JIMMA UNIVERSITY INSTITUTE OF HEALTH, FACULTY OF PUBLIC HEALTH, DEPARTMENT OF HEALTH ECONOMICS, MANAGEMENT AND POLICY

ASSESSMENT OF PHARMACEUTICAL SUPPLY MANAGEMENT PRACTICES IN PUBLIC HEALTH FACILITIES OF SOUTH WEST SHOA, OROMIA REGIONAL STATE, ETHIOPIA

BY: EDESSA DIRIBA CHEMEDA (B.PHARM)

A Thesis Submitted to, Department of Health Economics, Management and Policy, Faculty of Public Health, Jimma University Institute of Health; in Partial Fulfillment for the Requirement for masters of health care and hospital administration.

JIMMA, ETHIOPIA

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Abstract

Background: Modern health care is unthinkable without the availability of necessary medicines. Availability of essential drugs is the construct of the components of the pharmaceutical supply management (selection, quantification, procurement and distribution), and a failure in one part of the system leads to the failure of the whole pharmaceutical management process. To minimize this, investigating the real pharmaceutical management practices in the health sector is important.

Objective: The aim of this study is to assess pharmaceutical supply management practice in public health facilities of southwest Shoa, Oromia Regioanal State, Ethiopia

Methods: Facility based cross-sectional study was conducted among selected twenty six health centers, one public hospital and five Woreda and one Town Administration health offices and Zonal Health Department of the of Southwest Shoa, Oromia Regional state, Ethiopia from March 13 to April 9, 2017. Data collection was done by using self administered Questionnaire, document review and in depth interview. Ethical clearance was obtained from Jimma University Institutional Review Board. The data was checked for completeness and consistency, cleared, coded, and Quantitative data was entered in to EPI DATA 3.1 and exported in to SPSS 20 and was descriptively analyzed. Qualitative data was thematically analyzed.

Results: Three fifth of the surveyed facilities developed their Essential Medicine List. In around 85% of the health facilities pattern of prevalent disease is criteria for medicine selection. The mean score of selected pharmaceutical procurement practices, selected good storage practices and inventory management practices of the facilities were around 61%, 55% and 62% respectively when compared to the standard. Most the prescribers do not always prescribe by generic name and consider drug interaction and patient related problems while prescribing. Greater than one fourth dispensers were not pharmacy professional and only around half them were responded that they do have access to drug information. All dispensers do not fully provide necessary information and didn't consider special groups while dispensing.

Conclusion and Recommendation: Generally this study identified selected pharmaceutical selection, procurement, distribution and use practices are not satisfactory when compared to national and internationals minimum standards. Barriers hindering these states of affairs should be acted up on by the facilities, WoHO, ZHD, RHB, Federal MOH and other stakeholders.

Key words: Pharmaceutical selection, procurement, distribution and use practices

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Table of Contents

List of tables

List of figures

Acronyms

APTS	Auditable Pharmaceutical Transaction and Service
CCO	Chief Clinical Officer
CEO	Chief Executive Officer
DMIS	Drug Management Information System
DSM	Drug Supply Management
DTC	Drug and Therapeutic Committee
ED	Essential Drugs
EDL	Essential Drug List
EHRIG	Ethiopian Hospital Reform Implementation Guideline
EHSTG	Ethiopian Hospital Services Transformation Guidelines
EML	Essential Medicine List
EOPD	Emergency Outpatient
ESO	Emergency Surgery Officer
EWEC	Every Women Every Child
FEFO	First Expiry First Out
FIFO	First In First Out
FMHACA	Food, Medicine and Health Care Administration and Control Authority
GDP	Good Dispensing Practice
GPP	Good Prescribing Practice
HC	Health Center
HCF	Health Care Financing
HRM	Human Resource Management
ICT	Information and Communication Technology
INN	International Non-proprietary Name

IPD	Inpatient Department
IPLS	Integrated Pharmaceutical Logistic System
LMIS	Logistic Management Information System
M&E	Monitoring and Evaluation
MIS	Management Information System
MOH	Ministry of Health
MSH	Management Science for Health
OPD	Outpatient Department
ORHB	Oromia Regional Health
PFSA	Pharmaceutical Fund and Supply Agency
PHC	Primary Health Care
PSM	Pharmaceutical Supply Management
ROL	Re- Order Level
SDP	Service Delivery Point
STG	Standard Treatment Guideline
WHO	World Health Orginization
WoHO	Woreda Health Office
ZHD	Zonal Health Department

1. Chapter One: Introduction

1.1. Background

From the mid-1950s to the mid-1970s, basic pharmaceutical management concepts began to evolve in Cuba, Norway, Papua New Guinea, Peru, and Sri Lanka. Over the last thirty years, countries have acquired the following considerable experience in managing pharmaceutical supply.

- National drug policy provides a sound foundation for managing health commodities;
- Wise health commodities selection underlies all other improvements;
- Effective management saves money and improves performance;
- Rational drug use requires more than drug information and
- Systematic assessment and monitoring are essential(1).

Pharmaceutical products and vaccines have revolutionized health care in industrialized countries over the past 60 years. Unfortunately, only a portion of that progress is evident in developing countries, where hundreds of millions of people lack access to even essential drugs. Millions of adults and children die each year from conditions that could have been treated or prevented if effective and affordable drugs and vaccines had been available and properly used where and when they were needed(2).

Mortality figures across developing regions reflect a huge burden of illness that can be substantially reduced if carefully selected, low-cost pharmaceuticals are available and appropriately used(3). Pharmaceuticals not only save lives and promote health, but also 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(4). Accessibility to medicines is too the fundamental right of every person, and its effectiveness is substantially affected by the functioning of logistics system (5).

Adequate pharmaceutical supplies are necessary for the success of most health improvement strategies in developing countries. Too many health programs run into trouble because they have failed to address how the drugs essential to their goals will be supplied and managed in the

health care system. Drug purchases also represent one of the largest expenditures in public-sector health systems, and drugs are usually the single greatest health-related share of foreign exchange. Because resources are seldom equal to needs, efficient management of pharmaceuticals and medical supplies is crucial(2).

Pharmaceutical management is the set of practices aimed at ensuring the timely availability and appropriate use of safe, effective, quality medicines, health products, and services in any health care setting. These activities are organized according to functional components of a cycle and take place at various levels of the health system. Activities in the pharmaceutical management system are related to the selection, procurement, distribution, and use of products. It operates within and is affected by a political, legal, and regulatory framework. The components are the same for all sectors although procedures and activities within each component may differ(6).

Three reasons can be given to explain why drugs need to be managed properly. Firstly, drugs are part of the link between the patient and health services. Consequently, their availability or absence will contribute to the positive or negative impact on health. Secondly, poor drug management, particularly in the public sector of developing countries, is a critical issue, but major improvements are possible that can save money and improve access. Finally, drugs are no longer the responsibility of health workers only. Political, economic, financial and traditional considerations have become so crucial in health care that it has become imperative to look at drugs and health care from these perspectives(7).

The proper management of health pharmaceuticals ensures that:

- Increases the demand for health care services.
- Increases staff motivation to provide services which in turn increases quality of service
- Increase efficiency
- Ensure continuous availability
- Prevent wastage
- To minimize irrational use(8).

The provision of complete health care necessitates the availability of safe, effective and affordable drugs and related supplies of the required quality, in adequate quantity at all times. Despite this fact, in the past, the pharmaceutical supply chain management system of Ethiopia had several problems including non-availability, unaffordability, poor storage and stock management and irrational use(9). An effective pharmaceutical management system must be in place to ensure their accessibility and effective use, both at the service delivery level and in referral services. Pharmaceutical management in the health sector should follow well-established principles but must be flexible and responsive to the varied settings and services offered to ensure effective health service delivery(8).

1.2. Statement of the problem

Poor availability of Essential Drugs(EDs) is the key barrier to access to medicine especially in public sector where generic medicines availability is less than 60% (10). In the poorest countries of Africa and Asia, as much as 50% of the population lacks such access. While some 10 million lives could be saved annually by improving access to essential medicines and vaccines – 4 million in Africa and South-East Asia alone(11).

International initiatives have significantly increased availability and access to medicines in some parts of the developing world. Despite this, however, skills remain limited on quantifying needs for medications and ordering, receiving and storing medications appropriately; recording medications inventories accurately; distributing medications for use appropriately; and advising patients on how to use medications appropriately. In addition, increased supply of medicines often means increased opportunity for inappropriate use. Inappropriate patterns of drug use behavior can result in unsafe pharmaceutical use, waste of resources, non-compliance and excessive adverse drug reactions(12).

Lack of effective pharmaceutical logistics system not only affects the availability of EDs, but also significantly affects efficiency. Deficiencies in selection, quantification, storage, irrational prescribing, and incorrect use of medicines by patients cause losses totaling 70% of the original expenditure to medicines (1). The main objective of effective health commodities management is

to ensure that the necessary products are available where and when they are needed, in the correct quantities and that they are used properly (13).

Barriers to ensure necessary availability of pharmaceutical product can occur at any of the four stages of the health commodity management cycle(13). According to WHO, medicines are the second highest expense after staff costs in a country's health care system. The World Bank indicates that in many developing countries, a high percentage of medicine losses occur in the state procurement, storage, distribution, and utilization system. In Africa, the patient receives only 12 cents out of every dollar spent by the government on medicines. Inefficiency is the major contributor to these losses Out of the 100% budget allocated for medicines, 10% is lost through inadequate buying practices, 14% through quantification problems, 27% through procurement, 19% through inefficient distribution, 15% through irrational prescribing, and another 3% through patient non-compliance. All these losses that occur in the supply chain add up to 88% of the original budget(14).

In Ethiopia, majority of the common leading causes of morbidity and mortality can be substantially reduced if carefully selected, low-cost pharmaceuticals are available and appropriately used(15). Availability of EDs is the construct of pharmaceutical selection, quantification, procurement and distribution and a failure in one part of pharmaceutical logistics system leads to the failure of the whole pharmaceutical management process(1). Investigating the real pharmaceutical management practices and barriers and facilitators of this practice in the health sector can minimize this failure. Considering this as a base the aim of this study is to assess pharmaceutical supply management practice in public health facilities of Southwest Shoa, Oromia Regioanal State, Ethiopia

2. Chapter Two: Literature Review

2.1. Overview of perspectives of Pharmaceutical Supply Management

A useful way to understand the complex field of pharmaceutical management is to think of it as a cycle(6). Each component of the cycle builds on the previous one and leads to the next. Management support system is a core that sustains the drug management cycle: financial, human resources, and information management. These systems support the operation of the cycle as a whole, rather than as independent parts. The entire cycle rests on a policy and legal framework that establishes the mechanisms for the different functions and the basis on which they operate(2). This section discusses pharmaceutical supply management practices of developing countiries, and looks also at the literatures that guided this study.

2.2. Pharmaceutical Selection

The process of selecting essential medicines begins with defining a list of common diseases for each level of health care. The treatment of first choice for each health problem is the basis for the list of essential medicines, the national formulary system, and the treatment guidelines(1)

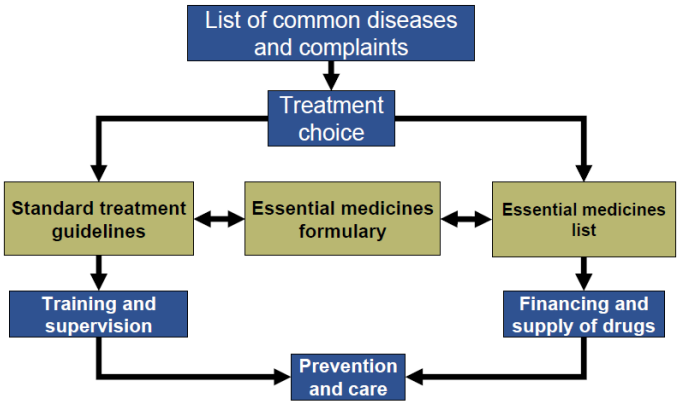
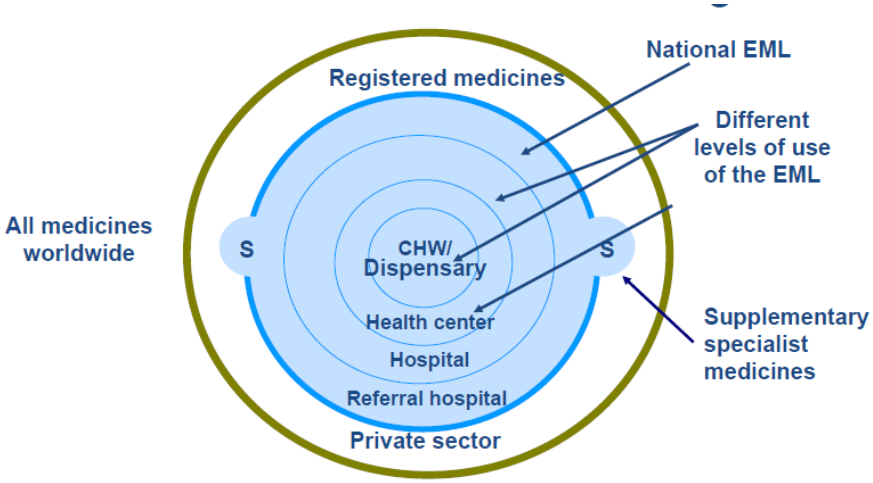


Figure 1: Components of selection process for public health system (source: MSH)

No public or private health care system in the world can afford to procure all drugs circulating in the market within its given budget. A limited list of drugs for procurement defines which drugs will be regularly purchased and is one of the most effective ways to control drug expenditure(16). Reducing the number of items leads to Larger quantities to procured which in turn encourages competitive drug prices and simplifies other supply management activities and

reduces inventory-carrying costs(16). The recommended average number medicines that should be included in facilities EML is 40–50 products for HC, and 150–200 for primary hospitals(1).



S Special medications for referral hospitals CHW Community Health Workers

Figure 2: Essential medicine target (source: MSH).

2.2.1. Facilitators and barriers of pharmaceutical selection

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(17). Similar study done on 12 facilities at different levels in Darbhanga district of Bihar showed none of these facilities have EML (18). Another survey done in public health facilities of Kenya a and Sudan showed in 38.9% and 54.8% of the facilities STG were available respectively(19,20). Survey done in public hospitals Ghana revealed availability of EML is 94% and 41% of this facilities stick to this list for procurement(21). Study done on 24 Addis Ababa health centers showed 95.8% of the HCs had their own EML of which 91.3% of them selected this medicine by DTC in preparing the EDL and pattern of prevalent disease was a criterion for selection in all the HCs, while 39.1% of them also use preference for well-known (familiar) drugs as a criterion (22). Study done on selected 8 private and government health facilities Amhara region Northwest Ethiopia showed availability of EML, national STG and drug formulary were 75%, 87.5% and 75% respectively(23)

The common reason for failure in selection is not involving as wide a group of experts as possible. Lists and guidelines developed by individuals, departments, or institutions operating in isolation are bound to fail, as those that are not updated regularly. Another common mistake is a lack of both a purpose and a medicine policy framework. If no procedure exists for incorporating suggestions and additions, the lists and guidelines are likely to fail. Failure can also result if selections are perceived as unrealistic (for example, listing sophisticated medicines for lower health care levels in resource-poor settings(1)

2.3. Pharmaceutical Procurement

Pharmaceutical procurement includes quantifying drug needs; determining the best methods of purchasing; managing tenders and other methods; and writing contracts. Strong procurement processes help to ensure that the right quantities of acceptable quality drugs are purchased at reasonable prices. By using proper procurement standards, countries can help ensure that selected drugs are made available for distribution to health facilities(2).

The success of the DSM cycle will depend upon the ability to reliably and consistently supply the drugs to health facilities at all levels of the health system. Delivery and distribution of drugs at various levels are not possible without effective drug procurement. Four strategic objectives of pharmaceutical procurement

1. Procure the most cost-effective drugs in the right quantities
2. Select reliable suppliers of high-quality products
3. Ensure timely delivery
4. Achieve the lowest possible total cost(16).

2.3.1. Facilitators and barriers of pharmaceutical procurement in public health facilities

Existing government policies, rules and regulations for procurement as well as institutional structures are frequently inadequate and sometimes hinder overall efficiency in responding to the modern pharmaceutical market. Even if appropriate policies and procedures are in place, lack of properly trained staff in key positions can doom any procurement system to failure. While effective training programs can remedy this problem, in many supply systems there is limited

access to training in good procurement practices. Also unattractive public sector salaries and lack of career development tend to restrict capacity to attract and retain qualified staff(16).

Study done in Ghana showed most facilities use the traditional consumption based method as opposed to the morbidity based method for the estimation of quantities of pharmaceuticals or health supplies needed for a procurement cycle(21).

Study done at Kisii teaching and referral hospital showed ethics and introduction of ICT affected procurement process. From the findings proper procurement has been begged on proper ethical conduct of the people entrusted with the procurement process(24). Matse stated that procurement and distribution processes are compromised due to a lack of adequately trained staff. He also stated that "the professionals who are expected to ensure proper purchasing drugs often lack basic knowledge on the management of drug supplies"(14). A study conducted in the Mopani established that none of the workers understood the method they claimed to use to determine quantities to be ordered. Whether it was Maximum and Minimum Stock Order Levels, Consumption based ROL or the Average Monthly Consumption, the workers had no clue how these formulas were used. As a result the study concluded that staff relied on their working experience to determine the quantities to be ordered. It was found that almost thirty percent of the facilities indicated that they had no formal method(14).

While conducting pharmaceutical procurement facilities encounter different barriers like: lack of coordination in the supply chain, unclear procurement process, Bureaucratic and cumbersome procurement practice, Limited use of procurement flexibilities, Lack of product standardization, Unpredictable and long lead times, Unplanned, unsolicited, and unspecified donations and etc(25). Procurement challenge trends identified around several themes include;

- Access to funds (transparency of the budgeting and funding processes and communication, while donor coordination delayed funds availability, complex bureaucratic processes and unclear lines of communication),
- Blockage in Procurement Process (personnel shortages, limited access to a designated signatory, or lack of clarity around who is authorized to provide approvals.

- Corruption (Competitive bidding and vendor selection are especially vulnerable to challenges resulting from corruption or as part of a tendering process that is not transparent to all participants.)
- Quality assurance issues ((linked to defining product specifications during the supply planning phase; supplier selection during the purchasing phase; and inspection and testing in the contract performance phase.)
- External Systems (delays caused by activities or functions that are outside of the procurement process, but that are required for the process to be completed and the goods to be delivered. Examples include banking transactions and port clearance.
- Slow and Cumbersome Process (complex and lengthy processes.)
- Small Quantity (For buyers with relatively low quantity requirements, it can be challenging to find a supplier willing to accept and fill small orders, or to fill the order at a competitive price).(26).

2.4. Pharmaceutical Distribution

Distribution involves getting the drugs through customs and to warehouses and facilities where they can be dispensed to the patients. Effective distribution includes efficient clearing of drugs through customs, transporting them and making timely deliveries, stock control and management at all levels of the system(2). Generally a well designed and a well managed distribution should

- Maintaining constant supply of medicines.
- Keep the medicine in good condition throughout the whole distribution process
- Minimize losses caused through expiry and spoilage
- Maintain accurate inventory records
- Rationalize medicine storage points.
- Use available transportation resources efficiently and effectively as possible.
- Reduce theft and fraud
- Providing information for forecasting medicine needs
- Incorporate quality assurance program(27)

A study done in Kenya revealed 76% the respondents felt central medical store poorly kept delivery schedule(28). Another study done in West Hararghe WoHO drug stores zone revealed 5

of them properly labeled their shelves, arrange and issued the drugs and medical supplies on FEFO/FIFO basis and arrange the drugs according to pharmacologic- therapeutic order. None of them arranged their drugs according to alphabetical/pharmaceutical order. In four of the stores all drugs were arranged on shelves while in one of the stores all drugs were not arranged on shelves In all of the study stores expired/ damaged/ obsolete products were isolated, vaccines, sera, biological and blood products were kept in cold room and Freezers temperature was maintained and recorded. Controlled substances were kept in securely locked cabined only in one of the stores where as the rest four stores had no controlled substances and securely locked cabinet. In all stores wooden or metal buckets filled with sand were not used and room temperature was not maintained and recorded(29).

2.4.1. Facilitators and barriers of pharmaceutical distribution and inventory management

Having efficient and reliable processes to distribute appropriate commodities from central warehouses to service delivery points (SDPs) is a critical part of effective supply chain management, yet many low- and middle-income countries face numerous challenges with their commodity distribution systems(30).

A survey done in 31 public hospitals of Sudan showed 55% of the facilities have good storage conditions, however there were improper stock recording practices in some hospitals(20). Similar study done at Daressalaam region hospitals reveal that most of the personnel involved in medicine supply did not know methods to be used in controlling inventory and those for quantifying medicines needed(31). Survey done in Uganda local government health units mainly health center faced inadequate professional practice (procurement skills and credible information) and poor logistics (lack of transport and bureaucratic procurement guide lines), storage bottlenecks and lack of credible data(32).

Study done in West Hararghe zone revealed out of the study stores, only 1 had adequate space for the movement of goods while four stores had no adequate space and all of the stores had ceiling and windows adequate for ventilation and adequate lighting. Two of the stores have sufficient storage and reception area. Four of the stores were dry, clean and pest free while only one was not dry, clean and pest free. Out of the total five observed study stores two of them had sufficient shelves and wooden pallets while the rest three had no sufficient shelves and wooden

pallets. Only one facility had a lockable cabinet for narcotics and psychotropic drugs while the rest four had no a lockable cabinet for controlled drugs. All of the stores had no computer, ladder, fire-extinguisher and wall thermometers(29).

Every Woman Every Child (EWEC) countries currently experience a number of barriers and challenges to improving commodity distribution, including the lack of reliable transportation, long distances to health centers, changing commodity demand, poor distribution planning, and lack of reliable and timely data(30).

Generally the distribution of goods is frequently handicapped by inadequate infrastructure, excessive centralization and the lack of effective management information systems. It is also undermined by a shortage of warehouses and transport vehicles, poor roads and broken bridges, missing links in and poor management of the cold chain, and clinics without secure storage space. The information systems for tracking stock and associated documentation may also be poorly managed, leading to gaps in the control of orders at all levels. Front-line healthcare providers lack the knowledge, or may not be legally authorized, to place orders. Mismanagement of distribution is therefore common, leading to both the oversupply of unnecessary products and the under supply or stock-outs of essential items, including life-saving and other essential medicines(8).

2.5. Pharmaceutical Use

Use is a critical function of the drug management cycle because it is the reason the entire cycle exists to ensure that the correct drugs, in sufficient quantities, reach the patients who need them. Use involves diagnoses of illnesses and diseases, prescribing and dispensing of drugs, and proper consumption of drugs by the patient or administration by a health worker. To use drugs in the most effective, rational way, patients must receive the correct dosage of drugs that best treats their illness. Patients also need enough medication to take for an adequate time, at an affordable cost to themselves and/or to the health system. Labels with proper information and warnings help the patient use the drugs correctly and consistently(2).

Drug use is complex subject involving the physician, the patient and the dispenser. To improve drug use practices globally, the World Health Organization (WHO) developed a set of objective

indicators for measuring health facility drug use practices in outpatient settings. The best way to investigate drug use in health facilities is by the usage of indicators created and validated by the World Health Organization(33)

The following WHO Core indicators are used globally to evaluate the degree of adherence to health facility indicators related to rational drug use

a. Availability of EDL/Formulary and STG: The purpose is to indicate the extent to which copies of the national essential drugs list or local formulary are available at health facility.
b. Availability of Key Drugs: The purpose is to measure the availability at health facilities of key drugs recommended for the treatment of some common health problems. Access to essential drugs is one of the basic requirements for delivery of proper health care.
c. Stock out duration: To measure the historical availability of essential drugs, a retrospective survey was undertaken by reviewing the stock cards of the facilities covering a period of six (6) months.

These indicators enable health care planners, managers and researchers to compare situations in different facilities and/or at different times(34).

Irrational use of medicines can stimulate inappropriate patient demand and lead to reduced access and attendance rates due to medicine stock outs and loss of patient confidence in health care system. Selection of essential drugs are important to fulfill the real need of the majority of the population in diagnostic, prophylactic, therapeutic and rehabilitative services (35).

Study done in selected health facilities in Southwest Ethiopia reveals that the pattern of prescription in terms of generic name and poly-pharmacy was near to optimal which was encouraging. The pattern of antibiotics and injection prescribing appears appropriate when compared with the world health organization guideline. There is a need to improve patients' knowledge on dispensed drugs and availability of essential guidelines and key drugs in the stock(35). Similar study done in Amhara regional state, north Ethiopia showed that the applications of facility indicators were very far low compared to WHO standards. The availability of essential drugs and up-to-date information sources (EDL, STG and Formulary)

about drugs were not yet at the optimal level. There is a strong need to improve drug use practices and ensure availability of key essential drugs for the most common health problems and thereby avoid stock outs(23).

Study done at South West Shoa Zone, Oromia Region, Ethiopia showed drug utilization of the prescribers was found to be good. Majority of the prescribers were aware of essential drugs and had access to up-to date drug information. They also considered price, followed standard treatment guidelines, used generic names, always considered the therapeutic appropriateness of the indication, and used drug formularies as the source of their information during prescribing. However, majority of the prescribers paid less attention to patient compliance, did not always consider availability of drugs, did not always look at appropriateness, drug interactions, and other related patient problems. Their belief on success of treatment was also not satisfactory. Half of the dispensers got up-to-date drug information, even though this value is lower than that of the prescribers. Majority of the dispensers got drug information from inserted leaflets, drug formularies, standard treatment guidelines, and books (pharmacology and pharmacotherapy)., Majority of dispensers also checked for correctness of prescription and communicated with patients appropriately. The study-site drug utilization patterns did not meet the standards of the WHO(36).

A survey done in 31 public hospitals of Sudan showed in 55.5% of the facilities medicines are adequately labeled while dispensed and this study also showed 43.5% medicines prescribed by generic name (INN) at this facilities (20).

2.5.1. Facilitators and barriers drug utilization in public health facilities

Rational drug use practice is often overlooked by health planners and considered as secondary importance to diagnosis, procurement, inventory control, and distribution. This is unfortunate, because poor or uncontrolled dispensing practices can have a very detrimental impact on the health care delivery system. All of the resources required to bring a drug to the patient may be wasted if dispensing practice does not ensure that the correct drug is given to the right patient in an effective dosage and amount, with clear instruction, and in packaging that maintains the integrity of the drug. The quality of dispensing is affected by lack of knowledge, skills, DIS,

unrestricted availability of medicines, workload of health personnel, inappropriate promotion of medicines and profit motives from selling medicines(37).

The irrational drug use becomes the world wide problem, however, in developing countries have rather worsened condition. Likewise, irrational drug prescribing, dispensing and inappropriate use of drugs by patients is common in Ethiopia(23). Irrational use of medicines can stimulate inappropriate patient demand and lead to reduced access and attendance rates due to medicine stock outs and loss of patient confidence in health(35).

In Africa, injections are often given rather than pills, as many patients see these as more powerful. In a detailed study of medication in India, categorized more than 50 percent of all drugs prescribed as “unnecessary” or “contra-indicated,” although some of these judgments are subjective(38). In Kenya, Matse determined that inadequately trained staff members are an important contributing factor to drug shortages as a result of their irrational prescribing(14).

Other studies attributed drug shortages to drug misuse and abuse by patients who collect treatment even if they are not sick, or those who accumulate more drugs than they require (39). Moreover, while self-prescription is not uncommon in the west, it is extremely common in the poorest countries, perhaps in part because of the shortage of trained physicians. Many patients purchase and consume only an incomplete course of medication, especially when symptoms subside after a partial course (38).

2.6. Policy and Management support related issues

Management support, in terms of finance, information systems, and human resources, ensures that the drug management process functions as a cycle. This organizational infrastructure provides structure for the different parts of the cycle and helps to ensure communication among the various parts in the system. An effective DMIS offers useful feedback on how each level of the pharmaceutical system is functioning. The entire drug management system relies on effectively integrating and managing finances and budgets, maintaining accurate and useful information systems, identifying and motivating capable staff, and instituting monitoring and

evaluation systems. The expertise and organizational framework provided through management support are critical at each stage of the drug management cycle(2)

A country's policy and legal framework defines the laws and regulations under which the drug management cycle operates and determines the general goals and parameters for effective drug management. Determining the authority and responsibilities of staff in the field of drug management helps ensure that the entire system works for the benefit of the public's health. Drug policies include allocating budgets, prioritizing research and development, promoting education initiatives, and defining the role of the public and private sectors in drug development. Through pharmaceutical laws and regulations, countries can determine drug quality standards, set price limits, require licensing of drug products, and establish production guidelines(2)

Senior management should regularly monitor the cost and performance of the distribution system as important indicator of health care system(27). DSM tools help managers with the process of distributing drugs and supplies to facilities and ultimately to patients, through following a series of steps: forecasting needs, the tender process, ordering, receiving, storing/warehousing, and distribution(40). However, despite availability of numerous tools for the management of drugs, none of these specifically targets the health worker who has had no formal training in drug logistics and supply management systems(18).

One of challenge of pharmaceutical management for policy makers and managers is the issue of achieving financial sustainability. If the demand of the medicine exceeds the available resources, the health system remains with only four options: improve efficacy, increase financial resources, reduce demand and accept decline of quality of care(1)

.

It has been established that in certain areas a significant proportion of essential medicines and supplies meant for PHC are misappropriated or diverted. This diversion is at two levels, firstly at the district pharmacy drug store level and secondly, at the PHC level(14). Health workers, especially the store managers and those at the dispensaries, divert some of these items either for personal use or by outright theft as some of the items delivered to the health centers have been found in the open drug markets. This matter is worsened by poor supervision because in many cases there are no

pharmacists to provide supervision and even the other health care staff to which such duties are assigned are sometimes negligent or even collude to divert the medicines and supplies. Similar situations exist in some state medical stores and general hospitals (14).

The importance of the availability of qualified staff and appropriate infrastructure is often taken for granted within government institutions and policy implementation is expected without appropriate resources. According to an article published by the World Council of Churches, the implementation of PHC services requires a minimum of the following pre-conditions(41):

a. Availability and accessibility of affordable quality essential medicines,
b. Availability of a sufficient number of qualified human resources for health,
c. Availability of adequate infrastructure according to guidelines and norms.

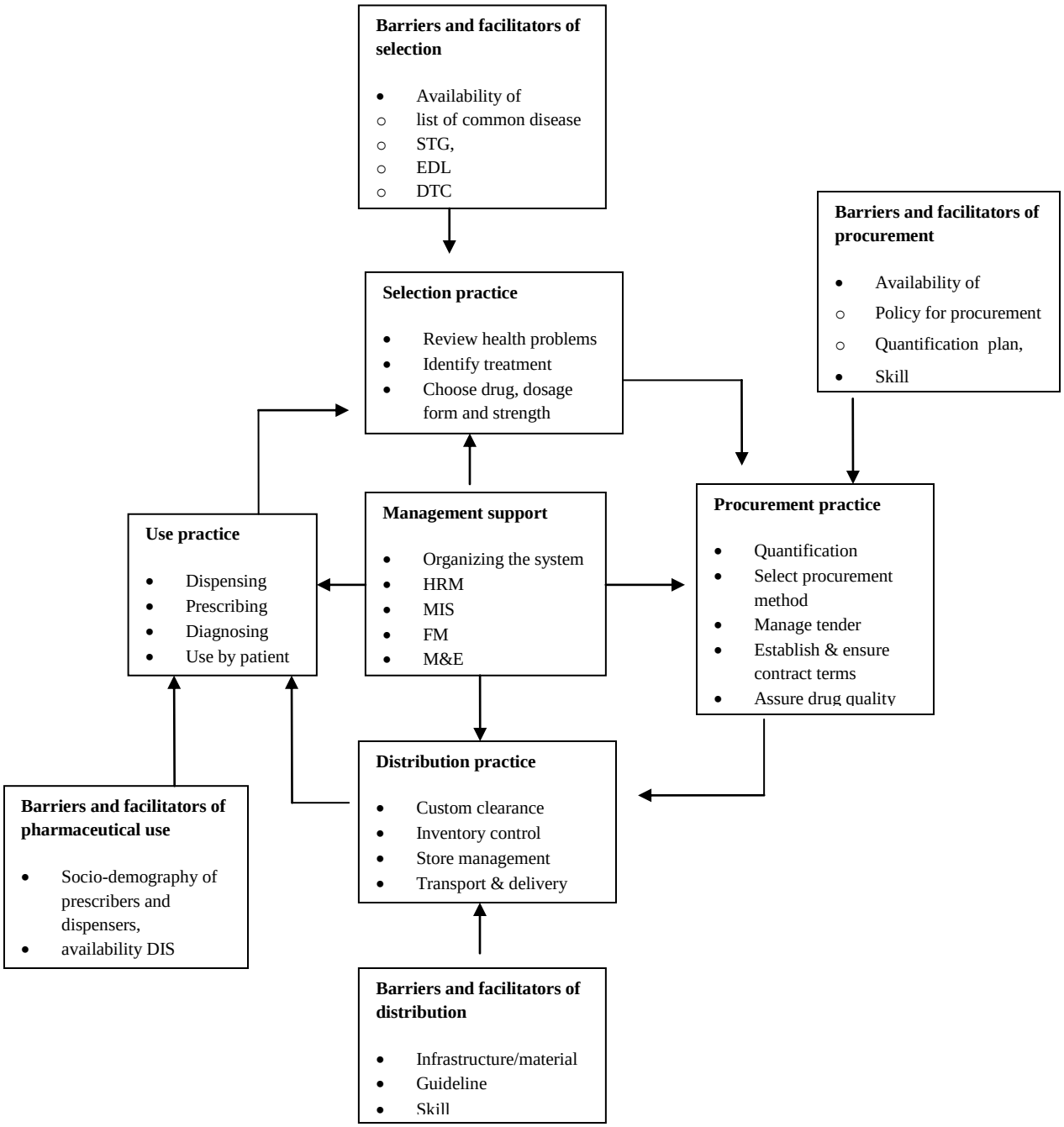


Figure 3: Conceptual framework of pharmaceutical supply management practices (developed by reading theoretical frameworks

3. Chapter Three: Significance of the study

Unless changes in drug supply systems are based on careful analysis of the underlying causes for the weaknesses of the existing system, a change in the system is unlikely to produce the desired outcome. Systems that are chosen because they function in a "successful" market economy may not prove to be the solution to the drug supply problems faced in the context of a developing country (14).

The results from the study will also assist in:

- Identifying barriers and facilitators of PSM.
- Providing a baseline of performance against which subsequent quality improvements can be measured in drug selection, procurement and distribution of the study area.
- Updating the current monitoring tool.
- Enhancing the capacity and skills of participants at PHC level in DSM,
- Providing recommendations for improving the functioning of DSM.

The results of this study are believed to be of great benefit to:

a. Management

The management shall be acquainted with major issues that affect the supply of pharmaceutical products in their facilities and therefore be in a position to make sound judgments and decisions on how to counter them. In addition ensure smooth running of the facilities by ensuring all required pharmaceuticals are available when needed hence no stock outs and unwarranted overstocking which can lead to expiry of products.

b. Government

The government being in charge of delivering proper medical care to its citizens; the finding of this research will facilitate in formulating and putting in place best practices to ensure all public health facilities receive supplies. Having deployed great effort to achieving better medication for all Ethiopians, the government will be able to assess its performance.

c. The public

The public could be benefited from the finding of this study after the concerned body utilizes this result to improve PSM.

4. Chapter Four: Objectives

4.1. General objective

- To assess pharmaceutical supply management practice of public health facilities southwest Shoa, Oromia Regioanal State, Ethiopia

4.2. Specific objectives

- To assess pharmaceutical selection practices of public health facilities of study area.
- To assess pharmaceutical procurement practices of public health facilities of study area.
- To assess pharmaceutical distribution practices of public health facilities of study area.
- To assess pharmaceutical use practices of prescribers and dispensers of public health facilities of study area.
- To explore facilitators and barriers of pharmaceutical supply management practices the study area

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5. Chapter Five: Methods

5.1. Study Setting and Period

This study was conducted on 26 health centers, 1 public hospital, 5 WoHO, 1 town administration health office and ZHD of southwest Shoa, Oromia regional state, Ethiopia. Southwest Shoa is one of the zones in Oromia regional state. The catchment population of the zone is estimated to be 1,200,464. The zone consists of eleven woredas and one city administration. The zone has one public hospital, one mission hospital and fifty three health centers.

The study was conducted from March 13, 2017 to April 9, 2017 in the Public health centers and hospitals in south west Shoa, Oromia regional state, Ethiopia.

5.2. Study Design

Facility based cross-sectional study design was utilized by employing both quantitative and qualitative data collection methods.

5.3. Study Population

Study populations taken from a source population of 1351 health professionals of public health facilities of the zone were categorized as follows:

a. Professionals working as pharmacy head/drug supply managers in selected 26 health centers and one public hospital.
b. Pharmacy store managers in selected 26 health centers and one public hospital.
c. Dispensers in selected 26 health centers and one public hospital.
d. Prescribers in selected 26 health centers and one public hospital.
e. HCs' directors and hospital CCO and selected WoHO and ZHD logistic officers.

5.4. Sample Size and Sampling Procedures

Five Woredas(Waliso, Bacho, Dawo, Tole, Goro) and Waliso Town Administration were included in the study by lottery method until 50% the zone's public health facilities were

included in the study. All Health Centers (26), Public Hospital (1) and Health offices(6) of the selected Woreda and Town Administration and ZHD were included in the study.

The study participants were selected purposely due to their knowledge for the subject matter of this study. To capture a wide range of perspectives and gain greater insights into this study the participants were grouped based on their expertise (Logistic officers, Health Center Directors and Hospital CCO, facility store managers, Pharmacy head/drug supply managers, dispensers and prescribers). Taking this as a base the following study participants were purposely included in the study.

- Logistic officers of selected Woredas and Town administration and ZHD (n_1= 7)
- All pharmacy professionals working in selected hospital were selected for study(n_2=7)
- Prescribers assigned at OPD, IPD, EOPD and maternity ward working in selected hospital (n_3 = 9)
- Prescribers assigned at OPD and EOPD from each health center (n_4 = 78)
- Two professionals from each health center assigned to perform pharmacy activities (n_5=52)
- The hospital CCO and the selected health centers directors (n_6 = 27)
- Total sample size included in the study
    - N = $n_1+n_2+n_3+n_4+n_5+n_6$=7+7+9+78+52+27 = 180 study participants were selected to be involved in the study.

5.5. Study Variables

- Facilitators and barriers drug selection (availability of list of common disease, STG, national EDL and management support(HRM, financing, MIS and M&E))
- Facilitators and barriers of pharmaceutical procurement (availability of policy/guideline for procurement and quantification plan, management support(HRM, financing, MIS and M&E)
- Facilitators and barriers of pharmaceutical distribution (distance from usual supplier, condition of the warehouse, availability of storage materials, transportation, policy that guide LMIS and management support(HRM, financing, MIS and M&E))

- Facilitators and barriers of pharmaceutical use (Socio-demographic variables of prescribers and dispensers, implementation of STG, developing facility specific medicine list, availability of drug information service and management support(HRM, financing, MIS and M&E))
- Pharmaceutical supply management practice
    - Selection
    - Procurement
    - Distribution
    - Use

5.6. Data Collection Methods and Tools

Data was collected by four data collectors, who have ample experience on drug supply management practice. Each two data collector were assigned to one district (woredas) and while one data collector was assigned one district (woredas) and one town administration and while the other one was assigned to two woredas. To assure the quality of the data collected two pharmacists were assigned as supervisors. Data were collected through:

a. Self administered Questionnaire

This part was divided into four parts

i. Section A: For professionals assigned as pharmacy head/drug supply manager and this part is to assess pharmaceutical selection, procurement practices of the facilities and 27 participants were involved in this section.
ii. Section B: For professionals assigned at pharmaceutical stores of the facilities and WoHO and this is to assess storage and inventory management of the facilities and 33 participants were included in this part
iii. Section C: For all dispensers in the facilities included in the study and this part was to assess dispensers side pharmaceutical use practice.
iv. Section D: For selected prescribers in the facilities included in the study and this part was to assess prescribers side pharmaceutical use practice.

b. Document review (bin card stock card)

c. In depth interview with WoHO and ZHD logistic officers, health center directors and hospital CCO and 33 participants were included in this part.

The questionnaire was designed to collect both qualitative and quantitative data. The source of questionnaire is from different DSM book, from similar type of study done(1,14,22,42,43). The questionnaire was administered only at work place of study participants.

5.7. Data Processing and Analysis

Quantitative data collected during the study was entered in to EPI DATA 3.1 and exported to SPSS 20 for analysis. The analysis of quantitative data was done descriptively and analysis of qualitative data was done thematically.

5.8. Operational Definitions

Pharmaceutical Selection practice: - Is activities that involve development of guidelines/policies for drug selection and facility based EML and assessing frequency at which this list updated, who participates and criteria for pharmaceutical selection to avail necessary medicines for the facilities.

Pharmaceutical Procurement practice: - Is activities that involve development of policies/guidelines for procurement and assessing quantification methods, whether procurement is limited to EML and conducted by generic name and type facilities of procurement.

Pharmaceutical Distribution practice: - Is activities that include preparing schedule for pharmaceutical delivery, having appropriate lead time, storage and inventory management practices of the facilities.

Pharmaceutical use practice: - Is activities of prescribers and dispensers in securing patients' medication use.

5.9. Data Quality Assurance

Data collection tools were prepared, reviewed, and pre-tested on Ilu Woreda health centers' (Taji and Asgori) and Ambo hospital before it was finalized. Data collectors and supervisors had orientation to ensure they completely understood the questions and methodology prior to field data collection and supervision. Several quality safeguards were incorporated into the data entry

program and Preliminary analysis like Cronbach's Alpha was calculated before the full data analysis to ensure internal consistency.

5.10. Ethical Considerations

Ethical approval was obtained from the Jimma University Institutional review board(IRB). Permission for the study was also guaranteed from South west Shoa zonal health department and official letter was written from each woreda health office for their respective health centers to conduct a research. Participants were given informed consent form after the data collectors explained the aim of the study. Questionnaires were anonymous and therefore the identities of participants were not revealed. Data was collected and placed into a sealed box. Each questionnaire was allocated a unique reference number, which will be linked to the facility name. This was for the purposes of the researcher only, and was not indicated in the research report.

5.11. Dissemination Plan

This study is significant at this time when the public health facilities are faced with great challenge of handling huge Ethiopian population who require better services.

The result of this study is important for the governing bodies, especially for those in health sectors. The government being in charge of delivering proper medical care to its citizens; the finding of this research will facilitate in formulating and putting in place best practices to ensure all public health facilities receive supplies. Having deployed great effort to achieving better medication for all Ethiopians, the government will be able to assess its performance.

After the findings of this thesis approved by Jimma University for the sake of the benefit of the public the first plan of principal investigator is to present the finding of this study in a presence of; all health centers directors, at least one professional working as pharmacy personnel from each health centers, all woreda pharmacy store managers, pharmacy head from hospitals, chief clinical officers and CEO of hospitals and concerned body from zonal health department.

The fund for the disseminating the finding of this study is expected from two sources:

- From zonal health department of South West Shoa, Oromia, Ethiopia.
- From partners working in this zone, especially those on pharmacy services

The above plan will be expected to be realized 1/8/2017 to 30/8/2017.

The second plan is to disseminate the copy of approved finding at least to each woreda, the city administration and ZHD if the above plan fails to be successful for different reasons.

6. Chapter Six: Results

From all health centers and hospital included in the study, 56 professionals working as pharmacy heads and/or dispensers and/or store managers and 69 prescribers were respondents of this study. All selected health centers' heads, hospital CCO, five WoHO and ZHD logistic officers have responded in the study. From 180 initially proposed study participants 158(87.77%) of them were responded exactly in the study.

6.1. Pharmaceutical Selection Practices

As shown in the table below 22(81.5%), 16(59.3%) and 17(63.0%) of facilities have list common disease, national STG and national essential drugs list/formulary respectively. The finding of this study also showed 16(59.3%) of the facilities developed facility specific Essential Medicine List and among those that developed their own facility specific EML 11(68.75%) of them stick to this list for procurement. Around 17(63%) of facilities have written or defined criteria for medicine selection

Table 1: pharmaceutical selection practices in selected public health facilities of Southwest shoa, Ethiopia, March, 2017.

Pharmaceutical selection practices	**Total no. of response(N)**	**Frequency [Yes] n (%)**
Does the health facility have list of common disease?	27	22(81.5)
Does the facility have national STG?	27	16(59.3)
Does the health facility have copy of national essential drug list/formulary?	27	17(63)
Does the health facility have its own essential medicine list?	27	16(59.3)
Is procurement in the facility limited to EML of the facility?	16	11(68.75)
Do pharmaceutical donations comply with the facility list?	16	10(62.5)
Is there any written or defined criteria for medicine selection in your facility?	27	17(63)
Mean score		**65.34%**

From 24 responded in this study 79.17% of the facilities performs pharmaceutical selection by drug and therapeutic committee of their respective facilities while 20.83% of them undertake selection by pharmacy unit only. As indicated below among facilities that have facility specific EML 57.14% of them revise their list annually.

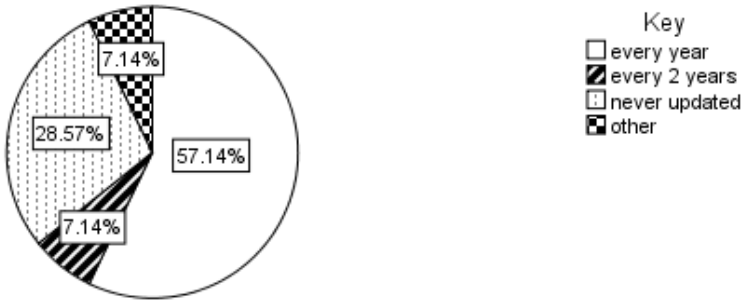

Figure 4: Frequency at which EML is in selected public health facilities of Southwest shoa, Oromia 2017 (n=14)

From the figure below 1(6.67%) of health center knows and identified the number of medicines included in their essential medicine list is 40 to 50.

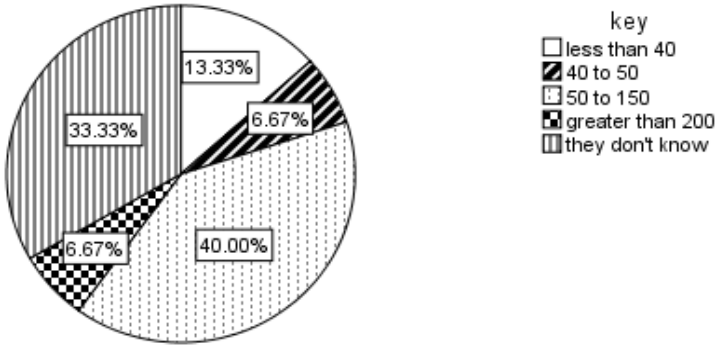

Figure 5: Total number of pharmaceuticals included in facility specific EML in selected public health centers of Southwest Shoa, Oromia (n=15)

In preparing facility specific EML, 23(85.19%) of facilities surveyed uses pattern of prevalent disease as criterion for selection of pharmaceuticals.

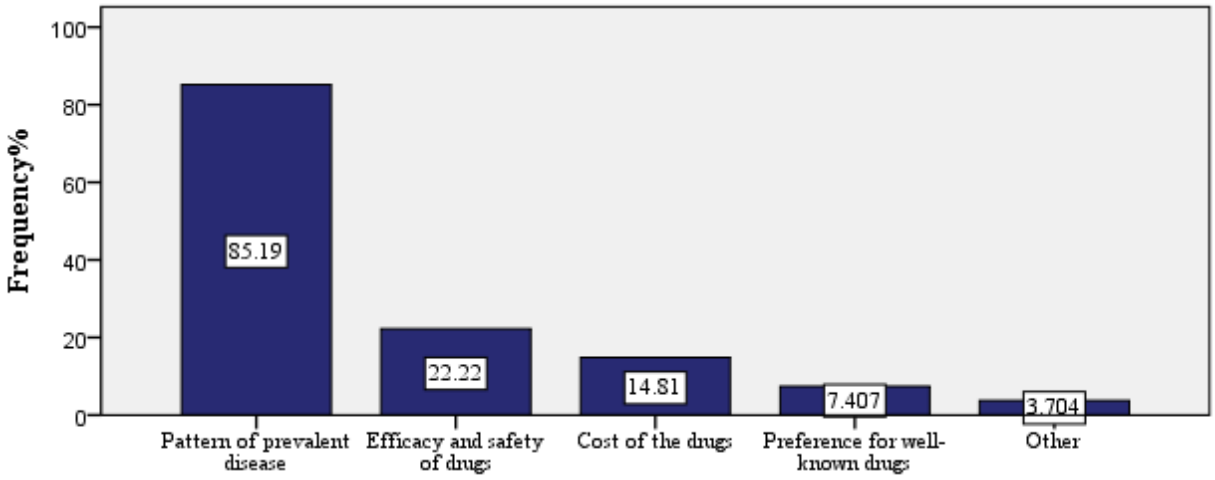

Figure 6: Criteria for drug selection in selected public health facilities of Southwest shoa, Oromia 2017 (n=27)

When asked about factors that are keys for appropriate pharmaceutical selection, most the key informants' interviewed ascertained, development of facility specific EML is a primary factor. The ZHD logistic officer believes that: "…*The selection of pharmaceuticals in our public health facilities are based on national list of pharmaceuticals. Most facilities have national drug and Formulary lists that are important for reference purposes and based on these some of them have been trying to select pharmaceuticals of their own and develop facility specific drug list*."

Most facilities having facility based essential drug list identified their strength behind development EML and good selection practice they have. Some facility heads responded selection for procurement is made based on developed facility medicine list only. This list was prepared by strong participation of multidisciplinary committee based on predefined criteria. These activities are strong in a certain facilities because they do have functional and trained drug and therapeutic committee. To the contrary in most of health facilities two Woreda pharmacy logistic officers evaluated there is a poor pharmaceutical selection practice. According to them most facilities didn't developed facility specific drug list because either they didn't established DTC or do not have functional DTC, this is due to the fact that before 2 to 3 years ago almost all facilities do not have pharmacy professionals and recently after few druggists assigned to a certain facility they only do their dispensing job only.

6.2. Pharmaceutical Procuremnt Practices

As shown in the table below 11(40.7%) of facilities have policy or guideline for procurement and 22(81.5%)) of them have annual quantification plan of which 14(63.6%) of facilities' plan matches with budget available and 23(82.5%) of surveyed facilities conduct their procurement by generic name. From all surveyed facilities 40.7% and 51.9% of them conducted ABC and VEN analysis respectively.

Table 2: Pharmaceutical procurement practices in selected public health facilities of Southwest shoa, Oomia, 2017

Pharmaceutical procurement practices	**Total no. of response(N)**	**Frequency [Yes] n (%)**
Is there any policy or guideline for procurement?	27	11(40.7)
Does your facility annual quantification plan?	27	22(81.5)
Does your quantification plan matches with budget available?	22	14(63.6)
Did you conduct ABC analysis?	27	11(40.7)
Did you conduct VEN analysis?	27	14(51.9)
Is all procurement made by generic name?	27	23(85.2)
Mean score		**60.60%**

While quantifying pharmaceuticals 62.96% and 37.04% of the facilities (n=27) determines their resupply quantities by formula and guess respectively and 88.89%) and 11.11% of the facilities (n=27) use consumption method morbidity method respectively for quantifying their pharmaceuticals

As shown in figure below 17(62.96%) of the facilities determine their resupply quantities by themselves 6(22.22%) and 4(14.81%) of the facilities resupply quantities are determined by RHB/WHO and the suppliers respectively.

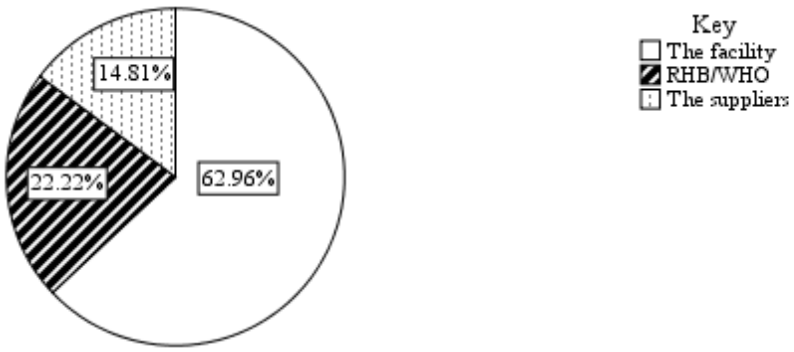

Figure 7: Figure showing who determines facilities resupply quantities in selected public health facilities of Southwest shoa, Oromia 2017 (n=27)

As indicated in the figure below in 12(44.44%), 10(37.04%) and 9(33.33%) of facilities lack of coordination between technical staff while quantification, lack of capacity in quantification and poor/inadequate/inaccessible data are barriers in pharmaceutical quantification of the facilities respectively.

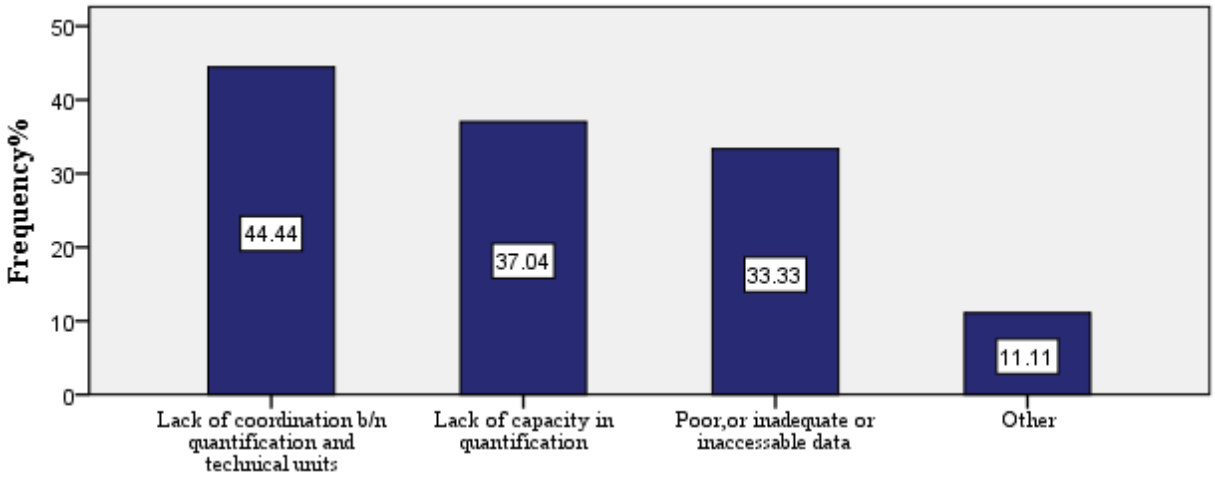

Figure 8: Barriers of pharmaceutical quantification in selected public health facilities of Southwest shoa, Oromia 2017 (n=27)

As shown in figure below limited use of procurement flexibilities, lack of coordination between quantification personnel and ware house personnel, lack of product standardization, unclear procurement process, unplanned/unsolicited/unspecified donation and bureaucratic and cumbersome procurement practices are barriers of pharmaceutical procurement in 13(48.15%), 7(25.93%), 7(25.93%), 5(18.52%), 3(11.11%) and 2(7.41) of the facilities respectively.

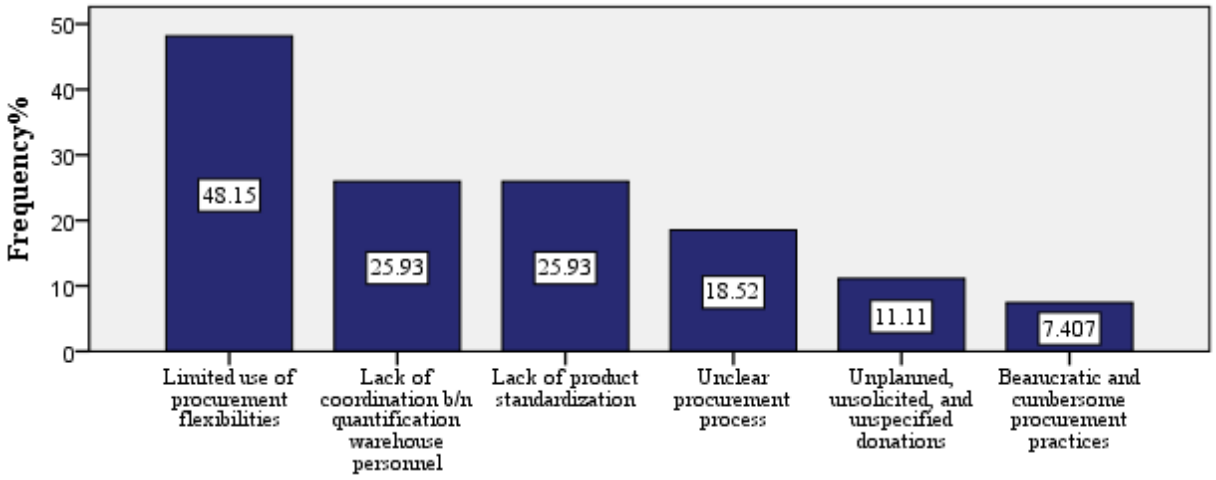

Figure 9: Barriers of pharmaceutical procurement in selected public health facilities of Southwest shoa, Oromia 2017 (n=27)

In depth interview with key informants clearly identified pharmaceutical procurement practice and associated factors. According to ZHD logistic officer *"…Currently all health centers of our zone, simply lists and quantifies what they want and the supplier in our case Biftu Adugna share company resupplies according to their forecasts and 180,000 ETB(same budget) allocated for all health centers. For program pharmaceuticals and supplies (like HIV, TB, Malaria and the like) the selection and procurement processes are done at national level not at lower health facility level. Non-programmatic pharmaceuticals are ordered once at the beginning of the year and based on the agreement between ORHB and Biftu Adugna S.C, the resupply was made twice a year. Concerning program pharmaceuticals ordering has been made every two month and the reports was collected, aggregated and sent to PFSA hub by Woreda health offices through zonal health departments."*

"…Because of many reasons, currently the performance of our health facility is far below expectation. Even though all of them ordering and receiving pharmaceuticals according to the schedules set at the beginning of the year, there are many challenges on calculating their real consumption and placing order. Most of our health centers have no their own essential drug lists. The first challenge is shortage of pharmacy professionals, the second is knowledge and skill gap and the other is less attention by administrative bodies."

Their opinion towards improving the process of selection and procurement of pharmaceuticals in the government health facilities stipulated by most interviewed respondents were building the

capacity and skill of pharmacy professionals through training, availing skilled personnel and giving equivalent attention and continuous supportive supervision and monitoring with other service areas.

6.3. Pharmaceutical Distribution Practices

As sshown in the table below 12(44.4%) and 14(51.9%) of the facilities have dedicated vehicle for medication delivery from suppliers and schedule which they follow to deliver pharmaceuticals from suppliers respectively. From 19(70.4%) facilities which receives pharmaceuticals by direct delivery of the suppliers 7(36.84%) of them supplied on time and from all health 14(51.9%) of them always encounter discrepancy between order and delivery.

Table 3: Pharmaceutical distribution practices selected public health facilities of south west shoa, 2017

Pharmaceutical distribution practices	**Total number of response(N)**	**Frequency [Yes] n(%)**
Is there a dedicated vehicle to deliver medication?	27	12(44.4%)
Do you have a schedule which you follow to deliver medicine from supplier	27	14(51.9%)
Do the suppliers deliver pharmaceuticals to the facility premises?	27	19(70.4%)
Is the delivery by the suppliers is made on time?	19	7(36.84%)
Is there a porter when the medication is delivered?	27	7(25.9%)
Is there always discrepancy between the order and delivery?	27	14(51.9%)
Mean score		**46.89%**

As shown in a figure below it takes less than 2 weeks for 13(50%) health facilities between ordering and receiving from PFSA respectively.

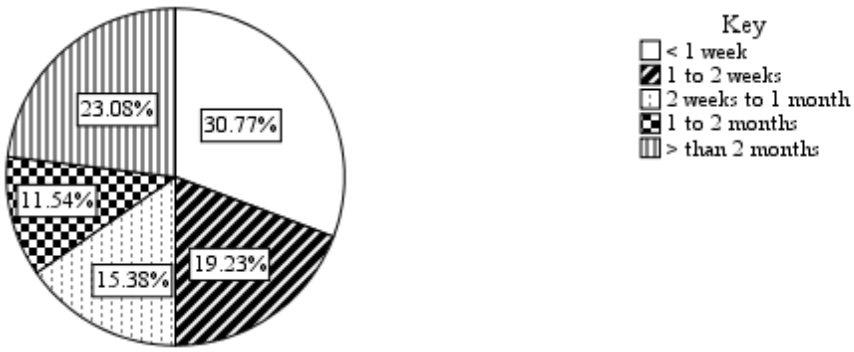

Figure 10: Average time it takes between ordering and receiving from PFSA in selected public health facilities of Southwest shoa, Oromia 2017 (n=26)

As shown in the figure below limited transportation infrastructure and poor distribution planning are prominent pharmaceutical distribution barriers in more than half of surveyed facilities

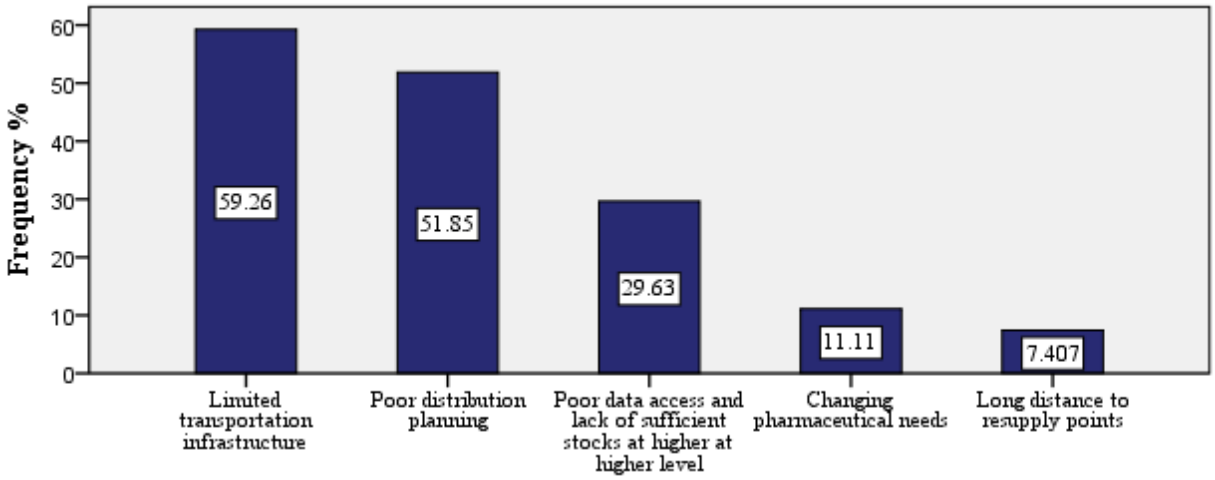

Figure 11: Barriers of pharmaceutical distribution in selected public health facilities of Southwest Shoa, Oromia, 2017 (n=27)

6.3.1. Pharmaceutical Storage System

As shown in the figure below 14(50%), 6(21.43%), 5(17.86%) and 3(10.71%) of the facilities pharmaceutical ware house is managed by nurse, druggist, pharmacist and public health officer respectively.

Figure 12: Profession of pharmaceutical store managers in selected public health facilities of Southwest shoa, Oromia 2017 (n=28)

6.3.1.1. Infrastructure and Condition Warehouses

Among surveyed facilities 26(96.3%) of their store is separate from dispensary, 12(42.9%) of the facilities' store had visible cracks/holes/sign of water leakage, the ceilings of 19(67.9%) pharmaceutical store were in good condition and the store rooms are dry, clean, well ventilated, and between +15 and +25°C. Facilities having receiving and unpacking area and accessible fire safety equipment are 9(32.1%) and 11(39.3%) respectively.

The following figure shows availability of necessary equipments in pharmaceutical store of surveyed facilities.

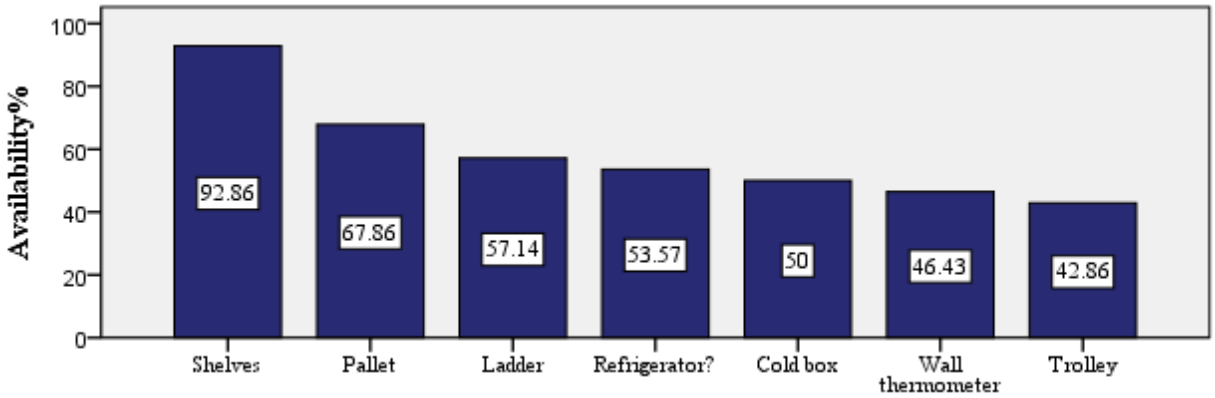

Figure 13: Availability of necessary equipments in pharmaceutical store of selected public health facilities of Southwest Shoa, Oromia, 2017 (n=28)

6.3.1.2. Organization of Pharmaceuticals in Warehouse

As shown in the table below in 8(28.6%) pharmaceutical warehouses expired pharmaceuticals are stored with usable pharmaceuticals and in 8(28.6%) of the facilities warehouses narcotics and psychotropic drugs are in a separate, double-locked storage space.

Table 4: Pharmaceutical storage practices in selected public health facilities of south west shoa, 2017

Pharmaceutical storage practices	**Total number of response(N)**	**Frequency [Yes] n (%)**
Do supplies are systematically classified on the shelves	28	23(82.1%)
Do supplies are arranged on the shelves in alphabetical order by generic name within each category?	28	12(42.9%)
Do tablets and other dry medicines are stored in airtight containers?	27	17(62.96%
Do liquids, ointments, and injectables are stored on the middle shelves?	28	20(71.4%)
Do supplies, such as surgical items, condoms, and bandages, are stored on the bottom shelves?	28	15(53.6%)
Are there expired drugs in the store?	28	8(28.6%)
Do medicines with expiry date stored in FEFO?	28	19(67.9%)
Do supplies with no expiry date stored in FIFO?	28	18(64.3%)
Do supplies with only manufacture date stored according to chronological order?	28	12(42.9%)
Are narcotics and psychotropic drugs are in a separate, double-locked storage space?	28	8(28.6%)
Mean score		**54.53%**

6.3.2. Pharmaceutical Inventory Management Practices

As shown in the following table 21(75%), 22(78.6%) and 18(64.3%) health facilities have standard inventory control system, updated all bin cards of selected pharmaceuticals and

performs physical count at regular intervals respectively. Only 15(53.6%) facilities stock records correspond with physical stock for all samples pharmaceuticals selected. Only16 (57.1%) health facilities store managers' undergone formal training in inventory management and only 10(35.7%) health facilities have procedures manuals for inventory management available in the store.

Table 5: Pharmaceutical inventory management in selected public health facilities of south west shoa, 2017

Pharmaceutical inventory management practices	**Total number of response(N)**	**Frequency [Yes] (%)**
Is there a standard inventory control system at health facilities?	28	21(75.0%)
Do all pharmaceuticals in the facility store have a bin card?	28	22(78.6%)
Is a physical count made at regular intervals?	28	18(64.3%)
Is the minimum or safety stock level set according to the frequency of delivery and average consumption?	28	20(71.4%)
Are used bin cards kept for a defined period?	28	17(60.7%)
Do stock records correspond with physical stock for all samples pharmaceuticals selected?	28	15(53.6%)
Did you undergo any formal training in inventory management?	28	16(57.1%)
Are procedures manuals for inventory management available in the store?	28	10(35.7%)
Mean score		**62.05%**

Among facilities surveyed 19(67.86%), 3(10.71%), and 9(32.14%) store managers thought poor warehouse infrastructure, Poor product traceability, stock leakage and security and Poor performance of existing staff are barriers of their inventory management in their respective health facility respectively.

The ideas of interviewed key informants were summarized as follows;

In order to maintain the shelf life of pharmaceuticals sufficient store and good storage condition is inevitable. But practically from all health centers found in our zone only 8 health centers have

separate design of pharmaceutical store. Less than 25% of them have sufficient store properly kept pharmaceuticals. Because of the current waste disposal directive (FMHACA) all facilities kept expired and damaged pharmaceuticals with usable stock in those narrow store. Beside these all challenges, currently there are good changes observed here and there. This may be due to regular IPLS training for professionals having contact with pharmaceutical supply management.

Recommendation towards improving pharmaceutical store and storage management in health facilities by most of the interviewed key informants were to build strong management especially on areas of securing enough budget for store construction, equipping and filled with furniture and commitment of individuals towards the success of pharmaceutical supply chain and its management.

6.4. Pharmaceutical Use Practices

To assess provider side pharmaceutical use in selected health facilities of south west Shoa 69 prescribers (male 51(73.9%) and female 18(26.1%)) and 43 dispensers (male 34(79.1%) and female 9(20.9%)) were involved in the study. From prescribers participated in the study 3(4.3%), 35(50.7%), 14(20.3%), 13(18.8%) and 4(5.8%) of them were General practitioner, Public health office, BSc nurse, Clinical nurse and other professional like ESO and BSc in dental science respectively. Likewise from dispensers participated in the study 3(7%), 12(27.9%), 19(44.2%), 9(20.9) of them were public health officer, pharmacist, druggist and nurses respectively.

Table 6: Socio-demographic characteristics of prescribers and dispensers involved in the study of assessment of pharmaceutical supply management practices of public health facilities of southwest Shoa, Oromia regional state, Ethiopia, 2017

Socio-demographic characteristics	**Prescriber n (%)**	**Dispenser n (%)**
Sex		
Male	51(73.9)	34(79.1)
Female	18(26.1)	9(20.9)
Total	69(100)	43(100)
Age		
Less than or equal to 25	22(31.9)	12(27.9)
26 to 30	36(52.2)	28(65.1)
31 to 35	7(10.1)	2(4.7)
Greater than 35	4(5.8)	0
Qualification		
Specialist	0(0)	-
General practitioner	3(4.3)	-
Public health officer	35(50.7)	3(7)
BSc nurse	14(20.3)	-
Clinical nurse	13(18.8)	-
Pharmacist	-	12(27.9)
Druggist	-	19(44.2)
Nurse(both BSc and clinical)	-	9(20.9)
Other	4(5.8)	-
Total	69(100)	43(100)
Years of experience as prescriber/ dispenser		
Less than or equal to 3	24(34.8)	16(37.2)
4 to 6	23(33.3)	18(41.9)
7 to 9	13(18.6)	4(9.3)
More than 9	8(11.6)	-
Total	68(98.3)	39(90.7)

As shown in the table below let alone using national STG, greater than one third of prescribers do not have national STG at their working area and 20(29%) and 15(21.7%) of prescribers usually and always stick to Ethiopian national STG respectively. For most 44(63.8%) of prescribers injectables are preferable form of way to deliver medicines when needed (sometimes). Almost half prescribers don't have access to up-to-date drug information and 17(24.6%), 14(20.3%), 13(18.8%), 12(17.4%) and 13(18.8%) of them never, rarely, sometimes, usually and always take note of drug price before prescribing respectively. Only 47.8% of prescribers always prescribe by generic and only few of them, around 4%, justify why they do not always prescribe by generic.

Table 7: Prescriber related information about pharmaceutical use in selected public health facilities of Southwest Shoa, Oromia, 2017

Prescriber related information about pharmaceutical use	Number (%)
Is there any kind of STG available in your working area?	
Yes	41(59.4)
No	27(39.1)
Do you stick to standard treatment guidelines of Ethiopia?	
Never	3(4.3)
Rarely	11(15.9)
Some times	20(29)
Usually	20(29)
Always	15(21.7)
Are injections a preferable way to deliver medicines for you?	
Never	2(2.9)
Rarely	14(20.3)
Some times	44(63.8)
Usually	5(7.2)
Always	3(4.3)
Do you get up to date drug information?	
Yes	34(49.3)
No	33(47.8)
Do you take note of drugs' price before prescribing?	
Never	17(24.6)
Rarely	14(20.3)
Some times	13(18.8)
Usually	12(17.4)
Always	13(18.8)
Do you prescribe by generic?	
Never	4(5.8)
Rarely	6(8.7)
Some times	10(14.5)
Usually	16(23.2)
Always	33(47.8)

As indicated in the table below prescribers are on good track in fulfilling the completeness of the prescription while prescribing as most of them always include 85.5% age of the patient, 84.1% dose of the medication, 76.8% route of administration, 75.4%frequenct at which the medication administered and 71% treatment duration. However only 40.6%, 40.6%, 36.2% and 43.5% of them always consider medication availability in the facility, drug interaction, patient related problems like renal failure and previous medication of the patient respectively

Table 8: Prescribers' inclusion and consideration of necessary information while prescribing

Information	Always	Usually	Sometimes	Rarely	Never	**Total**
	n(%)	n(%)	n(%)	n(%)	n(%)	**N(%)**
Age	59(85.5)	6(8.7)	4(5.8)	-	-	69(100)
Dose of medication	58(84.1)	8(11.6)	3(4.3)	-	-	69(100)
Dosage form	47(68.1)	15(21.7)	5(7.2)	2(2.9)	-	69(100)
Route of administration	53(76.8)	11(15.9)	4(5.8)	-	1(1.4)	69(100)
Frequency	52(75.4)	12(17.4)	4(5.8)	1(1.4)	-	69(100)
Treatment duration	49(71)	14(20.3)	5(7.2)	-	1(1.4)	69(100)
Medication availability	28(40.6)	19(27.5)	8(11.6)	12(17.4)	2(2.9)	69(100)
Drug interaction	28(40.6)	9(13)	12(17.4)	17(24.6)	3(4.3)	69(100)
Patient related problems	25(36.2)	14(20.3)	10(14.5)	17(24.6)	3(4.3)	69(100)
Previous medication	30(43.5)	17(24.6)	14(20.3)	5(7.2)	3(4.3)	69(100)

As indicated in a figure below in surveyed facilities around 28% of professionals participated in dispensing activity are not pharmacy professionals.

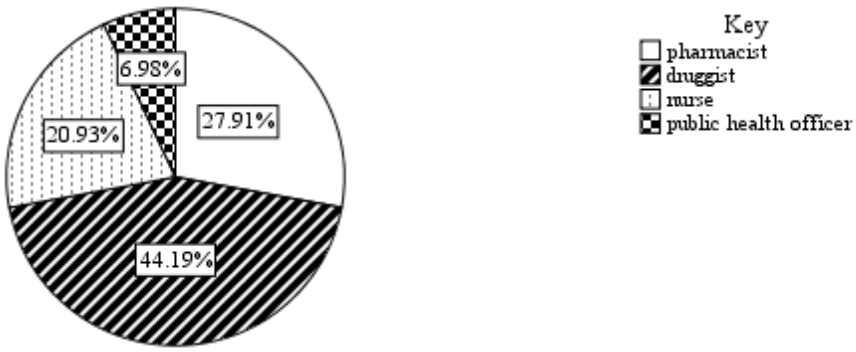

Figure 14: Professionals participating in dispensing duty in selected public health facilities of Southwest shoa, Oromia (n=43), 2017

As shown in the table below most dispensers 31(71%), 27(62.8%), 25(58.1%) and 23(53.5%) always provide how often to take the drug, when to take the drug (e.g. before meal), how to take the drug (e.g. with water, chewing) and how to store the drug respectively. However only20 (46.5%) and 21(48.8%) dispensers always provide information on how long the treatment last and no to share the medication for the clients respectively.

Table 9: Information provided by dispenser to the patient in selected public health facilities of Southwest shoa, Oromia 2017

Do you provide drug information below	Always	Usually	Sometimes	Rarely	Never	**Total**
	n(%)	n(%)	n(%)	n(%)	n(%)	**N(%)**
How often to take drug	31(72.1)	7(16.3)	3(7)	2(4.7)	-	43(100)
When to take the drug e.g. before meal	27(62.8)	4(9.3)	6(14)	5(11.6)	1(2.3)	43(100)
Duration of treatment	20(46.5)	8(18.6)	6(14)	5(11.6%)	4(9.3)	43(100)
How to take the drug e.g. with water, chewing	25(58.1)	10(23.3)	5(11.6)	2(4.7)	1(2.3)	43(100)
How to store the drug	23(53.5)	7(16.3)	6(14)	5(11.6)	2(4.7)	4(100)
Not to share medicine	21(48.8)	4(9.3)	6(14)	8(18.6)	4(9.3)	43(100)

As indicated in table below 53.5% of dispensers perceive that they are getting up to date drug information for their day to day service provision and always check whether prescription is

appropriately written or not. Only 19(44.2%) of prescribers always label drug they are dispensing including quantity to be dispensed and frequency before dispensing and give focus for special patients like geriatrics, pediatrics, chronic patients and etc. Most of prescribers' 35(81.4%) checks expiry date of drugs before dispensing.

Table 10: Dispenser related drug information about pharmaceutical use in selected public health facilities of Southwest shoa, Oromia 2017

Dispenser related information about pharmaceutical use	**Number (%)**
Do you get access to up-to-date drug information	
Yes	**23(53.5)**
No	**20(46.5)**
Do you check whether prescription is appropriately written or not?	
Never	1(2.3)
Rarely	2(4.7)
Sometimes	7(16.3)
Usually	10(23.3)
Always	23(53.5)
Do you label at least including quantity to be dispensed and frequency before dispensing?	
Rarely	4(9.3)
Sometimes	9(20.9)
Usually	11(25.6)
Always	19(44.2)
Do you give focus for special patients like geriatrics, pediatrics, chronic patients and etc?	
Never	1(2.3)
Rarely	3(7)
Sometimes	10(23.3)
Usually	10(23.3)
Always	19(44.2)
Do you check expiry date of drugs before dispensing	
Sometimes	1(2.3)
Usually	7(16.3)
Always	35(81.4)

6.5. Management and Policy related issues

The idea from key informants regarding to management and policy related factors on pharmaceutical supply management practices is summarized as follows.

Health facility governance proclamation and regulation like Health Care Finance (HCF) in managing the financial aspects and services of the health facility, Pharmaceutical waste management directive used to manage and dispose expired and damaged pharmaceuticals and the new reform called APTS implementation regulation expected to improve pharmaceutical services in the health facilities are some of the rules and regulations enacted to improve pharmaceutical supply management and pharmacy services. Guidelines like Ethiopian Hospitals Reform Implementation (EHRIG), Ethiopian Health Centers Reform Implementation guidelines (EHCRIG), Guidelines for Good Prescribing Practice (GPP) and Good Dispensing Practices (GDP) and etc are all important for pharmaceutical supply management practices. However, it is not simple to implement all these rules and regulation at lower level of health facilities because they need strong collaboration with other government sectors like Finance, Administration, Public service offices and the like.

According to ZHD logistic officer *"Pharmaceutical supply chain management and Pharmacy services are the back bone health sector. But these activities are put aside and the professionals assigned in these areas have no or low support from the health sector governing bodies. The government changed pharmacy curriculum from supply oriented to clinical oriented so that the supply chain part of pharmacy services encounter a great challenge in sustainably availing pharmaceutical supplies and giving quality and full services to our community. These indicate that, even the government of this country not treating all subject matters equally."*

7. Chapter Seven: Discussion

Most leading causes of death and disability in developing countries can be prevented, treated, or at least alleviated with cost-effective essential medicines. Despite this fact, hundreds of millions of people do not have regular access to essential medicines. Many of those who do have access are given the wrong treatment, receive too little medicine for their illness, or do not use the medicine correctly(1). The ultimate purpose of pharmaceutical supply management is to avoid the problems highlighted above. The finding of this study focused on selection, procurement, distribution, inventory management and pharmaceutical utilization practices and facilitators and barriers of these practices.

7.1. Pharmaceutical Selection Practices

This study revealed that only around three fifth of the facility developed facility specific essential drug list and among those that have their own facility specific medicine list 68.75% of them stick to EML for procurement. This finding is not encouraging when compared with situation of Addis Abeba health centers where more than 95% surveyed health centers have their own facility based EDL(22). The reason of lower EDL development in surveyed public health facilities of south west shoa may be due to nonfunctional DTC, unavailable DTC and unavailability of pharmacy professionals in some health facilities.

Additionally, essential medicines list names the medicines considered optimal treatment choices to satisfy the health care needs of a given population. In its simplest form, it is used for one health facility to indicate which medicines should be procured and prescribed(1). As per Ethiopian Hospital services Transformation Guidelines all facilities should develop facility specific pharmaceuticals list comprised of medicines, medical supplies, medical equipment and laboratory reagents(44). For selection EML be objective and evidence-based all health facilities DTC should agree on explicit set of criteria i.e. based upon the WHO criteria(45).

This study also ascertained around three fourth of facility medicine selection is performed by DTC. Compared to the survey done in Addis Abeba health centers where more than 90% of their facilities pharmaceutical selection was done by DTC (38). As obtained from in depth interview this finding may due to the fact that DTC is not available in certain facilities.

From this study only 57.14% of the facilities are updating their EML annually. However as per EHSTG pharmaceuticals list should be reviewed and updated at least annually. As evidenced by in depth interview of key informants this is still may due to nonfunctional DTC member of the health facilities.

Another finding of this study identified that only 6.67% of health center knows and identified the number of medicine list included in their EML is between 40 and 50. WHO recommends that health centers, number of medicine in their EML to fall within 40 to 50. This indicates in most of the health centers EML consists of therapeutically duplicated medicines and this contradicts with the essence of why EML list should be developed at facility level. As highlighted in this study 23(85.18%) of health facilities selects their EML based on pattern of prevalent disease, which is in line with WHO criteria for medicine selection(1).

7.2. Pharmaceutical Procurement Practices

This study revealed only around 40.7% of surveyed facilities had policy or guideline for procurement in contrast to the national minimum standard for health facilities which requires health facilities to develop policies and guidelines for managing medicines. The standard stressed that health facilities shall have written policies for the procurement of drugs from government and private suppliers(22). At facility level policies or guidelines for managing pharmaceutical procurement should be developed by DTC(46). But in most surveyed health facilities DTC was not either established or functional and this may the reason for most facilities for not developing procurement guidelines or policies.

As clearly indicated in this study of 22(81.5%) health facilities having annual pharmaceutical quantification plan only 14(63.6%) of the facilities quantification plan matches with budget available. As elaborated in in-depth interview budget allocated for health centers located in urban with high patient flow is similar with health centers in rural areas and this may be the reason behind the discrepancies

This study also stipulated that only 40.7% and 51.9% of the surveyed facilities conducted ABC and VEN analysis respectively. This figure is much less than when compared to similar study

done in Addis Ababa where 91.7% and 54.2% of the health center surveyed conducted VEN and ABC analysis respectively. This difference is because of the fact that 40.7% of these study public health facilities didn't developed facility EML.

As indicated in this study 85.2% of the health facilities surveyed purchase pharmaceuticals always by generic name. Procurement by generic name has become the standard for purchasing pharmaceuticals. Pharmaceutical price reduction has largely been driven by procurement of generics (1). Therefore it is very promising that living in resource limited country like Ethiopia, using International Nonproprietary Name (INN) is a must and inevitable while procuring pharmaceuticals in public health facilities.

The finding of this study showed around 37% of surveyed public facilities determines their resupply by quantities by guess. Even though this finding is less when compared with similar survey conducted in Addis Ababa which is around 25%, it is far from the target of the recommendation of SOP manual of IPLS in health facilities of Ethiopia which recommends all facilities should report their calculated consumption to PFSA every two month(9,22). This discrepancy may due to barriers of procurement like lack of coordination between supply chain personnel and service delivery staff, lack of capacity in quantification and poor, inadequate and inaccessible data prominent in surveyed facilities.

This study revealed that 88.89% of the facilities are using consumption method while quantifying their demand. This finding is similar with study done in Ghana where most facilities use the traditional consumption based method as opposed to the morbidity based method for the estimation of quantities of pharmaceuticals or health supplies needed for a procurement(21). This may due to the complexity of morbidity method as it requires a list of common health problems, an essential medicines list that includes therapy for the problems, and a set of standard treatments for quantification purposes while consumption method requires inventory records of past consumption only.

7.3. Pharmaceutical Distribution Practices

As identified by this study only l2 (44.4%) health facilities have dedicated vehicle to transport pharmaceuticals from their respective suppliers. This situation is similar with Addis Ababa health centers where only 46% of this facility uses facility car for pharmaceutical

transportation(22). However, as elaborated by in-depth interview this situation is harsh in this study when compared to that of Addis Ababa where 54% facilities have the capacity to use private vehicles for this purpose. In most public facilities surveyed in this study due to lack of transportation, facilities can't even collect their product from WoHO store to their respective facilities.

This study also documented from 19(70.4%) facilities directly delivered by suppliers only 7(36.84%) receive their product on time. As it was elaborated during interview with key informants due to this issue most health facilities are prone to long term stock out and even they can't process any kind of procurement process since their budget is hold at regional level and agreement with the suppliers was done at this level. All their budget pharmaceuticals are supplied two times a year, this contradicts with SOP manual of IPLS of Ethiopia which guides health facilities to report and collect their product bimonthly(9).

As indicated by the result of this study it takes less than 2 weeks for 13(50%) health facilities between ordering and collecting procured product from PFSA. This data is much less than the survey done in Addis Ababa where 88% of the health centers collects there product within two weeks of request placement for purchasing. This may be due to the distance of the facilities in this study area from PFSA.

7.3.1. Pharmaceutical Storage System

More than 60% pharmacy store of surveyed health facilities are managed by professionals other than pharmacy professionals' i.e.by nurses and public health officer. According to FMHACA and council of ministers regulation number 299/2013 article 63 sub article 2 no health professional with professional license may provide health services beyond the scope of practice of his profession unless with special decision of appropriate organ in exceptional compelling circumstances(47). Even though the regulation stipulates this, no health facilities have special decision from government organ governing the facility for violating this regulation.

Almost in all health facilities facility pharmaceutical store is separate from dispensary. However there is a facility where store is not separate from dispensary, in such type of set up it is difficult to manipulate any consumption analysis and it is also illegal way of management of resource. In

most of the pharmaceutical the store have cracks, holes, or sign of water leakage, ceiling is not in good condition, and fire safety equipment is not accessible. As it was explained by many key informants interviewed in most health centers previously constructed warehouses were not for pharmacy store and even appropriate renovation is not also done while storing pharmaceuticals in a very narrow room and these may be the reason for the above finding.

The mean score of availability of necessary equipment like cold box, ladder, pallet, shelves, trolley, wall thermometer and refrigerator in surveyed health facilities is around 58%. This means only around 58% pharmaceutical warehouse is equipped with basic equipments mentioned above. This figure is much less than the survey done in Addis Ababa where the mean score is 77%. The mean score of storage practice in surveyed public health facilities of south west shoa is around 54.48%. That means only 54.48% health facilities are practicing good storage practice. This figure is again far from those of surveyed Addis Ababa health centers which is around 68.2%(22). This may due to low storage conditions and the knowledge and commitment of store managers since most of them are working beyond their professional jurisdiction.

7.3.2. Pharmaceutical Inventory Management Practices

This study documented 21(75%) health facilities have standard inventory control system. As identified by in depth interview the inventory management system and LMIS the health facilities are using is called IPLS developed by PFSA. This finding is much less than the finding of the survey done in Addis Ababa health centers in which 91.7% of health centers have documented LMIS(22). This may be due to the fact that only 16(57.1%) of health facilities undergo any formal training in inventory management.

The finding of this study also indicated 22(78.6%) of health facilities have bin card for all selected pharmaceuticals and of which 15(53.6%) of facilities updated their bin card. This finding is similar with survey done in Addis Ababa health centers where 84.5% of health facilities selected pharmaceuticals have bin cards of which 69.5% were updated. However as per SOP of IPLS manual of Ethiopia all health facilities of should maintain Bin Cards and Stock Record Cards, transaction and consumption records for all pharmaceuticals.

Pharmaceutical warehouses are challenged by insufficient human resources, poor physical infrastructure, and a lack of good systems to effectively track products throughout the system. These barriers lead to stock-outs, overstocking, and wastage of health resources(48). These are major problems in low-income country settings where resources for health are already limited. By using these as promising practices in warehousing and inventory management 9(32.14%) and 19(67.86%) of health facilities prominently face poor warehouse infrastructure and poor performance of existing staff are prominent barriers in the facilities surveyed respectively.

7.4. Prescribers and Dispensers Pharmaceutical Utilization Practices

7.4.1. Prescribers Pharmaceutical Use Practices

Ethiopian STG provides up-to-date information relevant to the prevention, diagnosis and treatment of common diseases in Ethiopia which helps to achieve provision of quality care to patients(49). However this study identified only 59.4% and 21.7% of surveyed prescribers have national STG at their working area and stick always to it respectively The result of this finding also indicated that only around half of surveyed prescribers believe that they do have access to up to date drug information. This finding is much less than the result previously done in the same zone during that around 76% of study participant responded that they does have access to drug information. This may be due to inclusion of many rural health centers in this study where there is no access of internet and electric service. Access to clinically relevant, up-to-date, user-specific, and objective information is required to make appropriate decisions for medicine prescribing, dispensing, and use. A health care system can provide access to the highest-quality medicines, but if those medicines are not properly used, they may have negligible, or even harmful, effects. Although access to good information about medicines does not guarantee appropriate decisions and use, it is a basic requirement for good decision making(1).

The result of this study also depicted that only 18.8% of prescribers always take note of drugs before prescribing. Medication cost is an underappreciated aspect of prescribing. Expensive, newer medicines are frequently used when comparable well-established and cheaper ones are available for the same condition. Printing pharmaceutical prices as manuals and giving it to the

prescribers may encourage them to make inexpensive choices(1).This study also documented only 33(47.8%) of surveyed prescribers always prescribe by generic. However, the requirement by WHO for rational drug use is always 100% prescription by generic name (1). Prescription by generic name will save the cost incurred by unnecessary brand prescription except in some drugs for which particular attention of concentrations or other factors are needed(15). Those prescribers not always prescribing by generic didn't have a reason why they to do so but few of them prescribe by brand name because some brand names are easy to write.

According to FMHACA general hospital STG, prescription is written order by the prescriber to the dispenser on how the medicine should be dispensed that serves as means of communication among the prescriber, dispenser and medicine consumer, pertaining to treatment or prophylaxis. It should include

- Name, address, age body weight of the medicine consumer and date of the prescription
- Diagnosis, generic name, dosage form and strength and directions for use of the medicines.
- Prescriber's name, signature and address(49).

However in this study it is documented that while prescribing, most of prescribers always include 85.5% age of the patient, 84.1% dose of the medication, 76.8% route of administration, 75.4% frequency at which the medication administered and 71% treatment duration. Another poor activities of the prescribers are only 40.6%, 36.2% and 43.5% of them always consider drug interaction, patient related problems like renal failure and previous medication of the patient respectively while prescribing. These are the most important and most critical factors in deciding what to prescribe, when to prescribe, and what to expect after prescribing.

7.4.2. Dispensers Pharmaceutical Utilization Practices

The quality of dispensing may be determined by the training and supervision the dispenser has received and the medicine information available to the dispenser(50). However as indicated in this study only 23(53.5%) dispensers responded that they do have access to up to date drug information and around 28% professionals participated in the study were either nurse or public health officer in their profession. Pharmacy professionals involved in dispensing of medicines

have the need for medicines information in order to keep themselves up to date with developments related to medicines and to provide such information to patients, other health professionals and to the general public. Lack of knowledge and information by patients about the medicines they take leads to incorrect use which in turn results in loss of efficacy or occurrence of adverse effects(50).

As indicted in the result majority of dispensers check whether prescription is appropriately written or not, and expiry date of drugs before dispensing. Most of the dispensers provide information on how often to take drug, when to take the drug e.g. before meal and how to take the drug e.g. with water, chewing for the patients. However, greater than half of surveyed dispensers do not always provide information on how long the treatment will last and not to share medicine with others. Only around 44.2% of surveyed dispensers label at least including quantity to be dispensed and frequency while dispensing and give focus for special patients like geriatrics, pediatrics, chronic patients and etc. Ideally good dispensing practice ensures that the correct medicine is delivered to the right patient, in the required dosage and quantities, with clear instructions, and in package that maintains an acceptable potency and quality of the medicine. The discrepancy from ideal practice may be due to poor M&E on pharmacy service by concerned body and inaccessible drug information by most dispensers.

8. Chapter Eight: Limitations of the Study

The study didn't include suppliers like whole sales and PFSA which do have great potential to identify problems related pharmaceutical supply management practices of the study area. In this study all components of the logistics system such as pharmaceutical waste management and cold chain logistics system wasn't addressed. Due to the nature of study design recall bias can occur in this study. This study focuses on assessing the prevalence only known associated factors of pharmaceutical supply management practices.

9. Chapter Nine: Conclusion

Generally from this study the following finding can be concluded;

- With respect to pharmaceutical selection even though most of surveyed facilities developed their EML the result wasn't as per the national minimum standard. However it is encouraging to see that most of the surveyed facilities select their pharmaceuticals for procurement based on pattern of prevalent disease in line with WHO selection criteria.
- In most of the facilities purchase pharmaceuticals by generic in line with standard for purchasing pharmaceuticals, however other procurement practices are not inline national and international standards.
- This study identified lack of coordination between quantification personnel and warehouse personnel, unclear procurement process, bureaucratic and cumbersome procurement practice, limited use of flexible procurement practices and lack of product standardization as barriers of pharmaceutical procurement in surveyed facilities.
- Most facilities delivered by suppliers are prone to long term stock out due to long lead time and half of those that directly collect their products from suppliers faces lack of transportation infrastructure specially dedicated vehicle and poor distribution planning and this implies much to do on pharmaceutical distribution practice of the facilities.
- Most facilities storage and inventory management is not good when compared to standard practice. Prominent barriers not to be in line with available standard were poor warehouse infrastructure and poor performance of existing staff.
- Most prescribers didn't always include and consider necessary information while prescribing and this implies most prescribers do not adhere to good prescribing practice.
- The finding of this result also revealed all dispensers do not fully provide necessary information and didn't consider special groups while dispensing. These can lead to lack of knowledge and information by patients about the medicines they take and then incorrect use which in turn results in loss of efficacy or occurrence of adverse effects. This shows much should be done to provide necessary drug information for patients

10. Chapter Ten: Recommendations

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

- To perform effective drug selection health facilities should establish and strengthen their DTC through monitoring and evaluating the performance of this committee on regular basis and giving basic training for them. Facility managers should give attention on this as selection of medicines has a considerable impact on the quality of care and the cost of treatment, and it is therefore one of the areas where intervention is most cost-effective and must taken in public health facilities of study area.
- Public health facilities of the study area should coordinate multidisciplinary staffs and units for Pharmaceutical quantification as this relies on the collaboration and coordination of various units and service delivery staff. Because quantification plan may be a highly technical process; Suppliers, Zonal and woreda health offices should build local capacity in quantification
- Facilities and suppliers should link logistics and service delivery data because missing and/or poor quality data inhibit the accuracy and impact this plan
- To overcome pharmaceutical procurement that may not be timely and cost-effective facilities should establish pharmaceutical logistic officer or drug supplier manager in each facility, outsourcing the procurement activities, framework contracts, prime vendor contracts and establishing known lead time. Facilities are recommended to use category/commodity management where there is unclear procurement process as barrier for procurement.
- Public health facilities are recommended to use framework and prime vendor contracts to overcome limited procurement flexibilities which is prominent form of pharmaceutical procurement barrier in most of public health facilities of south west shoa. Category/ commodity management and pooled procurement should be practiced in facilities where lack of product standardization is challenge for procurement pharmaceuticals and policies for the donation of medical commodities should exist in facilities where unplanned, unsolicited, and unspecified donations as a barrier pharmaceutical procurement.
- Facilities and woreda health offices should use distribution outsourcing and level-jumping where there is difficulty with transportation infrastructure and long distances at the lower levels of the supply chain and poor distribution planning.
- Promising practice recommended for the facilities with challenge storage space and materials available for the volume of products that move through the warehouse is to introduce infrastructure improvements for optimal storage.

- Health facilities should do performance management and supportive supervision, increasing capacity for health personnel at the service delivery point and assign dedicated personnel where there is inadequate training (or sometimes no training) and poor performance assigned staff for inventory management
- Training on good prescribing and dispensing should be arranged for prescribers and dispensers to improve their respective practices. Dispensers and prescribers should also improve their skill by using different guiding books and facilities are expected to avail different reading materials like good dispensing and prescribing manuals, standard treatment guidelines, drug lists, medicine formularies and etc.
- A comprehensive policy should be in place to influence prescribing and dispensing behavior at all levels of the system, focusing on the priority problems and targeting the prescribers and dispensers involved, because at many places prescribers include nurses, who received little training in the use of medicines and dispensers are public health

References

1. MSH. MDS-3: Managing Access to Medicines and Health Technologies [Internet]. Arlington, VA: Management Sciences for Health, Inc. All; 2012. 1088 p. Available from: http://www.msh.org/resource-center/ebookstore/copyright.cfm.%5Cnwww.mds-online.org
2. Management Sciences for Health, Inc., and the U.S. Pharmacopeial Convention I. Improving Drug Management for Public Health: Lessons From The Rational Pharmaceutical Management Project. Arlington, VA: Management Sciences for Health.: Rational Pharmaceutical Management Project; 2001.
3. Adzimah ED, Aikins I, Awuah-gyawu M, Duah PA. Health Care Delivery ; a Supply Chain Perspective . the Case of. Eur J Bus Soc Sci. 2014;3(8):78–103.
4. WHO. ALMA-ATA 1978 Primary Health Care. International Conference on Primary Health Care. Alma-Ata; 1978.
5. John Snow Inc., DELIVER. The Logistics Handbook [Internet]. Andersen Consulting, New York. Arlington, VA: John Snow Inc./DELIVER, for the U.S. Agency for International Development (USAID).; 2004. Available from: http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:The+Logistics+Handbook#8
6. USAID, Management Sciences for Health, Project QA. Health Systems Assessment Approach: A How-To Manual. [Internet]. Islam M, editor. Arlington; 2007. Available from: http://healthsystems2020.org.
7. Manual T. Management of Drugs at Health Centre Level ■ [Internet]. Vol. 2, World Health Organization. Brazzaville: WHO Regional Office for Africa; 2004. 1-84 p. Available from: http://apps.who.int/medicinedocs/pdf/s7919e/s7919e.pdf
8. Adzimah ED, Aikins I, Awuah-gyawu M, Duah PA. AN ASSESSMENT OF HEALTH COMMODITIES MANAGEMENT PRACTICES IN HEALTH CARE DELIVERY; A SUPPLY CHAIN PERSPECTIVE. THE CASE OF SELECTED HOSPITALS IN ASHANTI REGION-GHANA Emelia. 2014;3(8):78–103.
9. pharmaceutical fund and supply Agency (PFSA). Standard operating procedure manual for the integrated pharmaceutical logistics system in health facilities of Ethiopia,. Second. Addis Ababa, Ethiopia; 2015. 92 p.
10. Yadav P, Lega Tata H, Bababley M. The world medicines situation 2011 - Storage and

Supply Chain Management [Internet]. 3rd ed. Medicine expenditures. …. Geneva: World Health Organization; 2011. 22 p. Available from: http://apps.who.int/medicinedocs/en/d/Js20037en/

11. WHO hai. Measuring medicine prices, availability, affordability and price components. Geneva: World Health Organization and Health Action International; 2008. 1-310 p.
12. Elizabeth A. McCarthy* , Megan E. O'Brien WRR. Training and HIV-treatment scale-up: Establishing an implementation research agenda. PLoS Med. 2006;3(7):0989–93.
13. Laing R. Ten recommendations to improve use of medicines in developing countries. Health Policy Plan [Internet]. 2001;16(1):13–20. Available from: http://heapol.oxfordjournals.org/cgi/doi/10.1093/heapol/16.1.13
14. TAYOB S. Challenges in the management of medicine supply in primary health care centres in a district of Gauteng Province , South Africa. Vol. 1. Limpopo; 2014.
15. DACA. STNDARD TREATMENT GUIDELINE FOR HEALTH CENTERS. Addis Ababa, Ethiopia; 2010. 1-349 p.
16. WHO. Operational principles for good pharmaceutical procurement. In: Managing drug supply. 2nd ed. Geneva: WHO; 1999. p. 32.
17. MOHSW. IN-DEPTH ASSESSMENT OF THE MEDICINES SUPPLY MANAGEMENT SYSTEM IN TANZANIA. Dar es salaam, Tanzania; 2008.
18. Roy C, Jha HK, Das JK, Bhattacharya V, Shivdasani J. A Study on the Logistics and Supply Management System of Drugs at Different Levels in District Darbhanga of Bihar. 2009.
19. Republic of the Sudan FMOH. Assessment of the National Pharmaceutical Sector Level II health facilities survey. 2007.
20. Ministry of Medical Services and Ministry of Public Health& Sanitation. Access to Essential Medicines in Kenya A Health Facility Survey. Nairobi; 2009.
21. GNDP, MOH. Ghana Assessment of Medicines Procurement and Supply Management Systems in the Public Health Sector. Accra; 2009.
22. Mudzteba M. Assessment of Pharmaceutical Logistics System in Health Centers of Addis Ababa , [Internet]. Addis Ababa University; 2014. Available from: http://etd.aau.edu.et/bitstream/123456789/6102/1/Mezid Mudzteba
23. Nigussie WD. Assessment of the degree of adherence to health facility indicators related

to rational drug use in Selected Health Facilities of Amhara Region , Northwest Ethiopia. 2014;5(4):171–8.

24. Muturi W. Factors Affecting Public Procurement of Hospital Supplies in Public Health Institutions in Kenya. Int J Econ Commer Manag. 2015;III(11):863–72.
25. Program Systems for Improved Access to Pharmaceuticals and Services (SIAPS). Promising Practices: PROCUREMENT. 2014. p. 1–26.
26. DELIVER, USAID. Addressing Procurement Bottlenecks A Review of Procurement Bottlenecks in Public Sector Medicine Supply Chains and Practical Approaches Taken to Resolve Them [Internet]. Arlington, VA; 2013. Available from: http://deliver.jsi.com/dlvr_content/resources/allpubs/policypapers/AddrProcBottl.pdf
27. WHO. Managing Distribution. In: MDS-3: Managing Access to Medicines and Health Technologies. management sciences for health; 2012. p. 2–21.
28. Achuora JO, Arasa RM, Ochiri G, Muangangi P. Factors Affecting Distribution Performance for Pharmaceutical Products in Kenya ' s Public Sector. IMS Manthan. 2012;VII(2):1–8.
29. Gizat M, Mammo S. Assessment of pharmaceutical store management in woreda health offices of west Hararghe zone, Ethiopia. 2014;5(8):642–5.
30. SIAPS. Promising Practice: Distribution [Internet]. Arlington, VA: Management Sciences for Health; 2014. p. 19. Available from: http://apps.who.int/medicinedocs/documents/s21505en/s21505en.pdf
31. Kagashe GAB, Massawe T. Medicine Stock Out and Inventory Management Problems in Public Hospitals in Tanzania : a Case of Dar Es Salaam Region. Int J Pharm [Internet]. 2012;2(2):252–9. Available from: http://www.pharmascholars.com/download.php?file=upload/pharmacy_52baba3bb4f8a.pdf&iid=56
32. Pross Nagitta Oluka, Francis Ssennoga SK. Tackling Supply Chain Bottlenecks of Essential Drugs: a Case of Uganda Local Government Health Units. Heal (San Fr [Internet]. 2010;1–23. Available from: http://www.ippa.org/IPPC4/Proceedings/01ComparativeProcurement/Paper1-3.pdf
33. WHO. Operational package for assessing , monitoring and evaluating country pharmaceutical situations. Guide for coordinators and data collectorsman, F. Geneva:

World Health Organization can be obtained from WHO Press; 2007. 1-160 p.

34. World Health Organization. How to investigate drug use in health facilities [Internet]. 1993. p. 1–92. Available from: http://apps.who.int/medicinedocs/pdf/s2289e/s2289e.pdf
35. Angamo MT, Wabe NT, Raju NJ. Assessment of Patterns of Drug use by using World Health Organization ' s Prescribing , Patient Care and Health facility indicators in Selected Health Facilities in Southwest Ethiopia. J Appl Pharm Sci [Internet]. 2011;1(7):62–6. Available from: www.japsonline.com
36. Kebede M, Borga DK, Bobasa EM. Drug utilization in selected health facilities of south west Shoa Zone, Oromia Region, Ethiopia. Drug Healthc Patient Saf. 2015;7:121–7.
37. Jan SU. Php112 – Prescription Practices and Perceptions of Health Care Professionals Regarding Rational Drug Use. Value Heal. 2016;19(3):277.
38. Kremer M. Pharmaceuticals and the Developing World. J Econ Perspect [Internet]. 2002;16(4):67–90. Available from: http://pubs.aeaweb.org/doi/10.1257/089533002320950984
39. Elliott R. Problems with medication use in the elderly: an Australian perspective. J Pharm Pract Res Res [Internet]. 2006;36(1):58–66. Available from: http://search.informit.com.au/documentSummary;dn=469147618143114;res=IELHEA
40. Raja S, Mohammad N. National HIV/AIDS Programs: Supply Chain Management for HIV/AIDS Medical Commodities [Internet]. 1st ed. Population (English Edition). Washington; 2004. Available from: http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/AFRICAEXT/EXTAFRHEANUTPOP/EXTAFRREGTOPHIVAIDS/0,,contentMDK:20450745~menuPK:717173~pagePK:34004173~piPK:34003707~theSitePK:717148,00.html
41. Odoi-adome PWM. Health System Strengthening: Focus on Church Based Pharmaceutical Human Resources. A Publ world Counc churches. 2010;189(March).
42. USAID | DELIVER PROJECT TO 1. Logistics Indicators Assessment Tool (Liat). Arlington, Va.: USAID | DELIVER PROJECT, Task Order 1.; 2008.
43. Makuru M. Assessiment of vaccines distribution system in public healthcare facilities in Coast region, Tanzania. 2012;5–93.
44. ETHIOPIAN HOSPITAL MANAGEMENT INITIATIVE. Ethiopian Hospital Services Transformational Guidelines. 1st ed. Vol. 1. 2016. 440 p.

45. Bobek V, Kolostova K, Pinterova D, Kacprzak G, Adamiak J, Kolodziej J, et al. MASTER OF SCIENCE THESIS The occurrence of medication errors and the occurrence of risk factors for medication errors in state hospitals in Ghana : Patients ' safety improvement in focus SCHOOL OF MANAGEMENT AND Table of contents. Vol. 14, Anticancer Research. Geneva and Arlington; 2005. 4799-4804 p.
46. PFSA. SOPs Manual for Drug and Therapeutics Committe in health facilities of Ethiopia. Addis Ababa, Ethiopia; 2016. 1-149 p.
47. The Federal Negarit gazette of FDRE. Food Medicine and Healthcare Administration and Control Councils of Ministers Regulation No 299 /2013.pdf. Addis Ababa, Ethiopia; 2014. p. 38.
48. Systems for Improved Access to Pharmaceuticals and Services(SIAPS) P. Promising Practices Warehousing and Inventory Management. 2014;1–16.
49. FMHACA. Standard Treatment Guidelines For General Hospital. 3rd ed. Addis Ababa, Ethiopia; 2014.
50. FMHACA. Manual for Medicines Good Prescribing Practice. second. Addis Ababa, Ethiopia; 2012. 114 p.

Annex

Annex 1: products' bin card checking

No.	Product name	Facility name_____	
		Available	Updated
1.	3TC+ZDV+NVP (150mg + 300mg + 200mg) tablet		
2.	Acid alcohol 1% solution		
3.	Amoxicillin 500mg/250 mg Capsule		
4.	Arthmeter + Lumfanthrine – 20mg + 120mg		
5.	Blood lancet		
6.	Ceftriaxone 1gm/500mg injection		
7.	Ciprofloxacin 500mg tablet		
8.	Co-trimoxazole 240mg/5ml suspension, 100ml		
9.	Dextrose in normal saline with giving set		
10.	EDTA Tube		
11.	Efavirenz 600mg capsule		
12.	Ethnogestril 68mg Implant (Implanon) or Levonorgestrel 75mg Implant (Jadelle)		
13.	Ferrous sulphate + folic acid		
14.	Gentamycin 80mg/2ml ampoule, injection		
15.	Giemsa stain 0.76 % solution		
16.	KHB		
17.	Mebendazole tablet		
18.	Medroxyprogesterone Acetate 150mg/ml Injection		
19.	Microscope slide		
20.	Nevirapine 10mg/ml oral suspension		

21.	Oral Rehydration Salt (ORS)		
22.	Oxytocin 10units/ml in injection		
23.	Paracetamol 500mg tablet		
24.	Quinine Dihydrochloride 300mg/ml injection		
25.	RHZE-150mg/75mg+400mg+275mg-tablet		
Total			

Source: Ethiopian national survey of IPLS, 2015

Annex 2: List of health facilities to be included in the study

No.	Name of the health facilities	Woreda
1.	Waliso number one health center	Waliso woreda
2.	Waliso number two health cemter	Waliso woreda
3.	Dilala health center	Waliso woreda
4.	Karu simale health center	Waliso woreda
5.	Dase jabo health center	Waliso woreda
6.	Dire dulati health center	Waliso woreda
7.	Obi health center	Waliso woreda
8.	Hancabi health center	Waliso woreda
9.	Ciracha wanbari health caenter	Waliso woreda
10.	Korke health center	Waliso woreda
11.	Goro health center	Goro woreda
12.	Gurura health center	Goro woreda
13.	Burka bido health center	Goro woreda
14.	Wayu health center	Goro woreda
15.	Tulu bolo hospital	Bacho woreda
16.	Tulu bolo health center	Bacho woreda
17.	Jato health center	Bacho woreda
18.	Shankur health center	Bacho woreda
19.	Awash bune health center	Bacho woreda
20.	Busa haealth center	Dawo woreda
21.	Karsa health center	Dawo woreda
22.	Dima jallewan health center	Dawo woreda

23.	Dawo sadeen health center	Dawo woreda
24.	Bantu health center	Tole woreda
25.	Abebe health center	Tole woreda
26.	Kusaye health center	Tole woreda
27.	Tume wayu health center	Tole woreda
28.	Waliso woreda health office pharmacy store	Waliso woreda
29.	Goro woreda haealth office pharmacy store	Goro woreda
30.	Bacho woreda health office pharmacy store	Bacho woreda
31.	Dawo woreda health office pharmacy store	Dawo woreda
32.	Tole woreda health office pharmacy store	Tole woreda

Annex 3. Questionnaire

ASSESSMENT OF PHARMACEUTICAL SUPPLY MANAGEMENT PRACTICES AND IN PUBLIC HEALTH FACILITIES OF SOUTH WEST SHOA, OROMIA REGIONAL STATE, ETHIOPIA

CONSENT FORM FOR THE STUDY PARTICIPANT

Good day. My name is _____. I am here to collect data in your facility that is needed for thesis titled *"***Assessment of pharmaceutical supply management practices and in public health facilities south west shoa, oromia regional state, ethiopia***"*. A Research to be Submitted to, Department of Health Economics, Management and Policy, Faculity of Public Health, Jimma University Institute of Health; in Partial Fulfillment for the Requirement for masters of health care and hospital administration by principal investigator Edessa Diriba.

This survey is done in selected health facilities of south west Shoa. The research will provide an empirical snapshot of the current pharmaceutical supply management practices and associated factors in public health facilities of South west Shoa

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 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 1** **No 2** If Yes, Continue

For comments/questions please contact **EDESSA DIRIBA** (0911829562), principal investigator for the study.

SECTION A: PHARMACY HEAD			
Health facility code_____			
1.	Socio-demography		
	1.1. Years of experince_____ 1.2. **Profession**/Pharmacist 1 Druggist 2 Nurse 3 Public health officer 4 Other 0 Specify_____		
2.	**PHARMACEUTICAL SELECTION**		
2.1.	Does the health facility have list of common disease?	Yes 1	No 0
2.2.	Does the facility have national STG?	Yes 1	No 0
2.3.	Does the health facility have copy of national essential drug list?	Yes 1	No 0
2.4.	Is there any documented policy or guideline for drug selection?	Yes 1	No 0
2.5.	Who do selection? DTC 1 Pharmacy unit only 2 Other 0 specify_____		
2.6.	Does the health facility have its own essential medicine list? If no proceed to 2.12.	Yes 1	No 0
2.7.	How often EML of the facility is revised? Every year 1 Every two tears 2 Never 3 Other 0 Specify_____		
2.8.	What are the total numbers of medicines on facility EML? _____		
2.9.	Is procurement in the facility limited to EML of the facilty?	Yes 1	No 0
2.10.	Do you know the value of medicines from the EML out of the total value of medicines procured? (if yes ask the value or percentage)	Yes 1	No 0
2.11.	Do pharmaceutical donations comply with the facility list?	Yes 1	No 0
2.12.	Is there any written or defined criteria for medicine selection in your facility?	Yes 1	No 0
2.13.	What are the criteria for drug selection in your facility? Pattern of prevalent disease 1 Efficacy and safety 2 Cost of the drugs 3 Preference for well-known drugs 4 Other 0 Specify_____		
2.14.	What are the factors that affects drug selection in your faclity? Pattern of prevalent diseases 1 Treatment given in the facilities 2 Genetic, Demographic, and envi- ronmental factors 3 Training and experience of available personnel 4 Financial resources 5 Other 0 Specify_____		
3.	**PHARMACEUTICAL PROCUREMNT**		
3.1.	Is there any policy or guideline for procurement?	Yes 1	No 0
3.2.	Does your facility annual quantification plan? If no proceed to 3.4	Yes 1	No 0
3.3.	Does your quantification plan matches with bugdet available?	Yes 1	No 0

3.4.	Which type of quantification method do you use? Consption method 1 Morbidity method 2 Other 0 specify_____		
3.5.	How are the facility's resupply quantities determined? Guess 1 Formula 2 Other means(specify) 3 _____		
3.6.	Who determines this facility's resupply quantities? The facility 1 RHB/ZHD 2 The supplier 3 Other 0 specify_____		
3.7.	What are the barriers for your facilty in the quantification process? ?(more thaan one choice is possible) • Lack of coordination between quantification and technical units 1 • Lack of capacity in quantification 2 • Poor,or inadequate or inaccessable data 3 • If other specify_____		
3.8.	Did you conduct ABC analysis?	Yes 1	No 0
3.9.	Did you conduct VEN analysis?	Yes 1	No 0
3.10.	Is all procurement made by generic name?	Yes 1	No 0
3.11.	Wich type of procurement do you use? Purchase order 1 Annual contract 2 Multi-year contract 3		
3.12.	Do you purchase pharmaceuticals form private suppliers?	Yes 1	No 0
3.13.	Does your facility have supplier list?	Yes 1	No 0
3.14.	On average how long does your procurement process will be delayed due to payment system your facility follows? _____days		
3.15.	Is there any responsible body that monitors order status?	Yes 1	No 0
3.16.	What are the barriers for your facility pharmaceutical procurement? (more thaan one choice is possible) • Lack of coordination between quantification personnel and warehouse personnel 1 • Unclear procurement process 2 • Bearucratic and cumbersome procurement practices 3 • Limited use of procurement flexibilities 4 • Lack of product standardization 5 • Unplanned, unsolicited, and unspecified donations 6 • Specify if other_____		
4.	**PHARMACEUTICAL DISTRIBUTION**		
4.1.	What is the distance of the facility from usual supplier?_____Km		
4.2.	Is there a dedicated vehicle to deliver medication?	Yes 1	No 0

4.3.	Do you have a schedule which you follow to deliver medicine from suppliers?	Yes 1	No 0
4.4. .	On average, approximately how long does it take between ordering and receiving from PFSA? < 1week 0 1-2 weeks 1 2weeks to 1 month 2 1-2months 3 >2months 4		
4.5.	On average, approximately how long does it take between ordering and receiving from private suppliers (if your answer is yes for 3.12)? < 1week 0 1-2 weeks 1 2weeks to 1 month 2 1-2months 3 >2months 4		
4.6.	Does the suppliers delivers pharmaceuticals to the facility premises?	Yes 1	No 0
4.7.	If the answer for 4.6 is yes is delivery is made on time?	Yes 1	No 0
4.8.	Is there a porter when the mdication is delivered?	Yes 1	No 0
4.9.	Is their descripancies between the order and delivery?	Yes 1	No 0
4.10.	If descripancies exist what do you do? Explain _____ _____		
4.11.	What the barriers your facility face in pharmaceutical distribution? (more than one choice is possible) • Limited transportation infrastructure 1 • Long distance to resupply points 2 • Poor distribution planning 3 • Changing pharmaceutical needs due to seasonal change and disease incedence 4 • Poor data access and lack of sufficient stocks at higher at higher level 5 • Specify if other_____		
SECTON B: STORE MANAGER			
1.	**Socio-demography**		
	1.1.Age_____		
	1.2.Sex _____		
	1.3.**Profession** Pharmacist 1 Druggist 2 Nurse 3 HO 4 If other specify_____		
	1.4.How long did you work as store manager_____		
2.	**Infrastructure conditions: How does your store match up to the ideal store**	Yes	No
2.1.	Is store is separate from the dispensary.	1	2
2.2.	Is store is large enough to keep all supplies?	1	2
2.3.	Does the store have cracks, holes, or sign of water damage?	1	2
2.4.	Does store has a ceiling that is in good condition?	1	2
2.5.	Is there a receiving area and unpacking area?	1	2

2.6.	Is the storeroom dry, clean, well ventilated, and between +15 and				1	2
2.7.	Does current space and organization is sufficient for existing products and reasonable expansion (i.e., receipt of expected product deliveries for foreseeable future)?				1	2
2.8.	Do fire safety equipment is accessible (any item identified as being used to promote fire safety should be considered)?				1	2
2.9.	Does current space and organization is sufficient for existing products and reasonable expansion (i.e., receipt of expected product deliveries for foreseeable future)?				1	2
2.10.	Are the following equipments available in the store?					
	○ Cold boxes				1	2
	○ Ladder				1	2
	○ Pallets				1	2
	○ Shelves				1	2
	○ Trolley				1	2
	○ Wall thermometer				1	2
2.11.	Is there a refrigerator?	Yes 1	No 2	2.12. Is its temperature	1	2
2.13.	Based up on the above how do you see your facility pharmaceutical store infrastructure? Poor 1 Fair 2 Good 3 Very good 4 Excellent 5					
3.	**Storage procedures: How well is your store organized**					
3.1.	Do supplies are systematically classified on the shelves (i.e., by dosage forms or therapeutic class)?				1	2
3.2.	Do supplies are arranged on the shelves in alphabetical order by generic name within each category?				1	2
3.3.	Do tablets and other dry medicines (e.g., ORS) are stored in airtight containers?				1	2
3.4.	Do liquids, ointments, and injectables are stored on the middle				1	2
3.5.	Do supplies, such as surgical items, condoms, and bandages, are stored on the bottom shelves?				1	2
3.6.	Are there expired drugs in the store?				1	2
3.7.	Do medicines with expiry date stored in FEFO?				1	2
3.8.	Do supplies with no expiry date stored in FIFO?				1	2
3.9.	Do supplies with only manufacture date stored according to chronological order?				1	2
3.10.	Are narcotics and psychotropic drugs are in a separate, double-locked storage space?				1	2
3.11.	Do products are stacked at least 10 cm off the floor?				1	2
3.12.	Do products are stacked at least 30 cm away from the walls?				1	2
3.13.	Do products are stacked no more than 2.5 meters high?				1	2

3.14.	Based up on the above how do you see your facility pharmaceutical storage procedure? Poor 1 Fair 2 Good 3 Very good 4 Excellent 5		
4.	**Inventory management**		
4.1.	Is there a standard inventory control system at health facilities?	1	2
4.2.	Do all pharmaceuticals in the facility store have a bin card?	1	2
4.3.	Is the bin card kept on the same shelf as the item?	1	2
4.4.	Is information recorded on the bin card at the time of stock	1	2
4.5.	Is a physical count made at regular intervals?	1	2
4.6.	Are pharmaceuticals reordered according to a consumption-based	1	2
4.7.	Is the minimum or safety stock level set according to the frequency of delivery and average consumption?	1	2
4.8.	Are used bin cards kept for a defined period?	1	2
4.9.	Do stock records correspond with physical stock for all samples pharmaceuticals selected?	1	2
4.10.	Did you undergo any formal training in inventory management?	1	2
4.11.	Are procedures manuals for inventory management available in the	1	2
4.12.	Based up on the above how do you see your facility pharmaceutical inventory management? Poor 1 Fair 2 Good 3 Very good 4 Excellent 5		
4.13.	What are the barriers of your facilty in warehousing and inventory management?(more thaan one choice is possible) • Poor warehouse infrastructure 1 • Poor product traceability, stock leakage and security 2 • Poor performance of existing staff 3 If other specify _____ _____ _____		

SECTION C: PRESCRIBERS			
1. Socio-demography			
1.1.Sex ____	1.2. Age_____	1.3. Years of experience _____	
1.4. Qualification Specialist 1 General Practitioner 2 Public health officer 3 BSc. Nurse 4 Clinical nurse 5 Other 0 Specify_____			
2.	Is there any kind of STG available in your working area	Yes 1	No 0
3.	Do you stick to standard treatment guidelines of Ethiopia?		

	Never 1 Rarely 2 Sometimes 3 Usually 4 Always 5		
4.	Are injections a preferable way to deliver medicines for you? Never 1 Rarely 2 Sometimes 3 Usually 4 Always 5		
5.	How do you rate adherence of patients to drugs? Poor 1 Fair 2 Good 3 Very good 4 Excellent 5		
6.	Do you get up to date drug information?	Yes 1	No 0
7.	Do you take note of drugs' price before prescribing? Never 1 Rarely 2 Sometimes 3 Usually 4 Always 5		
8.	Do you prescribe by generic? Never 1 Rarely 2 Sometimes 3 Usually 4 Always 5		
9.	If the answer for the above question is other than always? Why? _____ _____		
10.	Do the following information will be included and considered while prescribing the medication?		
	10.1. Age of the patient Never 1 Rarely 2 Sometimes 3 Usually 4 Always 5		
	10.2. Appropriate dose Never 1 Rarely 2 Sometimes 3 Usually 4 Always 5		
	10.3. Appropriate dosage form Never 1 Rarely 2 Sometimes 3 Usually 4 Always 5		
	10.4. Appropriate route of administration Never 1 Rarely 2 Sometimes 3 Usually 4 Always 5		
	10.5. Appropriate frequency of administration, Never 1 Rarely 2 Sometimes 3 Usually 4 Always 5		
	10.6. Appropriate duration of treatment, Never 1 Rarely 2 Sometimes 3 Usually 4 Always 5		
	10.7. Availability in the health facility Never 1 Rarely 2 Sometimes 3 Usually 4 Always 5		
	10.8. Drug interactions Never 1 Rarely 2 Sometimes 3 Usually 4 Always 5		
	10.9. Other patient related problems e.g., renal failure, hepatic failure, etc Never 1 Rarely 2 Sometimes 3 Usually 4 Always 5		
	10.10. Previous medication of the patients Never 1 Rarely 2 Sometimes 3 Usually 4 Always 5		
11.	On average how many patients do you serve per day_____?		
SECTION D:-DISPENSERS			
1. Socio-demography			
1.1. _____	1.2.Sex_____	1.3.Years of experience in dispensing_____	

	1.3.Qualification Pharmacist 1 Druggist 2 Nurse 3 Public health officer 4 other 0 specify_____		
2.	Do you provide the following information for the patients?		
2.1.	How often to take the drug Never 1 Rarely 2 Sometimes 3 Usually 4 Always 5		
2.2.	When to take the drug (e.g. before or after the meals) Never 1 Rarely 2 Sometimes 3 Usually 4 Always 5		
2.3.	How long the treatment is to last Never 1 Rarely 2 Sometimes 3 Usually 4 Always 5		
2.4.	How to take the drug (e.g. with water, chewing or swallowing) Never 1 Rarely 2 Sometimes 3 Usually 4 Always 5		
2.5.	How to store the drug (e.g. avoid heat, light and dampness) Never 1 Rarely 2 Sometimes 3 Usually 4 Always 5		
2.6.	Not to share drugs with other persons Never 1 Rarely 2 Sometimes 3 Usually 4 Always 5		
3.	Do you get access to up-to-date drug information	Yes 1	No 0
4.	Does your facility has standard prescription format	Yes 1	No 0
5.	Do you check correct writing of prescription format? Never 1 Rarely 2 Sometimes 3 Usually 4 Always 5		
6.	Do you label at least including quantity to be dispensed and frequency before dispensing? Never 1 Rarely 2 Sometimes 3 Usually 4 Always 5		
7.	Is any good dispensing procedure posted in dispensing area	Yes 1	No 0
8.	Do you give focus for special patients like geriatrics, pediatrics, chronic patients and etc? Never 1 Rarely 2 Sometimes 3 Usually 4 Always 5		
9.	Do you check expiry date of drugs before dispensing? Never 1 Rarely 2 Sometimes 3 Usually 4 Always 5		
10.	How many prescriptions do you dispense on average at working hour? _____		

Annex 4: Guide for in depth interview for store manager, pharmacy head and health center directors and hospital chief clinical officer

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

Probing (1): With respect to:

   a. Developing and usage of EDLs
   b. Ordering and receiving pharmaceuticals

Probing (2): what conditions affects selection and procurement in your facility?

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

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

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

Probing (2): What is your recommendation for improving the availability of pharmaceuticals 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. What are the challenges to give managerial support for drug supply management of your facility?

Probing (1): Challenges encountered in organizing pharmaceutical supply management service of the facility?

Probing (2): Strengths and challenges in financing pharmaceutical supply management.

Probing (3): Challenges related to human resource issues in supply management

Probing (4): What are your recommendations to overcome the above challenges?

5. What are the challenges related to legal and policy framework that guides the pharmaceutical supply management of your facility?

Probing (1): Challenges related to government finance rules and regulations.

Probing (2): Auditing system of pharmaceuticals

Probing (3): Waste management directive

Probing (4): Other policy and legal frame works that impend pharmaceutical supply of the facility

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