize the existing products pharmaco-therapeutically.”*

This study also identified 58.5% of the storage facilities condition did not have sufficient space for pharmaceuticals storage. This finding is almost similar with study conducted in health facilities of East Shoa, Oromia, Ethiopia most of them had storage space limitations (60%) (Tadesse, 2016). The storage space limitation of this study might be emanated from the building design was not drafted for pharmaceutical drug store. Storage space limitation made picking, cleaning difficult and also enforced the store persons to stack medicines over one another without any space till it touched the roof which in turn limited air circulation within the store. Pharmaceuticals should be stored in a specially designed secure area or space of a building in order to avoid contamination or deterioration, avoid disfiguration of labels, maintain integrity of packaging and so guarantee quality and potency of drugs during shelf life (USAID| Deliver Project, 2015).

In this study protection of pharmaceuticals from direct sun light was 40 (97.6%) of the stores which was in line with a study conducted in Rwanda where 98% of medical stores did protect medical laboratory commodities from sun light (Lijdsman, 2003).

In this study 1 (2.4%) of hospital was separating flammable and hazardous laboratory commodities this finding was somewhat smaller than a study conducted in Rwanda where dangerous and flammable products were adequately stored in separate spaces in 43% of the facilities. This could be due to lack of adequate rooms, carelessness of the staffs or absence of guidelines how to separately store these products. Flammables, such as alcohol and ether, must be stored in special buildings or rooms because it greatly reduces the risk of a fire's spreading to the main store (WHO, 2004).

#### 4.7 Availability of equipment

Availability of Fire extinguisher 8 (19.5%), ladder 13 (31.7%), wall thermometer 7 (17.1%) in the health facilities which is noncompliant to the standard.

**Table 5: practical activities of pharmaceutical storage conditions**

S.No	Storage practice	Frequency Yes (%)
1	Pharmaceuticals are arranged so that identification labels, expiry dates and/or manufacturing dates are visible.	24 (58.5%)
2	Pharmaceuticals are stored & organized in a manner which facilitates use of First-to-expire, first-out (FEFO).	25(61%)
3	Cartons and products are in good condition, not crushed due to mishandling	20(48.8%)
4	unwanted items (damaged or expired drugs, non-pharmaceutical items, etc.) in the store room separated from the usable stock	34(82.9%)
5	Pharmaceuticals are protected from direct sunlight	40(97.6%)
6	Storage area visually free from harmful insects and rodents	31(75.6%)
7	the store sufficient enough to accommodate the existing pharmaceuticals	17(41.5%)
8	store room have Placement of door /window/ grills or Iron bars for Security	41(100%)
9	flammable chemicals stored in a specialized or in separate area	1(2.4%)
10	Fire safety equipment is accessible	8(19.15%)
11	Availability of ladder	13(31.7%)
	<b>Average</b>	<b>62%</b>

S.No	Equipments available	Frequency Yes (%)
1	Sufficient wooden pallets	2(4.9%)
2	Bin dust	38(92.7)
3	Trolley	11(26.8%)
4	Cold boxes	39(95.1%)
5	Refrigerator	25(61%)
6	Wall thermometer	7(17.1%)
7	Fire extinguisher	8(19.5%)
8	Ladder	13(31.7%)
9	Office Table and Chair	37(90.2%)
10	Lockable cabinet	3(7.3%)
11	Sufficient shelves	27(65.9%)
	<b>Average</b>	<b>46.6%</b>

Source: Own survey, 2018

#### **4.8 Cold chain storage practice**

In this study only, 13(31.7%) health facilities were having adequate refrigerator for storing cold chain items, only 1(2.9%) hospital was recorded refrigerator temperature daily on the temperature registration sheet to manage cold chain items (Table 6).

Many facilities were not having adequate cold chain refrigerator and only one hospital recorded refrigerator temperature daily on the temperature registration sheet to manage cold chain items.

One respondent said that,

*“We don’t have enough standard refrigerator..... you can see we put oxytocin injection with vaccines.” This is in line with WHO standard for cold chain refrigerator (WHO, 1998).*

With respect to availability of adequate refrigerators for storing cold chain items, only 13(31.7%) health facilities had adequate refrigerators. This result was in line with study conducted in Addis Ababa which was 36.4 % (Kelemework, 2014).This lower number of refrigerators availability

for cold chain might be due to inaccessibility of refrigerator in the local market as of World health organization (WHO) specification (WHO,1998).

The finding of this study indicated only 1(2.9%) hospital was recorded refrigerator temperature daily on the temperature registration sheet to manage a cold chain item which is against World Health Organization standard, where every cold chain items stored in refrigerator should be monitored and recorded its temperature at least once each working day, preferably twice a day and documented as maximum reading, minimum reading and actual reading (WHO, 2013).

**Table 6: Cold chain storage practice**

S.No	Cold chain storage practice (Except Vaccines)	Ferequency	Percent
1	Functional refrigerator for storing cold chain items	34	82.9%
2	Cold storage products stored between 2°C and 8°C	28	82.4%
3	Store managers who answered Cold storage products stored between 2°C and 8°C	36	87.8%
4	Health facilities recorded refrigerator temperature daily on the temperature registration sheet to manage cold chain items	1	2.9%
5	adequate number of refrigerators for storing cold chain items	13	31.7%

Source: Own survey, 2018

#### **4.9 Handling of expired items and its disposal management**

With regards of pharmaceutical waste management, in majority of health facilities, 38 (92.7%) pharmacy units was responsible waste management. 5(12.2%) health facilities were disposed pharmaceutical waste less than 6 months ago, 21(51.2%) within 6-12 months ago, 33(80.5%) Health facilities were having a document for disposed pharmaceutical, Majority 34(82.9%) health facilities were separated expired items from usable stock (Table 7).

In this study, 34(82.9%) health facilities had the practice of separating expired/damaged items from usable stock in the store. This finding almost in line with the study conducted in East Shoa,Oromia, Ethiopia which was 17(85%) (Tadesse 2016).This could be possibly due to a limited space for storing pharmaceuticals, shortage of shelves and pallet to handle the existing

pharmaceuticals. Expired or damaged stocks immediately removed from the usable inventory and are moved to a separate place, latter, they can be disposed of according to the established guidelines (DACA, 1996).

In this study, 26(63.4%) health facilities were disposed pharmaceutical waste within for the last one year which was higher than from a study conducted in Addis Ababa 16(66.7%) of the health centers reported that they disposed the pharmaceuticals wastes more than a year ago. This difference may be wastage rate of pharmaceuticals from each health facility has to be reported every two months for North Shoa Health Dept. as one of key performance indicator for pharmaceutical logistics performance measurement.

**Table 7: Practice of handling of expired items and its disposal management**

Variables (N=41)	Frequency	Percentage
<b>pharmacy unit responsible for managing the pharmaceuticals waste</b>		
Yes	38	92.7%
No	0	-
I don't know	3	7.3%
<b>documented policy or guideline for pharmaceuticals waste management</b>		
Yes	36	87.8%
No	5	12.2%
I don't know	8	19.5%
<b>Health facilities disposed pharmaceutical wastes</b>		
less than 6 months ago	5	12.2%
6 to 12 months ago	21	51.2%
more than 12 months ago	15	36.6%
<b>Facilities which documented disposed pharmaceuticals</b>		

Yes	33	80.5%
No	0	-
I don't know	8	19.5%
<b>Variables (N=41)</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Expired drugs separated from usable stocked</b>		
Yes	34	82.9%
No	7	17.1%
<b>written guidelines for pharmaceuticals storing practices</b>		
Yes	29	70.7%
No	6	14.6%
I don't know	6	14.6%

Source: Own survey, 2018

#### **4.10 Supportive supervision and feedback**

21(51.2%) of the facilities mentioned that they were received supportive supervisions in the last quarter either from zonal health department or woreda health offices or partner on pharmaceutical logistics management and 21(51.2%) of the facilities were obtained feedback related integrated pharmaceutical logistics management implementation issue.

With respect to supportive supervision this study revealed that 21(51.2%) of the facilities were received supportive supervisions in the last quarter either from zonal health department or woreda health offices or partner on the pharmaceutical logistics management, this finding is lower than the study conduct in Addis Ababa by Muzteba M. on assessment of pharmaceutical logistics system in health which was 19(79.2%) of the HCs, this might be due to Addis Ababa is accessible for transportation, majority NGOs working on pharmaceutical logistics prefers to work in Addis Ababa.

**Table: 8 Supportive supervision and feedback in pharmaceutical store management practice**

Variables (N=41)	Frequency	Percentage
Supportive supervision and feedback(Zonal,WoHO,JSI/AIDS free)		
Yes	21	51.2%
No	20	48.8%

Source: Own survey, 2018

## **CHAPTER FIVE**

### **SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS**

#### **5.1: Summary of findings**

This study attempted to answer the specific objectives addressed by the study. Based on presentation of the results, the following major findings of the study are summarized as follows: Twenty five (61%) health facilities were stored and organized their pharmaceuticals in a manner accessible for first to expire first out (FEFO) issuing. All of the health facilities had store rooms with replacement of door /window/ grills or Iron bars for security. Except one hospital, the other health facilities did not separate flammable chemicals from other pharmaceutical products in separated area. Only 17 (41.5%) of health facilities had adequate space to accommodate the existing pharmaceuticals. Although 13(31.7%) health facilities were having adequate refrigerator (accommodate all existing cold chain items), only 1(2.9%) hospital recorded the daily refrigerator temperature on the temperature registration sheet to manage cold chain items. In majority of the health facilities, 38 (92.7%), the pharmacy units, in 38 (92.7%) of the health facilities, was responsible for the pharmaceutical waste management disposal (expired and/or damaged items). The pharmacy units separated expired items from usable stock in 34(82.9%) of the health facilities. Twenty one (51.2%) of the facilities obtained supportive supervision and feedback related to integrated pharmaceutical logistics management implementation issues.

#### **5.2 Conclusion**

The stock management of the facilities revealed that the bin cards were not updated periodically and this was due to the multiple responsibilities of the store managers. In this study, majority of the health facilities storage conditions had inadequate storage space and this caused a problem to accommodate the existing pharmaceuticals and to apply first to expire first out (FEFO) principles. The health facilities were arranged and organized their products with pharmacotherapeutics order and further separated the expired and/or damaged items from usable stock. Giving training to stock managers was important in solving some of the problems.

### 5.3 Recommendations

- ❖ Regular internal supportive supervision by management unit of each health facilities to monitor and follow regular updating of stock recording system. It is through an effective stock record system health facilities can regulate the flow of products in such a way that the right quantity is available when required to meet patient needs and also to access information to assist in making future decisions in relation to quantification, price and source of supply and data from these records are used in reporting, calculating reorder quantities and for monitoring stock levels.
- ❖ Expansion of computerized health commodity management system in health facilities store is a very important input for the stock management information when used effectively: to capture consumption, stock balance, and losses and adjustments to calculate issue quantity, automation eases the tedious work of drug stock management, save personnel time and promotes quality of services.
- ❖ In majority of health facilities calls for early interventions on storage conditions especially with respect to adequacy of storage spaces. Amhara regional health Bureau, stake holder and its partner should construct standard pharmaceutical stores following established standard in the health facilities where pharmaceutical store become major problem to practice pharmaceutical store management.
- ❖ Health facilities should practice storing and organizing their pharmaceuticals in a manner accessible for first to expire first out (FEFO) principles to expiration of medicines in health facilities.
- ❖ Expired or damaged stocks immediately removed from the usable inventory and are moved to a separate place, latter, they can be disposed of according to the established guidelines.
- ❖ Health facilities should procure sufficient shelves to accommodate the existing and the incoming stock from their health care financing (revolving drug fund) for proper management of pharmaceuticals in the store.
- ❖ Health facilities must separate flammable chemicals from other pharmaceutical products in adequately separated area to reduce the risk of a fire's spreading to the main store.
- ❖ Regular trainings should be given to store managers on integrated pharmaceutical logistics system.

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**Annex I : Research Consent Form**

Research Topic: Pharmaceutical store management practice in public health facilities

Dear Sir/ madam;

“Good day”. My name is Yehun Telila . I am Master’s Degree student of Logistics and Supply Chain Management program in School of Commerce, Addis Ababa University. As part of our academic requirements, we are expected to conduct assessment of Pharmaceutical store management practice in public health facilities. The information that we will obtain from you is very useful for FMOH, PFSA, RHB’s and policy makers in the area of supply chain. I assure you that the information that you will give us will be kept confidentially. There is no any harm to you by giving this information except the time you will spend for the response of the question. This will take about 15-20 minutes and you have full right to participate or to refuse or to withdraw in the meantime.

Are you willing to participate to fill this questionnaire?

Yes \_\_\_\_\_ signature (continue) \_\_\_\_\_ no \_\_\_\_\_ (stop)

Thank you for your cooperation!!!

**Annex II: Questionnaire**

Research Topic: Pharmaceutical store management practice in public health facilities

Individual questionnaire each question is provided with a box or a dotted line. Encircle the appropriate response code or write on the space provided.

**Section I : Facility Identification and Profession**

Date: ...../...../.....

- 1.1 Name of health facility .....
- 1.2. Region .....
- 1.3. Zone.....
- 1.4. Woreda.....
- 1.5. Position of respondent.....

1.6. Gender

- A. Male
- B. Female

1.7. Educational status

- A. Diploma
- B. Degree
- C. Above degree

1.8. Profession

- A. Pharmacy professional
- B. Non pharmacy professional
- C. If you choose no 2, specify what professional you are.....

1.9. Type of facility

- A. Health Center
- B. Hospital

1.10. Number of years the respondent has been at this facility

- A. Less than 2 years
- B. Between 2-5 years

C. More than 5 years

1.11. Did you receive integrated pharmaceutical logistics system training?

A. Yes

B. No

1.12. How long have you been since you took the training?

A. Less than two years

B. More than two years

1.13. If you didn't take the training. How did you know about proper store management?

A. Attended formal integrated pharmaceutical logistics system training

B. Briefed by

co workers

C. On my own

1.14. Is there a designated store manager for pharmaceuticals at this facility?

A. Yes

B. No

1.15. Do you work in other units other than your assigned responsibility?

A. Yes

B. No

## **SECTION II: Facility and storage conditions of pharmaceuticals**

2.1 Do Pharmaceuticals are arranged so that identification labels, expiry dates and/or manufacturing dates are visible.

A. Yes

B. No

2.2 Do Pharmaceuticals are stored & organized in a manner which facilitates use of First-to-expire, first-out (FEFO).

A. Yes

B. No

2.3 Do cartons and Pharmaceuticals are stored in a good condition, not crushed due to mishandling; if cartons are open determine if the products are not wet or cracked due to heat or radiation e.g. fluorescent lights in the case of condom cartons right-side up for Depo-Provera<sup>®</sup>?

A. Yes

B. No

2.4 Do unwanted items (damaged or expired drugs, non-pharmaceutical items, etc.) in the store room separated from the usable stock?

A. Yes

B. No

if not why not? \_\_\_\_\_

2.5 Do Pharmaceuticals are protected from direct sunlight and high heat at all times of the day/during all seasons?

A. Yes

B. No

2.6 Is the Storage area visually free from harmful insects and rodents? (Check the storage area for traces of bats and/or rodents [droppings or insects].)?

A. Yes

B. No

2.7 Is the storeroom maintained in good condition (clean, all trash removed, sturdy shelves, organized boxes).

A. Yes

B. No

2.8 Does the store sufficient enough to accommodate the existing pharmaceuticals?

A. Yes

B. No

2.8 What is the size of store? width .....length ..... height .....

2. 10 How many store rooms found in your health center/hospital?

A. One

B. Two

C. Three

D. Four

E. Other (specify) -----

2.11. Does your store room have Placement of door /window/ grills or Iron bars for Security?

A. Yes

B. No

2.12. Do you follow manufacturer's instruction or WHO (World Health Organization) guide line for appropriate storage Pharmaceuticals or items?

A. Yes

B. No



D. Other (specify) -----

3.2. Do all shelves properly labeled

A. Yes

B. No

3.3 Do bulky packages placed on pallets?

A. Yes

B. No

3.4 Does store have sufficient space for movement of pharmaceuticals?

A. Yes

B. No

3.5. Are Products stacked at least 10 cm off the floor.

A. Yes

B.No

3.6. Are Products a stacked at least 30 cm away from the walls and other stacks.

A. Yes

B. No

3.7. Products are stacked no more than 2.5 meters high

A. Yes

B. No

3.8 Are the following equipments available in the store?

A. Sufficient wooden pallets

A. Yes

B. No

B Bin dust

A. Yes

B. No

C Trolley

A. Yes

B. No

D Cold boxes

A. Yes

B. No

E Refrigerator

A. Yes

B. No

F Wall thermometer

A. Yes

B.No

G Fire extinguisher

A. Yes

B.No

H Ladder

A. Yes

B.No

I Office Table and Chair

A. Yes

B.No

J Lockable cabinet A.AYes B.No

K Sufficient shelves A.Yes B.No

3.9 Did you receive Supervisions from PFSA, or from RHB, or from ZHD, or from WoHO, or from Partners in the field?

A.Yes B. No

3.10 Does your facility receive feedbacks from WoHO's, ZHD's or PFSA?

A. Yes B. No

#### **Section IV: Stock record and HCMIS Management**

4.1. Do you use bin card in the store?

A. Yes B. No

4.2 If your answer is yes to question number 4.1, do you update when you receive and issue?

A. Yes B. No

4.3 Does the physical count of the pharmaceuticals in the store match with balance found on the bin card

A. Yes B. No

4.4 Have you done annual inventory for pharmaceuticals? (Check documents)

A. Yes B. No C. I don't know

4.5 Do you use computerized pharmaceutical management system (HCMIS) in the store?

A. Yes B. No

4.6 For what functions do you use HCMIS?

- A. To trace stock level
- B. To determine consumption
- C. To trace expiry date

- D. To determine issue quantity
- E. To determine order quantity
- F. To receive order quantity
- G. To prepare reports
- H. Other (Specify) \_\_\_\_\_

**Section V: Handling of expired items and its disposal management**

5.1 Is the pharmacy unit responsible for managing the pharmaceuticals waste?

- A. Yes                      B. No                      C. I don't know

5.2 Is there any documented policy or guideline for pharmaceuticals waste management?

- A. Yes                      B. No                      C. I don't know

5.3 When did you dispose medicine wastes for the last time?

- A    less than 6 months ago    B    6 to 12 months ago    C. more than 12 months ago  
D. I don't know

5.4 Is the disposal of pharmaceuticals documented?

- A. Yes                      B. No                      C. I don't know

5.5 Are there written guidelines for pharmaceuticals storing practices?

- A. Yes                      B. No                      C. I don't know

5.6 What factors in your facility do you think contribute to poor pharmaceuticals store management practice?

(Tick all that apply)

A. Educational status

B. Commitment of staff

C. Multiple responsibilities

D. Inadequate pharmacy personnel in the HF.

E. Weak ownership by facility management

F. No IPLS trained personnel in the facility

G. Inadequate IPLS related Supervisions and feedback.

H. Reporting system (Whether HF's are Reporting directly or not)

I. Other (specify)\_\_\_\_\_

5.6 What type of problems do you typically encountered with the storage Pharmaceuticals commodities?

Please list some of them

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### Annex III: Observation Check lists and formats

#### Stock Status

**Readiness** : Be sure you have access to the (1) usable and (2) expired Pharmaceuticals, (3) Bin cards (4) The store personnel

Column:

1. Check if the bin card is available, answer Y for yes or N for no.
2. Check if the bin card had been updated within the last 15 days, answer Y for yes or N for no.  
Note: If the bin card was last updated with the balance of 0 and the facility has not received any resupply, consider the bin card up-to-date.
3. Record the balance on the bin card traceable
4. Physical count for traceable Pharmaceuticals
5. look at eHCMIS updated during issuing, receiving items

Table 1: storage and storage conditions

S.N	Description	Yes	No
1	Pharmaceuticals are arranged so that identification labels, expiry dates and/or manufacturing dates are visible.		
2	Pharmaceuticals are stored & organized in a manner which facilitates use of First-to-expire, first-out (FEFO).		
3	Cartons and products are in good condition, not crushed due to mishandling		
4	unwanted items (damaged or expired drugs, non-pharmaceutical items, etc.) in the store room separated from the usable stock		
5	Pharmaceuticals are protected from direct sunlight		
6	Storage area visually free from harmful insects and rodents		
7	the store sufficient enough to accommodate the existing pharmaceuticals		
8	store room have Placement of door /window/ grills or Iron bars for Security		
9	flammable chemicals stored in a specialized or in separate area		
10	Fire safety equipment is accessible		
11	Fire safety equipment is accessible (any item identified as being used to promote fire safety should be considered).		

S,no	Check the Availability of equipment	Yes	No
1	Sufficient wooden pallets		
2	Bin dust		
3	Trolley		
4	Cold boxes		
5	Refrigerator		
6	Wall thermometer		
7	Fire extinguisher		
8	Ladder		
9	Office Table and Chair		
10	Lockable cabinet		
11	Sufficient shelves		

**List of public Health Facilities found in North Shoa, Amhara Regional State**

Name of Woreda	Name of Health facilities	Randomly selected HF's
	Karakore HC	Karakore HC
	Alala HC	Ataye HC
	Ataye HC	Jewaha HC
<b>Efratana Gidem</b>	Jewaha HC	
	Meskel Ber HC	
	Ber Gibi HC	
	Majete HC	
	Abayatir HC	Abayatir HC
<b>Kewot</b>	Ayaber HC	
	Tere HC	
Shoa Robit	Shoa Robit HC	Shoa Robit HC
	Agamber HC	
<b>Tarmaber</b>	Armania HC	Armania HC
	Debre Sina HC	Debre Sina HC
	Mezezo HC	Tarmaber hospital
	Tarmaber hospital	
	Daniso HC	Daniso HC
	Gishoge HC	Mekoy
<b>Antsokiya Gemza</b>	Mekoy HC	
	Ambo Wuha HC	
	Gawuna HC	Sasit HC
<b>Mojana Wodera</b>	Sasit HC	Seladingay HC
	Seladingay HC	

	Dell HC	
<b>Gishe Woreda</b>	Feres Bet HC	
	Girar Amba HC	
	Rabel HC	
	Girar Amba	
	Arerti HC	
	Balchi HC	
<b>Minjar Shenkora</b>	Bolo HC	
	Dire HC	
	Kiristos Samra HC	
	Akrimit HC	
<b><u>Berehet</u></b>	Mekagno HC	
	Shega HC	
	Meteh Bila HC	
	Ayer Tena HC	Taken for pilot
	Debre Berhan HC	Taken for pilot
<b><u>Debre Berhan</u></b>		Taken for pilot
<b><u>Adm.town</u></b>	Tebase HC	
	<b><u>Debre Berhan Hospital</u></b>	Taken for pilot
	Giffit HC	Keyit HC
	Keyit HC	Bere Ager HC
<b>Basonaweran</b>	Bere Ager HC	
	Goshebado HC	
	Chacha HC	
<b>Angolelatera</b>	Kotu HC	

	Tengego HC	Tsigereda HC
	Tsigereda HC	
	Bash HC	Molale HC
<b>Menz Mama</b>	Kolo Margefiya HC	Yigem HC
	Molale HC	
	Yigem HC	
	Alem Ketema HC	
	Fetra HC	Fetra HC
	Gavezemogn HC	Zeyita HC
<b>Merhabet</b>	Kolash HC	Enat hospital
	Zeyita HC	
	<b>Enat hospital</b>	
	Gorebela HC	Gorebela HC
	Derefo HC	Aliyu Amba HC
	Gorgo HC	
<b>Ankober</b>	Haramba HC	
	Mescha HC	
	Aliyu Amba HC	
	<b>Kubit HC</b>	
<b>Menz Lalo</b>	Wegere HC	Wegere HC
	Bulga HC	
	Koremash HC	Bulga HC

<b>Hagere Mariam</b>	Sokoro HC	Sokoro HC
	Gorfo HC	
	Ashen HC	Mehal Meda hospital
<b>Menz Gera</b>	Wejed HC	Mehal Meda HC
	Mehal Meda HC	Tsehay Sina HC
	Tsehay Sina HC	
	Mehal Meda hospital	
	Deneba HC	
	Siyadebir HC	Wayu HC
<b>Siyadebirnawayu</b>	Wayu HC	Deneba Hospital
	Deneba hospital	
	Kera Mejet HC	
	Meragna HC	Meragna HC
<b>Mida Woremo</b>	Rema HC	Rema HC
	Behera HC	Tegora HC
	Tegora HC	
	Lamgeno HC	Lemi HC
<b>Ensaro</b>	Lemi HC	Salayish HC
	Salayish HC	
	Tikur Dur HC	
	Enewari HC	

	Jihur HC	Enewari HC
	Keteb HC	Jihur HC
<b>Moretina Jiru</b>	Entera HC	
	Kolako HC	
	Zeret HC	
	Kimir Dingay HC	Kolako HC
<b>Menz Keya</b>	Zemero HC	Zemero HC
	Ginager HC	Ginager HC
<b>Asagirt</b>	Tamo HC	Tidesh HC
	Tidesh HC	