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**ADDIS ABABA UNIVERSITY SCHOOL OF COMMERCE
DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN
MANAGEMENT**

**ASSESSMENT OF INTEGRATED PHARMACEUTICAL LOGISTICS
SYSTEM IMPLEMENTATION IN BLACK LION HOSPITAL**

BY

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ADVISOR: TARIKU JEBENA (PHD)

**A Thesis Submitted to Addis Ababa University School of Commerce
in Partial Fulfillment of the Requirements for the Award of Masters
of Arts Degree in Logistics and Supply Chain Management**

**MAY, 2017
ADDIS ABABA, ETHIOPIA**

DECLARATION

I the undersigned, hereby declare that the work which is presented in this thesis entitled *“Assessment of Integrated Pharmaceutical Logistics System Implementation in Black Lion Hospital ”* is the original work of my own effort and done under the guidance of Tariku Jebena (Phd), and that all the sources of materials used for the study have been duly acknowledged. I further confirm that the thesis has not been submitted either in part or in full to any other university for the purpose of earning any degree.

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This thesis has been submitted to Addis Ababa University School of Commerce Graduate Studies for examination with my approval as a university advisor.

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LOGISTICS AND SUPPLY CHAIN MANAGEMENT**

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ABSTRACT

BACKGROUND: IPLS is a term applied to the single system for reporting and distribution pharmaceutical items based on the overall mandate and scope of the PFSA. This system aims to provide patients pharmaceuticals they need. In order for this system to be successful, it must fulfil all the six rights of supply chain management which are ensuring right type of item, of the right quality, in the right quantity, at the right place, at the right time and with the right cost. At a facility level, IPLS incorporates all the three logistic functions which are Logistic Management Information System, Inventory Control System, and Storage System of pharmaceuticals.

OBJECTIVES: To assess implementation of Integrated Pharmaceutical Logistics System in Black Lion Hospital

METHODS AND MATERIALS: An explanatory descriptive approach was used in the study whereby the LMIS, the inventory control system and the storage system of the hospital was assessed and examined against the requirements and standards of IPLS. Purposive sampling technique was used to collect data. In addition, check lists, interview guides & observations were some of the tools used in the data collection process.

RESULT: Detail results pertaining to major indicators of IPLS implementation such as availability & proper use of LMIS, LMIS data quality, training and supervision on logistics management, stock availability, availability of expired items, fulfillment of acceptable storage conditions for ARV drugs store room, resupply period, order fill rate, emergency order trends and major challenges on IPLS implementation are described and presented in the result section of this paper.

CONCLUSION & RECOMMENDATION: With respect to some measurements such as availability of LMIS tools, supervision and training, availability of drugs, resupply period, emergency order trend, the effort towards IPLS implementation in the Hospital is encouraging. But much gap is observed in some other measurements such as in proper utilization of LMIS tools, LMIS data quality, and perceived order fill rate and storage conditions which leads to an overall conclusion that IPLS is not being implemented in the Hospital in full scale. In order to bring improvements, among other things, there should be regular supportive supervision and continuous trainings, in placing consistent monitoring and evaluation mechanisms, enforcing strict adherence to the IPLS SOP procedures and standards, and increased commitment of top management

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LIST OF ACRONYMS & ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
ART	Anti-retroviral therapy
ARV	Anti-retroviral
CHC	Community health center
CSMP	Council of Supply Chain Management Professionals
EPI	Expanded Program of Immunization
FMOH	Federal Ministry of Health
HEWs	Health Extension Workers
HIV	Human Immuno Virus
HPMRR	Health Post Monthly Report and Resupply Form
IFRR	Internal Facility Report and Resupply Form
IPLS	Integrated Pharmaceutical logistics system
LIAT	Logistics Indicator Assessment Tool
LMIS	Logistic Management Information System
MCH	Maternal and Child Health
MSH	Management Science for Health
PFSA	Pharmaceutical Fund and Supply Agency
RDF	Revolving Drug Fund
RHB	Regional Health Bureau
RRF	Report and Requisition Form
SC4CCM	Supply Chain for Community Case Management Project
SCMS	Supply Chain Management System
SOP	Standard Operation Procedure
TB	Tuberculosis
USAID	United States Agency for International Development
WHO	World Health Organization
WoHO	Woreda Health office
ZHD	Zonal Health department

CHAPTER 1. INTRODUCTION

1.1 Background of the Study

Logistics can be defined as the part of supply chain which is concerned with planning, implementing, and controlling the efficient and effective forward and reverse flow and storage of different goods, services, and related information between the point of origin to the point of consumption for the sole purpose of meeting and satisfying customer requirements. (CSCMP, 2011).

Providing complete and acceptable health care services requires availability of safe, effective and acceptable drugs and pharmaceutical items with the right quality, right quantity and for the right patient/client at all times. In spite of this requirement, various supply chain management gaps such as stock non availability, stock shortage, poor storage and poor stock management system, unaffordability and irrational drug use had been observed, in previous times, in the Ethiopian Pharmaceutical Supply Chain Management System. (PFSA IPLS SOP, 2015)

Since drugs and other Pharmaceutical items covers up to 40 % of the countries health care budget, proper logistics management of these items in the supply chain system is indispensable as poor management will lead to stock outs and shortage of items that would prevent access to medicines and poor health outcomes. In addition, poor management of these items may lead to overstock and wastage of items that will lead to health hazard and wastage of limited resources. (MSH, 1997)

To tackle this problem, The Ethiopian Pharmaceutical Fund and Supplies Agency (PFSA), was established under FFMOH as a semi- autonomous agency to operate with a mandate of running and coordinating the whole pharmaceutical supply chain operation so that proper accessibility and affordability of essential drugs with the right quality, quantity, safety and efficacy can be availed for public health systems. To enable this, PFSA in partnership with its support partners developed and began implementing the IPLS system since 2009. Since then this IPLS has been in use for the supply management of all essential pharmaceuticals and program commodities which includes

ARV drugs, Anti-malarial drugs, Anti- TB drugs, Anti- leprosy drugs, EPI and MCH items. (PFSA IPLS SOP, 2015)

IPLS is a term applied to the single system for reporting and distribution pharmaceutical items based on the overall mandate and scope of the PSA. This system aims to provide patients pharmaceuticals they need. In order for this system to be successful, it must fulfil all the six rights of supply chain management which are ensuring right type of item, of the right quality, in the right quantity, at the right place, at the right time and with the right cost. At a facility level, IPLS incorporates all the three logistic functions which are Logistic Management Information System, Inventory Control System, and Storage System of pharmaceuticals. (PFSA IPLS SOP, 2015)

Each of these three IPLS components contains its own sets of indicators that are used to measure the status of IPLS implementation (i.e, gaps, progresses and performances) by measuring system leakage, assessing the availability and proper utilization of logistic management recording tools(e.g Bin card records..) and by determining the extent to which facility pharmacy personnel compete and submit quality LMIS reports(FMOH, 2010, FRDE PFSA, 2014).

Using a phase- based approach, and using three phases schedule, IPLS is has been being implemented in most of the public health facilities in the country in which as part of the phase 1 approach IPLS has been implemented in black lion hospital since 2011. (Amhara RHB, 2015, FRDE PFSA, 2014)

Some routine health monitoring reports shows that IPLS has benefited in improving LMIS data recording and reporting, pharmaceutical storage and distribution practices and also availability of essential pharmaceutical items at the health facility level. (PFSA IPLS SOP, 2015)

Nevertheless, there are no much studies done on assessment of IPLS implementation especially at the big health facility level like Black Lion hospital. Hence, this study is purposed to assess implementation of in Black Lion hospital so that gaps and challenges can be identified to forward relevant recommendations for further progress.

1.2 Statement of problem

As per the estimation of WHO, nearly one third of the world's population suffers with lack of access to essential pharmaceutical items, diagnostic facilities and health care system. This

proportion greatly increases to fifty percent in the poorest part of Africa and Asia. Even though, the major causes for poor availability and hence accessibility of pharmaceutical items remains complex, major contributing factors includes unaffordable price of pharmaceutical items, irrational drug use, shortage of budget, unreliable supply and distribution system to make essential pharmaceutical items available for patients. (WHO, 2004)

According to the Health Logistics Quarterly newsletter report in 2014, Ethiopia has been challenged in facing various public health pharmaceutical supply chain management system gaps where various multiple stakeholders involved were responsible for managing supply chain for various essential pharmaceutical items. (USAID/DELIVER PROJECT, 2014)

Managing supply chain for health commodities especially for ARV drugs has been a unique challenge given that HIV treatment requires lifelong therapy and few or no substitution can be made if stock out occurs or if drug resistance happens due to treatment failure as result of sock outs of existing treatment regimen started. (Bunting BA, 2013)

Since stock outs at health facilities can result in treatment interruption that can quickly lead to drug resistance or missed opportunities for diagnosis, significant resource for procurement and distribution of essential drugs especially ARV items is invested to prevent this stock outs. Hence, poor supply chain and logistics management of these items implies loss of significant resources. (Bunting BA, 2013)

Proper implementation of IPLS helps to reduces stock outs, delay in delivery, drugs expiry, and also improves product availability by ensuring continuous supply of ARV drugs fulfilling the six rights of supply chain management which are availing the right products to patients, in the right quantity, of the right quality, at the right place, at the right time and for the right cost and hence better service of ART treatment for HIVAID patients. (PFSA IPLS SOP, 2014; USAID, LMIS M & E indicators, 2006)

With all its importance, unless its proper implementation is studied and gaps and challenges of implementation are identified and appropriate measures are taken, all the consequences of poor implementation such as stock outs, delay in delivery, drug expiry and wastage of finance and resources will result with an ultimate negative impacts of poor health of the community. Such consequences are extremely sever and dire if IPLS is poorly implemented for ARV drugs supply

chain management as these items are lifesaving and lifelong treatments for people living with HIV Aids and the negative consequences of poor implementation of IPLS for these items will result to treatment failure due to missed dose, developments of resistant strains of the virus, quick deterioration of health and death of patients.

Therefore, focusing on the Anti-Retroviral (ARV) drugs supply chain management, doing this proposed research on assessment of Integrated Pharmaceutical Logistics System Implementation in black lion hospital is justified based on the following reasons.

Firstly, IPLS is a big topics that encompasses three main components such as the Logistic Management Information System, the Inventory Control System and the Storage System of items and all these three components are addressed in this study.

Secondly, in IPLS implementation different parties such as such as PFSA, health facility management, and different internal parties such as pharmacy professional are involved and the study could show role and impact of each parties in proper implementation of the IPLS.

Thirdly, IPLS implementation is extremely important and sensitive especially for drugs like ARV as these drugs are very essential, costly, potentially lifesaving and poor implementation leads to death of patients and have significant impact on community/nations wellbeing.

Fourthly, IPLS implementation can be successful with proper operation, in placement and consistent use of mandatory requirements such as availability and proper utilization of various logistic data reporting and recoding tools, LMIS data quality, supervision and monitoring mechanisms and other facility requirements such as acceptable storage facility. And the study has addressed all these in a comprehensive way.

Fifthly, IPLS implementation has potential failures that requires early assessment of its operation, follow up, proper intervention and management commitments which reflects the importance of the study.

In addition to the above reasons, considering its importance, its impacts and contribution to promote health of individuals, community and nation at large, more researches on IPLS implementation focusing on ARV drugs supply chain at health institution level need to be

conducted to investigate bottle necks and challenges to its proper implementation and investigate and identify further ingredients to its success and take necessary and quick interventions.

Therefore, focusing entirely on ARV drugs, this study has tried to assess the implementation of IPLS (Integrated Pharmaceutical Logistics System) in Black Lion Hospital using relevant indicators that helps to measure availability, proper use and functioning of the three components of IPLS which are the Logistic Management Information System, the Inventory Control System and the Storage System.

1.3 Research Questions.

This study is believed to answer the following questions

1. What does the logistic and inventory system management practice with in the Hospital looks like?
 - Are all the logistics reporting and recording tools and stock keeping logistic formats available and properly used in the Hospital?
 - What does the LMIS data quality looks like?
 - Is there a regular training and supervision on logistics management?
2. What is the status of stock availability & storage condition of the Hospital?
3. How is the logistic system performance of the hospital
 - How does the resupply period, the order fill rate and the emergency order trend of the Hospital look like.
4. What are the factors that affect implementation of IPLS in the Hospital?

1.4 Objectives of the study

1.4.1 General objective:

To assess implementation of Integrated Pharmaceutical Logistics System in Black Lion Hospital.

1.4.2 Specific Objectives:

- ✓ To assess the logistics and inventory system management practice of the Hospital
- ✓ To assess the stock availability and storage practice of the Hospital

- ✓ To assess the logistics system performance of the Hospital
- ✓ To identify factors that affects IPLS implementation

1.5 Significance of the study

In health care, ensuring that there are adequate drugs and supplies especially ARV drugs for every patient is paramount as partial or interrupted treatment can lead to less than optimal results and in some cases is even disastrous both for the individual patient and the public at large. (USAID | DELIVER PROJECT newsletter, Volume6.No.3)

Most importantly, the issue of absence of continuous and uninterrupted supply of ARV drugs in the right quality, quantity, from the right sources and at the right time for PLWHA is extremely critical and will result dire consequences such as treatment failure, drug resistance, deterioration of health status of the patient and subsequent death.(World Bank Global HIV/AIDS Program.Dec.2005)

To avoid such severe consequences, improves quality of life of PLWHA and prolong their life, implementing IPLS successfully for ARV drugs supply in health facilities is so critical and indispensable.

Hence, this study will help us to examine in detail how IPLS is being implemented for the supply drugs in Black Lion Hospital so that areas of strengths can be identified and reinforced for further improvements and bottle-necks and gaps that challenges the successful implementation of the system can be sorted out for corrections, amendments and necessary actions to promote effective and efficient supply of drugs especially ARV drugs can be realized to save the life of PLWHA.

In addition, this study will contribute in academics & training by providing important insights to learners and trainees on possible challenges of IPLS implementations and on what are the important remedial actions that should be taken to enable proper implementation of the system.

On top of this, since there are no enough studies in the area, this study is believed to provide a comprehensive starting point and will help as a source of information for future research that is aimed to go in-depth to the subject matter and also for any study that is aimed to assess the progress made in IPLS implementation or to sort out any other challenges to IPLS implementation that has not been identified in this study.

1.6 Scope of the Study

The study is focused on assessing implementation of IPLS at Black Lion Hospital

Because of the wide nature of the subject of IPLS and because the large number of patients treated in the biggest referral hospital of Ethiopia (Black Lion Hospital), the scope of the study is limited in assessing implementation of IPLS for ARV drugs supply at Black Lion Hospital.

1.7 Limitation of the study

One of the limitation of the study is lack of similar studies in Ethiopia that has created a gap to compare and contrast and make comparative conclusions.

In addition, the focus of this study was assessing the availability and proper use of IPLS implementation tools & requirements, availability of drugs and identifying challenges of IPLS implementation at the health facility level. Hence it didn't look to the overall system implementation or drug availability at the higher supplying unit (PFSA).

Thirdly, this study focused on IPLS implementation for ARV drugs. Hence, because of the nature and significance of ARV drugs in treating the most life threatening illness (HIV AIDS), the degree of implementation, attention and challenges associated with it may differ from IPLS implementation for other drugs, hence the results may not be inferable to IPLS implementation of drugs other than ARV drugs.

1.8 Operational Definition of Key Terms

Acceptable storage practice: - The extent to which the Hospital store fulfils at least 80% of the storage requirement as per the set storage guideline.

LMIS data Quality: - The extent to which the data recorded on the bin card is correct and is consistent with data filled on other reporting and recording tools like RRF.

Availability of LMIS tools: Presence of different tools such as IRRF, IFFR, bin cards and stock cards which are important for reporting and recording data related to drugs supply and distribution. These tools are important for successful operation and implementation of LMIS.

Duration of stock outs and over stock: the time period at which a given drug remains stock outs (completely not available) or overstock (beyond the maximum stock level)

Frequency of stock outs: How many times a given drug is reported stock outs with in a certain time interval

Logistics Management Information System (LMIS): is a system that generates basic logistics information, which is needed to make logistics decisions

Proper use of LMIS tools: correct and timely recoding and reporting of drugs supply and distribution data using the LMIS tools.

Product Availability: - The amount of stock on hand at the time of visit

Stock out on the day of the visit: Not having any available stock on the day that the data collector has arrived to check stock availability.

Stock refill: The amount of stock of drugs refilled by PFSA hub up on the request of the hospital

Tracer Medicine: a selected type of drugs that are vital and essential and must be available at The health facilities. Availability and access of these medicines with proper quantity at health facility is usually an indication of good pharmaceutical supply chain management system.

Order fill rate: The percentage of correct items that are actually filled according to ordered quantities

IPLS training: a formal, preservice or on job training given to health professional on IPLS.

Supervision: a personal and visual inspection accompanied by questions, evaluations and discussions, given by higher level to bring improvement in individual and system performance. Supervision also helps to alert managers on potential problems at facility level such as stock outs, understocks, overstocks, poor storage condition and risk of drug expiry.

1.9 Organization of the study

This study is organized in the following five major chapters.

Chapter 1 presents general introduction to the thesis which begins with providing back ground information on the overall concept of IPLS followed by describing other components of the chapter such as statement of the problem, research question, objectives, significance, scope and limitation of the study. Chapter 2 presents a review of relevant literatures related to the subject matter IPLS including different empirical studies. Chapter 3 presents the methodology used in conducting the research. Chapter 4 presents the result (findings) and discussions part of the research work based on the analysis done. Finally, Chapter 6 presents the conclusion and recommendations part of the research work which is concluded and recommendation provided based on the findings and discussions made.

CHAPTER 2. REVIEW OF RELATED LITERATURE

2.1 Overview of IPLS in Ethiopia. (Source: FRDE, IPLS SOP, 2015)

Hospitals order different program drugs including ARV drugs, every two months using and LMIS tool called RRF that is used to report previous consumption while at the same time requesting to refill for the next two months consumption in the Hospital. PFSA after reviewing the RRF sent by the Hospital will directly refill items requested by the Hospitals. The decision to refill by PFSA with the required quantity as requested by the hospital and with the expected re-supply period depends on the timely submission of the RRF report with good quality of logistic data such as data on previous period consumption, stock on hand at the time of report, maximum stock level, minimum stock level and others LMIS data.

Once PFSA received good quality and timely LMIS data, it will use third data to make appropriate and reasonable logistic decisions on how much to refill the items within the expected resupply period. In addition, this data will help the PFSA to prepare for future logistic management decision such as in forecasting the future demand and procuring the items so that it can have sufficient stock in the future to provide uninterrupted supply of program drugs to health facilities like hospitals and health centers.

In order to enable successful implementation of IPLS, all of its three components/ functions should successfully be in place with all requirements of quality, availability and functionality as briefly described below.

A. Logistics Management Information System (LMIS) in IPLS.

The purpose of Logistics Management Information System (LMIS) is to collect, organize, and report information to other levels in the system in order to make important logistic management decisions which govern the logistic system and ensure that all the six rights are fulfilled for each patient.

Hence for the successful and health operation of the LMIS, important LMIS tools (recording and reporting tools) such as Bin Cards, Stock Cards, Internal Facility Report and Resupply Forms (IFRR), and Report and Requisition Forms (RRF) should always be available as blank forms in

the facility for use, and should also be used timely and accurately to record and report quality LMIS data. Proper, timely and accurate use of LMIS tools helps to have a good quality, timely and well organized LMIS data that would help to make logistic management decisions at higher level like PFSA for timely resupply and appropriate refill of pharmaceuticals when requested by lower level facilities like Hospitals.

B. Inventory Control System in IPLS.

The purpose of an inventory control system is to inform personnel when and how much of pharmaceutical items to order so that appropriate stock level of every items can be maintained each time to meet the needs of patients.

A well designed and well functioned inventory control system helps to prevent shortages, stock outs, over supply, and expiry of pharmaceuticals which all are the ultimate goals of successfully implemented IPLS system. A well functioned inventory control system can be realized by maintaining adequate stock levels of each items by analyzing the appropriate, timely collected and good quality LMIS data that have been collected by accurate and timely use of the LMIS tools.

In addition to preventing stock outs (ensuring stock availability), preventing expiry, over stock and wastage of pharmaceuticals, a well-functioning inventory control system will reduce frequent emergency orders that would happen due to understock of items below the expected minimum levels of stock.

C. Storage of pharmaceuticals in IPLS

Storing is the safe keeping of drugs to avoid damage, expiry, and theft so that items stored can remain useful throughout their shelf life.

Poor storage condition will affect the quality of pharmaceuticals being stored. Rooms that are too hot, stacks of carton that are too high, and other poor storage condition can cause damage or deterioration of the pharmaceutical product that would contribute for reduction of shelf life.

A well-organized store will keep items safe, help simplify the facility's work and reduces time wastage in trying to find needed items.

Health facility pharmacy store improvement is one of the IPLS related pharmaceuticals management initiatives which includes having a well-organized and well spacious store room that contains all the required storage facilities and adhering to the good pharmaceutical storage guidelines & practices.

2.2 Previous studies and reports in IPLS

It seems that some literature records are observed with respect to IPLS relate studies in some African countries but very limited published research is observed in similar studies sin Ethiopia.

A study conducted in Lesotho showed that only 17 % of Hospitals had SOP for medicine supply management system and only 53 % of facilities had stock record cards to keep stock record of reagents. And none of the facilities had a practice of separating damaged or expired items from usable ones which is one of a sign of poor storage management. In addition the study showed that there is poor management and supervision in logistics management issues. (Pharasi B.2007)

According to a study made on the inventory management of ARV drugs at community health centers in the Cape Metropole in western Cape town in 2015, 86.7% of CHCs utilized a logistics tool (either manual or electronic) to manage ARV drugs. About 82.7 % of ARV drugs have logistics recording tools out of which only 21.9 % are accurately used. Out of the total available logistic tools in use only 32.9% had up-to-date records. In addition, the variation between stock records and physical counts for the ARV drugs assessed was 51.6% and no historical data on stock outs and monthly usage (monthly consumption) could be retrieved in any of the CHCs, although there were no actual stock outs on the day of the fieldwork. (Mahoro M,2015).

According to a cross sectional study conducted in Zimbabwe public health facilities on HIV-AIDS commodities logistic system assessment, 35 % of the facilities had reported that they had never received formal logistics training in completing and updating logistics formats and calculating order quantities. Moreover only 41% of the facilities received logistics supervisory visit. Among

the total health facilities included in the study 85 % of them had stock cards but only 75% of them are observed to use it accurately. (Jabulani N & etal, 2005)

A national health commodity survey conducted in Rwanda showed that, among the total health facilities included in the study, 39% and 42% were stock outs of the HIV laboratory test kits and reagents respectively during the past six months prior to the study. (Lijdsman & etal, 2003)

A qualitative and quantitative baseline survey on logistic laboratory system conducted in Ghana showed that 60% of the facilities were fully stocked on the day of visit, Expired items were observed to be fully separated from the usable stock, and most facilities had a well-functioning cold chain storage system which shows good pharmaceutical warehouse management practice. (Akwei N & etal, 2006)

A study on the assessment of pharmaceutical logistic system in south Sudan showed that among the total health facilities included in the study, 89% of them had all tracer medicines in stock, 11 of health facilities had expired tracer medicines, 39% of the health facilities shad LMIS tools such as logistic formats and 27 % of them experienced accurate logistics records. In addition, in 17 % of the facilities, staff were trained to use logistics forms, 24 % of health facilities received the quantity of medicines they ordered to refill. 35 % of the health facilities maintained acceptable storage condition and practice. Concerning product availability, 25 % of the health facilities had stock levels that ensures near term product availability and 27 % of the health facilities showed stock outs of one or more drug at the time of visit. (Dick M. ,Farai C. & Joseph N. ,2011

According to assessment of IPLS for the management of HIV/AIDS and TB laboratory diagnostic commodity in public health facilities in Addis Ababa in 2016, availability of IPLS formats for recording and reporting such as bin cards, internal facility report and requests(IFRR), and report and request forms (RRF) was reported in majority of facilities (92.6%) but Regular update of bin cards was reported to be low 61.5% facilities, while IFRR and RRF were completed by 84.6% and 92.6% of facilities, respectively. Utilization of bin cards was higher at health centers (76.5%) compared to hospitals (33.3%). The report further shows that management support for IPLS implementation was significantly associated with improved data quality and utilization of IFRR. The study concludes its study stating that the majority of facilities reported the availability and utilization of IPLS tools to manage HIV/AIDS and TB laboratory commodities. However, most experienced stock out of one or more commodities during the last six months, which could be due

to failure to implement IPLS in full scale. (Tilahun A, Geleta DA, Abeshu MA, Geleta B, Taye B, 2016)

According to the national survey conducted by PFSA in 2015, the availability of blank bin cards, IFRRs, and RRFs are high at hospitals (above 90 percent) and health centers (close to 80 percent). However, the availability of the recording and reporting formats decline when moving down the supply chain. The availability of bin cards which are the fundamental logistics records that captures essential inventory data was 40 percent at the health post level. In addition, the study stated that the accuracy of balances on bin cards by facility level showed at hospitals, accurate balances ranged from 29 percent to 71 percent per different items with an average of 49 percent. The survey result also showed that there is a variation in use of RRF by phase of IPLS implementation (phase I, II, and III). For Example, The RRF use was high (97 percent) among phases I and II facilities, both in hospitals and health centers. This was not the case for phase III health centers, where only 54 percent used the RRF. (Shewarega, Abiy, Paul Dowling, Welelaw Necho, Sami Tewfik, and Yared Yiegezu 2015)

In another cross-sectional study descriptive study to assess the laboratory LMIS status in managing HIV/AIDS and TB laboratory commodities at selected health facilities in Addis Ababa, it is observed that majority (60.5 % of health facilities) experienced stock out for at least two items. In addition, 16 facilities (37.2%) had experienced stock out for at least two items at the time of visit. It is also observed that only 50 % of the Hospitals used standard LMIS tools and 54 % of the health centers used stock record cards such as bin cards and stock cards for all laboratory commodities at the pharmacy store. Among these only 25 % (Hospitals) and 20.8 % (for health centers) were updated with accurate information matching with the physical count done at the time of visit. (Desale A, Taye B, Belay G, Nigatu A 2013)

A study on the assessment of training coverage on the integrated pharmaceuticals Logistics system at selected health facilities in four regions of Ethiopia in 2012 showed that, the percentage of HEWs who had got a training on IPLS were 67%, 75%, 50%, and 63% in Oromia, in Amhara, in Tigray and in SNNPR, respectively. (SC4CCM. 2012)

CHAPTER 3. RESEARCH METHODOLOGY

3.1 Description of the Study Area

The study was conducted in Black Lion Referral and Teaching Hospital, Addis Ababa from March 13 – 17, 2017.

Black Lion Hospital (TikurAnbesa in Amharic) is Ethiopia's largest specialized public teaching hospital. In 1998 Black Lion Hospital, which is also the largest referral hospital in the country was given to Addis Ababa University (AAU) by the Ministry of Health (MoH) for the faculty as a main teaching hospital. The faculty is the oldest and the largest among the health training institutions in the country, staffed with the most senior specialists. (Black Lion Hospital Directory)

The hospital provides a tertiary level referral treatment and is open 24 hours for emergency services. The hospital is administered by Addis Ababa University providing teaching for about 300 medical students and 350 Residents every year. (Black Lion Hospital Directory)

Black Lion hospital offers diagnosis and treatment for approximately 370,000- 400,000 patients a year. The hospital has 800 beds, with 130 specialists, 50 non-teaching doctors. The emergency department sees around 80,000 patients a year. (Black Lion Hospital Directory)

Black Lion Hospital is purposely selected because the Hospital is one of the biggest national referral and teaching hospital that provides preventive and curative services for significantly large number of patients including those referred by other health facilities. In addition, the hospital has started implementation of IPLS for ARV drugs since 2011 and currently significant number of PLWHA are getting ARV drugs treatment.

3.2 Research Approach

The type of research approach used was an explanatory descriptive approach whereby the LMIS, the inventory control system and the storage system of the hospital was assessed and examined against the requirements and standards of IPLS.

3.3 Research Design

A qualitative study design was used to conduct this study by collecting qualitative and some quantitative data that will help to assess the implementation of IPLS in Black Lion Hospital.

3.4 Population and Sample and Sampling method

The Black Lion Hospital overall Pharmacy section in general and all the pharmacy section professionals were taken as study population

Using purposive sampling method, The Black Lion Hospital ARV pharmacy units such as ARV Drug store, ARV drug dispensing units and key informants such as ARV drugs pharmacy section head, ARV drug store manager and ARV drugs Drug Dispensing unit head were taken as sample. The reason for taking ARV drugs as sample is because of the fact that these drugs are meant for treatment or management of HIV/Aids infection and full scale implementation of IPLS in management of these items is so crucial and mandatory to make continuous availability of these drugs with right quantity to save life of PLWHA.

3.5 Data Sources and Types

The following two types of data sources were used to collect the qualitative and quantitative types of data

3.5.1 Primary data sources

Interviewing key informants using structured interview guide and observations were used as a primary data sources.

Such data sources included interviewing key informants such as ARV drugs pharmacy section head, ARV drug store manager and ARV drugs Drug Dispensing unit head ; Physical counts of all ARV drugs available in the hospital . In addition, physical inspection of the ARV drug store and ARV drug dispensing unit and observations of availability and use of and IPLS implementation tools such as RRF, IFRR, IPLS SOP manual, were also used.

3.5.2 Secondary data sources

Physical and electronic documents such as stock record cards such as bin cards, IFRR, RRF, and reports were also be used as data sources.

3.6 Data collection procedures.

Head of the hospital (the Medical Director) was approached to obtain consent and permission to undertake the data collection process. In the process of data collection, combination of different methods such as interview questions using open ended and with guiding options; check lists with close observation; physical inventory and examining existing records (bin cards, RRF & IFRR) were used to collect data.

Data related to the LMIS, Inventory control system and the Storage system practice of the hospital was collected with close collaboration from head of the hospital pharmacy department, the hospital's ARV drugs store manager, and also heads of drug dispensing units.

The level of product availability, accuracy of records and reports associated with drugs logistics was assessed by reviewing records and by conducting physical inventory of those drug. The physical inventory and record review was then be compared to evaluate the level of discrepancy between them. The hospital store manager, head of pharmacy department, and head of ARV drugs dispensing unit were further interviewed to enrich the findings from physical interview and record review process.

3.7 Variables of the Study

3.7.1 Dependent Variables:

- IPLS implementation

3.7.2 Independent Variables

1. Personnel, training, supervision and management support related factors
 - Supervisory visit to the Hospital
 - Training on IPLS
 - Top management support
 - Performance management practice
2. Practice related factors
 - Availability of LMIS tools and formats
 - Proper use of LMIS tools
 - LMIS data quality

- Storage condition
- Logistic system performance (Resupply period, order-fill rate & emergency order trend)

3.8 Ethical considerations

Letter of support from A.A University School of commerce was provided to the researcher to be presented to Black Lion Hospital Head (Medical Director) to obtain permission to conduct the research work. Much degree of confidentiality was maintained during data collection process and no name of the participating subjects (respondents) is revealed on any part of the research paper.

3.9 Data analysis

Data analysis were guided by considering core and important indicators that measure IPLS implementation.

Analysis was done in a descriptive and explanatory approach with reference to the different requirements, tools, procedures and practices demanded by IPLS implementation

Results are presented in the form of figures, percentages, tables and narratives.

In order to provide an accurate and valid illustration of variables that are relevant to the research question, a descriptive approach was used with major focus on indicators that could measure IPLS implementation in the Hospital.

CHAPTER 4. RESULT AND DISCUSSION

4.1. RESULT

4.1.1. Logistic and Inventory system management practice with in the Hospital

4.1.1.1 Availability of logistics reporting and recording tools and stock keeping logistic formats

As per the interview with the facility pharmacy and observation during the day of visit by the principal investigator, this assessment shows that all the required logistics recording and reporting tools such as bin cards, Stock Cards, RRF Formats, IFRR formats and IPLS SoP Manuals are available in the hospital.

4.1.1.2. Proper utilization of the logistics recording and reporting tools.

Proper utilization of bin cards

As it can be shown from the below table (Table 1) , among the total 17 ARV drugs, that have bin cards, bin card is updated, during the last one month period, only for seven types of items (41.2 %) namely Atazanavir + Ritonavir 300mg+100mg tab, Efavirenz + Lamivudine + Tenofovir 600mg+300mg+300mg tab, Lamivudine + Tenofovir 300mg + 300mg , Lamivudine + Zidovudine 150 mg +300mg, Lopinavir + Ritonavir 200mg + 50mg and Nevirapine 10mg/ml oral suspn, while for the remaining 10 (58.8%) types of drugs bin cards are not up dated for the last one months.

Table 1: Availability and list of items with updated bin card for ARV drugs in Black Lion Hospital, March 2017.

S.N o.	Items	Bin card available	Bin card updated
1	Abacavir 300mg tab	Yes	No
2	Atazanavir + Ritonavir 300mg+100mg tab	Yes	yes
3	Efavirenz + Lamivudine + Tenofovir 600mg+300mg+300mg tab	Yes	yes
4	Efavirenz 200mg caps	Yes	No
5	Efavirenz 50 mg caps	Yes	No

6	Efavirenz 600 mg caps	Yes	No
7	Lamivudine + Nevirapine + zidovudine 150mg+200mg+300 tab	Yes	No
8	Lamivudine + Nevirapine + zidovudine tab, 30mg + 50mg + 60mg tab	Yes	No
9	Lamivudine + Tenofovir 300mg + 300mg	Yes	yes
10	Lamivudine + Zidovudine 150 mg +300mg	Yes	Yes
11	Lamivudine + Zidovudine 30mg +60mg	Yes	No
12	Lamivudine 150mg tab	Yes	No
13	Lopinavir + Ritonavir 200mg + 50mg	Yes	Yes
14	Lopinavir + Ritonavir 80mg + 20mg/ml	Yes	No
15	Nevirapine 10mg/ml oral suspn.	Yes	yes
16	Nevirapine 200mg tab	Yes	No
17	Abacavir+lamivudine60mg+30mg	Yes	No

As also shown in table 2 below, this assessment shows that out of the 17 types of ARV drugs handled by the Hospital, only 14 (82.4%) of them showed accurate balance record on the bin card while for three types of items (17.6 %)namely Efavirenz + Lamivudine + Tenofovir 600mg+300mg+300mg tab, Efavirenz 600 mg caps, Lamivudine + Nevirapine + zidovudine tab, 30mg + 50mg + 60mg tab, and Lopinavir + Ritonavir 200mg + 50mg, the balance recorded on the bin card is not accurate with respect to the physical count taken during the day of visit.

Table 2: Bin card record accuracy for ARV drugs in Black Lion Hospital, March 2017.

Items	Accurate balance	Near accurate balance (+/- 10%)
Abacavir 300mg tab	Yes	
Atazanavir + Ritonavir 300mg+100mg tab	Yes	
Efavirenz + Lamivudine + Tenofovir 600mg+300mg+300mg tab	No	Yes
Efavirenz 200mg caps	Yes	

Efavirenz 50 mg caps	Yes	
Efavirenz 600 mg caps	No	Yes
Lamivudine + Nevirapine +zidovudine 150mg+200mg+300 tab	Yes	
Lamivudine + Nevirapine +zidovudine tab, 30mg + 50mg + 60mg tab	No	Yes
Lamivudine + Tenofovir 300mg + 300mg	Yes	
Lamivudine + Zidovudine 150 mg +300mg	Yes	
Lamivudine + Zidovudine 30mg +60mg	Yes	
Lamivudine 150mg tab	Yes	
Lopinavir + Ritonavir 200mg + 50mg	Yes	
Lopinavir + Ritonavir 80mg + 20mg/ml	Yes	
Nevirapine 10mg/ml oral suspn.	Yes	
Nevirapine 200mg tab	Yes	
Abacavir+lamivudine60mg+30mg	Yes	

Proper utilization of IFRR and RRF formats

As per the result of the interview and observation during the visit while conducting this assessment, it is observed that the Hospital uses the Available RRF and IFRR formats for reporting of previous consumption and requisition of resupply. (i.e, RRF used by the facility medication store manager and reported to RHB & PFSA while IFRR formats used by the ART dispensary section head and submitted/reported to the Hospital Store manager.)

4.1.1.3.LMIS data quality

The Logistic Management Information System data quality is assessed by checking Data reported on the most recent RRF report sent to PFSA hub (higher supplying unit) and comparing this data from the bin card recorded at the time of the most recent RRF report. Accordingly as shown on the below table, out of the 17 ARV drugs, only for three items (17.6%), namely **Efavirenz 50 mg caps, Lamivudine + Nevirapine +zidovudine, 30mg + 50mg + 60mg tab** and **Nevirapine 10mg/ml oral suspn**, the data is found to be accurate while for the remaining 14 items (82.4%), the data reported on the RRF is different to that recoded on the bin card.

Table 3: LMIS data quality (data reported on the RRF vs data on bin card balance for ARV drugs in Black Lion Hospital, March 2017.

S.N o.	Items	Usable Stock on hand as reported on the most recent RRF report (30/05/09)	Usable Stock on hand as documented on the bin card at the time of the most recent RRF report.
1	Abacavir 300mg tab	292	540
2	Atazanavir + Ritonavir 300mg+100mg tab	432	324
3	Efavirenz + Lamivudine + Tenofovir 600mg+300mg+300mg tab	1600	2600
4	Efavirenz 200mg caps	100	159
5	Efavirenz 50 mg caps	1965	1965
6	Efavirenz 600 mg caps	100	2104
7	Lamivudine + Nevirapine +zidovudine 150mg+200mg+300 tab	547	469
8	Lamivudine + Nevirapine +zidovudine , 30mg + 50mg + 60mg tab	593	593
9	Lamivudine + Tenofovir 300mg + 300mg	718	1056
10	Lamivudine + Zidovudine 150 mg +300mg	1200	1624
11	Lamivudine + Zidovudine 30mg +60mg	320	456
12	Lamivudine 150mg tab	450	448
13	Lopinavir + Ritonavir 200mg + 50mg	165	100
14	Lopinavir + Ritonavir 80mg + 20mg/ml	96	84
15	Nevirapine 10mg/ml oral suspn.	10	10
16	Nevirapine 200mg tab	604	582
17	Abacavir+lamivudine60mg+30mg	140	40

4.1.1.4. Training and supervision on logistics management

As per the interview conducted during the assessment period, it is reported by key personnel that out of the total 78 pharmacy staff available and working under the pharmacy unit of the Black Lion Hospital, only 48 of them (61.5%) are trained on IPLs, and all personnel engage in IPLS implementation learn to complete and record the IPLS tools/formats from the IPLS training they once obtained.

In addition, the result of the interview shows that the Hospital staff engaged in the implementation of IPLS obtain supportive supervision, occasionally, provided by higher levels such as PFSA with the most recent supervision visit received at 3-6 months ago on different focus areas such as pharmaceutical logistics and inventory management including checking the logistics reports, storage conditions etc.

4.1.2. Stock status information and storage system(conditions) within the system

4.1.2.1. Stock availability

As per the below table on the day of visit, it is observed that two (11.8%) of the ARV drugs namely, Lopinavir + Ritonavir 200mg + 50mg and Nevirapine 10mg/ml oral suspn are found to be stock out (not available) at the Hospital store room, while the remaining 15 (88.2%) of ARV drugs are available in the store. On the same day of visit as per the observation made on the ARV dispensary units, the availability of these items were checked and was observed that both of these drugs are available with quantity of 47 and 2 respectively.

Table 4: Availability of ARV drugs on the day of visit at Black Lion Hospital, March 2017

S.N o.	Items	Available at the day of Visit(Yes/No)
1	Abacavir 300mg tab	Yes
2	Atazanavir + Ritonavir 300mg+100mg tab	Yes
3	Efavirenz + Lamivudine + Tenofovir 600mg+300mg+300mg tab	Yes
4	Efavirenz 200mg caps	Yes
5	Efavirenz 50 mg caps	Yes

6	Efavirenz 600 mg caps	Yes
7	Lamivudine + Nevirapine + zidovudine 150mg+200mg+300 tab	Yes
8	Lamivudine + Nevirapine + zidovudine tab, 30mg + 50mg + 60mg tab	Yes
9	Lamivudine + Tenofovir 300mg + 300mg	Yes
10	Lamivudine + Zidovudine 150 mg +300mg	Yes
11	Lamivudine + Zidovudine 30mg +60mg	Yes
12	Lamivudine 150mg tab	Yes
13	Lopinavir + Ritonavir 200mg + 50mg	No
14	Lopinavir + Ritonavir 80mg + 20mg/ml	Yes
15	Nevirapine 10mg/ml oral suspn.	No
16	Nevirapine 200mg tab	Yes
17	Abacavir+lamivudine60mg+30mg	Yes

As clearly seen on the below table 5, as per observation of bin card records, for a period of recent six months prior to the visit, the result shows that three items namely Efavirenz 600 mg caps, Lopinavir + Ritonavir 200mg + 50mg and Nevirapine 10mg/ml oral suspension were found to be stock outs for one, one, and five times and with a total number of days of stock outs of 15, 23, and 35 days, respectively.

Table 5: Stock outs during the recent 6 months prior to visit for ARV drugs in Black Lion Hospital, March 2017.

S.N o.	Items	Stock out during the recent 6 months, prior to visit (Yes/No)	Number of stock outs	Total number of days stock outs
1	Abacavir 300mg tab	No	–	–
2	Atazanavir + Ritonavir 300mg+100mg tab	No	–	–

3	Efavirenz + Lamivudine + Tenofovir 600mg+300mg+300mg tab	No	–	–
4	Efavirenz 200mg caps	No	–	–
5	Efavirenz 50 mg caps	No	–	–
6	Efavirenz 600 mg caps	Yes	1	15 days
7	Lamivudine + Nevirapine + zidovudine 150mg+200mg+300 tab	No	–	–
8	Lamivudine + Nevirapine + zidovudine tab, 30mg + 50mg + 60mg tab	No	–	–
9	Lamivudine + Tenofovir 300mg + 300mg	No	–	–
10	Lamivudine + Zidovudine 150 mg +300mg	No	–	–
11	Lamivudine + Zidovudine 30mg +60mg	No	–	–
12	Lamivudine 150mg tab	No	–	–
13	Lopinavir + Ritonavir 200mg + 50mg	Yes	1	23
14	Lopinavir + Ritonavir 80mg + 20mg/ml	No	–	–
15	Nevirapine 10mg/ml oral suspn.	Yes	5	35
16	Nevirapine 200mg tab	No	–	–
17	Abacavir+lamivudine60mg+30mg	No	–	–

4.1.2.2. Availability of expired items

During the visit it is observed that out of the 17 types of ARV drugs handled by the Hospital, four types namely Efavirenz 50 mg caps, Efavirenz 600 mg caps, Lamivudine + Tenofovir 300mg + 300mg and Nevirapine 10mg/ml oral suspn. Are found to be expired with significant quantity as per the below table.

Table 6: List of available expired items for ARV drugs in Black Lion Hospital, March 2017.

S.N	Item	Qty	Ex.Date
1	Efavirenz 50 mg caps	115	1/17

2	Efavirenz 600 mg caps	212	2/17
3	Lamivudine + Tenofovir 300mg + 300mg	334	2/17
4	Lamivudine + Zidovudine 30mg +60mg	900	8/16
5	Nevirapine 10mg/ml oral suspn	73	10/16

4.1.2.3. Fulfillment of acceptable storage conditions for ARV drugs store room

Storage conditions met by the store room of the facility

Careful observation using check list during the day of visit showed that the most common storage conditions met by the store room are the following,

- Drugs are protected direct sunlight and high heat,
- Cartoons and drugs are protected from water and humidity
- Drugs seems to be stored at appropriate temperature even though the store room lacks wall thermometer to verify this all the time.
- The store room is equipped (in separate room) with refrigerator for storage of drugs that require cold storage condition
- Storage is well secured with lock and Key
- Roof is well maintained in good condition to avoid sunlight and water penetration.
- Store room is well maintained in good condition (clean and tidy, all trash removed, equipped with well-organized shelves and boxes)
- Storage area is visually free and protected from harmful insects and rodents
- Products are stacked at least 10 cm off the floor
- Fire safety equipment are in place and accessible, and
- Drugs are stored separately from insecticides and chemicals.
- There is separate room/ location to store or put expired and damaged items before they get disposed.

Storage conditions that are not met by the store room of the facility

Observation using check list showed that the following important storage conditions are not met by the Hospital's store room

- Majority of the drugs are not arranged properly and professionally in such a way to enable that identification labels and expiry dates and/or manufacturing dates are visible
- Majority of drugs are not organized and arranged in a manner that is accessible for first- expire – first out (FEFO) stock rotation method.
- The current space of the store room is not sufficient for the existing products and reasonable expansion
- Some products are stacked with very much less than 30 cm away from the walls (even some products are arranged in a pallet leaning the wall)
- Most products are stacked with more than 2.5 meter high with some piled up nearest to the roof.

In addition, the store room lacks implant equipment to regulate and monitor room temperature such as ventilator and room wall thermometer, respectively.

4.1.3. Logistic system performance with in the system

4.1.3.1. Length of resupply period

As per the interview conducted with key personnel and verifications of order and resupply documents on Average, for a normal order, it will take, approximately greater than two weeks between sending an order and receiving products form this main supply point.

4.1.3.2. Order fill rate

In this research, the order fill rate which is percentage difference between quantity ordered by the hospital and quantity received from the higher supplying unit (PFSA hub) is assessed. Hence, as it can be shown from the below table, out of the 17 types of ARV drugs, the hospital has recently placed order(request of resupply) for 13 items, out of which for 9 of the items, same quantity is received as per requested (100 % order fill rate) while for the remaining four items, 3 items are

received with less quantity (90.3 – 40%), while one items is not totally delivered (0% order fill rate) even though requested by the Hospital.

Table 7: List of drugs ordered during the recent order period vs order fill rate, in Black Lion Hospital, March 2017.

S.No	Items	Quantity ordered during the recent order period (30/05/09)	Quantity received during the recent delivery period.	Order fill rate
1	Abacavir 300mg tab	864	864	100%
2	Atazanavir + Ritonavir 300mg+100mg tab	864	864	100%
3	Efavirenz + Lamivudine + Tenofovir 600mg+300mg+300mg tab	8160	8160	100%
4	Efavirenz 200mg caps	300	80	26.7%
5	Efavirenz 50 mg caps			—
6	Efavirenz 600 mg caps	1900	1900	100%
7	Lamivudine + Nevirapine +zidovudine 150mg+200mg+300 tab	1344	1344	100%
8	Lamivudine + Nevirapine +zidovudine , 30mg + 50mg + 60mg tab			—
9	Lamivudine + Tenofovir 300mg + 300mg	1600	1600	100%
10	Lamivudine + Zidovudine 150 mg +300mg	2000	2000	100%
11	Lamivudine + Zidovudine 30mg +60mg			—
12	Lamivudine 150mg tab	180	180	100%
13	Lopinavir + Ritonavir 200mg + 50mg			—
14	Lopinavir + Ritonavir 80mg + 20mg/ml	48	0	0%
15	Nevirapine 10mg/ml oral suspn.	50	20	40%
16	Nevirapine 200mg tab	450	450	100%

17	Abacavir+lamivudine60mg+30mg	144	130	90.3%
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Reasons for not having the perceived fill rate

The interview result further showed the reason for not having the perceived fill rate (exact type and quantity of items requested) are absence of adequate stock at the resupplying PFSA hub and sock out of items during the resupply period at the resupplying PFSA hub.

4.1.3.3. Emergency order placement

As per the interview of the key personnel, in addition to using the RRF and IFRR, emergency orders are usually placed through phone or orally for the resupply of items by both the hospital store manager and the ARV dispensing unit personnel. For Example, for the last three months the hospital made two emergency orders of ARV drugs from the regional PFSA hub (PFSA A.A branch)

4.1.4. Challenges to IPLS implementation

Assessment result from the interviews conducted with three key respondents such as the Store Manager, The Dispensary Unit Head and Head of Pharmacy Unit Directorate shows that the major challenges of IPLS implementation in the Hospital includes, poor commitment of staff, Stock outs and Shortage of items at the higher supplying unit (PFSA hub) , delivery(distribution) of items with near expiry date by the higher supplying unit (PFSA hub), poor data quality on documentation and reporting, execs work load and sever shortage of manpower, poor follow up and support by top management, absence of performance measurement practice of pharmacy staffs with respect to their IPLS responsibility, huge paper work involved in IPLS, lack of data clerk in the pharmacy store and lack of incentives for store managers who are laboring too much on store management activity, insufficient space of pharmaceutical storage and inadequate vehicles for transportation of items to and from the facility.

In addition, even though the key respondents described the above challenges of IPLS implementation, they all agreed that IPLS is preferred to the vertical/kit system due to reasons/advantages they mentioned such as, if properly implemented IPLS is useful to prevent over stock, understock, stock outs and wastage of pharmaceuticals due to damage, loss and expiry and ultimately help patients get the right drug, at the right time, in the right quantity and in the

right condition. In addition, they emphasized the advantage of implementing IPLS stating that if properly implemented, IPLS provides real time data for accurate reporting and recording of pharmaceutical items storage and distribution.

4.2. DISCUSSION

4.2.1. Logistic and inventory system management practice with in the Hospital

Proper implementation of IPLS demands use of various recording and reporting formats and tools that should consistently and properly used at different levels of the pharmaceutical supply chain system of Ethiopia.

Standardized recording and reporting formats and tools consistent availability and proper usage constitutes critical supply chain indicators.

In collaboration of its partners, PFSA introduced by printing and distributing these important recording and reporting tools to health facilities like Black Lion Hospital. These tools and formats include Bin cards, Stock cards, Internal Facility Report and Resupply Form (IFRR) and also Health Post Monthly Report and Resupply Form (HPMRR).(PFSA, 2014)

4.2.1.1. Availability of logistics reporting and recording tools and stock keeping logistic formats

As per the result obtained in this study using interview of key personnel and observation during the day of visit, this assessment showed that all (100% of) the required blank logistics recording and reporting tools such as bin cards, RRF Formats, IFRR formats and IPLS SoP Manuals are available in the hospital.

In a Pharmaceutical Logistics System Assessment using LIAT done in Sudan in 2011 showed that the availability of blank logistics recording and reporting tools in health facilities was only 39%.

(Dick M. ,Farai C. & Joseph N. ,2011)

In addition, according to an assessment of IPLS for the management of HIV/AIDS and TB laboratory diagnostic commodity in public health facilities in Addis Ababa in 2016, availability of IPLS formats for recording and reporting such as bin cards, internal facility report and

requests(IFRR), and report and request forms (RRF) was reported in majority of facilities (92.6%).(Tilahun A, Geleta DA, Abeshu MA, Geleta B, Taye B,2016).

When compared to the above two studies done in Sudan and in Addis Ababa, 100 % availability of blank logistics recording and reporting tools such as bin cards, RRF Formats, IFRR formats and IPLS SoP Manuals for use at Black Lion Hospital is highly encouraging which needs continued attention, effort and commitment so that consistent and continuous availability of these tools are maintained every time.

4.2.1.2. Proper utilization of the logistics recording and reporting tools

One of the requirement for successful inventory management system is proper, consistent and accurate use of bin cards for all products managed in the supply chain. Hence, in addition to availability of bin cards, proper and accurate utilization of bin cards in the Hospital was further assessed for all ARV drugs available in the Hospital.

A given bin card is considered up to date, if it is updated with in the previous 30 days or if the bin card was last updated with the balance of zero for a given product and the facility has not received any amount of that given product since then.

As it can be shown from the result part (Table-1, even though bin card is available for all the 17 ARV drugs, it is only for seven (41.2 %) of them are bin cards are updated. This is a significant gap that would affect proper implantation of IPLS in the Hospital and much has to be done to improve this gap so that regular update of bin cards can be maintained at full scale.

Such gap of failing to regularly update bin cards are also observed in other studies among which are; in a study with assessment of the practice for HIV/AIDs and TB laboratory commodities done in selected public health facilities in Addis Ababa, only in 25% of the Hospitals and 20.8% of the Health Centers exhibited accurate update of bin cards. (Adino et al, 2013)

Also in similar studies of assessing IPLS for the management of HIV/AIDS and TB laboratory diagnostic commodity in public health facilities in Addis Ababa in 2016, regular update of bin cards was reported to be in 61.5% of health facilities. (Tilahun A, Geleta DA, Abeshu MA, Geleta B, Taye B,2016)

In this study, in addition to checking timely update of bin cards, the quality of updated data on bin card was cross checked by comparing the accuracy of bin card balance with the physical count for all the 17 ARV drugs available in the Hospital store. The comparison was done at two levels of accuracy in such a way that a bin card balance with perfect accuracy (no discrepancy) with the physical count is considered accurate while a bin card having a less than 10 % discrepancy in value between the bin card balance and the physical count is considered near to accurate.

Hence as shown in table 2 of the result part, out of the 17 types of ARV drugs handled in the Hospital store, only for 14 (82.4%) of them showed accurate bin card balance recording & 17.6% in accuracy when compared with the physical balance.

In another study made on the inventory management of ARV drugs at community health centers in the Cape Metropole in Western Cape town in 2015 showed that the variation between stock records and physical counts for the ARV drugs assessed was 51.6%,(Mahoro M,2015), which shows that the percentage of inaccuracy is higher than the one observed in Black Lion hospital.

In a national survey conducted by PFSA in 2015, the accuracy of balances on bin cards by facility level showed that at hospitals, accurate balances ranged from 29 percent to 71 percent per different items with an average of 49 percent.

Such gap of data accuracy in updating bin cards which are the fundamental logistic records that help to capture essential inventory data across the supply chain need special attention otherwise will result in poor implementation of the IPLS

Proper utilization of RRF and IFRR formats is important to report the previous consumption of items and as the same time requesting the reasonable amount of stock for the next period use which is crucial for effective implementation of IPLS. As it can be shown from the result part, in this study, it is observed that the Hospital store uses RRF and the dispensing unit uses IFRR formats for reporting of previous consumption and requisition of resupply for the next period consumption. While utilizing the RRF and IFRR formats by the hospital store and IFRR by the dispensing unit is an encouraging practice, it is also observed that there is still some gap in that some columns of the IFRR and RRF remains unfilled which may contribute to provide incomplete information for decision making. This gap may be caused due to the work load and limited man power available in the hospital which is evidenced at the time of visit by the principal investigator and the response of key informants for questions related to challenges to IPLS implementation in the hospital.

4.2.1.3. LMIS data quality

The study also assessed that LMIS data quality by checking the data quality reported on the most recent RRF reports sent to PFSA hub (higher supplying unit) and comparing this data with the balance recorded at the time of the most recent RRF report. Hence as per the result observed in table-3, out of the 17 ARV drugs, for 14 items (82.4%), the data reported on the RRF is different to that recorded on the bin card which shows a very poor LMIS data quality.

In another study on the assessment of pharmaceutical logistic system in south Sudan, among the total health facilities included in the study 27 % of them experienced accurate logistics records that shows good LMIS data quality (Dick M. ,Farai C. & Joseph N. ,2011)

Good quality of LMIS data is so critical to help disseminate reliable information to the higher level to enable appropriate and effective decision making and hence to have a well-functioning IPLS system. One of the major importance of IPLS is to assist health facilities to produce a reasonable resupply (order) request of items, to PFSA, every two month using RRF at the same time providing reliable information on their previous performance and stock at hand using the same RRF form. PFSA receiving the RRF and the LMIS data communicated by RRF will further make appropriate logistic discussion such as resupplying the items requested, making future demand forecasts, and consecutive logistic decisions such as procurement planning of items with planned quantity based on the forecasted demand

4.2.1.4. Supervision and Training on logistics management

Supervision

Supervision is also an important component for successful implementation of IPLS in that it promotes quality assurance for the performance of any logistics system.

Supervision enables improvements of staff and system performance and further helps to identify potential gaps at the health facility level which includes stock outs, overstocks, understocks, drug expiry etc. there by alerting managers and decision makers to take some proactive prevention methods.

The result of this study showed that the hospital staff engaged in the implementation of IPLS obtain occasional supportive supervision a 3 to 6 months interval by higher level such as PFSA, in

different areas such as pharmaceutical logistics and inventory management including checking the logistics reports, storage conditions etc.

When we compare the trend of supervision in Black Lion Hospital with another study conducted in Zimbabwe public health facilities on HIV-AIDS commodities logistic system assessment, it is reported that only 41 % of health facilities involved in the study received logistics supervisory visit. (Jabulani N, & et al. 2005). Compared to this study, the trend in Black Lion Hospital is encouraging and further efforts should be made to maintain the supervision consistently and if possible more frequently to obtain better results.

Training

As part of the successful IPLS implementation plan, PFSA and its partner have had a major focus of building the capacity of health facility personnel. Regular capacity building programs such as provision of training helps staffs to remind and refresh them with basic concepts and principles of IPLS implementation and to be equipped with additional information related to the subject matter.

Taking training on IPLS is indispensable to anyone who is engaged in logistic management of pharmaceutical items at hospital level as lack or absence of training may result in poor performance in logistic management and hence poor IPLS implementation. As per the above result,

As per the result of the study, from the total pharmacy staff available in the hospital only 61.5% have got training on IPLS while the remaining are not. This shows more than 50 % of the staffs are trained in IPLS which seems encouraging but more effort is required to training the remaining staff.

In another study on assessment of laboratory logistic management information system practice for HIV/AIDS and TB laboratory commodity conducted in selected health facility in Addis Ababa, out of a total of 114 professionals, only 71 of them (62.3%) were trained in IPLS(Adino et al, 2013). This figure is almost comparatively equal with the result obtained above in Black Lion Hospital. But in another study conducted in Zimbabwe public health facilities on HIV-AIDS commodities logistic system assessment, among those health facilities included in the study, 35 % of had reported that they had never received formal logistics training in completing and updating logistics formats and calculating order quantities. . (Jabulani N, & et al. 2005). This is a serious gap when comrade with the result of the study in black lion hospital.

4.2.2. Stock status information & Storage condition within the system

4.2.2.1. Stock availability

Stock availability is the most important outcome of a successful logistic system. If a successful logistic system is in place, pharmaceutical stocks will be available for use at the right time and quantity so that an improved health outcome can be achieved which is the ultimate goals of any successful health logistic system. On the contrary, stocks outs in any health logistics system implies critical system failure which result in failure of addressing the treatment needs of patients there by causing reduced reliance on the health system by the society.

Hence, in order to avoid this, facilities has to maintain appropriate stock every time by avoiding stock outs, too little stocks (that may run stock out shortly) or over stocks that may lead to wastage.

In this study, in order to assess stock availability in the hospital, stock on hand data on the day of visit was collected and using the bin cards record, both the frequency (how many times stock out happened) and duration of stock outs (for how many days were stock outs lasted), during the past six months prior to the day of the survey was measured.

Hence, as it is shown on the result part, out of the 17 types of ARV drugs, 2 of them (11.8%) are out of stock from the hospital main store. But in addition to checking stock availability at the sore room, further assessment of stock availability is done in the hospital dispensary (where drugs are dispensed directly to patients) to check whether those two drugs(Lopinavir + Ritonavir 200mg + 50mg and Nevirapine 10mg/ml oral suspn) that are out of stock at the day of visit are stocked out or not in the dispensary. As it is described in the result part, even though these drugs were out of stock in the store room they are found available in the dispensary with quantity of 42 and 2, respectively.

In addition, for the past six months prior to the day of visit, 3 of the 17 (17.6 % ARV drugs) , were found to be stock outs for one, one, and five times and with a total number of days of stock outs of 15,23,and 35 days, respectively (with average duration of 24 days).

Different studies showed a record of stock out for certain items during an assessment. For Example, in an assessment of pharmaceutical sector in Ethiopia in 2010, it was observed that the national average for availability of essential drugs in public health facilities was 70% (30 % stock

outs) and the average duration for stock out is 99.2 % days which are higher figures when compared with the result of this study as discussed above. (WHO, 2010)

Proper implementation of IPLS demands maintaining a fixed minimum and maximum stock levels at main stores of a given health facility. For example, at Hospital and health center level a minimum stock level for two months consumption and a maximum stock level for four months consumption should be maintained at any given time. That means if the stock level fall short of or beyond these level implies poor stock management practice hence poor IPLS implementation. (PFSA, 2014).

Hence, as per this principle, any result that shows stock out of one or more of an item for any given period in a given supply and distribution system where IPLS is claimed to be in place is totally unacceptable.

4.2.2.2. Availability of expired items

As part of assessing the storage condition and performance, this study also assessed the availability of expired items at the time of visit. Accordingly, as it can be seen from the result part , out of the 17 types of ARV drugs handled by the Hospital, four drugs are found to expired with significant quantities as shown on Table 6 of the result part.

The presence of expired drugs is also reported in other studies. For example, in a study on the assessment of pharmaceutical logistic system in south Sudan, it is reported that among the total of facilities included in the study, it is reported that 11 of health facilities had expired tracer medicines, which shows a gap in IPLS implementation.

One of the major goal of IPLS is to enable health facilities to have adequate (reasonable quantity) of stocks any time so that overstock, wastage due to expiry, understock and stock outs can be avoided any time so that health commodity resources can be used efficiently and effectively and quality and satisfactory health service can be provided to clients any time. Hence, the presence of significant quantities of expired drugs in the hospital at the time of visit shows that, there is a gap in IPLS implementation.

4.2.2.3. Storage conditions for ARV drugs store room.

Keeping drugs safe, protected and well-arranged by prevent damage, waste and deterioration of drugs due to poor storage condition is critical to provide patients with high quality products and hence medial services.

In order to assess the storage condition of the Hospital, 17 standard criteria (see annex) was considered and physical inspection with interviewing key Hospital staff were used to evaluate compliance of the Hospital store to these criteria.

Accordingly, it is observed that among the 17 standard criteria set to measure compliance of the storeroom with acceptable standard condition, it is observed that the store room fulfilled 12 of them (70.6%). Hence, since this figure is less than 80%, which is a minimum requirement for having acceptable storage condition for Pharmaceuticals, the Hospital store is considered that it doesn't fulfil normal storage condition for pharmaceuticals storage as per the storage guideline.

Different studies also shows gaps of meeting storage condition requirements. For example, in a Pharmaceutical Logistics Assessment conducted in 2011 in Sudan, only 35% of the health facilities included in the study were able to meet the acceptable standard condition. (Dick M. ,Farai C. & Joseph N. ,2011)

Also in another study conducted in Lesotho, none of the facilities had a practice of separating damaged or expired items from usable ones which is one of a sign of poor storage management. . (Pharasi B.2007).

4.2.3. Logistic system performance in the hospital

4.2.3.1. Resupply Period

As per the recommendation of the Standard Operation Procedure (SOP) designed by PFSA, PFSA is responsible to resupply health facilities with the requested quantity within one month of receiving resupply request from health facilities. (PFSA, 2014).

The assessment tried to assess the length of the resupply period by examining the perception of the facility key staff on the timelines on the resupply period for products requested by the Hospital. Accordingly the result showed that on average, for a normal order, it will take, approximately

greater than two weeks between sending an order and receiving products from the main supply point which is PFSA hub. This result is encouraging in that the supplying PFSA hub has maintained the resupply period which within the one month's period of request as it is recommended on the IPLS SOP.

4.2.3.2. Order fill rate

The per the result shown in Table 7, pertaining to the order fill rate, which is the percentage of items resupplied (filled) by the supplying PFSA hub with respect to the total amount of items requested by the Hospital for resupply shows that, out of the 13 items recently requested by the hospital for resupply, only 9 items were fully resupplied with the requested quantity (100% fill rate), while for the remaining four items, 3 items are received with less quantity (90.3 – 40%), while one items is not totally delivered (0% order fill rate) even though requested by the Hospital. This result shows that among the total of 13 drugs requested only 8 of them (61.5%) had a perfect fill rate (100%).

Such gaps in order fill rate performance is also observed in other studies. For example, in a pharmaceutical logistic assessment conducted in Sudan in 2011, it is reported that only 24 % of health facilities received the quantity of the RDF drugs they ordered (Dick M. ,Farai C. & Joseph N. ,2011)

Further assessment was done on the reason for not having the perceived order fill rate by the hospital. Hence, the result obtained from the respondent interview showed that the two reasons for not having the exact type and amount of items requested by the hospital are absence of adequate stock at the resupplying PFSA hub and stock out of items during the resupply period at the resupplying PFSA hub.

In ILPS, facilities should always be able to maintain the maximum- minimum inventory stock level so that they can always have enough amount of stock in their store in order to serve their clients and bring the desired health outcome. This maximum- minimum inventory stock helps to avoid emergency orders, and stock outs.

4.2.3.3. Emergency order trend

This assessment also tried to see the emergency order trend of the Concerning the Emergency order trend. Hence, as per result obtained from interviewing of the key personnel, in addition to

using the RRF and IFRR, the Hospital places emergency orders through phone or orally for the resupply of items. The assessment further showed that for the last three months the hospital made two emergency orders of ARV drugs from the PFSA supplying hub. Having an emergency order of two times within three months period is not considered frequent and hence the trend is encouraging.

As per the requirement of IPLS and under normal condition Hospitals are expected to request refill by sending their RRF report to PFSA every two months and it is only under rare condition when their stock fall below two weeks consumption should they request emergency order so that they can avoid stock outs. Hence, as per the IPLS recommendation frequent emergency order is not encouraged. (PFSA, 2014).

4.2.4. Challenges of IPLS Implementation

As per the result obtained from the interview with key Hospital informants, the study showed that the major challenges related to IPLS implementation at the Hospital level can be categorized in to Human resource related factors (poor commitment of staff, execs work load and severe shortage of manpower, lack of data clerk in the pharmacy store); Management related factors (absence of performance measurement practice, lack of incentives for staffs); Supply problem related factors (Stock outs, shortage of items and supplying items with short shelf life by the higher supplying unit (PFSA hub)); LMIS related factors (huge paper work involved in IPLS, and, poor data quality on documentation and reporting); Infrastructure related factors (insufficient space of pharmaceutical storage and inadequate vehicles for transportation of items to and from the facility.). Different studies showed that some of the factors mentioned above can have negative impact on the overall productivity of staffs hence on poor implementation of the system they use to produce successful result. For example in two different studies conducted by the Global Pharmacy Workforce 2008 and by WHO in 2010, showed that factors such as shortage of man power, lack of proper training, lack of top management commitment in supervision and follow up are some of the significant factors that could cause staff dissatisfaction, high turnover and poor performance in their assignment. (Dick M, Farai C., 2011, WHO, 2010)

Proposed Conceptual Frame work of the study



Figure 1. Proposed Conceptual framework of the study

CHAPTER 5. CONCLUSION AND RECOMMENDATION

5.1. Conclusion

The overall result of this study provides an important information that can be used to measure and conclude on the level of IPLS implementation at the Hospital.

The result clearly shows that, IPLS implementation in the Hospital is encouraging only with respect to some measurements such as availability of logistics reporting and recording tools and stock keeping logistic formats, providing supervision and training, availability of drugs and some measurements of logistic system performance such as having an acceptable resupply period and less frequent emergency order trend.

Even though the hospital showed good logistic and inventory system management practice and logistic system performance with respect to the above mentioned measurements, much gap is observed in some other logistic and inventory system management practice and logistic system performance measurements such as in proper utilization of the logistics recording and reporting tools, LMIS data quality, and perceived order fill rate.

In addition, the study clearly show that certain gaps are observed in Stock status information & Storage condition measurements that include, availability of expired items, gaps in storage conditions for ARV drugs store.

Hence, from the above concluding points, this study concludes that even though some encouraging practices are observed with respect to some measurements of IPLS implementation, certain gaps are observed which clearly indicate that IPLS is not properly implemented in full scale at Black Lion Hospital.

5.2. Recommendations

In order to address the gaps observed in IPLS implementation in this study and to enable successful and effective implementation of IPLS with full scale in Black Lion Hospital, the following recommendations are forwarded.

- Continuous efforts such as providing on job training, regular supervision, regular and timely monitoring and feedback on RRF reports should be done to maximize proper utilization of LMIS tools and bring improved LMIS data quality.

- The concept and knowledge of IPLS should be incorporated to the curriculum of formal training of pharmacy students at university and college so that students can have early knowledge on the subject matter and contribute to successful implementation of IPLS in their actual work environment.
- Man power- work load assessment should be done by higher management to ensure adequate manpower is in place to successfully work towards full scale implementation of IPLS.
- The Hospital management should enforcing strict adherence to the IPLS SOP procedures and standards by incorporating IPLS practices and procedures in to the staff performance evaluation practice.
- Renovation and expansion on the pharmacy store should be done and all the required storage conditions as per the storage condition requirement guideline should be fulfilled to avoid any gap with respect to the physical structure (e.g space) of the store room and fulfillment of necessary storage conditions.
- Receiving a good quality LMIS data from the Hospital, the supplying PFSA hub should maintain sufficient stock of all items at all times based on accurate forecast of future needs/demands. This would help to provide the exact perceived re-fill of items with respect to type and quantity as requested by the Hospital.
- Further research should be conducted on IPLS implementation so that comparison with the result of this study can be made to trace any improvements.

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ANNEXES

Annex I. (Data collection tool I)

Section I. Product availability

Table 1. This table helps to gather data that is used to assess the stock status.

Description of each column

Column 1. Name of all authorized ARV drug products that will be counted

Column 2. Unit of count for the product

Note: Column 1 & 2 are filled out before questionnaires are printed for the survey.

Column 3. Record or not the product is managed at this facility, Answer Y for yes and N for no.

Column 4. Check if the bin card is available. Answer Y for yes and N for no.

Column 5. Check if the bin card has been updated with in the last 30 days, Answer Y for yes & N for no.

Note: if the bin card was last updated with the balance of 0 and the facility has not received any resupply, consider the bin card as updated.

Column 6. Record the balance on the bin card.

Column 7. Record '1' for accurate balance and '0' for near accurate balance.

Column 8. Record if the facility has had any stock out of the product during the previous six month period from September, 2016 to February 2017. Answer Y for yes & N for no.

Column 9. Record how many times the product has been stocked out for the last six period from September, 2016 to February 2017, according to bin cards.

Column 10: Record the total number of days the product was stocked out between September, 2016 to February 2017.

Column 11. Record the quantity of products issued from the store room between September, 2016 to February 2017.

Column 12. Record the number of months the issued data represents (may be 6 months or less), record the months for which there is any data available, including 0.

Column 13. Record the physical count in the store room.

Column 14. Record if the facility experiencing a stock out of the product on the day of visit, answer Y for yes or N for no. If products are available outside the store room there is no stock out. Visually verify that usable products are in stock.

Column 15. Record if the facility has expired products.

No	Item	Unit s of coun t	Manag ed at this facility ? (Y/N)	Bin card avail able ? (Y/N)	Bin card update d? (Y/N)	Balanc e on bin card	1=Accura te Balance 0=Near accurate balance (+/-10%)	Stock out most recent 6 month s (Y/N)	Num ber of stoc k outs	Total number of days stocked out	Total issued (most recent 6 month s)	Numbe r of Months of data availabl e(MOS)	Physica l invento ry— Store room	Stock out today ? (Y/N)	Availab ility of expired product (Y/N)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1	Abacavir 300mg tab	60													
2	Atazanavir + Ritonavir 300mg+100mg tab	30													
3	Efavirenz + Lamivudine + Tenofovir 600mg+300mg+3 00mg tab	30													

4	Efavirenz 200mg caps	90													
5	Efavirenz 50 mg caps	30													
6	Efavirenz 600 mg caps	30													
7	Lamivudine + Nevirapine + zidovudine 150mg+200mg+300 tab	60													
8	Lamivudine + Nevirapine + zidovudine tab, 30mg + 50mg + 60mg tab	60													
9	Lamivudine + Tenofovir 300mg + 300mg	30													
10	Lamivudine + Zidovudine 150mg +300mg	60													

1	Lamivudine	+	60												
1	Zidovudine														
	30mg +60mg														
1	Lamivudine		60												
2	150mg tab														
1	Lopinavir	+	120												
3	Ritonavir 200mg														
	+ 50mg														
1	Lopinavir	+	60ml												
4	Ritonavir 80mg +														
	20mg/ml														
1	Nevirapine		240												
5	10mg/ml oral		ml												
	suspn.														
1	Nevirapine		60												
6	200mg tab														
1	Abacavir+lamivu		60												
7	dine60mg+30mg														

Table 2. Stock status in the dispensary unit.

Descriptions of the column:

Column 1. Name of all authorized ARV drug products

Column 2. Unit of count for the product

Note: Column 1 & 2 are filled out before questionnaires are printed for the survey.

No.	Product	Units of count	Stock out today? (Y/N)
1	Abacavir 300mg tab	60	
2	Atazanavir + Ritonavir 300mg+100mg tab	30	
3	Efavirenz + Lamivudine + Tenofovir 600mg+300mg+300mg tab	30	
4	Efavirenz 200mg caps	90	
5	Efavirenz 50 mg caps	30	
6	Efavirenz 600 mg caps	30	
7	Lamivudine + Nevirapine +zidovudine 150+200mg+300mg tab	60	
8	Lamivudine + Nevirapine +zidovudine 30mg + 50mg+60mg tab	60	
9	Lamivudine + Tenofovir 300mg + 300mg tab	30	
10	Lamivudine + Zidovudine 150 mg +300mg	60	
11	Lamivudine + Zidovudine 30mg +60mg	60	
12	Lamivudine 150mg tab	60	
13	Lopinavir + Ritonavir 200mg + 50mg	120	
14	Lopinavir + Ritonavir 80mg + 20mg/ml	60ml	
15	Nevirapine 10mg/ml oral suspn.	240ml	
16	Nevirapine 200mg tab	60	

17	Abacavir + Lamivudine 60mg+30mg tab	60	
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Column 3. Record if the dispensing unit experiencing a stock out of the product on the day of visit. Answer Y for yes or N for no. Visually verify that usable products are in stock.

Section II. Storage conditions.

Table 3. This table is used as a check list to assess the storage condition of the Hospital which is used to store drugs. Place a check mark in the appropriate column based on visual inspection of the storage facility. Write any relevant observation noted in the comment’s column.

N: B. to qualify as ‘yes’ for each criteria, the store room must meet the requirement as per described per each criteria

No.	Description	No.	Yes	Comments
1	ARV drugs are arranged properly and professionally in such a way that identification labels and expiry dates and/or manufacturing dates are visible.			
2	ARV drugs are stored, organized and arranged in a manner that is accessible for first-expire – first-out (FEFO) stock rotation method			
3	Cartons and products are in good condition, not crushed, deteriorated, and spoiled due to mishandling. If cartons are open, determine if products are wet or cracked due to heat/radiation			
4	There is a separate location to store/put damaged and/or expired ARV drugs by removing from usable products before they get disposed using appropriate procedure.			
5	ARV drugs are protected from direct sunlight and high heat at all times of the day and during all seasons			
6	Cartons and drugs are protected from water and humidity during all seasons			

7	Storage area is visually free and protected from harmful insects and rodents (check the storage area for traces of bats and/or (dropping or insects))			
8	Storage area is well secured with a lock and key, but is accessible during normal working hours; access is limited to authorized personnel			
9	Drugs are stored at the appropriate temperature during all seasons according to product temperature specifications			
10	Roof is always maintained in good condition to avoid sunlight and water penetration			
11	Storeroom is maintained in good condition (clean & tidy, all trash removed, sturdy shelves, well organized boxes).			
12	The current space of the store room is sufficient for existing products and reasonable expansion (i.e., receipt of expected product deliveries for foreseeable future).			
13	Products are stacked at least 10 cm off the floor			
14	Products are stacked at least 30 cm away from the walls and other stacks.			
15	Products are stacked no more than 2.5 meters high.			
16	Fire safety equipment is available and accessible			
17	Drugs are stored separately from insecticides and chemicals			

Section III. LMIS data quality.

Table 4. This table is used to collect data which is used to assess the LMIS data quality based on information of usable stock on hand at the time of the most recent LMIS report.

Descriptions of each column:

Column 1. Name of all authorized ARV drug products (are filled out before questionnaires are printed for the survey)

Column 2. Whether or not the product is managed at this facility (answer Y if yes and N if no)

Column 3. Check if the bin cards and RRF are available. (Answer Y for yes and N for no).

Column 4. Get the most recent RRF report showing the selected product and record the stock on hand from the RRF report in column 3.

Column 5. Write the quantity of the usable stock on hand from the bin card from the time of the selected RRF report.

Column 6. Note the reason for any discrepancy

Product	Usable Stock on Hand (at time of most recent LMIS report)				
	Managed at the facility No=0 Yes = 1	Are order records available (bin card and RRF)? (If NO to RRF or bin card skip to next item – only use acceptable data sources) No=0 Yes = 1	According to most recent RRF report	From bin card from time of RRF report	Reasons for discrepancy
1	2	3	4	5	6
Abacavir 300mg tab					
Atazanavir + Ritonavir 300mg+100mg tab					
Efavirenz + Lamivudine + Tenofovir 600mg+300mg+300mg tab					
Efavirenz 200mg caps					
Efavirenz 50 mg caps					
Efavirenz 600 mg caps					

Lamivudine + Nevirapine + zidovudine 150+200mg+300mg tab					
Lamivudine + Nevirapine + zidovudine 30mg + 50mg+60mg tab					
Lamivudine + Tenofovir 300mg + 300mg tab					
Lamivudine + Zidovudine 150 mg +300mg					
Lamivudine + Zidovudine 30mg +60mg					
Lamivudine 150mg tab					
Lopinavir + Ritonavir 200mg + 50mg					
Lopinavir + Ritonavir 80mg + 20mg/ml					
Nevirapine 10mg/ml oral suspn.					
Nevirapine 200mg tab					
Abacavir + Lamivudine 60mg+30mg tab					

Section IV. Order fill rate.

Table 5. This table is used to collect data that will help to assess the order fill rate by examining the percentage difference between quantity ordered and quantity received.

Descriptions of each column

Column 1. List of same products as in table 1.

Column 2. Whether or not the product is managed at this facility answer Y for yes and N for no.

Column 3. Check if the bin cards and RRF are available (answer Y for yes and N for no)

Column 4. Enter the quantity ordered for the last order period for which the product should have been received. (Don't include open orders whose expected receipt date has not arrived).

Column 5. Enter the quantity received in the last order.

Product	Managed at the facility No=0 Yes = 1	Are RRFs available? No=0 Yes = 1 (If NO Skip to next item – only use acceptable data sources)	Quantity Ordered For Last Order Period	Quantity Received In Last Order/Procurement	Reasons for discrepancy
1	2	3	4	5	6
Abacavir 300mg tab					
Atazanavir + Ritonavir 300mg+100mg tab					
Efavirenz + Lamivudine + Tenofovir 600mg+300mg+300mg tab					
Efavirenz 200mg caps					
Efavirenz 50 mg caps					
Efavirenz 600 mg caps					
Lamivudine + Nevirapine +zidovudine 150+200mg+300mg tab					
Lamivudine + Nevirapine +zidovudine 30mg + 50mg+60mg tab					
Lamivudine + Tenofovir 300mg + 300mg tab					
Lamivudine + Zidovudine 150 mg +300mg					
Lamivudine + Zidovudine 30mg +60mg					
Lamivudine 150mg tab					
Lopinavir + Ritonavir 200mg + 50mg					

Lopinavir + Ritonavir 80mg + 20mg/ml					
Nevirapine 10mg/ml oral suspn.					
Nevirapine 200mg tab					
Abacavir + Lamivudine 60mg+30mg tab					

Annex II. (Data collection tool II).

Interview of key respondents using a check list and open ended questions.

Dear sir/madam; Greetings! My name is Amare Sisay and I am a post graduate student in Logistics and supply Chain management at Addis Ababa University School of commerce.

Currently I am doing my thesis work in titles, Assessment of Integrated Pharmaceutical Logistics System Implementation in Black Lion Hospital. For this purpose I am going to collect data that will help me to achieve the following objectives.

- ✓ To assess the inventory and logistics system management practices within the IPLS system, which includes proper and timely utilization of recording and reporting formats, availability of efficient and effective transportation and distribution system, supervision, and training.
- ✓ To collect stock status information, including stock availability, stock out duration, stock on hand, product expiries, and storage conditions
- ✓ To assess the logistic system performance such as performance with respect to order fill rate and the like.
- ✓ To identify key issues and challenges in IPLS implementation so that gaps can be identified and further improvement steps can be pointed out to improve the logistics systems.

Finally I would like to confirm that this is neither a supervisory visit nor performance evaluation of individual staff members. Rather, the findings of this research work will help to provide relevant information to make decisions and to bring improvements.

I would like to thank you so much for your great cooperation in supporting me collecting data to this research

Part I. Quantitative Assessments

A. INFORMED CONSENT

Using this questionnaire, I would like to ask the store manager/pharmacy head a series of interview questions about the ARV drugs available at the Hospital.

On top of this, I would like to actually count the ARV drugs you have at stock today and assess their general storage conditions using observation.

Do you have any questions? May I begin the interview now?

- I. The Respondent agrees to be interviewed responding, Yes, you can begin your interview _____. Continue the Interview
- II. The respondent does not agree to be interviewed responding no, you can't continue your interview. _____. Ends the interview.

B. INFORMATION ABOUT INTERVIEW

Date (dd/mm/yy): _____

Interviewer/s Name: _____

First, ask the following questions of the in-charge or pharmacy head/store manager. After asking questions 01 -06 under section I, visit the storeroom, or storage area where the health products listed are managed.

Section I. Back ground characteristics of the respondents

1. Name, title and mobile phone number of person interviewed for this survey

Name: _____

Till: _____

Mobile Phone Number _____

2. No. of year and months you have worked at this Hospital: Years _____ Months _____

3. Are you the primary person responsible for managing ARV drugs storage and distribution at this facility using IPLS system : Yes _____ No: _____

4. How many staff the facility has under the Pharmacy unit? No. of pharmacy staff _____
5. How many of them are trained in IPLS : No. trained _____
6. Overall educational qualification of Pharmacy unit staff :
 - No of staff with degree: _____
 - No. of staff with diploma _____ others _____

Section II. The Hospital services and infrastructure.

1. Provides ART services: 1. Yes _____ 2. No _____
2. Product Delivery modality from PFSA 1. Direct _____ 2. Indirect. _____
3. Availability of the following facilities at the health facility:
 - a. Paved road to the facility: 1. Yes _____ 2. No. _____
 - b. Operational water in the building in the day of visit: 1. Yes _____ 2. No. _____
 - c. Operational telephone (land line or mobile) : 1. Yes _____ 2. No. _____
 - d. Functional Vehicle: 1. Yes _____ 2. No _____
If yes, Specify, _____
 - e. Functional emergency generator 1. Yes _____ 2. No. _____
 - f. Functional waste disposal equipment 1. Yes _____ 2. No. _____
If yes, Specify, _____
4. Availability of the following facilities at the health facility store:
 - a. Operational electricity on day of visit: 1. Yes _____ 2. No. _____
 - b. Operational water in the room on the day of visit: 1. Yes _____ 2. No. _____
 - c. Operational telephone (land line or mobile) : 1. Yes _____ 2. No. _____
 - d. Operational Computer: 1. Yes _____ 2. No. _____
 - e. Internet Access: 1. Yes _____ 2. No. _____
 - f. Adequate shelves and pallets: 1. Yes _____ 2. No. _____
 - g. Functional Refrigeration system (Refrigerator and/or Deep freezer, cold rooms, cooler Box): 1. Yes _____ 2. No. _____
If yes specify: _____

h. Functional temperature control system(fans, air cons, ventilator, wall thermometer)

1. Yes ____ 2. No. ____

If yes specify: _____

i. Functional Fire extinguisher: Yes ____ 2. No. ____

If yes, check expiry date: _____

Section III. IPLS Implementation

1. Are the following LMIS formats, Job Aids and SOPs are available at the facility?

a. Bin cards: 1. Yes _____ 2. No _____

b. Internal Facility Report & Requisition Form (IFRR): 1. Yes _____ 2. No _____

c. Facility Report & requisition Form: 1. Yes _____ 2. No _____

d. Standard Operation Procedure (SOP for IPLS: 1. Yes _____ 2. No _____

2. Do you use the following stock keeping logistics formats to manage health products in this facility?

Must be verified by checking sample completed bin cards

a. Bin cards: 1. Yes _____ No _____

b. Stock cards: 1. Yes _____ No _____

c. Others(Specify) _____

3. What LMIS forms do you use for reporting/ordering

Multiple response are possible

Must be verified with completed reports

a. IFRR: 1. Yes _____ No _____

b. RRF: 1. Yes _____ No _____

c. HPMRR: 1. Yes _____ No _____

d. Other. 1. Yes ____ (Specify) _____ 2. No _____

4. The Hospital compiles and sends RRF reports to higher level?

1. Yes _____ 2. No _____

If No, go to question no. 12.

5. If yes, to whom? **Multiple responses are possible. DO NOT READ THE RESPONSES**

- a. PFSA _____
- b. RHB _____
- c. Zone Health Office _____
- d. WoHO _____
- e. Resupply Health Center _____
- f. Don't Know _____
- g. Other(Specify) _____

6. If Yes, How often are these LMIS reports (RRF reports) sent to the higher level?

Multiple responses are possible. DO NOT READ THE RESPONSES

- a. Monthly. _____
- b. Bimonthly (every two months) _____
- c. Quarterly _____
- d. Semi-annually _____
- e. Annually _____
- f. Other _____

7. When was the last time the Hospital sent RRF report?

Must be verified with completed reports

- a) Never _____
- b) Within the last month _____
- c) months ago _____
- d) 3 months ago _____
- e) More than 3 months ago _____

8. Do all columns in RRF are completed for all medicines?

Must be verified with last completed reports

- a. Yes _____
- b. No _____
- c. Completed reports not available _____

9. What is the mechanism that your Hospital sends RRF report to the higher level?

- a. Hand carried by facility's staff _____

- b. Picked up by supervisor _____
- c. Picked up by other higher level staff _____
- d. Sent via drivers _____
- e. Sent through mail _____
- f. Other(specify) _____

10. Does the facility received feedback on RRF reports from the higher level?

Yes. _____ No. _____

11. Did your last feedback received include drug management/ logistics(e.g. Stock transfer facilitated, stock status of priority products(vital pharmaceuticals), number of stock outs, reporting rate, consumptions trend, errors of reporting, performance measurement compared to other facilities in their area)?

Yes. _____ No. _____ Don't Know _____

12. Does the ART dispensing units (DUs) use IFRR for regular reporting?

Must be verified with completed report

Yes _____ No _____ N/A _____

13. Does the Hospital has a resupply schedule for dispensing units?

Yes _____ No _____

If Yes, Check posted Schedule _____

If No, specify the reason _____

14. If yes, do the dispensing units follow their regular schedule?

Yes _____ No _____

If yes, Observe filled IFRR with their schedule _____

If no reason _____

15. How did you learn to complete the forms/records used at this facility?

Multiple responses are possible

a. Formal Trainings IPLS _____

b. Pre service Trainings _____

- c. Other formal trainings (Specify)_____
- d. On-the-job training (other staff from facility)_____
- e. On-the-job training (someone outside facility)_____
- f. Never been trained_____
- g. Other (specify) _____

16. How many emergency orders have you placed in the last three months?

If available ask for documents to verify using RRF

- a. None_____
- b. 1_____
- c. 2_____
- d. 3_____
- e. More than 3_____
- f. NA_____

17. What type of formats have you used to place emergency orders?

- a. Using RRF_____
- b. Using letter_____
- c Through phone_____
- d Orally_____
- e. Other(specify)_____

18. Who determines this facility resupply quantity?

Multiple responses are possible

- a. The facility itself_____
- b. Higher-level facility (Health Center, PFSA/Woreda/Zone/RHB)_____.
- c. Other (Specify)_____

19. What are the direct sources of supply for ARV drugs at this Hospital?

Multiple responses re possible

- a. PFSA _____
- b. RHB_____
- c. ZHD_____

- d. Woreda _____
- e. Health Center _____
- f. Other (specify) _____

20. If multiple responses. What is the usual source (most common source) ?

Select only one answer

- 1. PFSA _____
- 2. RHB _____
- 3. ZHD _____
- 4. Woreda HO _____
- 5. Health Center _____
- 6. Other (specify) _____

21. On average, for a normal order approximately how long it takes between sending an order and receiving products from main supply point?

- 1. Less than two weeks _____
- 2. Weeks to 1 month _____
- 3. Between 1 and 2 months _____
- 4. More than 2 months _____

22. Does the facility usually get the quantities of products it orders?

- 1. Yes _____
- 2. No _____
- 3. Don't know _____

If Yes or don't know, go to question 24

23. If no, why not? _____

- a. The resupply point does not have adequate supply _____
- b. The resupply point was stocked out _____
- c. Order amount changed at the resupply point _____
- d. Other (specify) _____

24. Does this facility normally collect or are the pharmaceuticals/commodities delivered?

1. Collect _____
2. Are delivered _____
3. Both (explain) _____

25. Does this Hospital engage in inter-facility transfer/Redistribution of excess/unwanted/near expiry drugs and supplies?

1. Yes _____
2. No _____
3. Don't know _____

26. Who is responsible for transporting products to your Hospital?

Multiple responses are possible

- a. PFSA _____
- b. RHB _____
- c. ZHD _____
- d. Woreda _____
- e. Hospital _____
- f. Health Center _____
- g. Health Posts _____
- h. Other (specify) _____

27. If you collect, what type of transportation is most often used?

1. Facility vehicle _____
2. Public transportation _____
3. Private vehicle _____
4. Motorcycle _____
5. Bicycle _____
6. On foot _____
7. Other (specify) _____

28. Distance from usual resupply point (approximately)

a. / _____/KM / _

b. ___/___/ time Hr min

29. Constraints of regular transportation of medicines and supplies

1. Long distance from the source of supply _____
2. Inadequate Facility Vehicles _____
3. High rental cost of private vehicle _____
4. Poor state of roads _____
5. Difficult of land topography (eg mountains, Iceland, wetlands) _____
6. Seasonality(eg: rains) _____
7. Insecurity(eg: bandits) _____
8. Other(specify) _____

30. When did you receive your most recent supervision visit?

Check visitors book, if necessary

1. Never received _____
2. Within the last month _____
3. 1 - 3 months ago _____
4. 3 - 6 months ago _____
5. More than 6 months ago _____
6. Other (specify) _____

If received continue with the following two questions.

31. Did your last supervision visit include drug management/logistics (e.g., bin cards checked, logistics reports checked, storage conditions checked, etc.)?

1. Yes _____
2. No _____
3. Don't know _____

32. The last supervision visit that included drug management was by:

Multiple responses are possible.

- a. PFSA_____
- b. RHB_____
- c. Zone Health Office_____
- d. Woreda_____
- e. Health Center_____
- f. Partner(specify)_____
- g. Other (specify)_____

Part II. Qualitative assessment for pharmacists or other professionals in charge of integrated pharmaceutical logistic system activities.

Person's interviewed _____ date of interview _____

Please note that information obtained using this questionnaire is confidential and used for the academic research purpose to identify gaps and propose future improvements.

Questions

1. What are the challenges of IPLS implementation at your facility?

2. Does management of your facility incorporate IPLS in to performance measurement of pharmacy staff and other professionals in charge of IPLS?

Yes _____ NO _____

3. Does the management of the facility follow up implementation & progress of IPLS at this facility?

Yes _____ NO _____

4. What is your role in IPLS at this facility? Or what activities do you perform in IPLS?

5. Which system do you prefer, the IPLS or the kit/vertical programme?

6. If IPLS, explain its pros & cons at your facility?

Pros(Advantages)

Cons(dis advantages)

7. .If kit/vertical programme, explain its pros & cons at your facility?

Pros(Advantages)

Cons(dis advantages)
