Assessment of Pharmaceutical Logistics System in Health Centers of Addis Ababa, Ethiopia

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List of Abbreviations

AAHB	Addis Ababa Health Bureau
AMX	Amoxacilline 500 mg capsule
BPR	Business Processes Reengineering
DACA	Drug Administration and Control Authority
DTC	Drug and Therapeutics Committee
ED	Essential Drug
EDL	Essential Drug List
FDRE	Federal Democratic Republic of Ethiopia
FMHACA	Food, Medicines and Healthcare Administration and Control Authority
FMOH	Federal Ministry of Health
HC	Health Center
HCMIS	Health Commodity Management Information System
HPR	House of Peoples' Representatives
HSDP	Health Sector Development Plan
IFRR	Internal Facility Report and Resupply Form
KI	Key Informant
LIAT	Logistics Indicator Assessment Tools
LMIS	Logistics Management Information System
MBZ	Mebendazole 100mg tablet
MOH	Ministry of Health
MSH	Management Science for Health
NPD	Non-program drugs
NPTD	Non-program tracer drug
ORS	Oral Rehydration Salt
PCM	Paracetamol 500mg tablet
PFSA	Pharmaceutical Fund and Supply Agency
PLMP	Pharmaceutical Logistic Master Plan
PTD	Program Tracer Drug
RRF	Report and Requisition Form

TD	Tracer Drug
TTEO	Tetracycline Eye Ointment 1%
WHO	World Health organization

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Abstract

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In Ethiopia, majority of the common leading causes of morbidity and mortality can be substantially reduced if essential drugs (EDs) are made available and appropriately used, where functioning of the pharmaceutical logistics system is necessary. Thus, tracking changes and improvements of the pharmaceutical logistics performance is important. The aim of this study was to assess the pharmaceutical logistics system of health centers (HCs) in Addis Ababa giving emphasis to non-program drugs (NPDs). A facility based descriptive cross sectional survey of the pharmacy of HCs in Addis Ababa was conducted using both quantitative and qualitative methods. Twenty four HCs were included in the study. Most 23(95.8%) of the HCs had their own Essential Drug List (EDL). All HCs determined their own NPDs resupply quantity, majority of them using standard formula. On average, only 47.52% of the HCs received the full quantity of NPTDs they ordered. It was the responsibility of all HCs to collect NPDs from Pharmaceutical Fund and Supply Agency (PFSA); majority 13(54%) of them using renting private vehicles. The availability of either of non-program tracer drugs (NPTDs) or tracer drugs from program source was 85.4%. Adequacy storage condition was 71.8%. Majority of the NPTDs had bin cards, and the accuracy in keeping stock records was < 10% for majority of NPTDs. Most 21(87.5%) of the HCs used computer system to manage NPDs. In 12 out of 22 HCs, not all personnel involved in handling of medicines waste were aware of the potential risks of hazardous medicines and 11(45.8%) of the HCs usually stored medicine wastes for 6 to 12 months. From the in-depth interview, all key informants (KIs) agreed that the strength of DTC determined the practice of selection. All the KIs related facilitators and barriers of forecasting and procurement with the services at PFSA. All KIs agreed that budget was determinant on availability of NPDs while the limited capacity of PFSA reported to contribute for the stock outs in HCs. Store

size was identified by all KIs as a facilitator and barrier for storage condition when it is large and small, respectively. The Health Commodity Management Information System was a major input for the Logistics Management Information System according to majority of the KIs. In conclusion, there was no major problem common to all HC's regarding drug selection. Inadequate supply of NPDs at PFSA was a major obstacle for the overall logistics system. Transportation of NPDs and infrastructures related to medicine waste management were not adequate, Therefore, PFSA should enhance its capacity in all aspects. HCs' management should support HCs' pharmacy, and stakeholders should construct standard stores and medicine waste disposal sites.

Key words: pharmaceutical logistics, non-program drugs, pharmaceutical storage, logistic management information system, medicine waste, LIAT

1. Introduction

Health is an important indicator of the status of development of a society and country, and medicines are the cornerstone and integral part of every health care system (Hertzman, 2001). That is why efforts began to ensure medicines widespread availability began within a decade after the first modern medicines became available (MSH, 2011). Modern health care is unthinkable without the availability of necessary medicines. They not only save lives and promote health, but prevent epidemics and diseases too. During the Alma-Ata conference in September 1978, the availability and accessibility of essential medicines were reaffirmed as basic components of primary health care (WHO, 1978). Accessibility to medicines is too the fundamental right of every person, and its effectiveness is substantially affected by the functioning of logistics system (Kar et al., 2010; John Snow Inc./DELIVER, 2004). Accordingly, in Ethiopia, the pharmaceutical logistics system performs under the concept “No Product, No Program” (FMOH, 2009).

As defined by the Council of Supply Chain Management Professionals: “logistics is the process of planning, implementing, and controlling procedures for the efficient and effective transportation and storage of goods including services, and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements” (Vitasek, 2013). Pharmaceutical logistics system typically includes a number of activities such as selection, forecasting, procurement, inventory management, and serving customers that supports the six rights - the right goods in the right quantities and in the right condition delivered to the right place at the right time at the right cost (John Snow Inc./DELIVER, 2004).

In any logistics system, products must be selected. In the health sector, no health care system can afford to supply all drugs that are available on the market (WHO, 2001). Selection of medicines ensures that available financial resources are used wisely provide a limited list of drugs and dosage forms that are appropriate to the health problems of a country or community. Selection of medicines involves reviewing the prevalent health problems, identifying treatments of choice, choosing individual medicines and dosage forms, and deciding which medicines will be available at each level of a health care

system (MSH, 2011). In Ethiopia, the drug policy ensures that medicines which are required for prevention, diagnosis, treatment, mitigation and rehabilitation of diseases affecting the majority of Ethiopian people have to be identified and classified to respective levels of health service delivery (MOH, 1993).

After products are selected, the quantity required of each product must be determined and procured. Quantification is the process used to determine how much a product is required for the purpose of procurement. In addition to estimating the quantities needed of medicines, quantification should estimate the financial requirements to purchase the medicines. Quantification must include contextual factors, such as available funds, storage capacity, capacity to deliver services, and human resources (MSH, 2011). In this paper the terms quantification and forecasting are used interchangeably. The next step after quantification is procurement which seeks to ensure the availability of the right medicines in the right quantities, at reasonable prices, and at recognized standards of quality (MSH, 2011).

After a 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 (MSH, 2011).

The logistics information is the motor that drives the pharmaceutical logistics. Information has to be gathered and analyzed about each activity in the cycle to coordinate subsequent actions. Thus, there is a need to manage the information system for other activities of the logistics to function properly. Logistics management information system (LMIS) is the collection, processing and utilization of logistics information for decision-making (John Snow Inc./DELIVER, 2004).

The other very important issue regarding management of pharmaceuticals is management of medicine wastes. Pharmaceuticals designed for humans often become unfit to use for a

variety of reasons, ranging from a physical damage of packaging to expiration. These unfit to use accumulated pharmaceuticals represent sub-optimal delivery of health care and the potential for environmentally unsound disposal, which can pose exposure risks for humans and animals (Ruhoy & Dauhgton, 2007).

This study will try to fill the paucity of data on the status, barriers and facilitators of the pharmaceutical logistics system particularly that of non-program drugs (NPDs) in HCs of Addis Ababa.

2. Statement of the Problem

Pharmaceuticals represent a large portion of the costs in the healthcare system. They account for 20–60% of health spending in developing and transitional countries (Cameron et al., 2009). More than that, shortages of essential medicines, and spending on unnecessary or low-quality medicines also have a high cost - wasted resources and preventable illness and death (Islam, 2007). Poor availability of EDs is the key barrier to access to medicine especially in public sector where generic medicines availability is less than 60% across WHO regions, ranging from 32% in the Eastern Mediterranean Region to 58% in the European Region (WHO, 2011). In the poorest countries of Africa and Asia, as much as 50% of the population lacks such access. While some 10 million lives a year could be saved by improving access to essential medicines and vaccines – 4 million in Africa and South-East Asia alone (WHO/HAI, 2008).

In Ethiopia, majority of the common leading causes of morbidity (pneumonia, malaria, acute upper respiratory infections, helminithiasis, acute febrile illness, and diarrhea) and mortality (pneumonia, tuberculosis, malaria, neonatal sepsis and meningitis) can be substantially reduced if carefully selected, low-cost pharmaceuticals are available and appropriately used (FMHACA, 2010; FMOH, 2013). In this regard, efforts have been made to increase the accessibility of EDs such as increasing budget allocation by government and adoption of the pull system, but researches showed that availability EDs in public health facilities in various part of the country is still a challenge (Abiye et al., 2013; Carasso et al., 2009; FMOH, 2011; Nigussie, 2014). Availability of EDs is the construct of the components of the pharmaceutical logistics system (selection, quantification, procurement and distribution), and a failure in one part of the system leads to the failure of the whole pharmaceutical management process (MSH, 2011).

Lack of effective pharmaceutical logistics system not only affects the availability of EDs, 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).

As part of pharmaceutical management, medicine waste management has become a significant public health concern. Improperly disposed drugs contribute to the loading of pharmaceuticals and their metabolites to the environment potentially posing significant risk both on environment and human. For example, trace levels of ethinyl estradiol found in waterways has been shown to impair sexual development of aquatic animals, and the presence of antibiotics in waterways is associated with the presence of antibiotic resistant bacteria (Braund et al., 2009). 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 (MOHS, 2008).

As a capital city of Ethiopia, Addis Ababa houses many organizations that have stake with the pharmaceutical logistics including, the Central Pharmaceutical Fund and Supply Agency (PFSA), and around 130 pharmaceutical importers and wholesales (FMHACA, 2013). Moreover, many pharmacy and other health professionals, health facilities, and non-governmental organizations that work on the health sector are more concentrated in Addis Ababa than other part of the country (FMOH, 2013; Charities & Societies Agency, 2010). Hence, any problem in the pharmaceutical logistics in Addis Ababa has the probability of being manifested throughout the country.

In Ethiopia, studies on pharmaceutical logistics had been largely limited to program drugs such as contraceptives, anti-retroviral drugs, anti-tubercular drugs and anti-malarial drugs (Daniel et al., 2012; Mohammed, 2006; GH Tech, 2009). One research assessed the management of pharmaceuticals in Addis Ababa government hospitals as part of the whole quality of pharmaceutical care (Eshetu, 2010). The only research that can be mentioned for involving the pharmaceutical logistics assessment in HCs is the nation-wide survey made to assess the pharmaceutical sector 12 years ago (FMOH/WHO, 2003). Overall, studies dedicated to assess pharmaceutical logistics and medicine waste management in HCs in Addis Ababa are limited.

Bearing the aforementioned facts in mind, this study, therefore, aimed to assess the pharmaceutical logistics giving emphasis to NPDs in HCs found in Addis Ababa City Administration. This study envisages to provide an empirical snapshot of the current pharmaceutical logistics situation in HCs in Addis Ababa, and to provide baseline information to track changes and improvements in pharmaceutical logistics performance over time.

3. Literature Review

The pharmaceutical logistics system of a country is affected by the political, economic and social aspects of the country (MSH, 2011). This section discusses pharmaceutical logistics studies carried out in Sub-Saharan countries, and looks also at the literatures that guided this study.

3.1. Selection, Forecasting, and Procurement

The choice of essential medicines depends on many factors, such as the pattern of prevalent diseases, treatment facilities, the training and experience of available personnel, financial resources, and environmental factor (MSH, 2011). In health facilities found in Sub-Saharan countries where resources are scarce, wise selection of medicines most relevant to the health facility is indispensable. Spending the available scarce fund in duplicative and unnecessary drugs may lead to the stock-out of other essential medicines. For example, a study done in Tanzania showed that from 27 surveyed health facilities only 38% of them had EDL out of which only 52% of facilities procured medicines within the EDL (MOHSW, 2008).

The WHO recommends the selection of drugs to be based on a list of common conditions and complaints and the treatments of choice for these conditions and complaints as defined in standard treatment guidelines. In other words, EDL should constitute the drugs included in the standard treatment guidelines for a particular level of health care. EDL simplifies systems of procurement by guiding the procurement and supply of medicines in the public sector. Moreover, it leads to better supply of drugs, to more rational prescribing, and consequently to lower costs, to better quality of care, and to better health outcomes (WHO, 2003a).

Effective procurement is an important step in pharmaceutical logistics system. An effective procurement process seeks to ensure the availability of the right pharmaceuticals, in the right quantities, at reasonable prices, and recognized standards of quality (MSH, 2011). It is dependent on the routine availability of logistics data (e.g., rate of consumption and stock levels) and the capacity to select products and to forecast and quantify needs (Raja et al., 2006). In Tanzania, only 25% of the health facilities surveyed

conducted quantification on annual bases, and majority of them did not provide training on quantification to the staff (MOHSW, 2008).

There are numerous mechanisms by which health facilities manage their in-house procurement of pharmaceuticals ranging from open tender to direct procurement. They may procure pharmaceuticals by schedule or as needs arise. All these mechanisms have their own advantage and disadvantage in different situations. For example, a survey of health facilities in Tanzania revealed that the main method of procurement used by the facilities was direct procurement - the main supplier being the Medical Stores Department, a semi-autonomous unit under the Tanzanian ministry of health. The Medical Stores Department on other hand procures EDs through international competitive biddings (MOHSW, 2008). Public health facilities in Tanzania have also a possibility of procuring EDs from private sector. It was reported that only 33% of the health facilities purchased EDs exclusively from Medical Stores Department. The rest 67% purchased from the private wholesalers as well - mostly by direct procurement, and there was no official guidelines that guide the health facilities on how and when they are to procure form the private sector (MOHSW, 2008).

3.2. Availability of Essential Drugs

A well-organized pharmaceutical logistics system ensures the continuous availability of all pharmaceuticals that are required for patient care. At the same time, an effective pharmaceutical logistics system should be able to respond to sudden increases in drug demand, ensuring that adequate supplies are available to deal with any emergencies that arise (FMOH, 2010b). Stock availability is the ultimate measure of the other components of the logistics system and it also gives an idea of the overall effectiveness and efficiency of the system, from forecasting and procurement to distribution, storage and inventory management (John Snow Inc./DELIVER, 2004).

Measuring the availability of EDs at health facilities is one of the core components of the assessment of readiness of facilities to deliver quality services. The health facility assessments, however, employ a wide variety of tools and approaches to measure availability of EDs. For example, rapid assessments employ the reported availability by respondents without verification as a measurement of availability of EDs, while in-depth facility assessment methods validate the reported response by observing the medicines,

verifying the expiration dates and collecting further data on stock-out over an extended period. As a result, medicine availability estimates may vary across definitions, and need to be interpreted with careful consideration of the methods used (Choi & Ametepi, 2013).

Researches done in Sub-Saharan countries showed that availability of EDs has been improved, but still far from the WHO recommended target of 100% (WHO, 1993). In Ghana, the availability of key EDs selected for the country in public health facilities was 80%; and length of stock out duration 29.9 days (Ministry of Health of Ghana, 2009). In Tanzania, Uganda and Kenya, all of them East African countries, the availability of key EDs was 88.9%, 45.7% and 82.6%, respectively (MOHSW, 2008; Ministry of Health of Uganda, 2008; WHO, 2009).Though the availability of EDs seems high in the health facilities of Tanzania, the same facilities also presented a considerable number of stock-out days. Some medicines were out of stock for 4 months with the median number of stock-out 135.6 (MOHSW, 2008). In Uganda, the length of stock-out duration in public health facility pharmacy was 72.9 days (Ministry of Health of Uganda, 2008). A cross-sectional study conducted in health centers of Western Ethiopia showed that only 55.6% of the assessed drugs were available (Abiye et al., 2013).

3.3. Storage Conditions of Essential Drugs

EDs require specific 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 of stock, as well as attention to cleanliness, fire-prevention measures, and security within the store. A drug product must retain its properties within specified limits in order to be useful. When EDs are stored appropriately, clients can be assured that they will receive a high-quality product. The stability of a drug product depends on the active ingredient, which can be affected by its formulation and packaging. Inadequate storage and distribution can lead to physical deterioration and chemical decomposition, and reduced potency (MSH, 2011).

In Sub-Saharan countries like Uganda, and South Sudan, only 63.6% and 35% of the surveyed health facilities had adequate storage practices, respectively (Ministry of Health of Uganda, 2008; GhTech, 2011). In Kenya, adequacy of storage in public health facilities

was only 60% (WHO, 2009). A study done in Tanzania probably showed the situation of storage practice of pharmaceuticals in detail. The study revealed that most health facilities (71%) had a main storage place, but the storage space for forecasted quantities of medicines and medical supplies was inadequate and this was affirmed by 56% of facilities surveyed. The study reported that expired stocks did have a separate storage space in only 41% of the health facility pharmacies. As regards products requiring cold storage, only 52% of the health facilities had the equipment (MOHSW, 2008).

3.4. Pharmaceutical Logistics Management Information System

Pharmaceutical logistics data are collected, processed, and reported through LMIS, increasing the likelihood of an adequate supply of EDs. An effective LMIS may be manual or computerized collecting essential data about stock status and consumption. It ensures accountability, a reduction in supply imbalances (stock outs and overstocks), and efficient, cost-effective pharmaceutical logistics. Because a pharmaceutical logistics system cannot function effectively without timely, accurate LMIS data, the LMIS is an essential tool. It provides personnel responsible for pharmaceutical logistics with the information they need to react or, more important the information they need to anticipate demand (Shawkey & Hart, 2003).

To be effective, LIMS should be equipped with adequate trained staff, forms, equipments, and facilities. However, some studies showed that there is a problem in this regard (MOHSW, 2008; GH Tech, 2011).

LMIS is an important tool in inventory management, therefore accurate record keeping is essential. A study in Tanzania reported 8% and 72% recorded balance that was less and greater than the physical count (Kagashe & Massawe 2012). Another study done in Tanzania showed that often neither minimum nor maximum levels were defined (MOHSW, 2008).To the worst, in South Sudan, only 27% of the assessed health facilities were reported to fill forms accurately **(**GH Tech, 2011**).**

3.5. Medicine 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 (Sasu et al., 2011).

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 (Practice Green Health, 2008). Another survey made in South Sudan showed that only 19% of health facilities have pharmaceutical waste disposal equipment **(**GH Tech, 2011).

3.6. Pharmaceutical Logistics System in Ethiopia

The current Ethiopian health care system is guided by a National Health Policy which was issued in 1993 following changes of government in 1991 (MOH, 1993a). The policy was the first of its kind in the Ethiopia in a sense that it incorporates elements of democratization, decentralization, inter-sectoral collaboration, collaboration with neighboring countries, and promotion of the participation of the private sector in health care. The policy also calls for the promotion of occupational health and safety, environmental health and the extension of health services to pastoralists and other rural populations, the urban poor and victims of manmade and natural disasters (Kloos H. 1997).

In response to high burden of ill health and high rate of mortality in the country because of poor access to health services and complex health system, the Ethiopian government has sought to reform the health service system into a cost-effective and efficient system for past several years. Accordingly, a twenty-year health development implementation strategy, known as Health Sector Development Program (HSDP) with a series of five-year investment programs was launched in 1998 which is aligned with the wider frame works of Plan for Accelerated Development to End Poverty and Millennium Development Goals. Currently the country is implementing the fourth year of HSDP IV (FMOH, 2011).

Regarding the health delivery system, Ethiopia implemented a three-tier health service delivery system characterized by a first level of a Woreda/District health system comprising a health center (40,000 population) in urban areas, and primary hospital (with population coverage of 60,000-100,000 people), health centers (1/15,000-25,000 population) and their satellite health posts (1/3,000-5,000 population) in rural areas that are connected to each other by a referral system. A primary hospital, health center and health posts form a primary health care unit with each health center having five satellite health posts. The second level in the tier is a General Hospital with population coverage of 1-1.5 million people; and the third a Specialized Hospital that covers population of 3.5-5 million (FMOH, 2011).

As part of the health care reform, Business Process Reengineering (BPR) was employed in Ethiopian Fiscal Year 2001 with key principle of bringing a significant improvement in the quality of health services through the institutionalization of accountability and transparency. One mechanism of achieving this was to seriously consider the separation of purchaser, provider and regulator in the health system (FMOH, 2011). As part of this important endeavor, the former Drug Administration and Control Authority (DACA) has undergone an institutional transformation to a new agency called Food, Medicine and Health Care Administration and Control Authority (FMHACA). The mandate of the new agency is to undertake inspection and quality control of health and health related products; premises, professionals and health delivery processes in an integrated manner (HPR of FDRE, 2010).

The National Drug Policy of 1993 which is part and parcel of the health policy has served as an umbrella for pharmaceutical services in Ethiopia (MOH, 1993). Since the start of HSDP I, the government of Ethiopia was committed to ensuring community's access to the essential medicines that are safe, effective and of assured quality including rational drug prescription and use. Moreover, since HSDP III a number of reforms have been employed that have significant impact on quality of pharmaceutical service.

One of the reforms is the Pharmaceutical Logistics Master Plan (PLMP) which was introduced in 2009 with the aim of ensuring the uninterrupted supply of essential, quality and cost-effective pharmaceuticals at all health facilities (FMOH, 2009). To achieve this, the Pharmaceutical Fund and Supply Agency (PFSA) was created with mandates: to

supply the entire country with both Program and Essential pharmaceuticals, as well as serve as the distribution entity for vaccines, other health facility supplies, and laboratory equipment (The World Bank, 2009). So as to execute its mandate in the area of pharmaceuticals supply in an efficient and effective manner, PFSA developed the integrated pharmaceuticals logistics system that integrates the drug requisition, distribution, and reporting of eessential pharmaceuticals that used to be managed vertically into a single mechanism (FMOH, 2009).

PFSA's objectives include:

- *Improve availability of program and non program pharmaceuticals nationwide from 55% to 100%*
- *Reduce wastage rate from 8% to less than 2%*
- *Reduce cycle time (forecasting, procurement, storage and delivery to public health facilities) from 491 days to 165 days on average*
- *Establish a quality complaint system and ensure rational use of pharmaceuticals*
- *Improve customer satisfaction in terms of availability and quality of service at public health facilities from 51% to 100%*

The end goal is for PFSA to be the sole distributor of health-related materials to all public facilities within the country (The World Bank, 2009).

In 2009, the USAID aided DELIVER project introduced an automated health commodity management information system (HCMIS) that can significantly improve health facilities' ability to manage supplies in their stores. The HCMIS is a locally-developed, user-friendly software package that helps health facilities manages all EDs, as well as medical and laboratory supplies. The HCMIS automatically receives and issues reports and orders, manages inventory, and produces a variety of commodity reports for store managers, pharmacists, and facility heads. Since the program began, the project has implemented the system in 205 selected health facilities throughout Ethiopia as of 2011 (John Snow Inc./DELIVER, 2011).

Moreover National Minimum Standards for Health Centers were also developed in order to protect the public from sub-standard services and promote quality of health service.

The standard includes minimum standards for pharmaceutical services which include standards for medicine and supply management, and medicine waste management (FMHACA, 2011a).

Over the past few years, pharmaceutical waste management has received more attention in Ethiopia. Accordingly, FMHACA developed a directive on medicines waste management and disposal in 2011 in order to ensure safe pharmaceutical waste management and disposal practice, and hence to protect the public and the environment from health risks and hazards of pharmaceutical waste (FMHACA, 2011b).

4. Objectives

4.1. General Objective

To assess the pharmaceutical logistics system in HCs of Addis Ababa giving emphasis to NPDs

4.2. Specific Objectives

- To assess the selection, forecasting, and procurement of NPDs
- To assess availability of NPDs
- To evaluate the storage conditions
- To assess the logistics management information system of NPDs
- To evaluate the medicine waste management
- To explore facilitators and barriers of the pharmaceutical logistics of NPDs

5. Methodology

5.1. Study Area and Setting

Addis Ababa City, the capital city of Ethiopia covers an area of 540 km^2 with a total population of 3 Million. It is administratively sub-divided into 10 sub-cities (City Government of Addis Ababa, 2012). According to 2012 health and health related indicator there are 11 public hospitals, 37 private and NGO hospitals, and 50 HCs, while 25 more HCs are under construction. One hundred eighty nine pharmacies and 232 drug stores are also in the city. One hundred twenty two pharmacists and 160 pharmacy technicians work in public sectors in Addis Ababa (FMOH, 2013).

This study was conducted from July 11 to October 20, 2013 in HCs in Addis Ababa. HC is a facility at primary level of the healthcare with population coverage of 15,000-25,000 (FMOH, 2011). HCs provide promotive, preventive, curative and rehabilitative outpatient care including basic laboratory and pharmacy services with the capacity of 10 beds for emergency and delivery services (FMHACA, 2011).

5.2. Study Design

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

5.3. Study Sites

All “old” HCs in Addis Ababa which had around 10 or more years of service experience were included in the study. “New” HCs which started functioning in 2010 and beyond might not have well developed pharmaceutical logistics system compared to the “old” HCs, and hence not included in the study.

5.4. Selection of Study Subjects and Participants

All the “old” HCs in Addis Ababa were selected. Tracer drugs (TDs) were selected from the list of TDs for HCs in Addis Ababa, developed by Addis Ababa Health Bureau (AAHB). The TDs used in this study included 5 items out of 11 items in the list. The remaining 6 items were not included because they were program drugs. The TDs are representatives of therapeutic categories used to treat diseases important in the health care system that should be expected to be available all times at HC level in Addis Ababa. Bin

cards, receiving voucher (model 19) and ordering forms used for managing the TDs were selected.

All pharmacy heads and store keepers in the selected HCs were selected to participate in the quantitative survey made using researcher administered-structured questionnaire. The pharmacy heads from each HC were selected also for the in-depth interviews. The pharmacy heads were selected for the in-depth interview because they are expected to be in charge of the overall activities of pharmaceutical logistics and hence able to provide the needed information.

5.5. Data Collection

Quantitative data was collected by 2 data-collectors who were 4th year completed pharmacy students using researcher administered-structured questionnaire, document review and structured observation methods. The structured questionnaires were two types one for the storekeepers who were interviewed by the data collectors and the other for pharmacy heads who were interviewed by the principal investigator. To explore the facilitators and barriers of the pharmaceutical logistics system, in-depth interview with the pharmacy heads of each of the HCs was conducted by the principal investigator along with a structured questionnaire.

5.6. Data Collection Instruments

A structured questionnaire adapted from Logistics Indicator Assessment Tool (LIAT) was used to collect quantitative data (see Annexes). 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).

The structured questionnaire for storekeepers contained questions on availability of NPDs and LMIS whereas the structured questionnaire for the pharmacy heads contained questions on selection, forecasting and procurement of NPDs and medicine waste management.

On top of the information that were 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. LMIS tools used to manage NPDs in the HCs were also reviewed using LIAT data abstraction format.

National standards such as the National Minimum Standard for Health Center, the Standard for Pharmaceutical Store and Good Storage Practice, and the Medicines Waste Management and Disposal Directive were used in the preparation and adaptation of quantitative data collection tools (FMHACA, 2011a; DACA, 1998; FMHACA, 2011b). Interview guide was prepared for the in-depth interview and a digital voice recorder was used to record the in-depth interviews.

5.7. Data Quality Assurance

Before embarking upon data collection, pretest of the prepared questionnaires, data abstraction forms and checklist was performed in two HCs; one of which was a "new" HC in Addis Ababa and the other was an "old" HC in Burayu which were not included in the study, to insure the validity of the survey tools. The principal investigator supervised the data collection process and review completed questionnaires to clarify any data inconsistencies. Responses of interviews were verified by looking to what was really on the ground at the HCs as applicable. The data collectors were trained on the data collection instruments and processes for a session of half day.

5.8. Data Analysis and Presentation

The quantitative data was entered and analyzed using SPSS version 20 and Microsoft Excel 2007 and the result are presented in the form of tables and graphs. For the qualitative part, data was analyzed using a thematic analysis approach. The records were listened several times and transcribed from the voice recorder. The findings were grouped according to key themes; and positions that emerged under each key theme were identified. Each of the different positions was summarized and the extent to which each position held by participants was assessed. Then, the verbatim phrases that represent each position were pulled out. Finally, the findings are presented by narration.

5.9. Operational Definitions

- **Non-program drugs**: Drugs that exclude program drugs such as anti-malarial drugs, antiretroviral drugs, family planning drugs, and TB-drugs, as well as laboratory reagents, medical supplies and equipments

- **Medicine wastes**: unfit to use drugs generated in the pharmacy premises of the health facilities, but not to medical equipments, and other health care wastes generated by the health facilities
- **Stock out:** unavailability of usable stocks in the store or a balance of zero on the bin cards at store.

5.10. Ethical Considerations

Before commencing data collection, ethical approval was obtained from the Ethics Review Committee of the School of Pharmacy, Addis Ababa University. Then, the selected HCs were communicated with formal letters from the School of Pharmacy, Addis Ababa University. The study was conducted in the selected HCs after permission from the medical directors of respective HCs was obtained. Participants of the study were asked for consent before participating in the study. During the consent process, they were provided with information regarding the purpose of the study, why and how they were selected to be involved in the study, and what was expected of them and that they can withdraw from the study at anytime. Participants were also assured about confidentiality of the information obtained in the course of the study by not using personal identifiers and analyzing the data in aggregates. Concerning the in-depth interviews, interviews were recorded on digital voice recorder after interviewees gave informed consent. The name of the interviewees and the HC in which they work were not appear in data analysis, and interviewees were assured that the information they provide was only to be handled by the research team, and that it was not be discussed with the HC administrators or other participants of the study.

6. Results

All (n=24) "old" HCs were included in this study. The pharmacy heads worked on average for 2.6 years in pharmacy head position whereas the store keepers worked on average for 1.4 years on store keeper position.

6.1. Selection, Forecasting and Procurement of NPDs

As shown in table 1, most 23(95.8%) of the HCs had their own EDL of which 21(91.3%) of them selected the drugs by Drug and Therapeutics Committee (DTC). Most of them reported also practicing VEN analysis 22(91.7%), and purchase by generic name 24(100%). However, documented policy or guidelines for selection, forecasting, and procurement were available only in 9(37.5%), 6(25%), and 9 (37.5%) of HCs, respectively.

Table 1. Selection, forecasting and procurement practice in HC, Addis Ababa, 2013

Practices	No. of responses (n)	Frequency [Yes] N(%)
Documented policy or guideline for drug selection	24	9(37.5)
The health center has its own EDL	24	23(95.8)
Selection of drugs made by DTC	23	21(91.3)
Documented policy or guideline for NPD forecasting	24	6(25.0)
Documented policy or guideline for procurement of NPDs	24	9(37.5)
VEN analysis	24	22(91.7)
ABC analysis	24	13(54.2)
Purchase NPDs from private suppliers	24	22(91.7)
Procurement limited to the EDL	24	20(83.3)
Procurement made by generic name	24	24(100.0)

In preparing the EDL, pattern of prevalent disease was a criterion for selection in all the HCs 23(100%), only 9(39.1%) of them use preference for well-known (familiar) drugs as a criterion (Figure 1).

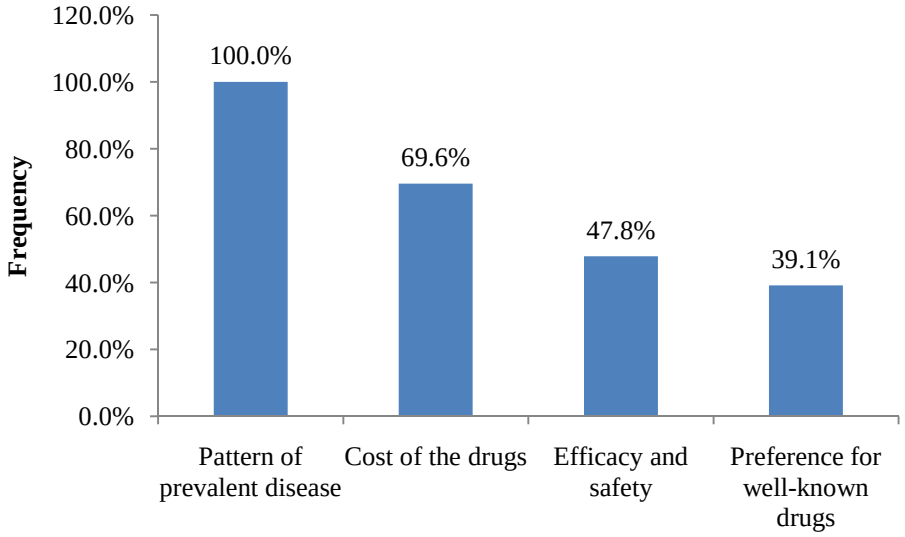

Figure 1. Criteria for selection of drugs in HCs, Addis Ababa, 2013 [n=23]

Most 17 (73.9%) of the HCs update their EDL annually whereas 3 (13.0%) of them never updated (Fig 2).

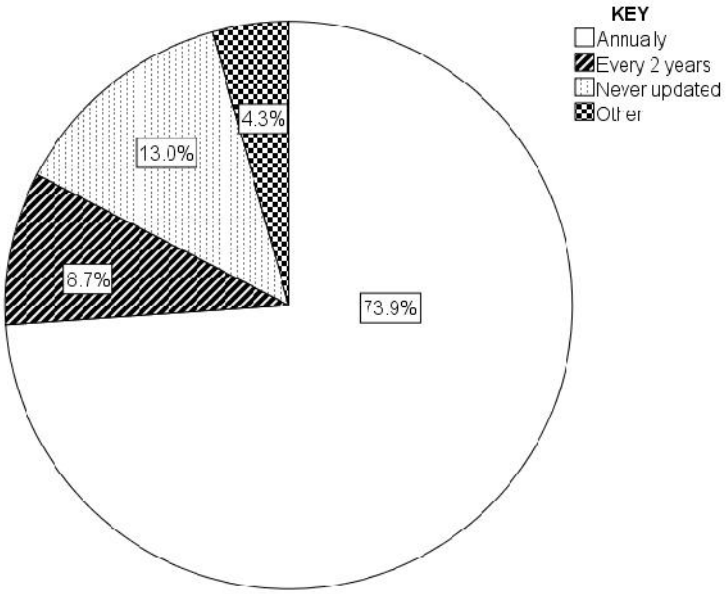

Figure 2. Period EDL updated in HCs, Addis Ababa, 2013 [n=23]

All 24 (100%) of the HCs reported to determine their own NPDs resupply quantity. Resupply quantity was determined by consumption method by all 24 (100%) of the HCs while 4(16.7%) of them used morbidity method as well. Majority 18(75%) of them determined the resupply quantity using a standard formula; the rest 6(25%) determined it

by guess. Majority 13(54.2%) of the HCs usually purchase NPDs on quarterly basis; whereas 7(29.2%) and 4(16.7%) of them usually purchase perpetually and bimonthly, respectively.

Regarding transportation, all HCs 24(100%) reported to collect NPDs from PFSA by themselves whereas private suppliers delivered for all HCs 22(100%). The type of transportation most often used to collect NPDs from PFSA by the majority 13(54%) of the HCs was private vehicle (rented cars) (Figure 3).

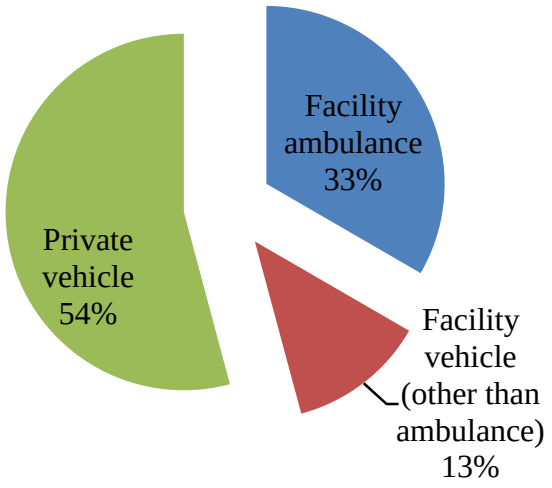

Figure 3. Type of transportation most often used for collecting NPDs from PFSA in HCs, Addis Ababa, 2013 [n=24]

Regarding lead time for NPDs, the approximate time between an order initiated and received from PFSA according to the respondents was 1 week to 2 weeks for the larger portion 10(41.7%) of the HCs. When purchased from private suppliers, the lead time for larger portion 10(45.5%) of HCs was between 2 weeks and 1 month (Figure 4).

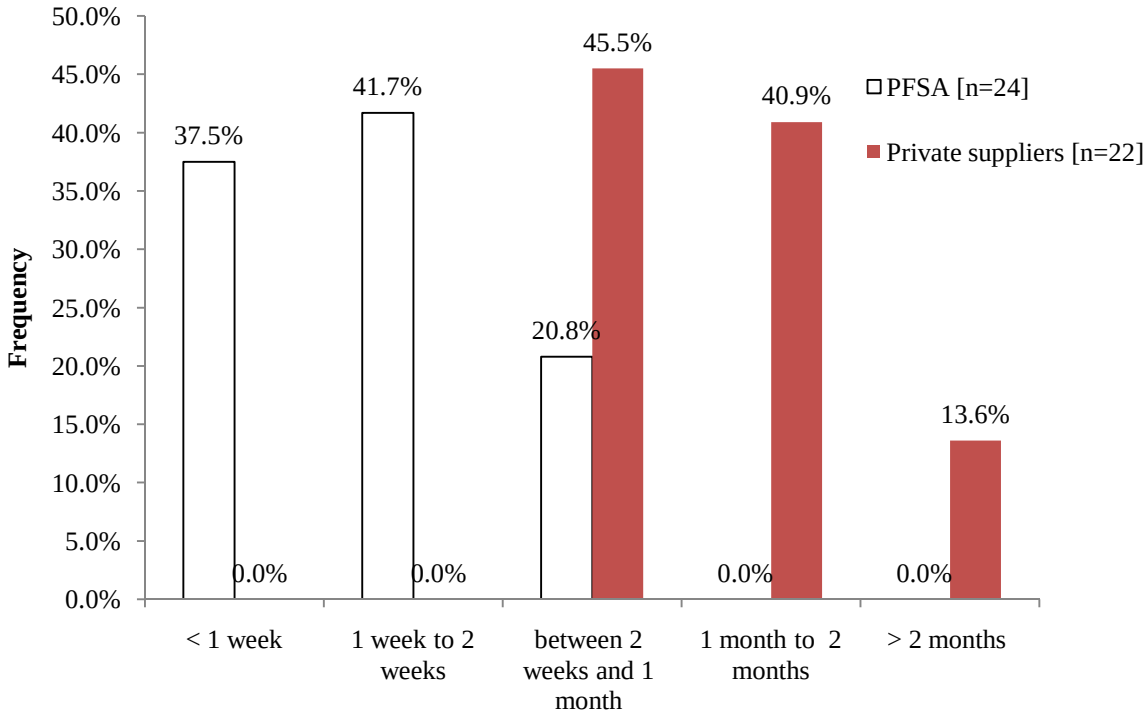

Figure 4. Lead time between ordering and receiving of NPDs from PFSA and private suppliers in HCs, Addis Ababa, 2013

Calculation of order fill rate showed that as much as a 95% reduction in the quantity ordered for TTEO (Table 2).

Table 2. Order fill rate* of NPTDs in HCs, Addis Ababa, 2013.

	n	Min.	Max.	Mean	S.D
AMX	21	-0.89	0.00	-0.16	0.31
ORS	19	-0.80	0.00	-0.18	0.29
MBZ	20	-0.85	0.00	-0.11	0.24
TTEO	12	-0.95	0.00	-0.43	0.37
PCM	11	-0.90	0.00	-0.15	0.34

* Order fill rate = (Quantity received-Quantity ordered)/Quantity ordered

As shown in table 3, the average percentage of HCs that receive the quantity of NPTDs ordered was 47.52%

Table 3. Percentage of HCs That Receive the Quantity of NPTDs Ordered, Addis Ababa, 2013

	n	N(%)
AMX	21	16(66.7)
ORS	19	13(54.2)
MBZ	20	15(62.5)
TTEO	12	4(16.7)
PCM	11	9(37.5)
Average		**47.52%**

6.2. Availability of NPDs

Availability of NPDs were assessed using different approaches such as NPDs that are reported to often stock out, frequency and duration of stock outs of TDs for a year and at the day of visit. Based on the store keepers response, majority 18(75.0%) of the HCs often stocked out some NPDs, while 9(37.5%) of the HCs often overstocked some NPDs (Figure 5).

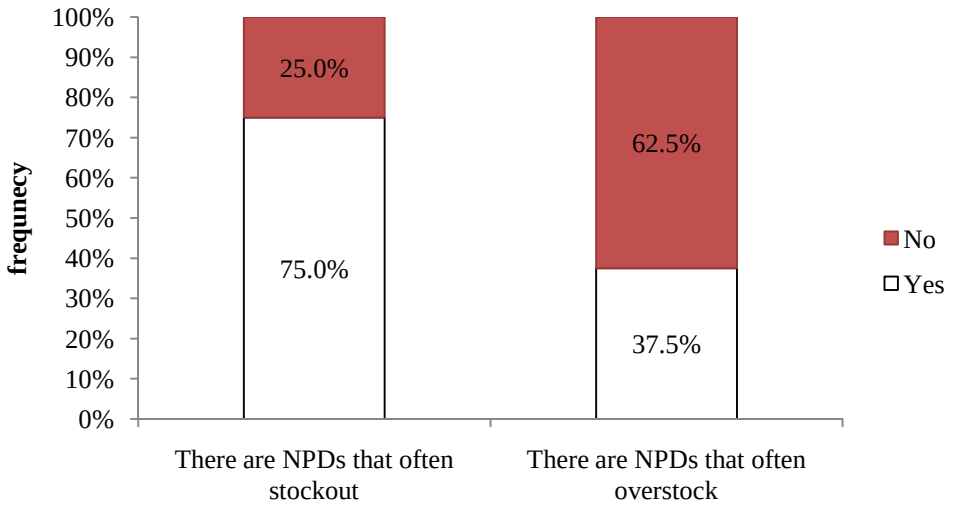

Figure 5. Percentage of HCs that reported to be often stock out and over stock NPDs, Addis Ababa, 2013 [n=24]

Overall, from the store keepers' response, there were 38 NPDs that are often stocked out; of these, 13 were reported to often stock out in 2 or more HCs (Figure 6). Twenty NPDs were reported to be often over stocked. Gentamycine injection and Procaine penicillin fortified injection were often over stocked in 2 or more HCs. AMX, ORS, and Ciprofloxacine 500mg tablet were reported to be often stocked out in some HCs and over stocked in other HCs.

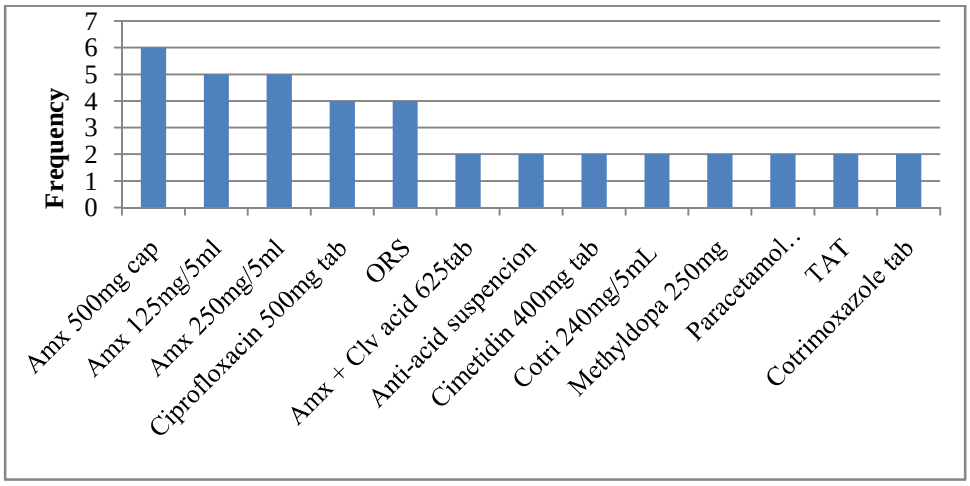

Figure 6. NPDs that often stock out in 2 or more HCs, Addis Ababa, 2013

Approaches used to assess frequency and duration of stock outs for a year and at the day of visit included assessment of TDs that received through programs (PTDs) assuming that the HCs might use PTDs for clients not using program services.

This study revealed that the availability of NPTDs and PTDs at the day of visit were 71.8% and 22.7%, respectively, while the availability of either of NPTDs or PTDs was 85.4%. Specifically, non-program and program TTEO were stocked out in 6(27.3%) of the HCs, while both non-program and program AMX was only stocked out in one HC at the day of visit. TTEO from non-program and Mebendazole 100mg tablet (MBZ) from program sources were stocked out in the majority 12(54.5%) and 21(95.5%) of the HCs, respectively (Table 4).

Table 4. TDs that were stocked out at the day of visit in HCs, Addis Ababa, 2013 [n=22]*

TDs	Non-program	Program	Both program & Non-program
	N (%)	N(%)	N (%)
AMX	2(9.1)	20(90.9)	1(4.5)
ORS	7(31.8)	20(90.9)	5(22.7)
MBZ	3(13.6)	21(95.5)	2(9.0)
TTEO	12(54.5)	14(63.6)	6(27.3)
PCM	7(31.8)	10(45.5)	2(9.0)

* Data from 2 HCs (the store was under construction in the 1st HC while the 2nd HC did not separately handle non-program and program drugs)

Stock out of non-program ORS was encountered in 14 out of 18 HCs (77.8%) whereas only in 2 out of 16 HCs (12.5%) stock out of non-program PCM encountered. On average, non-program MBZ and ORS were stocked out more than once (mean = 1.3, S.D =3.0; mean = 1.1, S.D=0.8, respectively). On average, non-program MBZ was stock out for longer period of time compared to the other NPTDs (mean=99.4, S.D=113.7) in the year. For majority of the HCs full data for PTDs were not available to measure stock outs (Table 5).

Table 5. Stock out of TDs in the last full 12 months in HCs, Addis Ababa, 2013

TDs	Non-program				Program			
		Stock out encountered [yes]	Frequency of stock outs	Stock out days		Stock out encountered [yes]	Frequency of stock outs	Stock out days
	n	N(%)	Mean (S.D)	Mean (S.D)	n	N(%)	Mean (S.D)	Mean (S.D)
AMX	20	7(35.0)	0.6(1.0)	17.1(34.5)	4	2(-)	0.5(0.6)	73.5 (101.4)
ORS	18	14(77.8)	1.1(0.8)	42.3(34.4)	4	3(-)	0.7(0.5)	169.0 (164.9)
MBZ	16	8(47.1)	1.3(3.0)	99.4(113.7)	1	0(-)	0	0
TTEO	14	9(64.3)	0.9(0.8)	75.5(116.9)	12	6(50.0%)	0.4(0.5)	18.8 (32.0)
PCM	16	2(12.5)	0.1(0.3)	7.2(20.2)	12	3(25%)	0.3(0.6)	26.3 (65.9)

Concerning expiration of drugs, expired TDs were not found in 14 out of 21 (60.9%) of the HCs. Expired drugs of 1 and 2 out of the 5 TDs were found in 5(21.7%) and 4 (17.4%) of the HCs.

6.3. Storage Conditions

Except for 1 HC whose store was under maintenance, the storage conditions of 23 HCs were assessed. 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 (Table 6).

Table 6. Storage condition of NPDs in HCs, Addis Ababa, 2013 [n=23]

No.	Description	Frequency [Yes](%)
Storage practice		
01.	Products are arranged systematically (pharmacological/ alphabetical).	18(78.3)
02.	Products are arranged so that identification labels are visible.	13(56.5)
03.	The products are stored and organized in a manner accessible for first-to-expire, first-out (FEFO) issuing.	16(69.6)
04.	Cartons and products are in good condition, not crushed due to mishandling.	15(65.2)
05.	Damaged and/or expired products/ TDs are separate from usable products.	19(82.6)
06.	Products are protected from direct sunlight.	21(91.3)
07.	Cartons and products are protected from water during all seasons.	18(78.3)
08.	Storage area is visually free from harmful insects and rodents.	16(69.6)
09.	Security devices (grilles for windows and doors made of glass, and lock and key) are in place	23(100)
10	Products that need cold temperature are stored in a functional refrigerator.	22(95.6)
11.	Storeroom is maintained in good condition (clean, all trash removed, strong shelves, organized boxes).	13(56.5)
12.	The current space and organization is sufficient for existing products and reasonable expansion (i.e., receipt of expected product deliveries for foreseeable future).	8(34.8)
13.	Products are stacked at least 10 cm off the floor.	16(69.6)
14.	Products are stacked at least 30 cm away from the walls and other stacks.	5(21.7)
15.	Products are stacked no more than 2.5 meters high.	18(78.3)
16.	Fire safety equipment is accessible.	8(34.8)
17.	Products are stored separately from insecticides and chemicals.	17(73.9)

Table 6: Continued . . .

Store equipments		
01.	Shelves	23(100)
02.	Pallets	19(82.6)
03.	Bin dust	21(91.3)
04.	Trolley	14(60.9)
05.	Cold boxes	15(65.2)
06.	Refrigerator	21(91.3)
07.	Wall thermometer	15(65.2)
08.	Fire extinguisher	8(34.8)
09.	Ladder	19(82.6)
10.	Table and Chair	23(100)

As shown in Table 7, none of the HCs met all the standard storage conditions; the maximum score was 25 out of 27. The mean score for adequate storage condition was 71.8%. The mean scores for availability of adequate storage practice and store equipments were 11.6 out of 17 and 7.7 out of 10, respectively.

Table 7. Score for adequacy of storage conditions in HCs, Addis Ababa, 2013 [n=23]

	Highest possible score	Min.	Max.	Mean score	SD
Storage Practice	17	6	16	11.6 (68.2%)	2.8
Store equipments	10	4	10	7.7(77.0%)	1.5
Storage conditions	27	13	25	19.4(71.8%)	3.2

6.4. Logistics Management Information System

Regarding the LMIS, 22 out of 24 HCs had documented policy or guideline for managing and using the LMIS. All the HCs reported to use bin cards in store and Internal Facility Report and Resupply Form (IFRR) while only 2(8.3%) of the HCs used Report and Requisition Form (RRF) to manage NPDs (Figure 7).

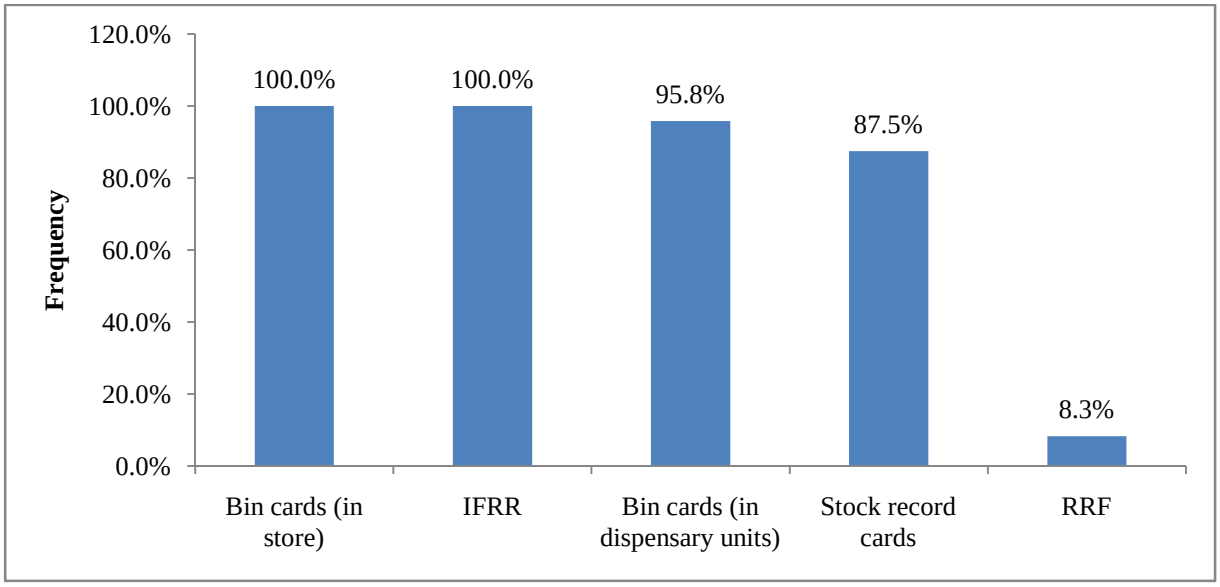

Figure 7. Types of logistics forms used to manage NPDs in HCs, Addis Ababa, 2013 [n=24]

All HCs prepared their own forms to order NPDs from suppliers, except 2 HCs that use RRF. In all HCs similar forms (IFRR) were used to request NPDs from HCs' pharmaceutical store. Receiving and issuing of NPDs also made with similar forms (government receiving voucher/model 19 and government issuing voucher/model 22, respectively).

Availability and up-to-dateness of bin cards, and accuracy of keeping logistics records was assessed for the NPTDs. Bin card was available for majority of NPTDs. On average, 84.5% of the NPTDs had bin cards of which 69.5% were updated (Table 8).

Table 8. Frequency of availability and up-to-dateness of bin cards for NPTDs in HCs, Addis Ababa, 2013

NPTDs	Bin card available [n=22]	Bin card updated	
	[Yes] N(%)	n	[Yes] N(%)
AMX	21(95.5)	21	17(80.9)
ORS	20(90.9)	20	14(70.0)
MBZ	19(86.4)	19	11(57.9)
TTEO	15(68.2)	15	10(66.7)
PCM	18(81.8)	18	13(72.2)
Average	**84.5%**		**69.5%**

Concerning the accuracy of keeping stock records, the mean discrepancy of AMX was 26% while the maximum was 270% (Table 9).

Table 9. Accuracy in keeping stock records* of NPTDs in HCs, Addis Ababa, 2013

	n	Min.,	Max.	Mean	S.D
AMX	20	0.0,	2.7	0.26	0.63
ORS	15	0.0	1.2	0.25	0.45
MBZ	18	0.0	0.3	0.07	0.11
TTEO	9	0.0	1.2	0.24	0.45
PCM	15	0.0	1.6	0.17	0.39

* Accuracy in keeping stock records = (|Bin card balance-physical inventory|)/Physical inventory

Regarding reporting of the stock status of NPDs, 20(83.3%) of the HCs sent reports to PFSA annually, all of them using similar form ("forecasting format") when requested by PFSA. In all 20 HCs that sent reports, quantity of NPDs consumed in the reporting period was reported while stock on hand, and loss and adjustments were not part of the report in all cases. Half 10(50.0%) of the HCs sent the report 6 months ago from the day of survey (Figure 8).

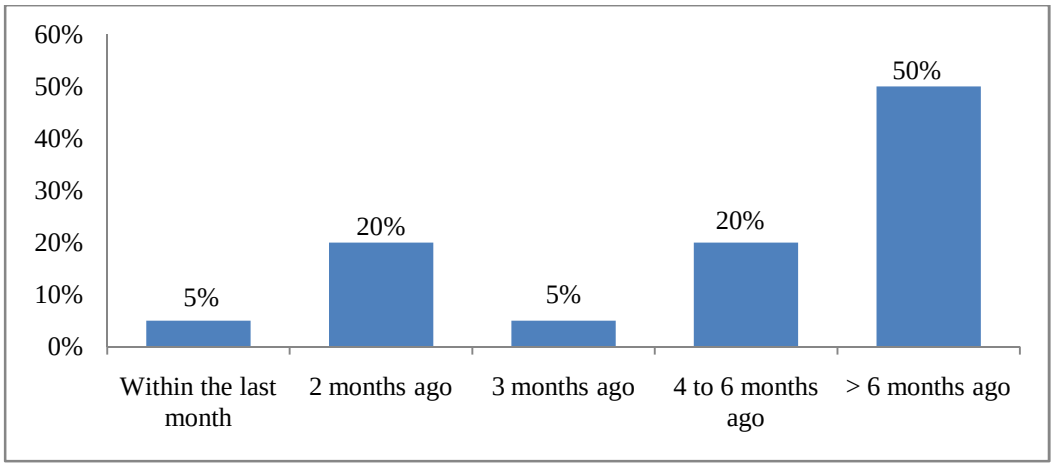

Figure 8. Last time LMIS report for NPDs sent from the date of the survey in HCs, Addis Ababa, 2013 [n=20]

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 rarely for conducting ABC analysis 2(9.5%) (Figure 9).

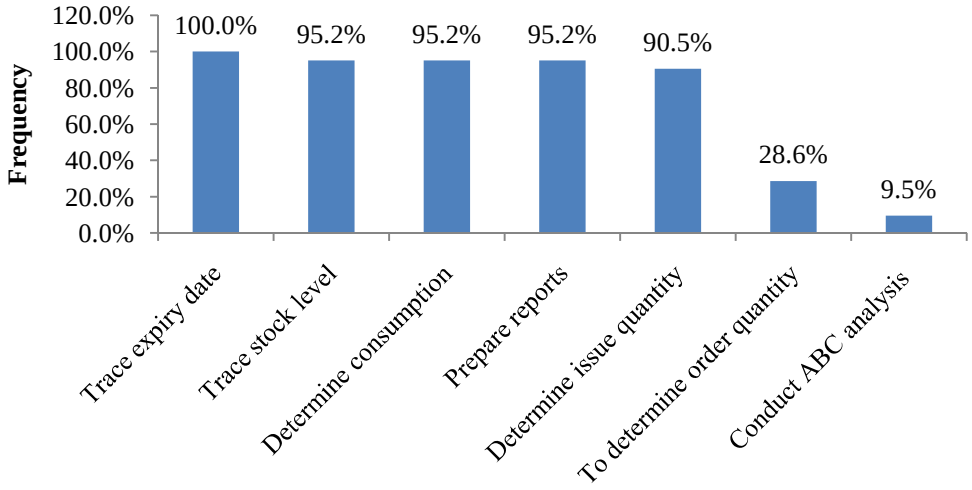

Figure 9. Use of HCMIS by the HCs, Addis Ababa, 2013 [n=21]

All the store keepers learned how to complete logistics forms/records in one or the other way. Logistics workshop was the learning source for majority 14(58.3%) of the respondents. Eleven (45.8%) and 10(41.7%) of the respondents learned from on job training and self-learning, respectively

Concerning supervision, majority 19(79.2%) of the HCs reported to have had supervision on the pharmaceutical logistics quarterly (Figure 10).

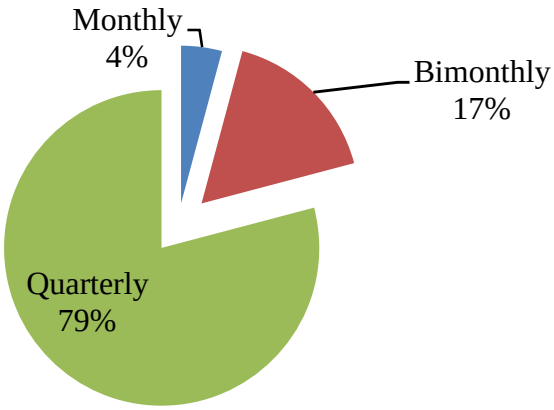

Figure 10. Frequency of pharmaceutical logistics supervision made in HCs, Addis Ababa, 2013 [n=24].

6.5. Medicine Waste Management

This study revealed that the pharmacy units in all surveyed HCs were responsible for medicine waste management. In 12(55.5%) HCs out of 22, not all personnel involved in handling of medicines waste were trained and/or well informed about the potential risks of hazardous medicines wastes and their management (Table 10).

Table 10: Medicine waste management in HCs, Addis Ababa, 2013

Practices	n	Yes N (%)
Pharmacy unit responsible for managing the medicine wastes	24	24(100)
Documented policy or guideline for medicine waste man	24	21(87.5)
Medicine waste disposal practice attended by an inspector from appropriate organ (FMHACA/Health bureau/Health office)	24	21(87.5)
Medicine waste disposal committee	24	23(95.8)
All personnel involved in handling of medicines waste trained and/or well informed about the potential risks of hazardous medicines wastes and their management	22	10(45.5)
Security measures to prevent scavenging of unfit to use medicines in place at disposal sites and temporary storage areas	24	24(100)
Disposal of medicines is documented	24	24(100)
Certificate of disposal received after disposal of medicines waste from the appropriate organ	22	10(43.5)

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 (Figure 11).

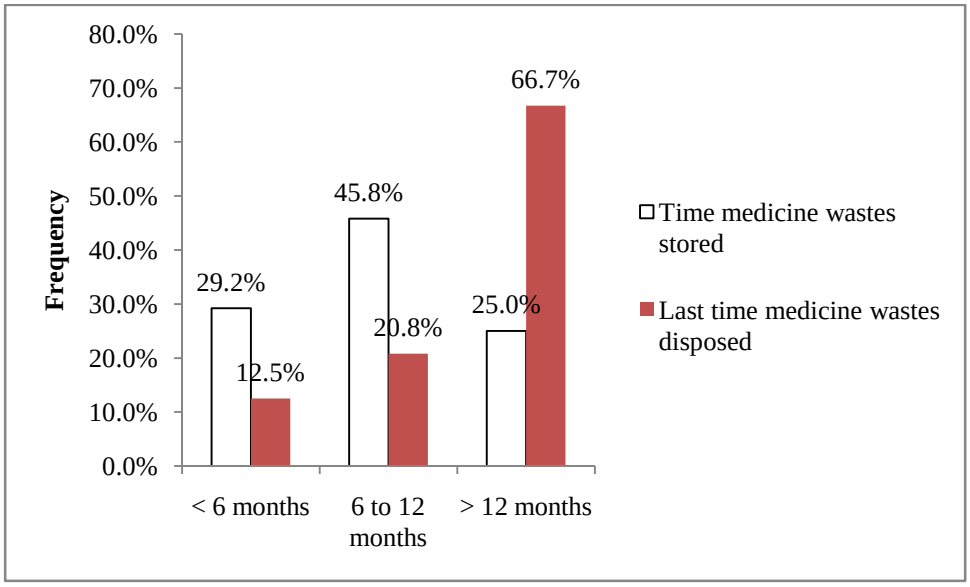

Figure 11. Frequency of HCs by length of time medicine wastes reported to be disposed and the last time medicine wastes were disposed, Addis Ababa, 2013 [n=24]

6.6. Facilitators and Barriers of the Pharmaceutical Logistics System

In-depth interview were held with all pharmacy heads of the HCs involved in this study. The pharmacy heads identified various facilitators and barriers on the pharmaceutical logistics system. They also forwarded important recommendations to improve the problems in the system.

6.6.1. Facilitators and barriers for selection, forecasting and procurement of NPDs

When asked about the facilitators and barriers of NPD selection, all the key informants (KIs) agreed on the importance of DTC on selection of NPDs. Strong DTC was identified as a facilitator, and weak DTC as a barrier. In discussing the weakness of DTC one KI said that:

"DTC members do not attend DTC meetings … after procurement, however, they suggest the inclusion of some drugs."

Majority of KIs also agreed on the importance of training on selection of drugs indicating that trainings had facilitated good drug selection practice while lack of trainings became a barrier. Unavailability of reference materials was also mentioned by some respondents as a barrier for the selection practice. Moreover, a single KI added that unavailability of NPDs at PFSA negatively affected the selection practice. The KI said that:

"… you may need some drugs, but they may not be available in PFSA… [so,] we select those drugs that will be available at PFSA."

To improve the selection process, some respondents recommended the strengthening of DTC.

Regarding forecasting, a single KI identified that frequent stock out of NPDs affected the accuracy of forecasting. Explaining this, the KI said:

"…when you are stock out, you don't serve your clients, and therefore you don't get the actual consumption data at the end."

All the KIs related facilitators and barriers of forecasting and procurement with the services at PFSA. Some KIs agreed that the fact that PFSA sells the NPDs with credit had facilitated the procurement. Some of them also agreed that the procurement of NPDs primarily from PFSA by itself was a facilitator for the reasons that direct procurement was easy and the cost of NPDs was not expensive. Moreover, the condition that PFSA accepted orders at any time without requiring its customer HCs to come on fixed schedule facilitated the procurement, according to some respondents.

However, some KIs mentioned that PFSA sometimes provide NPDs that have short expiry date. As a result, the HCs purchased only a quantity less than what they planned to purchase. As one respondent said:

"PFSA offers you to purchase some drugs that have only 2 or 3 months of expiry date. If you refuse to purchase, it will not give you a permit to purchase from private suppliers. If you purchase that, it may expire before it is consumed."

A barrier mentioned by several respondents was that not all needed NPDs were available in PFSA which caused different problems in the procurement process. One respondent mentioned that:

"Since PFSA usually does not provide drugs adequately, we are forced to purchase drugs perpetually… we don't purchase for only 2 or 3 months of stock, especially for vital drugs; instead we purchase in large amount because that drug may not be available next time."

Even if the NPDs were available at PFSA, there were times that it did not provide them in a quantity that each HC needed as several respondents explained. Moreover, majority of the KIs mentioned that they could not procure NPDs in the summer season because PFSA was closed at that time to make physical inventory.

According to majority of the KIs, NPDs had been purchased from private suppliers by bid when the drugs were not available in PFSA. According to some of the respondents PFSA may not immediately provide the permit to purchase the NPDs from private suppliers while it was stocked out which increased the lead time. Another factor that increased the lead time as a single KI explained was that:

" … the bidders should be three. It (the rule) says at least 3. Therefore, even if one and two [private suppliers] apply [for the bid], you must wait until the 3rd [bidder] and others apply."

Even after the bid winner had been announced, there were situation where the winner delay or even not make the delivery.

"… I think the winners [of the bid] apply for the bid without actually having the drugs. When they are asked to deliver, they take very long time … [even they] may not make the delivery"

Not only the bid process was lengthy as some of the participants described, but there were limitations on the number of bid that they can make in a fiscal year. Even there was a HC that did not allow procurement from private suppliers. As a single KI described:

"… if we don't get [NPDs] from PFSA, we don't purchase from private suppliers… it is the HC that prevented us from purchasing from private suppliers… they (the management of the HC) believe that everything that is purchased from private [suppliers] is expensive."

Another barrier on procurement of NPDs mentioned by several KIs was the lack of incentive for the HC staff who go to purchase. For example, a KI said that:

"…at least a lunch expense for a person who goes to PFSA is not covered. … this make that person not to be interested to go PFSA ... and it will decrease his commitment."

Moreover, majority of the KIs indicated that the inadequate quality of customer service at PFSA as a barrier in procurement. Explaining this one KI said that:

“Since many of the HCs visit PFSA mostly at similar time, there will be a crowed. They (PFSA staff) will tell you to come tomorrow, when you go on the next day your drug will not be ready and they will tell you to wait. . . like this you go there every day ... may be for a week. . . on the top of that they don’t treat you well..”

Lack of reliable transportation system was also identified by majority of KIs as a barrier in procurement. One KI explained that:

"…after you received the drugs, you go out to find a private vehicle while you put the drugs on veranda at PFSA which is a risk for the drug."

To improve the procurement process respondents forwarded couples of recommendations as summarized in the following box.

1. PFSA should enhance its capacity on supplying drugs and its service delivery
2. PFSA should deliver NPDs to each facility
3. Each facility should have its own vehicle
4. Health offices of each Sub-city should provide transportation service
5. PFSA should provide a permit to purchase from private suppliers immediately if it doesn't have the drugs
6. Staff who go to PFSA should be paid a per-diem
7. PFSA should provide drugs with long expiry date

6.6.2. Facilitators and barriers for availability of NPDs

All KIs related the facilitators and barriers for availability of NPDs with suppliers. Some of them agreed that the availability of NPDs at PFSA showed improvement, and hence the availability in the HCs though it was not adequate. Majority of the KIs mentioned that inadequate supply of NPDs at PFSA not only became a barrier for forecasting and procurement processes, but also for availability of drugs at the HCs.

Moreover, majority of the KIs identified barriers related to private suppliers. Some of the participants identified that the lengthy process in bidding was a barrier for availing NPDs in the HCs. For example one KI said that:

"… bid has become a headache for us… to purchase [NPDs] through bidding, the drug [list] will be sent to newspaper. Paying for the newspaper, the bid will be announced after 15 days. Until the [private] suppliers read [the bid notice] and come [to the HC] it will take one month. Between this what will happen?...the drug will stockout."

Some KIs mentioned that the cost of drugs from private suppliers was too high to purchase. According to one respondent:

"If you purchase [NPDs] from outside (private suppliers), you will finish your budget immediately. The drugs that you purchase from outside (private suppliers) are usually brands; as a result, you will finish your budget in short time. In addition, the community in this area is low in its economic status so, if you procure drugs from outside (private suppliers), you will add additional cost in the community, so we usually [prefer to] wait and purchase from PFSA."

KIs identified also other facilitators and barriers for availability of NPDs. All KIs mentioned budget as a determinant for availability of NPDs. Majority of the KIs agreed that budget allocated for procurement of drugs was either adequate or improved while some of them did not agree. For example one respondent said that:

"The major problem of the HC is that there is shortage of budget for drugs … it is 500,000 Birr per year allocated for drugs ... it was 500,000 3 years ago; it is also 500,000 today ... after you serve [the drugs] for 5 months, you will be run out of them".

Government commitment to improve supply of drugs and support from the management of the HCs were identified as facilitators by some KIs. Some respondents also mentioned that they share drugs including NPDs from other HCs. For example, one respondent explained that:

"…by borrowing from other HCs, we avail [drugs] in our facility… the main thing is that we share our drugs to others and they also share to us… by this way we handle the problem"

Majority of the KIs mentioned that there were situations where program drugs being used to fill the gap in availability of NPDs. According to one respondent:

"…there are times when drugs that come through programs become overstock. At that time what we do is... first if we are overstock of those drugs, second if their expiry date is near, we use those drugs to serve other patients ... it uses us for not to be stocked out."

The other added:

"...there are program drugs for treatment of opportunistic infections... you give these drugs to free patients"

A single KI mentioned that evaluation meeting with the community facilitated the availability of NPDs in their facility. The KI said that:

"…we had evaluation meeting with the community last June. … for example, ...some of them (community members) complained [on availability of drugs][saying] to the extent that 'methyldopa was not available in the HC; we are poor; we are free users; while the government supporting us [to get drugs free] and if you said that the drugs are not available, should we die?' ... after that we made frequent procurements to solve the problem".

Recommendations made by the KIs to improve availability of NPDs are summarized as follows:

1. PFSA should improve its supply
2. Adequate budget should be allocated
3. Revolving fund in which the HC use the income generated from the sale of drugs should be created without imposing limitation in the number of cycles that can be made
4. A strategy that minimize the lead time when NPDs procured from private suppliers should be devised
5. Priority should be given to HCs with high patient flow in resupplying NPDs
6. Communication between HCs should be improved

6.6.3. Facilitators and barriers for storage conditions

When asked about the facilitators and barriers of storage conditions, all KIs identified store space as a determinant on storage condition. While some respondents indicated that adequate store spaces facilitated proper storage practices, several respondents mentioned that inadequate storage spaces became an obstacle for proper storage of drugs. From the worst cases, one KI said that:

"…we have very narrow store. … in the first place, it was not purposely constructed for pharmaceutical store. Therefore, drug handling is very difficult. Even we could not practice FEFO method because items are stacked one over the other. ... it is difficult to clean the store. Even rats are there. They damage many things."

In addition to the inadequate storage space, program drugs that had been supplied to the HCs on push base aggravated the problem as some respondents indicated. Moreover, some respondents mentioned that expired products, most of which were program drugs tied up the spaces available for the usable stocks.

In addition to store spaces, other factors that became facilitators or barriers were mentioned by several respondents. Some KIs mentioned that, trainings on storage of drugs, store-keepers' commitment, availability of adequate store equipments, and supervision from the management, higher level and NGOs had facilitated the storage practice. Interestingly, NGO's requirement for good storage condition to computerize the LMIS became a facilitator for good storage practice as some KIs mentioned.

Majority of the respondents also identified unavailability or low performance of support staff as a barrier for good storage condition. Some of the respondents indicated that unavailability of porters became a barrier for proper handling of drugs. Some of them mentioned that the inadequate performance of the sanitary workers as a barrier. Regarding sanitation a single KI added:

"… even the pharmacy professionals did not give due attention for the sanitation of the store."

Moreover, inadequate store equipments were also mentioned by some participants as a barrier for proper storage practice.

To improve the storage practice some respondents recommended that pharmaceutical stores should be reconstructed according to standards. They also recommended stopping push delivery of program drugs, and frequent disposing of expired drugs to get more storage space for the usable stocks. In relation to manpower, some participants recommended employment of porters dedicated for the store and incentivizing and giving training for store keepers.

6.6.4. Facilitators and barriers for LMIS

Most KIs identified facilitators and barriers of LMIS in relation to the computerized system. Majority of the KIs mentioned that the computer system facilitated the LMIS. In connection to this, one KI said that:

" …the computer [system]… has made our work easy beyond our expectation."

In addition, the computer system had been updated frequently in response to feedbacks from the users which became a facilitator as some respondents explained. However, the store keepers did not have adequate skills on using the computer and fixing even minor problems which became a barrier as some respondents indicated. Moreover, some KIs mentioned that, IT professionals were not available immediately when problems occurred in the computer system. One KI said that:

"... the [IT] professionals do not come at the time you need them. Even when you need some information, they may come after a month, at the time you no longer need the information."

Availability of necessary materials, store keeper's commitment, supervision, and training were also mentioned by some KIs as facilitators of the LMIS. In contrast, resistance and negligence of using the LMIS by dispensary units other than the pharmacy had been an obstacle for the LMIS as described by some respondents. In connection to this, one KI said that:

"… dispensary units (other than the pharmacy dispensary unit) do not consider the activity [of LMIS] as their responsibility, but the responsibility of the pharmacy case team."

Another barrier mentioned by some of the respondents was that there was a rotation among pharmacy staff where the trained and experienced store keepers were replaced by another staff who was new to storekeeping.

The followings are among the recommendations forwarded by the KIs regarding LMIS:

1. Continues training should be given on the LMIS
2. PFSA should be networked with all HCs by information and communication technologies
3. HCs should own the LMIS
4. Adequate awareness should be created on staff that work in dispensary units other than the pharmacy, until they internalize the system
5. The LMIS should be computerized

6.6.5. Facilitators and barriers for medicine waste management

Majority of the KIs identified that having a separate room for medicine wastes are a facilitator for good medicine waste management and having no separate room as a barrier. In connection to this a single KI added that:

"we don't have a separate place for storing medicine wastes. Most of the expired medicines are in the dispensary units … there was an incidence once. Expired drug was dispensed by error to a client ... this case is now reached to the court."

Majority of the KIs identified that lack of suitable and standard medicine disposal place were barriers for proper handling and disposal of medicine wastes. Most of the KIs identified that the suspension of permits to dispose medicine wastes by the government for "long period" of time became a barrier. One respondent explained that:

"…since we were informed that we shall not dispose medicines wastes around residential areas, may be because of environmental issues, we couldn't dispose [medicine wastes]…and even we talked to the sub-city health office, but they told us to wait until a guideline come from health bureau."

Some KIs, identified also the inaccessibility of updated guidelines as a barrier.

Most of the KIs recommended that government should establish disposal sites at a center level or at sub-city level while some of the KIs added that updated guidelines should be delivered to HCs without a delay.

7. Discussion

The ultimate goal of the pharmaceutical logistics system is to ensure pharmaceutical accessibility to the end users. To achieve this, the system should be monitored frequently, so that limitations, barriers, strengths and facilitators of the system are identified. The findings of this study focused on selection, forecasting, procurement, availability, storage conditions, and LMIS of NPDs as well as medicine waste management.

This study revealed that written policies or guidelines for selection, forecasting, and procurement were only available in small number of HCs in contrast to the National Minimum Standard for Health Centers which requires HCs to develop policies and guidelines for managing medicines. The standard stressed that HCs shall have written policies for the procurement of drugs from government and private suppliers (FMHACA, 2011a). The fact that policies and guidelines provide guidance on appropriate and standard course of actions, it might have helped the pharmacy professionals in the HCs to get best out of the logistics system.

Regarding selection, this study documented that almost all of the HCs had their own EDL, and in most HCs selection of drugs was made by DTC and all of them using pattern of prevalent disease as a criterion which is in line with the standard (FMHACA, 2011a). This finding is encouraging when compared to the situation in other Sub-Saharan countries like Tanzania where only 38% of the surveyed health facilities had EDL and among them only 52% of the facilities procured medicines within the EDL (MOHSW, 2008). The reason that lower availability of EDL and use of EDL in Tanzania compared to the present study finding is probably because of the fact that national EDL in Tanzania were last updated in 1997, and therefore outdated; whereas national EDL in Ethiopia updated in 2010 which served HCs as a reference to prepare their own EDL. However, the in depth interview in the present study revealed that weakness of DTC was a barrier for good selection practice. According to the standard, DTC representing different service units of the HCs shall be involved in the selection of medicines (FMHACA, 2011a).

The present study documented that most of the HCs conducted VEN analysis while only about half of them conducted ABC analysis. It is essential that the HCs use these analyses tools to maximize their returns from investment at a minimal cost and to set up priorities

for purchasing medicines (WHO, 2003b). The reason that ABC analysis was not conducted in several HCs in contrast to VEN analysis may be related to the disadvantage of ABC method that it cannot provide information to compare medicines of different efficacy and the advantage of VEN analysis that allows comparing of medicines of different efficacy and usefulness (WHO, 2003b).

This study documented also that it was the HCs that determine resupply quantity of NPDs as the PLMP recommends (FMOH, 2009). This demand-based approach allows improved availability of medicines and reduces the volume of expiries (Tumwine et al., 2010). However, the order fill rate calculated for the NTDs in this study showed that there were situations where the HCs did not get the quantity of drugs they ordered. This was also supported by the finding from the in-depth interview where the respondents explained that PFSA did not always supply NPDs according to the demand of the HCs. Moreover, the HCs themselves may order a quantity less than they demand because of the short expiry of the drugs at PFSA. For a pull system to work properly sufficient supplies must be available at supply sources to meet all HCs demand (MSH, 2011). The main advantage of pull system over push is that health facilities are supplied according to their demand. In push system, however, medication needs are processed centrally without direct involvement or active contribution of health facilities (MSH, 2011).

Even though all HCs reported that they were responsible for determining resupply quantity of NPDs, a quarter of them determine the resupply quantity by guess. Order quantities that are not based on reliable estimates may lead to stock-outs of some drugs and overstocks of others which further may be translated to lower quality service and wastage (John Snow Inc./DELIVER., 2004).

This study revealed that there was no uniform purchasing pattern among HCs. This can be at least partially attributed to the unavailability and inadequate supply of NPDs that led the HCs not to stick to a specific schedule which further led to unnecessary crowd of customers at PFSA during arrival of drugs, as noted from the in-depth interview. Frequent procurement of drugs may also lead to additional costs such as transportation and time. Established schedules and other procurement procedures can be maintained by improving the supply capacity (Ventola, 2011). Moreover, if PFSA able to serve health

facilities according to some specified schedules, the pressure on PFSA staff can be reduced and hence can provide better quality service.

One of the important component of logistics system is transportation (John Snow Inc./DELIVER., 2004). Good transport practice demands reliability, efficiency, safety, accountability, timeliness, affordability, and sustainability (MSH, 2011). The present study documented that most of the HCs did not have their own vehicle to transport NPDs, and PFSA had not been delivering the drugs to the HCs. While majority of the HCs used private cars, one third of them used facility ambulance. The KIs indicated that the lack of reliable transport was a barrier for the procurement of NPDs. Rented private cars may not be appropriate if drugs are exposed to dust and may carry a risk of theft as some KIs mentioned. Ambulances may not respond quickly to emergency situation if they are engaged in transporting drugs, and may worsen the limited emergency medical service in the country (Germa et al., 2013).

Regarding lead time, this study revealed that it took one to two weeks for majority of the HCs to receive NPDs from PFSA after an order had been initiated. This was, however, found to be better than the lead time to receive NPDs from private suppliers which took 2 to 4 weeks after the bid is initiated. It is important to note that the time interval to receive NPDs from private suppliers might be underestimated because the time interval between a demand initiated and bid initiated was not included in measuring the lead time. The in-depth interview revealed that the number of bids HCs can carry out was limited; hence, they might wait until the next bid time reached.

The present study assessed the availability of NPDs using different approaches: NPDs that are reported to often stock out, frequency and duration of stock outs of TDs for a year and at the day of visit. This study revealed that majority of the HCs reported to often encounter stock outs of some NPDs. Paradoxically some NPDs that were reported to be often stock out in some HCs were reported to be often overstocked in other HCs. The tendency of HCs to purchase NPDs in large quantity anticipating that the drug might not be available at PFSA for the next order could have contributed to this paradox, as noted from the in depth interview. Hoarding drugs in advance of a feared stock out can deplete existing inventory and diverts any supplies away from other facilities and patients in need. Moreover, stockpiling drugs can also be expensive and can cause a facility to be

left with excess inventory, which is costly and might not be absorbed if the shortage at PFSA is averted or isn't as severe as had been anticipated (Ventola, 2011).

Regarding availability of EDs at the day of visit, this study assessed the availability of 5 TDs that shall be available all the times in the HCs. On average, 85.4% of the TDs from either of non-program or program source were available at the day of visit, but only 71.7% were available from non-program sources. The availability of TDs (both non-program and program) documented in this study is better than the situation in Sub-Saharan countries, such as Uganda (45.7%), Ghana (80%), and Jimma, South Western Ethiopia (55.6%) (Ministry of Health of Uganda, 2008; Ministry of Health of Ghana, 2009; Abiye et al., 2013). This showed that the pharmaceutical logistics system has been improved. However, the availability was far from the WHO recommended target of 100% (WHO, 1993).

This study documented also the frequency and duration of stock outs of the TDs based on available bin-card data for 12 full months. Full data was not available for PTDs in most of the HCs to record stock outs. Of the 5 TDs from non-program source, ORS stock out was encountered in majority of the HCs which might be at least partially attributed to an increase in consumption; and MBZ was stock out more frequently and for longer time which might be because of the availability of large stock of substitution drugs such as Albendazole as noted from some of the HCs. Compared to the situation in Tanzania where some medicines were out of stock for 4 months, the stock out duration was smaller in the HCs assessed in the present study which was around 3 months for MBZ (MOHSW, 2008).

The impact of unavailability of EDs is significant. Unavailability of EDs may put patients on less effective and less safe substitutes. Moreover, unavailability of EDs in the HCs compels patients to revert to the private sector where the cost of drugs is high, increasing the chance of incurring catastrophic health expenditures and the associated risks of falling into poverty (Carasso et al., 2009). Overall, this study revealed that the availability of NPDs in HCs needs improvement, which can be achieved by promoting the facilitators and resolving the barriers for availability of NPDs identified in this study.

Concerning the storage condition, none of the HCs' storage condition was complete; even some HCs scored as low as 35% in good storage practice and 40% in having store equipments. However, the mean storage condition was 71.8%. The size of stores in most of the HCs was not adequate - a barrier mentioned by majority of KIs for proper storage. Inadequate storage space leads to stacking of products one over the other, and make FEFO arrangement, easy picking of products and cleaning difficult (WHO, 2004). Similar inadequte storage conditions were reported in other Sub-Saharan countries such as, Uganda (63.6%) and South Sudan (35%) (Ministry of Health of Uganda, 2008; GhTech, 2011). Fire extinguisher was not available in most of the HCs which is non-compliant to the standard (FMHACA, 2011). The in-depth interview identified that over stock of program drugs that received by push method tied up the limited space available in the pharmaceutical stores. Generally, poor storage conditions put the quality of drugs at risk and cause wastage and the quality of care patients receive (MSH, 2011).

In this study, it was found that most of the HCs did not use RRF for managing NPDs. Instead they prepared their own form to request NPDs from PFSA. It might be easier for the HCs' pharmacy staff to prepare their own simple format instead of filling the relatively numerous columns of the RRF.

This study also revealed that not all NPTDs in the store had bin cards. Among NPTDs which had bin cards around one third of them were not updated. Here it is important to note that bin cards for NPTDs might not be updated if the HCs had been using TDs from program source for non-program services. Bin cards are important tools in the management of drug as they provide information on stock status, expiry date, and availability of products in addition to maintaining accountability (WHO, 2014).

This study found that 3 out of the 24 HCs did not have computerized LMIS in the store. The reason for this was that the storage condition or/and store size in these 3 HCs were not suitable to establish the computer system, as the KIs indicated. Before installing HCMIS, partners require strong store management systems and well organized physical storage (John Snow Inc./DELIVER PROJECT, 2011). Though the HCMIS was used by majority of the HCs for various functions, only a small number of the HCs used it to determine order quantity. This might be because the HCs could not order NPDs on the schedule as the system requires and also the situation that PFSA could not supply all the

EDs on the needed time and quantity, as documented from the in-depth interview. Generally, the automation of the logistics system facilitated the drug supply management of the HCs as majority of the KIs witnessed. When used effectively, automation eases the tedious work of drug inventory management, save personnel time and promotes quality of services (Awaya et al., 2005).

The indicator for accuracy in keeping stock records for the NPTDs showed as much as 270% discrepancy between recorded balance and physical inventory while the highest mean discrepancy calculated was 26%. Similar high discrepancies also reported in other studies. For example, a study in Tanzania reported 8% and 72% recorded balance that was less and greater than the physical count, respectively (Kagashe & Massawe, 2012). The high discripancey documented in the present study may be due to bin cards that were not updated. Generally, this indicator provides information on how accurately the facilities were tracking their inventories, and discrepancies of more than 10 percent should cause concern and may require efforts to improve data quality (John Snow Inc./DELIVER, 2005).

Finally, this study described the medicine waste management practice in the HCs. As Medicine Waste guideline (FMHACA, 2011b) and the National Minimum Standard for Health Centers (FMHACA, 2011a) indicated, all or most of the HCs' pharmacy were responsible for medicine waste management, and formed medicine waste disposal committee. Against the standard (FMHACA, 2011b), majority of the HCs usually stored medicine wastes longer than 6 months; even majority of the HCs disposed medicine wastes for the last time greater than 12 months ago. One reason for this was the suspension of permit to dispose medicine wastes as majority of the respondents mentioned in the in depth interview.

Overall, the result of this study highlighted the situation, and identified the barriers and facilitators of the pharmaceutical logistics systems specially that of NPDs.

8. Strengths and Limitations

The strengths of this study include that the study was done in all “old” HCs (i.e. census). This study combined both quantitative and qualitative method to supplement the findings each other. Moreover, this study is the first to study the logistics of NPDs, and management of medicine wastes in the HCs of Addis Ababa.

The limitations include lack of similar studies with similar setting and concentration. Unavailability and incompleteness of data, and the assumptions made might affect the finding of this study. This study did not address all components of the logistics system such as distribution and drug use, and cold chain logistics system. The findings of this study were from only HCs perspective and did not include other stakeholders. Moreover, some of the questions might introduce recall bias.

9. Conclusion and Recommendations

9.1. Conclusion

It can be concluded from this study that preparing written policies or guidelines regarding selection, forecasting and procurement of NPDs was not given attention. A major problem uniform to all the HCs was not found regarding selection of NPDs though each HC had its own problem in the selection of NPDs. The strength of DTC determined the effectiveness of the selection practice in majority of the HCs. Generally, inadequate supply of NPDs in PFSA affected the logistics of NPDs with respect to maintaining the pull system, purchasing pattern, and availability of NPDs. It is also evident that transportation of NPDs from PFSA was not reliable. The lead time in purchasing NPDs from private suppliers was longer than the lead time in PFSA. As a result of inter related problems it becomes clear that stock out was a concern in the HCs. Storage condition of NPDs in some HCs calls for early interventions especially with respect to adequacy of storage spaces. The computer system was a very important input for the LMIS, but accuracy of record keeping was low. Finally, it is evident that many HCs did not dispose medicines frequently as required by the standard.

Overall, albeit there is high government commitment in improving access to essential medicine as manifested in policies, proclamations and directives, much work is yet to be done in the pharmaceutical logistics system especially in addressing the stumbling problems identified in this study: frequent stock outs of NPDs, unreliable transportation system, in adequacy of storage spaces, and lack of standard disposal sites.

9.2. Recommendations

Based on the finding of this study the following recommendations can be drawn

- Written policies or guidelines for drug selection, forecasting and procurement should be prepared by the HCs or by respective Health Offices
- DTC in HCs should be strengthen by each health pharmacy units of the HCs and other stakeholders who closely work with the HCs such as health offices
- PFSA should improve its capacity of supply of NPDs and service that should include onsite delivery of NPDs

- AAHB and its partners should construct standard stores following established standards in the HCs where stores become an obstacle for other component of the logistics
- Regular supportive supervision by the management of each HCs should be conducted to improve the LMIS as well as the whole logistics system
- AAHB should prepare proper medicine waste disposal sites as early as possible before HCs overwhelmed by medicine wastes
- Similar studies should be conducted from the suppliers perspective as well as in other parts of the country

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Annexes

Annex 1: Questionnaire to Pharmacy Heads of HCs

Assessment of Pharmaceutical Logistics System in Health Centers of Addis Ababa, Ethiopia

Questionnaire for Health Centers in Addis Ababa
July, 2013

I. Verbal consent form before administering the questionnaire to the pharmacy head

"Good day. My name is Mezid Mudzteba. I am a student of Pharmacoepidemiology and Social Pharmacy MSc program in School of Pharmacy, Addis Ababa University. I am here to collect data about the pharmaceutical logistics system of your facility that is needed for my thesis titled *"Assessment of Pharmaceutical Logistics System in Health Centers of Addis Ababa, Ethiopia"*. This survey is done in all "old" 24 health centers. Your facility is selected because it is one of them. The research will provide an empirical snapshot of the current pharmaceutical logistics situation at primary health care level in Addis Ababa and provide baseline information to track changes and improvements in pharmaceutical logistics performance over time.

In this structured interview I would like to ask you few questions about the selection and procurement of essential drugs, and the pharmaceutical waste management. The interview will take 15-20 minutes of your time.

Your participation is completely voluntary. You can refuse to answer any questions and/or withdraw from the study at any time. All of the information collected is strictly confidential. No one other than the research team will have access to your responses. Your personal identifiers such as your name and that of your health facility will not be used. The principal investigator will not refer to individual respondents or individual facilities in the report, but rather will describe the overall picture of all facilities.

Do I have your permission?

Yes ☐ No ☐ If Yes, Continue

***Note**: Throughout the questions **Non-Program Drgus (NPDs)** refer to drugs **excluding** program drugs such as anti-malarial drugs, antiretroviral drugs, family planning drugs, and TB-drugs, as well as laboratory*

reagents, medical supplies, and equipments

II. Facility Identification

Health facility code _____

Interviewer: Mezid Mudzteba

Date of Interview_____

How long you have worked as a pharmacy head_____

III. Selection, Forecasting and Procurement of NPDs

3.1	Is there any documented policy or guideline for drug selection?	Yes ……..1 No 0	
3.2	Does the health center have its own essential drugs list?	Yes ……..1 No 0	If no, skip to Q. 3.6, and skip Q. 3.15
3.3	How often it is revised?	Annually..... 1 Every 2 years ..... 2 Every 3 years ..... 3 Every 4 years ..... 4 Every 5 years ..... 5 > 5 Years ..... 6 Never updated ..... 7 Other (specify) _____ 9	If never updated, write the reason
3.4	Who do the selection?	The pharmacy unit only ..... 1 DTC ..... 2 Other (specify) _____ 9	
3.5	What are the criteria for drug selection in the health center? (Circle all applies)	Pattern of prevalent disease ..... A Efficacy and safety..... B Cost of the drugs ..... C Preference for well-known drugs ..... D Others (specify) _____ W	
3.6	Is there a national essential drugs list available in the health center?	Yes ……..1 No 0	- If your answer was yes for Q.3.2, skip 3.6&3.7 - If No, skip Q. 3.8 & 3.15
3.7	Which national essential drug list is used?	Drug list for Hospitals ..... 1 Drug list for Health Centers ..... 2 Other (specify) _____ 9	
3.8	Is there any documented policy or guideline for NPDs forecasting?	Yes ……..1 No 0	

3.9	Is there any documented policy or guideline for procurement of NPDs?	Yes ……..1 No 0	
3.10	Who determines this facility's resupply quantities of NPDs?	The facility itself ..... 1 Health office/health bureau..... 2 Suppliers ..... 3 Other_____ 9	
3.11	Do you conduct VEN analysis	Yes ……..1 No 0	
3.12	Do you conduct ABC analysis	Yes ……..1 No 0	
3.13	Which types of quantification methods is/are employed? (Circle all applies)	Consumption method .....A Morbidity method.....B Other (Please specify) _____ W	
3.14	How are the facility's resupply quantities determined?	Formula ..... 1 Guess ..... 2 Other means (Specify)..... 3	
3.15	Is the procurement limited to the essential drugs list?	Yes ……..1 No..... 0	Skip this question, if the answer for Q 3.2 & Q 3.6 is no
3.16	Is procurement made by generic name?	Yes ……..1 No..... 0	
3.17	Which purchasing pattern is <u>usually</u> used?	Monthly..... 1 Bimonthly ..... 2 Quarterly ..... 3 Every 4 months ..... 4 Semi-annually ..... 5 Annually ..... 6 Perpetually..... 7 Other (Specify) _____ 9	
3.18	Do you purchase NPDs form private suppliers	Yes ……..1 No 0	If no, skip Q20 and Q23
3.19	Who is responsible for transporting NPDs to your facility when EDs are purchased from PFSA?	PFSA delivers .....A Health office/health bureau delivers .....B This facility collects .....C Other (specify) .....W	
3.20	Who is responsible for transporting NPDs to your facility when EDs are purchased from private suppliers?	Supplier delivers .....A Health office/health bureau delivers .....B This facility collects .....C Other (specify) .....W	Skip this question if the answer for Q3.18 was no
3.21	What type of transportation is <u>most often</u> used for transporting NPDs?	Facility ambulance ..... 1 Facility vehicle (other than ambulance) 2 Public transportation..... 3 Private vehicle..... 4 Supplier vehicle ..... 5 On foot..... 6	

		Other (specify) _____ 9	
3.22	On average, approximately how long does it take between ordering and receiving NPDs from PFSA?	Less than 1 week..... 1 1 week to 2 weeks..... 2 Between 2 weeks & 1 month ..... 3 1 month to 2 months..... 4 > 2 months 5	
3.23	On average, approximately how long does it take between ordering and receiving NPDs from private suppliers?	Less than 1 week..... 1 1 week to 2 weeks..... 2 Between 2 weeks & 1 month ..... 3 1 month to 2 months..... 4 > 2 months 5	Skip this question if the answer for Q3.18 was no

IV. Medicine Waste Management

4.1	Is the pharmacy unit responsible for managing the medicine wastes?	Yes ……..1	No..... 0	
4.2	Is there any documented policy or guideline for medicine waste management?	Yes ……..1	No..... 0	
4.3	Approximately, how long medicine wastes are stored usually?	< 6 month ..... 1 6-12 months..... 2 > 12 months..... 3 Don't know..... 6		
4.4	Where do you dispose medicine wastes	In this facility..... 1 In other health facility ..... 2 Referred to other organization ..... 3 Other (specify) _____ 9		If the answer is not 3, skip Q 4.9
4.5	Approximately, when did you dispose medicine wastes for the last time?	< 6 months ago ..... 1 6 to 12 months ago ..... 2 > 12 months ago ..... 3 Don't know 4		
4.6	Is the medicine waste disposal practice attended by an inspector from appropriate organ (FMHACA/Health bureau/Health office)?	Yes ……..1	No..... 0	
4.7	Has the health center formed a medicine waste disposal committee?	Yes ……..1	No..... 0	
4.8	Are all personnel involved in handling of medicines waste trained and/or well informed about the potential risks of hazardous medicines wastes and their management?	Yes ……..1	No..... 0	
4.9	To which organization do you refer?	Health bureau ..... 1 licensed disposal firms ..... 2 respective medicines suppliers ..... 3 central disposal sites ..... 4 Other (specify) _____ 9		Skip this if your answer was not 3, for Q. 4.4

4.10	Are security measures to prevent scavenging of unfit to use medicines in place at disposal sites and temporary storage areas?	Yes ……..1	No 0	
4.11	Is the disposal of medicines documented?	Yes ……..1	No 0	
4.12	Do you receive certificate of disposal after disposal of medicines waste from the appropriate organ?	Yes ……..1	No 0	

Annex 2: Questionnaire to Store Keeper of HCs

Assessment of Pharmaceutical Logistics System in Health Centers of Addis Ababa, Ethiopia

Questionnaire for Health Centers in Addis Ababa
July, 2013

I. Verbal consent form before administering the questionnaire to the store personnel

"Good day. My name is _____. I am working with the research team of the Department of Pharmaceutics and Social Pharmacy, School of Pharmacy, Addis Ababa University. I am here to collect data about the pharmaceutical logistics system of your facility that is needed for the Masters Thesis titled *"Assessment of Pharmaceutical Logistics System in Health Centers of Addis Ababa, Ethiopia"*. This survey is done in all "old" 24 health centers in Addis Ababa. Your facility is selected because it is one of them. The research will provide an empirical snapshot of the current pharmaceutical logistics situation at primary health care level in Addis Ababa and provide baseline information to track changes and improvements in pharmaceutical logistics performance over time.

I would like to ask you few questions about availability of non-program drugs (NPDs) and the functioning of Logistics Management Information System. In addition, I would like to actually count the tracer drugs you have in stock today and observe the general storage and storage conditions. The interview will take 10-15 minutes of your time.

Your participation is completely voluntary. You can refuse to answer any questions and/or withdraw from the study at any time. All of the information collected is strictly confidential. No one other than the research team will have access to your responses. Your personal identifiers such as your name and that of your health facility will not be used. The principal investigator will not refer to individual respondents or individual facilities in the report, but rather will describe the overall picture of all facilities.

Do I have your permission?

Yes ☐ No ☐ If Yes, Continue

- *For comments/questions please contact **Mezid Mudzteba** (0913102033), principal investigator for the study*

***Note**: Throughout the questions **Non-Program Drgus (NPDs)** refer to drugs **excluding** program drugs such as anti-malarial drugs, antiretroviral drugs, family planning drugs, and TB-drugs, as well as laboratory reagents, medical supplies, and equipments*

II. Facility Identification

Health facility code _____

Interviewer: _____

Date of Interview_____

How long you have worked as a storekeeper _____

III. Availability of NPDs

3.1	Are there certain NPDs that you <u>often</u> stock out of before resupply?	Yes ……..1 No.....0
3.2	List the NPDs (including the dosage form and strength) you stock out of most frequently (up to 5 products).	_____ _____ _____ _____
3.3	Do you <u>often</u> have a surplus of certain NPDs before resupply?	Yes ……..1 No.....0
3.4	List the commodities you have a surplus of most frequently (up to 5 products).	_____ _____ _____ _____

IV.	Pharmaceutical Logistics Management Information System		
4.1	Is there any documented policy or guideline for managing and using the logistics management information system (LMIS)?	Yes ……..1 No 0	
4.2	Do you use and fill out the following logistics forms to manage NPDs?		
	A. stock record cards	Yes ……..1 No 0	
	C. bin cards (in dispensary units)	Yes ……..1 No 0	
	D. bin cards (in store)	Yes ……..1 No 0	
	E. Internal facility report and requisition form (IFRR)	Yes ……..1 No 0	
	F. Reporting and resupply form (RRF)	Yes ……..1 No 0	
4.3	What form do you use for requesting/ordering NPDs <u>from suppliers</u>?	Gov't requesting voucher(Model 20) .....1 IFRR .....2 RRF .....3 Facility's own form.....4 Other (specify) _____9	
4.4	What form do you use for receiving NPDs from suppliers?	Gov't receiving voucher (Model 19).....1 Other (specify) _____ 9	
4.5	What form do dispensary units use to request NPDs from store?	Gov't requesting voucher(Model 20) .....1 IFRR .....2 Other (specify) _____9	
4.6	What forms do you use for issuing of NPDs to units in the facility?	Gov't distribution voucher (Model 22).....1 Other (specify) _____9	
4.7	Do you report NPDs to PFSA?	Yes ……..1 No 0	If no, skip to 4.13
4.8	What form do you use for reporting of NPDs to PFSA?	IFRR.....1 RRF.....2 Other (specify) _____9	
4.9	Does the report for NPDs include the following?		
	A. stock on hand	Yes ……..1 No 0	
	B. quantities used	Yes ……..1 No 0	
	C. losses and adjustments	Yes ……..1 No 0	
4.10	How often is the report for NPDs sent to PFSA?	Monthly.....1 Bimonthly .....2 Quarterly .....3 Every 4 months .....4 Semi-annually .....5 Annually 6	

		Other (specify) _____ 9	
4.11	When was the last time you sent the report for NPDs to PFSA?	Never ..... 1 Within the last month ..... 2 2 months ago ..... 3 3 months ago ..... 4 4 to 6 months ago ..... 5 > 6 months ago 6	
4.12	How often are you <u>supposed</u> to send the report for NPDs to PFSA?	Monthly ..... 1 Bimonthly ..... 2 Quarterly ..... 3 Every 4 months ..... 4 Semi-annually ..... 5 Annually ..... 6 Other (specify) _____ 9	
4.13	What computer software system do you use to manage NPDs in the store?	HCMIS ..... 1 RX solution ..... 2 Don't use software ..... 3 Other (Specify) _____ 9	If 3, skip to 4.17
4.14	Is the software functional at this time?	Yes .....1 No..... 0	If yes, skip to 4.16
4.15	How long the software has become not functional?	Less than 1 week ..... 1 About 2 weeks ..... 2 About 3 weeks ..... 3 About 1 month ..... 4 More than 1 month 5	
4.16	For what functions do you use the software?		
	A. To trace stock level	Yes .....1 No 0	
	B. To determine consumption	Yes .....1 No 0	
	C. To trace expiry date	Yes .....1 No 0	
	D. To determine issue quantity	Yes .....1 No 0	
	E. To determine order quantity	Yes .....1 No 0	
	F. To conduct ABC analysis	Yes .....1 No 0	
	G. To prepare reports	Yes .....1 No 0	
	H. Other (Specify)_____		
4.17	How did you learn to complete logistics forms/records used at this facility? (Circle that all apply)	Never learned ..... A During a logistics workshop ..... B On-the-job training ..... C On-the-job (self-learning) ..... D Other (specify) _____ W	
4.18	Approximately, how often you get supervision on pharmaceutical logistics mostly	Monthly ..... 1 Bimonthly 2	

	Quarterly .....3 Every 4 months .....4 Semi-annually .....5 Annually .....6 Other (specify).....

Thank You for Your Cooperation!!

Annex 3: Data Abstraction-formats and Observation Check lists

TABLE1: Stock Status

Preparation: *Be sure you have access to the (1) usable and (2) expired TDs, (3) Bid cards for the TDs, (4) The store personnel (to fill column 14)*

Column:

1. Name of the tracer drug (TD) that will be counted
2. Unit of count for the TD
3. Source of the TD
4. Check if the bin card is available, answer Y for yes or N for no.
5. Check if the bin card had been updated within the last 30 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.
6. Record the balance on the bin card. Note: If the answer to column 4 is N, record NA in this column.
7. Record if the facility has had any stock out of the product during the most recent 12 full months before the survey, answer Y for yes or N for no. Note: If the answer to column 4 is N, record NA in this column.
8. Record how many times the product stocked out during the most recent full 12 months before the survey. Note: If the answer to column 4 is N, record NA in this column.
9. Record the total number of days the product was stocked out during the most recent full 12 months before the survey. Note: If the answer to column 4 is N, record NA in this column. If the TD was stocked out from both sources, note the specific dates of stock outs in the comments section.
10. Record the quantity of product issued from the storeroom during the most recent 12 months before the survey. Note: If the answer to column 4 is N, record NA in this column.
11. Record the number of months the issued data represents; record the months for which there is any data recorded, including 0. Note: If column 4 is N, record NA in this column.
12. Record the quantity of product in open container. Estimate the quantity of the product to 1/4, ½, or 3/4 full using the smaller unit of count established in column 2.
13. Record if the facility is experiencing a stockout of the product on the day of the visit, according to the physical inventory, answer Y for yes or N for no.
14. Record the quantity of expired products. Count all expired products on the day of the visit. If there are products that are near expiry (within one week), note in the comments section.

Maximum months of stock_____ Minimum months of stock _____

Note: For any product that experienced a stockout in the last 12 months (including the day of the visit), please note reasons by product..

No	Tracer Drugs (TD)	Units of count	Source of TD	Bincard available?(Y/N)	Bincard updated?(Y/N)	Balance on bincard(#)	Stock-out most recent 12 months?(Y/N)	Number of stock-outs (most recent 12 months)(#)	Total number of days of stock-out(s)(#)	Total units issued (mostrecent12 months)(#)	Number of months of issue data available(#)	Physical inventory(in storeroom)(#)	Stock-out today? (Y/N)	Quantity of expired products(#)
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Amoxicillin 500mg capsule	Box (50X10)	Non-program											
			Program											
2	ORS	Sachet	Non-program											
			Program											
3	Mebendazole 100mg tablet	Packet (40x6)	Non-program											
			Program											
4	Tetracyclin eye ointment 1%	Tube	Non-program											
			Program											
5	Paracitamol 500mg tablet	Box (100x10)	Non-program											
			Program											

Comments:

TABLE2: Quantity Ordered and Quantity Received

Column:

1. Tracer drugs
2. Enter the quantity ordered for the last order period for which products should have been received (i.e., don't include open orders whose expected receipt date has not arrived).
3. Enter the date the order was placed.
4. Enter the quantity received in the last order.
5. Enter the date the order was received.

Tracer Drugs (TD)	Quantity Ordered for Last Order Period	Date Order Placed	Quantity Received in Last Order/Procurement	Date Order Received
1	**2**	**3**	**4**	**5**
Amoxicillin 500mg capsule				
ORS				
Mebendazole 100mg tablet				
Tetracyclin eye ointment 1%				
Paracitamol 500mg tablet				

Comments

Table 3. Storage and storage conditions

No.	Description	Yes	No	Comments
01.	Products are arranged systematically (pharmacological/ alphabetical)			
02.	Products are arranged so that identification labels are visible.			
03.	The products are stored and organized in a manner accessible for first-to-expire, first-out (FEFO) issuing.			
04.	Cartons and products are in good condition, not crushed due to mishandling. If cartons are open, determine if products are wet or cracked.			
05.	Damaged and/or expired products/ TDs are separate from usable products and removed from inventory.			
06.	Products are protected from direct sunlight			
07.	Cartons and products are protected from water during all seasons.			
08.	Storage area is visually free from harmful insects and rodents. (Check the storage area for traces of rodents [droppings or insects].)			
09.	Security devices (grilles for windows and doors made of glass, and lock and key) are in place			
10	Products that need cold temperature are stored in a functional refrigerator.			
11.	Storeroom is maintained in good condition (clean, all trash removed, strong shelves, organized boxes).			
12.	The current space and organization is sufficient for existing products and reasonable expansion (i.e., receipt of expected product deliveries for foreseeable future).			
13.	Products are stacked at least 10 cm off the floor.			
14.	Products are stacked at least 30 cm away from the walls			
15.	Products are stacked no more than 2.5 meters high.			
16.	Fire safety equipment is accessible (any item identified as being used to promote fire safety should be considered).			
17.	Products are stored separately from insecticides and			

	chemicals.			
18.	Are the following equipments available in the store?			
	Shelves			
	Pallets			
	Bin dust			
	Trolley			
	Cold boxes			
	Refrigerator			
	Wall thermometer			
	Fire extinguisher			
	Ladder			
	Table and Chair			

Annex 4: Interview Guide (English Version)

1. How do you assess the current process from selection to procurement of NPDs in your health facility giving emphasis to the strengths and limitations?

   Probing (1): With respect to:

   a. developing and usage of EDLs
   a. ordering and receiving NPDs
   b. transportation of NPDs

   Probing (2): What conditions have facilitated the processes from selection to procurement of NPDs and what barriers do you encountered?

   Probing (3): What is your recommendation for improving the process from selection to procurement of NPDs further?

2. How do you assess the availability of NPDs both in type and quantity in the facility?

   Probing (1): What conditions have facilitated for availing NPDs in the facility and what barriers do you encountered in availing NPDs in the needed type and quantity?

   Probing (2): What is your recommendation for improving the availability of NPDs further?

3. How do you assess the pharmaceutical store and storage condition in the health facility giving emphasis to the strengths and limitations?

   Probing (1): With respect to:

   a. The size and design of the store
   b. Equipments and furniture
   c. Handling of drugs and sanitation

   Probing (2): What facilitates for the current level of strength in the storage and storage practice in the facility and what barriers do you encountered?

   Probing (3): What is your recommendation for improving the pharmaceutical store and storage practice further?

4. How do you assess the LMIS in managing NPDs in the health facility giving emphasis to the strengths and limitations?

   Probing (1): With respect to:

   a. using logistics forms?
   b. using computer software?
   c. reporting of the stock status and consumption of NPDs?

Probing (2): What conditions facilitates for using LMIS in managing NPDs and what barriers do you encountered?

Probing (3): What is your recommendation for improving the LMIS further?

5. How do you assess the medicine waste handling and disposal in the facility giving emphasis to the strengths and limitations?

   Probing (1): With respect to using Medicine waste standard

   Probing (2): What conditions facilitates for managing of medicines waste and what barriers do you encountered?

   Probing (3): What is your recommendation in improving the medicines waste management?

6. Is there anything more you would like to add?

_____

I will analyze the information you and others gave me and submit a draft report to my advisor at department of pharmaceutics and social pharmacy, school of pharmacy, Addis Ababa University in two months. I will be happy to send you a copy to review at that time, if you are interested. Thank you for your time and cooperation.

Annex 5: Interview Guide (Amharic Version)

አዲስ አበባ ዩንቨርሲቲ
የፋርማሲውቲክስና ሶሻል ፋርማሲ የት/ክፍል

በአዲስ አበባ ከተማ ውስጥ በሚገኙ ጤና ጣቢያዎች ውስጥ ያለውን የመድኃኒት አስተዳደርን በተመለከት ከፋርማሲ ክፍል ኃላፊዎች ጋር ለሚደረግ ቃለ-መጠይቅ የተዘጋጀ መመሪያ

(ነ) በቃለ-መጠይቁ ለመሳተፍ የፍቃደኝነት መጠየቅያ ቅፅ

በመድኃኒት አስተዳደር ላይ ያሉ ጠንካራ ጎኖችና አበራታች ነገሮችን መለየት እነዲሁም የሚያጋጥሙ ወስንነቶችና መሰናከሎችን መለየት ለ ሕብረተሰቡ የመድኃኒት ተደራሽነትን ለማሻሻል ለሚደረጉ ጥረቶች ከፍተኛ አስተዋፅኦ እንደሚኖረው ይታወቃል፡፡ በመሆኑም በ ጤና ጣቢያችሁ ውስጥ ያለውን የመድኃኒት አስተዳደር ሁኔታ በሚመለከተ ያሎትን የግል አስተያየት በግልፅ እንዲነግሩን በአክብሮት እንጠይቃለን፡፡

በቃለ-መጠይቁ ወቅት የሚያነሱዋቸውን ነጥቦች ሙለ በሙሉ ለማስቀረት ይረዳን ዘንድ የርሶ ፍቃድ ከሆነ ይህ ቃለ-መጥይቅ በመቅረጸ-ድምጽ የሚቀዳ ይሆናል፡፡ ይህም በመሆኑ ድምፅዎን በሚሰማ መልኩ ጮክ ብለው እንዲናገሩ አሁንም በማክበር እጠይቃለሁ፡፡ ይሄም ከጊዜዎት ከአንድ ሰዓት ያነሰ ጊዜ ይወስዳል፡፡ በዚህ የቃለ-መጠይቅ ሂደት የሚገኙ ማናቸውም መረጃዎች በምስጢር የሚጠበቁ ይሆናል፡፡ ይህም ማለት የሚሰጡንን መረጃ ከጥናት ቡድኑ አባላት ውጭ ለማንም ግልፅ የማናረግ ሲሆን የሚዘጋጁ የቃለ-መጠይቆች ዘገባዎችም እርስዎን እንደ መረጃ ሰጪ የማይጠቅሱ ይሆናል፡፡ እርስዎ መናገር ስለማይፈልጉት ነገር ለመናገር እንደማይገደዱ እና ቃለ-መጠይቁን በማንኛውም ጊዜ ማቋረጥ እንደሚችሉም ላስታውስዎት እወዳለሁ፡፡ በቃለ-መጠይቁ ለመሳተፍ ፍቃደኛንዎት?

አዎ ☐ አይደለሁም ☐

በቃለመጠይቁ ለመሳተፍ ፍቃደኛ ከሆኑ ቃለ-መጠይቁ ይጀምራል፡

(2) በቃለ-መጠይቁ ወቅት የሚነሱ ነጥቦች ዝርዝር፡-

1. በጤና ጣቢያችሁ ውስጥ በአሁኑ ግዜ ያለውን የ ፕሮግራም ያልሆኑ መድሀኒቶችን ከምርጫ ጀምሮ እስከ ግዢ ያለውን ሂደት ጥንካሬዎች ላይና ውስንነቶች ላይ አጽንኦት በመስጠት እንዴት ይገመገሙታል?
   1.1. የሚከተሉትን ጉዳዮች አስመልክቶ፡
      ሀ. የ ፕሮግራም ያልሆኑ መድሀኒቶችን ዝርዝር ማዘጋጀትና አጠቃቀምን
      ለ. የ ፕሮግራም ያልሆኑ መድሀኒቶችን ማዘዝን እና ቅበላን
      ሐ. የ ፕሮግራም ያልሆኑ መድሀኒቶችን ማጓጓዝን
   1.2. የ ፕሮግራም ያልሆኑ መድሀኒቶችን ከመምረጥ እስከ መግዛት ባለው ሂደት ምን ምን ምቹ ሁኔታዎች አሉ? ምን ምን ሁኔታዎችስ መሰናከል ሆነውባችኋል?
   1.3. የ ፕሮግራም ያልሆኑ መድሀኒቶችን ከመምረጥ እስከ መግዛት ያለውን ሂደት የበለጠ ለማሻሻል ምን መደረግ አለበት ብለው ያስባሉ?
2. በጤና ጣቢያችሁ የ ፕሮግራም ያልሆኑ መድሀኒቶችን አቅርቦት (በአይነትና በ ብዛት) እንዴት ይገመገሙታል?
   2.1. በጤና ጣቢያችሁ የ ፕሮግራም ያልሆኑ መድሀኒቶችን በተፈለገው አይነትና መጠን ማቅረብ እንድትችሉ ምን ምን ምቹ ሁኔታዎች አሉ? ምን ምን ሁኔታዎችስ በተፈለገው አይነትና መጠን ለማቅረብ መሰናከል (ገደብ) ሆነውባችኋል?
   2.2. የ ፕሮግራም ያልሆኑ መድሀኒቶችን አቅርቦት በተፈለገው አይነትና መጠን ለማሻሻል ምን መደረግ አለበት ይላሉ?
3. በጤና ጣቢያችሁ ውስጥ በአሁኑ ግዜ ያለውን የ መድኃኒት መጋዘንና የመድኃኒቶች አያያዝ ሁኔታ፡ ጥንካሬዎች ላይና ውስንነቶች ላይ አጽንኦት በመስጠት እንዴት ይገመገሙታል?
   3.1. የሚከተሉትን ጉዳዮች አስመልክቶ፡
      ሀ. የመጋዝኑ መጠንና አሰራር
      ለ. ለመጋዘኑ የሚያስፈልጉ መሳሪያዎችና እቃዎችን
      ሐ. የመጋዘኑ ንፅህና አጠባበቅን
   3.2. መድኃኒቶችን በ መጋዘን ውስጥ በተገቢው ሁኔታ መያዝ እንድትችሉ ምን ምን ምቹ ሁኔታዎች አሉ? ምን ምን ሁኔታዎችስ መሰናከል (ገደብ) ሆነውባችኋል?
   3.3. የ መድኃኒት መጋዘኑና የ መድኃኒት አያያዝ ሁኔታ የበለጠ እንዲሻሻል ምን መደረግ አለበት ብለው ያምናሉ?
4. በጤና ጣቢያችሁ ውስጥ በአሁኑ ግዜ የ ፕሮግራም ያልሆኑ መድሀኒቶችን ለማስተዳደር የ "LMIS" አጠቃቀም ላይ ያሉ ሁኔታዎችን፡ ጥንካሬዎች ላይና ውስንነቶች ላይ አጽንኦት በመስጠት እንዴት ይገመገሙታል?
   4.1. የሚከተሉትን ጉዳዮች አስመልክቶ፡
      ሀ. የ "LMIS" ቅጾችን አጠቃቀም
      ለ. የ "computer software" አጠቃቀም
      ሐ. የ ፕሮግራም ያልሆኑ መድሀኒቶችን የ አቅርቦት ሁኔታንና ፍጆታን ሪፖርት ማድረግን
   4.2. በጤና ጣቢያችሁ የ "LMIS" አጠቃቀም ላይ ምን ምን ምቹ ሁኔታዎች አሉ? ምን ምን ሁኔታዎችስ መሰናከል (ገደብ) ሆነውባችኋል?
   4.3. የ "LMIS" አጠቃቀማቹ የበለጠ ለማሻሻል ምን መደረግ አለበት ብለው ያምናሉ?

5. በጤና ጣቢያችሁ “ጥቅም ላይ መዋል እማይችሉ” (የተበላሹና ጊዜ ያለፈባቸው) መድኃኒቶች አያያዝና አወጋገድ፡ ጥንካሬዎች ላይና ውስንነቶች ላይ አጽንኦት በመስጠት እንዴት ይገመግሙታል?

5.1. “ጥቅም ላይ መዋል እማይችሉ” መድኃኒቶች ላይ የወጡ መመሪያዎችን ከመጠቀም አንፃር

5.2. “ጥቅም ላይ መዋል እማይችሉ” መድኃኒቶች በ አግባቡ ለመያዝና ለማስወገድ ምን ምን ምቹ ሁኔታዎች አሉ? ምን ምን ሁኔታዎችስ መሰናከል (ገደብ) ሆነውባችኋል?

5.3. የ “ጥቅም ላይ መዋል እማይችሉ” መድኃኒቶች አያያዝና አወጋገድ የበለጠ ለማሻሻል ምን መደረግ አለበት ይላሉ?

6. ከዚህ በተጨማሪ ሊነግሩኝ የሚፈልጉት ነገር ካለ እድሉን ለርስዎ ልስጥ

_____

ፍቃደኛ የሚሆኑ ከሆነ ከሁለት ወር በኋሊ በ አዲስ አበባ ዩንቨርሲቲ በፋርማሲዩቲክስና ሶሻል ፋርማሲ ትምህርት ክፍል የማቀርበውን የዚህንና የሌሎችን ቃለ-መጠይቆች ረቂቅ ዘገባ ለርስዎም ብልክልዎት ደስ ይለኛል፡፡

ስለ ሰጡኝ ጊዜና ስላደረጉልኝ ትብብር ከልቤ አመሰግናለሁ፡፡

Annex 6: List of Health Centers Included in the Study

S.No.	Name of Health Centers	Sub-city
1	Addis Ketema	Addis Ketema
2	Akaki	Akaki Kality
3	Arada	Arada
4	Beletshachew	Lideta
5	Bole 17	Bole
6	Bole 17/20	Bole
7	Entoto No. 1	Yeka
8	Kality	Akaki Kality
9	Kasanchis	Kirkos
10	Kebena	Arada
11	Kirekos	Kirkos
12	Kolfe	Kolfe Keraniyo
13	Kotebe	Yeka
14	Lideta	Lideta
15	Meshuwalekia	Kirkos
16	Selam	Gulele
17	Semen	Arada
18	Shiromeda	Gulele
19	T/Hayemanot	Lideta
20	Woreda 24/9	Kolfe Keraniyo
21	Woreda 3	Nifas Silk Lafto
22	Woreda 7	Addis Ketema
23	Woreda 9	Nifas Silk Lafto
24	Yeka	Yeka