ADDIS ABABA UNIVERSITY

COLLEGE OF BUSSINESS AND ECONOMICS

SCHOOL OF COMMERCE

EVALUATION OF THE PERFORMANCE OF INVENTORY MANAGEMENT PRACTICE OF ANTIRETROVIRAL DRUGS IN ARMED FORCES REFERRAL AND COMPREHENSIVE HOSPITAL, ADDIS ABEBA, ETHIOPIA

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Thank you

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ABBREVIATION AND ACRONYMS

ARV-Antiretroviral Drugs

ART-Antiretroviral therapy

AFRCH -Army Force Referral and Comprehensive Hospital

EPSA-Ethiopian Pharmaceutical Funding and Supply agency

HC-health center

HF-health facility

IRRF-internal reporting and requisition form

IPLS-Integrated pharmaceutical logistics system

LMICs -Low andMiddle-Income Countries

MSH-Management Sciences for Health

RRF-reporting and requisition form

USAID-United States Agency for International Development

WHO-World Health Organization

ABSTRACT

The aim of this study was to evaluate the performance of inventory management practices of ARV medicines in Armed Forces Comprehensive and referral Hospital, in Addis Ababa Ethiopia. This study helps to optimize a best practice for inventory management of ARV drugs in AFCRH by examining current inventory management techniques in AFCRH, this study aids in the optimization of a best practice for ARV drug inventory management.. The mixed research method was employed in conjunction with a descriptive cross-sectional design. The census method was used to sample pharmacy personals involved. in inventory management of ARV medicines in Armed Forces referral and Comprehensive Hospital. The researcher used inventory management assessment tool and storage condition observation checklist to collect data for the research. The survey discovered that in AFRCH, the most common inventory management strategies were adopting a planned inventory control model, anticipating demand using prior consumption data, and keeping stock records for each product. Include critical logistical information in reports, such as safety stock and the storage of ARV medications in dedicated locations. The findings from the study also revealed that the visited hospital ARV products had stock out of in the past 100 days. In the last 100 days, they've run out of stock. The study discovered that the percentage of products available on the day of assessment in the surveyed hospital was 100%, that the percentage of stock keeping records that were accurate was 50%, that health facilities had on average 40% more records than physical counts, that health facilities had on average 20% less records than physical counts, and that the ratio of inventory variation to total stock was 17.2 percent. The examination also discovered that the health center used unacceptably poor storage practices (58.8 %). This analysis revealed poor inventory management in terms of the ARV store room's overall quality of record keeping, space allocation, and overall organization.. To maintain inventory records and management information systems up to date, the study suggested that health facilities establish a process for making timely entries and noting issues on logistical tools. To eliminate discrepancies and maintain proper supply levels, it is recommended that stock status be monitored on a regular basis. This will need to be monitored on a regular basis by the district pharmacist. The government should work to make computer inventory control a reality.

Keywords: *Inventory Management Practice, stock availability, stock record*

CHAPTER ONE

INTRODUCTION

1.1 . Background of the study

Access to life-saving treatments, such as antiretroviral drugs, is allowing a growing number of individuals to live with HIV. In 2020 worldwide ,37.7 million people were infected with HIV. .Approximately 680 000 [480 000–1.0 million] people died from AIDS-related illnesses in 2020. 28.2 million people were accessing antiretroviral therapy as of 30 June 2021(USAID.2021) . Sub-Saharan Africa is the most badly afflicted region on the planet. It accounts for almost two-thirds of all people living with HIV/AIDS worldwide. 81 percent of HIV-positive people in the region live in Ethiopia, Kenya, Malawi, Mozambique, Nigeria, South Africa, Uganda, United Republic of Tanzania, Zambia, and Zimbabwe.. The coverage of antiretroviral therapy was 60 %. (USAID ,2017).

The availability of drugs and medical supplies is critical to the success of any healthcare programme. Any healthcare program's success depends on it. Unreliable supply systems, on the other hand, have hampered the distribution of these life-saving drugs in many developing nations, with antiretroviral medicines used to treat HIV bearing the brunt of the consequences (USAID, 2016). Every sustainable pharmaceutical supply system is built on the foundation of inventory management. It describes the processes of ordering, receiving, storing, issuing, and replacing a limited number of commodities. The basic purpose of an optimal inventory management system is to provide a continuous supply of commodities to facilities and, eventually, clients while minimizing inventory holding costs. (WHO, 2004). Because of their unique qualities, such as their valuable efficacy in prolonging the survival of HIV/AIDS patients and the restricted possibilities of therapeutic substitution, special attention is required when it comes to the administration of ARV medicines(Chandani*et al.*, 2009; Deliver, 2008) .

Effective drug supply management and inventory management Avoid stock outs, loss due to premature expiration, and theft by ensuring that the desired pharmaceutical items are always available in sufficient quantities (RPM plus 2006). The supply chain performance is also determined from stock out rate But in many low and middle income countries, The capacity of the pharmaceutical supply management (PSM) system in developing nations has long been a challenge. The management of the ARV supply chain has gotten more complicated as the number of patients on ART, the number of sites administering ART, and the variety of ARVs available has grown(Erik. et al 2013)

Interruption of stock outs and supplies ARV medications put individual patients at risk of disease progression and mortality, contribute to drug resistance, stymie progress toward universal access, and tarnish ART's credibility in the eyes of patients, the community, and healthcare practitioners, as well as putting the public's health at risk. (USAID, 2016). One of the most common causes of drug waste is that it may have expired without anyone realizing the expiration date was approaching. Failure to recognize an approaching expiration date could result in the loss of a considerable amount of resources, particularly in emergency situations.. This type of loss is not acceptable to pharmaceuticals such as ARV drugs, which are very expensive (RPM plus 2006). Besides, due to poor handling of the available drugs and other pharmaceutical products by the patients and professionals, there is also a great loss of resources. This study was conducted to evaluate the inventory management practices of ARV drugs in AFRCH, Addis Ababa and to identify any potential weaknesses in the inventory management of these items.

1.2 Statement of the problem

Inventory management is an important part of assuring a steady supply of ARVs. It's critical to keep track of medicine levels in the store in order to keep ARVs in stock and minimize stock outs, overstocking, and expirations. These are issues that plague public-sector health-care facilities, and they're largely due to ineffective inventory management systems (Kassie.etal, 2014).

Despite the fact that ART has been available in resource-constrained nations for over a decade, most health information systems are still behind the times, making it impossible to create reliable forecasts(Deliver,2008). Majority of studiesconducted in developing countries revealed interruption of supplies and ARVs due to stock outsresulted from poor inventory management. According to some studies, one in five healthfacilities of developing countries reported a stock-out of antiretroviral putting the lives ofpatients in danger. The duration and frequency of stock outs vary widely across health facility. Astudy conducted in Tanzania showed that the stock out of ARVs and HIV test kits have occurredtwice and lasted 1week to 3months (Nyogea et al ,2015). According to a survey conducted in Addis Ababa, 84.2 percent of health centers (HCs) have one or more emergency orders, while all hospitals have had emergency orders for ARV medications more than three times in the previous six months, indicating poor supply chain management effectiveness(Chandani et al.2009). According to a study conducted in East Shewa Zone, the average updating practice and inventory accuracy are 59.5 percent and 28.5 percent, respectively, in stock control and record-keeping (Gemechu,2018). Only 61.5 percent of health facilities (HFs) in Addis Ababa update their bin cards on a regular basis, according to a comparable finding (WHO, 2016). According to the Ethiopian National Survey, around 60% of facilities are filled with the quantities required, with the correct product accounting for 37% of both hospitals and HCs (RMP plus, 2006). According to a research done in Addis Ababa, 60.5 percent of HFs said they normally run out of at least one ART monitoring product before restocking, and 37.2 percent said they were out of stock for at least one laboratory commodity at the time of their visit.(Erik et al, 2013).

The interruption of supplies of ARV medications puts an individual patient at risk of developing drug resistance, disease progression, and death, and also tarnishes the ART program's credibility in the eyes of the public(Deliver,2008).

For military health facility of Ethiopia, in the case of Armed forces referral and comprehensive hospital (AFRCH), Stock outs, emergency orders, storage conditions, stock management, order fill rate, and wastage rates are among the issues of HIV/AIDS commodities supply chain management that are not well understood. As a result, the goal of this study was to assess the effectiveness of HIV/AIDS inventory management procedures.

1.3. Research questions

Inventory management is considered to be the very important part of every viable pharmaceutical supply system. This study done on Inventory management of ARV drugs in AFRCH try to answer the following questions

1. What are the current inventory management practices for handling ARV drugs in the in AFRCH, Ethiopia?

2. What is performance of inventory management practice of ARV drugs in AFRCH?

3. What challenges affect inventory management of ARV medicines in AFRCH, Ethiopia?

1.4 Objectives

1.4.1General objective

To evaluate the performance of inventory management practices of ARV medicines in Armed Forces Referral and Comprehensive and Hospital, Addis Ababa, Ethiopia

1.4.2 Specific objectives

1. To identify the inventory management practices used for ARV medicines in Armed Forces referral and Comprehensive Hospital, Ethiopia
2. To evaluate the inventory management performance of ART medicines in Armed Forces referral and Comprehensive Hospital, Ethiopia
3. To identify the challenges affecting inventory management of ARV medicines Armed Forces referral and l Comprehensive Hospital, Ethiopia

1.5 Significance of the study

Inventory management is the safe process of storing items properly, distributing them, and keeping accurate records. It is the heart of the medication delivery system, and without it, the entire health-care system would collapse. The study's major purpose of this study is to optimize a best practice for inventory management of ARV drugs in AFCRH by assessing the current practices of inventory management, identifying the gap and giving suggestions for how things could be done better or differently.

The study provides insight into the current situation in AFCRH regarding ARV inventory management issues, as well as assisting management in making possible interventions in ensuring proper pharmaceutical inventory management, which results in uninterrupted ARV supply and avoids wastage, resulting in effective resource utilization and improved health services to citizens.

The study provides information to help decision makers make informed judgments and develop plans to address all aspects of existing ARV inventory management performance. As a result, the research would be useful in terms of providing information on the facility's ARV inventory management performance, which would reveal what is happening in the ARV inventory management and what measures are required. It aids management in guaranteeing proper inventory management at all times, as well as decision-making in developing strategies to address the chronic problem of inventory management in healthcare companies. The research findings would add insight to the body of knowledge in the area of inventory management for ARV drugs which would help researchers & scholars and be a basis for reference.

1.6. Limitations

Because the majority of defense facilities selling ARV drugs are at lower levels, the findings may not provide a comprehensive picture of inventory management across the whole defense system. Because this study focused just on ARV drugs, the findings may not be applicable to other inventory techniques.

1.7. Definition of Key Terms

Antiretroviral drugs; refers to drugs used in hospitals and health centers for viral load suppression in an infected person's blood.

Essential drugs: are those that the country must have on hand at all times in sufficient quantities to treat the most frequent health conditions that impact the majority of the population. WHO,2007)

. **Supply chain** encompasses all activities associated with the flow and transformation of goods (products and services) from initial design stage through the early raw material stage, and on to the end user, (Hines, 2004).

Supply chain management The planning and management of all activities involved in sourcing, procurement, conversion, and logistics management is referred to as supply chain management (Council of Supply Chain Management Professionals).

Public health facilities: Health institutions owned by the Ethiopian government and overseen by the FMOH or regional health bureaus

Pharmaceuticals: means any substance or mixture of substances used in the diagnosis, treatment, mitigation or prevention of a disease, and include medical instruments and medical supplies (Proclamation No 553/2007).

Inventory: is the stock of any item or resource used in an organization(UNAIDS, 2016)..

Inventory Management: deal with ordering supplies, receiving and storing stocks and recording and accounting for stocks(UNAIDS, 2016).

1.8. Organization of the paper

The structure of the paper The performance of ARV inventory management at AFRCH in Addis Ababa, Ethiopia, is being evaluated in this study. The following chapters are included in the research.

1st Chapter ;-The backdrop of the study, the statement of the problem, the research questions, the aims of the investigation, the significance of the study, the limitations of the study, and the definition of the terms were all covered in this chapter. The chapter concludes by outlining the study's structure.

2nd Chapter: This chapter offers a review of related literature and research on ARV inventory management performance. It includes a comprehensive overview of the theoretical literature on inventory management as well as an empirical assessment of inventory management performance in public health care.

Chapter 3: In this chapter, the researcher describes the research field, the research design, and the research methodology used in this study. The demographic and sample approaches are also discussed in this chapter. Data sources and types, data gathering processes, data processing, and data analysis are all things to consider. The chapter came to a close with highlighting the study's ethical considerations .The study's findings are analyzed and discussed in this chapter.

In the fourth chapter The summary of the study, conclusions made from the findings, and recommendations are discussed in Chapter 5.

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CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Inventory management is the safe process of storing items properly, distributing them, and keeping accurate records. It is the heart of the medication delivery system, and without it, the entire health-care system would collapse. Any healthcare program's success hinges on the availability of pharmaceuticals and medical supplies. The final link between patients and health services is drugs and medical supplies. They play an important role in prevention, treatment, and care programs, and a variety of medical commodities are necessary to keep these services running. The effectiveness of these nationwide programs will be determined by a stable and constant supply of essential commodities to health facilities at all levels of the health system. (Raja &Mohammad, 2005).

2.1 Theoretical framework of Inventory Management

Ordering goods, receiving and storing stocks, and registering and accounting for them all require an inventory management system and established processes in every facility. (UNAIDS, 2016). The cost-effectiveness of antiretroviral (ARV) medications, as well as their life-saving potential, leads to mismanagement and pilferage if appropriate inventory control procedures are not established. The maximum-minimum inventory control model is the popular one for managing health commodities .The aim of inventory management at all levels is to ensuring minimum stock levels, as well as secures storage and distribution throughout the supply chain. The most effective inventory control systems are maximum–minimum inventory systems, or systems that ensure that usable stock levels stay within a set range. Keeping huge amounts of merchandise in inventory costs more money, takes up more storage space, and exposes you to the danger of theft, damage, and expiration(WHO, 2016).

For this study stock records, stock out rates ,product availability , inventory variation , and storage conditions are considered as performance indicators of inventory management practices

In an inventory management system, stock records are the most important records. They come in two varieties: manual and computerized .Internal Facility Report and Resupply Form (IFRR) and Report and Requisition Form (RRF), Bin Card (BC), and Stock Record Card are

all common inventory tracking and documentation types (SRC). Inventory or stock records are the collective term for these records. In that they contain all transactions of individual units, stock records are sources of basic and essential information for inventory management. They track inventory receipts, issues, losses, orders, and balances, as well as suppliers, customers, and prices. The data they hold is utilized to assemble and generate performance reports, as well as other reordering formulae. The information derived from them is critical for distribution and quantification planning. As a result, they

In an inventory management system, stock records are the most important records.. They can be either manual or computerized. Common inventory recording and documentation formats are Internal Facility Report and Resupply Form (IFRR) and Report and Requisition Form (RRF), Bin Card (BC), Stock Record Card (SRC). Inventory or stock records are the collective term for these records. Stock records are sources of basic and primary information for inventory management in that they contain all transactions of individual units. They provide information on inventory receipts, issues, losses, orders and balances, suppliers, customers and prices. The information they contain is used to compile and generate performance reports and various reordering formulas respectively. The information inferred from them is essential for planning distribution and quantification. Hence, they are mandatory andat the center of inventory management system(ErikM,2013).

The availability or absence of products during a certain time period is measured by the stock out rate. It is a metric that assesses a program's or health facility's ability to meet client demand. Physical inventories taken during site visits, supervision records, and LMIS records are all sources of data that can be used to establish stock out rate. It can be for a single commodity across a number of facilities or for commodities that are projected to be offered in a specific facility type. (MSH, 2010)

Inventory control is also a crucial component of a wise shop management strategy. Without proper handling and storage, inventory management is impossible. Sunlight, heat, and water should be avoided, and medications should be stored and preserved as long as their nature permits (PFSA, 2013). When keeping products, the first-to-expire, first-out (FEFO) principle should always be followed. All products should be stored in a well-organized storage at the right temperature and humidity (no more than 60 percent moisture content). (Nahamya ,2014).The storage condition for pharmaceutical products should comply with the recommended good storage practices so as to preserve the quality of the products stored.

Well-located, well-built, well-organized, and secure storage facilities are essential components of pharmaceutical supply system Good inventory control necessitates careful consideration of the storage space's dimensions and design, the appropriate conditions for storing various types of supplies, the importance of stock rotation and systematic stock arrangement, as well as attention to cleanliness, fire prevention measures, and store security. (Embrey, 2013)

Patient safety will not be ensured without effective inventory management in any case. It's a device that allows you to minimize inventory variation However, in Ethiopia, inconsistencies between actual and recorded counts are prevalent, accounting for roughly 60% (Erik et al, 2013), necessitating the use of clean/accurate inventory records and an automated method. Expiry and stock outs of important medicines are significant; a poor inventory control system is the primary cause of wastage and shortages of necessary medicines owing to stock-outs. (PFSA,2013).

It health commodities, but especially HIV/AIDS-related commodities, because patients' access must be assured at all times.is critical to have an accurate quantification based on credible data and is essential for all health commodities ,but especially HIV/AIDS-related commodities, because patients' access must be assured at all times.. The management of the ARV supply chain has gotten more complicated as the number of patients on ART, the number of sites administering ART, and the variety of ARVs available has grown(Erik et al, 2017). A pilot study done in Ethiopia, however, showed that out of the 48 hospitals and health centers, 10(21 %) of the institutions did not have HIV medicines. This shortage of vital drugs and supplies in health institutions may jeopardize proper clinical management, leading to an increase in mortality and the development of resistance infections, posing a public health risk. (Roselida, 2017).

The supply chain management of important health commodities, such as high-value pharmaceuticals like antiretroviral (ARV) medicines, entails a set of procedures to ensure that items flow continuously from the manufacturer to customers. The nature of ART, as well as the unique properties of ARV drugs and how they are used, present unique management issues. for managing the supply chain for ARV medicines. Effective pharmaceutical supply management and inventory inventory management Avoid stock outs, loss due to premature expiration, and theft by ensuring that the desired pharmaceutical items are always available in sufficient quantities however, the capacity of the pharmaceutical supply management system

in many low and medium income countries (LMICs) has always been problematic and weak. (Roselida, 2017).

It has been almost a decade since ART and VCT services started in Ethiopia. VCT and ART services were first initiated at Zewditu memorial hospital in 2002 and 2003 respectively. ART service was then started at St. Peter (2004) and ALERT (2005) hospitals. Since then all governmental hospitals and HCs, some private hospitals and some NGO owned facilities started to provide VCT and ART and PMTCT service jointly or separately. The launching of the free ARV treatment campaign was marked by a significant infusion of commodities, which necessitated a lot of logistical support. (Alemayehu, 2009). The unmet need for ART in Ethiopia is due to the health system, not a lack of medications. (Brhanemeskel etal,2016).

Inaccurate stock records, insufficient and unsystematic monitoring of medical stock, and uncertain procedures in terms of frequency and quantity all point to poor inventory management. These occurrences can be linked back to a lack of inventory management knowledge and actual management. (MSH., 2012) The main areas of interest of this research when evaluating inventory management practices in an operating unit are: inventory control model, how order quantities are determined availability, accuracy and Stock keeping records and safety stock policy are up to date..

.2.2 Empirical evidence

The amount of useful stock on hand within the country's designated maximum-minimum range, as assessed by stock out rate, can be used to assess inventory management practices in health facilities. The stock out of ARV drugs is critical as it increases the risk of treatment interruption, antiretroviral resistance, treatment failure, morbidity and mortality (Johnson, 2019).. An assessment of the magnitude of stock out of HIV medicines and diagnostic tests in all zonal warehouses and public facilities in Kinshasa, Democratic republic of Congo showed stock outs of the regimen in 56% of the facilities (Roselida, 2017).

The assessment of medicine stock out and inventory management problems in Dar es Salaam region hospitals, Tanzania revealed about 20% of tracer medicines were stock out and imbalances of records on stock record card also observed (Awle 2016).In 2018,astudy done in Kenya hospital found that the prevailing In Nyamira County public hospitals, the following are the most popular inventory management strategies: usage of a planned inventory control

model (80.95 percent),, and keeping ARV medicines in dedicated stores (75%) (Johnson, 2019).

Health facilities of undeveloped countries may not comply with good storage practices (proper storage guidelines) because of their limited storage space, as well as poor capacity to manage the stores. A study result of the in-depth assessment of the medicines supply carried out in sub-Saharan African countries over four years (2007–2010) showed that only 45% of health facilities had good storage conditions(Aturaka et al ,2017). A study conducted in Ethiopia, east shewa zone, Oromia regional state also revealed that Only 25% of the evaluated health facilities followed acceptable storage practices (Gurmu et al,2017).

A major challenge in pharmaceuticals inventory management is to maintain usable stocks and avoid wastages. Studies conducted in Zambian and Nigerian health facilities at different times identified that limited storage capacity at health facilities compromised quality of inventory management (Global Fund., 2017). Limited storage capacity, lack of reliable data, lack of adequate human resource and poor performance of health care workers were the challenges of inventory management of ARV drugs (Gurmu,2017).

In Ethiopia a study conducted at Zewditu memorial hospital on assessment of inventory management practice and challenges showed that level of personnel, weak management system, lack of proper training of inventory management, insufficient funds for procurement, lack of technology in inventory management are the main challenges faced while managing pharmaceutical products which leads to the consequence of high level of stock out which might have leaded to services interruptions at the Hospital (Azeb, 2017). Studies also revealed that lack of storage facilities and poor storage condition also another main challenge in the health facilities (Adzimah et al 2014)A study was conducted on the assessment of HIV/AIDS related commodities in Addis Ababa indicated that 75% of the assessed facilities reported on the day of the visit, one or more ARV medications were out of stock((Berhanemeskel et al ,2016). Another study done in Oromia national regional state of Ethiopia showed that availability of first line ARV drugs were 100% and 95% at HCs and Hospitals respectively. Inventory control tools, as well as SOPs and guidelines, were hardly ever implemented. (Alemayehu, 2009).

Storage capacity was also reported to be inadequate at all levels in the logistics system. A study conducted in Ethiopia, east shewa zone, Oromia regional state also revealed that only 25% of the assessed health facilities were adhered to good storage practice (Gurmu ,2017).

Up to date Inventory management practices are shown to directly influence availability of ARV medicines. To improve, the researcher suggests hiring a health supply chain expert.. As a result, this research aids in evaluating current inventory management techniques, identifying the gap and making recommendations on how to maximize a best practice for inventory management of ARV drugs in AFCRH.

2.3 Conceptual framework

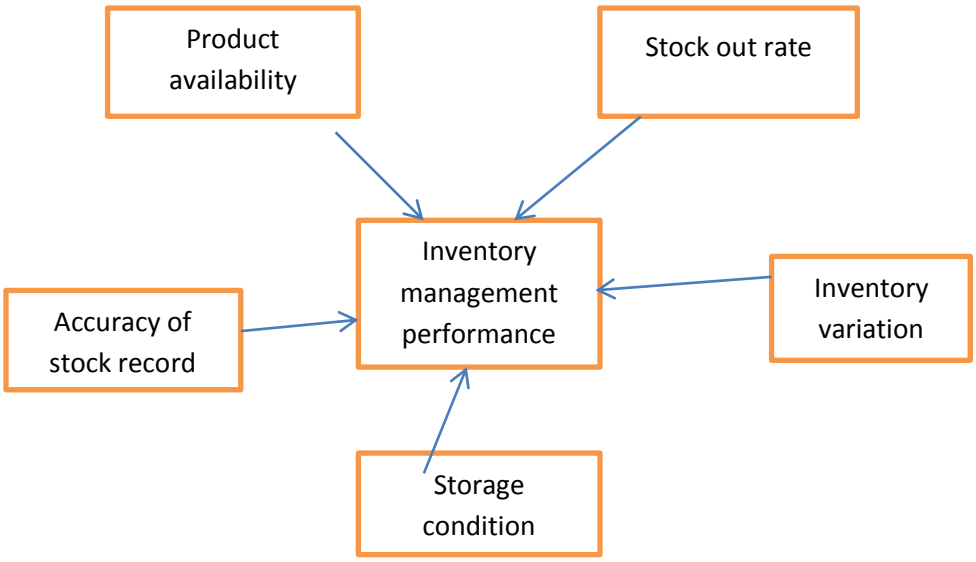


Figure 2.1-A conceptual framework

Source: Adopted from (Rogers, 2011)

CHAPTER THREE

3. METHODOLOGY

3.1 Study area

The study was conducted at Army force referral and comprehensive hospital (AFRCH), which is the only referral and comprehensive military hospital of the country. AFRCH is located in Addis Ababa, Ethiopia. It is organized under Health Main Directorate, Ministry of Defense. It provides medical services to members of the Ethiopian defense forces, their family and civil workers at the Ministry of Defense. AFRCH accepts referral cases from all the command referral hospitals including the Air force hospital. This hospital offers diagnosis and treatment for approximately 85,872 outpatients, 3723 inpatients and 789 deliveries per year. It is one of the biggest hospitals in the city where medical, pharmaceutical and other health science students get their attachment for clinical practice. The hospital has 541beds and offers 24 hours service.

3.2 Study design

The study was descriptive cross-sectional in nature because it gathered data on inventory management procedures at a single location. in AFRCH . The researcher examined a retrospective data record at AFRCH at one point in time to check for product availability, stock out rate, stock record accuracy, stock level (stock according to plan), and store management.. The researcher applied mixed quantitative and qualitative methods of data collection and for the quantitative method, The data was gathered utilizing a checklist for observing facility storage conditions and an Inventory Management Assessment Tool. The Storage observation checklist was used to collect information on the general state of ARV storage. The Inventory Management Assessment Tool is used to check stock records and historical stock outs as well as review inventory records. On the day of the visit, an observational method was used to check for stock availability, stock discrepancies (inventory accuracy), inventory level, and stock out on the physical stock of the inventory and the inventory record. Structured questioners for Inventory management practice and challenges in inventory management practice were filled by the pharmacistshospital administrator .For the qualitative method four pharmacists who were involved in different activities of ARV store management were interviewed.

The study's target group was health care personnel involved in medicine administration, specifically pharmacists in charge (one head of pharmacy), 23 clinical pharmacists, 6 hospital administrates who have related workwith health supply chain management in the hospital.

3.4 Inclusion/Exclusion criteria

3.4.1 Inclusion criteria

The participants in this study were AFRCH health personnel who were involved in the management of ARV medicines and freely gave informed consent and completed a consent declaration form.

3.4.2 Exclusion criteria

This study excluded AFRCH health workers who were not involved in the management of vital drugs.

3.5 Samples

For this investigation, the census method of sampling was used. This is owing to the study's limited sample size of AFRCH officers working in medicine management. The full research population (30) was utilized as the sample in this manner. As a result, all of the officers who participate in health supply chain management as the study population was used as the sample Because there is no element of chance in sampling, it delivers the maximum level of accuracy. (Kothari ,2004)

3.6 Data Sources and Types

3.6.1 Data Source

In this study, records were reviewed, primarily bin cards of ARV pharmaceuticals in the health facility store, as well as observations of the health facility's storage conditions and ARV drug stock availability.

The following data collection tools were used in this study:

1. Tool for evaluating inventory management Sciences for Health created the Inventory Management Assessment Tool (IMAT) that was used in this study. It is used to collect quantitative data on pharmaceutical inventory management that includes both manual and electronic logistical information. (MSH , 1995) (Appendix 2). Based on four indications, the tool is used to monitor and measure inventory management performance, the effectiveness of record-keeping, and stock management in a warehouse. Two of the indicators assess the

efficiency of record-keeping, while the other two assess the efficiency of stock-level monitoring systems.

2. Storage condition observation checklist

The checklist was used to gather information about the general state of pharmaceutical storage in the health facility. It is based on GMP (Good Pharmacy Practice) guidelines (SAPC, 2010). Seventeen components of the storage state are checked, including the storage room's internal security, the protection of medicines, the organization of medicines, and the storage itself. Appendix 3 contains the details of the checklist.

.Data collection procedure

The researcher followed the methods and processes outlined below when collecting data using data collection instruments. The lead investigator gathered all of the data. By evaluating the store ledger and/or bin card and comparing it to the actual counts on the day of the visit, data on stock record accuracy was gathered. Reviewing the available stock level of products in the shop and comparing it to the difference on the recorded stock level of the product yielded data on the ratio of inventory variation to total stock.

Product availability information was gathered via a physical count of the products in the store on the day of the visit. The number of days each product was out of stock during the assessment period was counted to collect data on days out of stock (the last 100 calendar days). The researcher looked into the transactions on the stock card during the previous 100 days for each product. The number of days the product had a 0 balance was added up for each stock-out during the 100-day timeframe.. Structured questioners were filled by the pharmacists who have ART pharmacy experience

Data on storage condition was gathered by examining the overall storage condition in the facility's store area and noting the specific storage criterion on the spreadsheet.. Face to face interview was made for hospital administrators and store keepers.

Table 3.1: list of indicators and data source

Sn.	Indicators	Data Source
1	The percentage of products that are in stock.	inventory count
2	Product out-of-stock rate as a proportion of total time	Records and respondent
3	Percentage of stock records that are accurate	The physical balance of bin cards and the balance of bin cards are compared.
4	Inventory variation to total stock ratio	The physical balance of bin cards and the balance of bin cards are compared.
5	the storage conditions	Visual observation

3.5. Validity of Instruments

To ensure data validity, the data collection tools were subjected to the following validity test. The data collection tools was pretested prior to commencing the study for its content, and any ambiguity of the tools were cleared. Days when the facility was particularly busy were also omitted from data collecting days to avoid errors caused by unrecorded data as a result of the heavy demand.

3.6. Reliability

To ensure reliability or generalizability of the study, clearly defined standards of measurements inventory management practice tool was used and standardized and a detailed observation checklist was used for store assessment . Use of adapted data collection tool did also improve reliability.

3.7 Data analysis

The term "data analysis" refers to the process of extracting meaning from the information gathered during the research. For sorting the data and facilitating future processing and analysis, a suitable system is used. The data was double-checked in the field to confirm that all of the data had been obtained and recorded correctly. The information was double-checked for completeness and internal correctness before and during data processing. The data was cleaned, and it was put into a format that could be manipulated and analyzed.

After each field visit, the data was double-checked for accuracy. The information gathered through the use of forms and checklists was entered into an excel spreadsheet. An excel sheet was used to complete the essential analysis and calculations. The data was evaluated through the creation and interpretation of frequencies, tables, graphs, and other visual aids.. The Management Sciences for Health established formulas that are used to calculate inventory management indicators (MSH, 1995). The percentage of time that pharmaceutical (tracer drugs) were out of stock was calculated using the average percentage of time that products were out of stock over the previous 100 days, and the percentage of availability of products in stock was calculated using the stock available on the assessment day.

The formulas created by the Management Sciences for Health are used to calculate indicators for inventory management (MSH , 1995). Pharmaceutical (tracer medication) stock outs are calculated using the average percentage of time that products were out of stock over the previous 100 days, and percentage of product availability is calculated using the stock available on the day of the assessment.

1st Indicator; Product availability as a percentage of total inventory:

It assesses the system's ability to keep a variety of products in stock (at the time of the assessment). first, calculate the percentage of tracer products available on the day of the assessment for each facility using the formula:

$$\text{Percentage of products in stock} = \frac{\text{Total products in stock x100}}{\text{Total number of products in the study}}$$

2nd Indicator: Average percentage of time that products are out of stock:

It measures the system's ability to maintain a consistent supply of products over time by reducing the length of time that stock outs occur. It is calculated using the average percentage of time products were out of stock during the previous 100 days. The first step is to calculate the average percentage of time the tracer products are out of stock at each plant, using the calculations below:

$$\textbf{Average percentage of time that products are out of stock} = \frac{\textbf{Total number of days stock out within the last 100 days}}{\textbf{Total number of products in the studyx 100 days}}$$

Indicator 3: Accuracy of stock records as a percentage of total:

It determines the accuracy of the recordkeeping system by determining the proportion of accurate records. The first step is to establish a facility-specific proportion of correct tracer medication stock records that correlate to physical counts using the calculations below**:**

$$\textbf{Percentage of stock records that is accurate} = \frac{\textbf{Count of records that are accurate}}{\textbf{Total number of products in the study}}$$

Indicator 4: Inventory variation to total stock ratio:

It indicates the severity of inaccuracies in recordkeeping. First, the following formula is used to calculate the facility-specific inventory fluctuation to total stock ratio:

$$\textbf{Ratio of inventory variation to total stock} = \frac{\textbf{Total sum of Absolute value of the difference between recorded and physical values}}{\textbf{Total sum of physical quantity [based on actual count]}}$$

Indicator 5: General pharmaceutical storage condition: \ facilities are categorized based on their total storage condition checklist scores. Excellent was assigned to those who scored 90 percent to 100 percent, acceptable to those who scored 70 percent to 89 percent, and unacceptable to those who scored less than 70 percent

.3.8. Ethical Considerations`

This thesis work was approved by Ethical Review Board of Addis Ababa University, school of commerce prior to the start of data collection. Permission was taken from Armed Force Referral and Comprehensive Hospital. Permission from the respective institutions was taken to approach the study participants. All the information collected from the study subjects was handled confidentially through omitting their personal identification, conducting the interview in private place and the data will be used for the research purpose only.

Although this research project may not have a direct benefit to the study participants, the study findings will benefit the disciplines of health supply chain by providing multi-dimension critiques of theInventory Management Practices in ART medicine. The study will benefit the community by assessing the magnitude and nature of inappropriate Inventory Management Practices and by setting solutions to tackle further development of better Inventory Management Practices.

3.9 Data quality assurance

To assure the quality of the data, the questionnaire was pre-tested. Modifications were incorporated into the questionnaire as per needs.. All completed questionnaires was examined for completeness and consistency during data management, storage and analysis. Qualitative data were collected by PI to increase the consistency of the information.

CHAPTER FOUR

4. RESULTS AND DISCUSSION

4.1 Introduction

This chapter covers the results and discussions of the analyzed data that were obtained from the primary data which was collected using a semi-structured questionnaire, interview and physical observation. The data was analyzed in accordance with the study's objectives, which were to identify inventory control techniques used in managing ARV-medicines, to asses ARV store management practice, to determine use of technology in inventory management, to determine challenges confronting management ARV items and to identify problems related to poor inventory management of ARV items at health facility. The results are categorized and presented according to various inventory management issues dealt with-in this study.

4.2 Inventory Management Practices

Management Techniques Inventory control models, order decision, stock keeping, reporting, safety stock policy, and storage are all examples of inventory management methods.

4.2.1. Inventory control models

Models for inventory management Inventory control models are mathematical models that assist a company or institution that deals with commodities in determining the best level of stock to keep on hand. The goal of an inventory model is to tell the supply chain manager when and how much to demand or issue in order to keep a proper stock level and avoid stock outs or overstocking. Model for inventory management

4.2.2 Determination of order quantities

Quantity of orders to be placed several considerations must be considered when establishing order quantity. Forecasting future demands is the least predictable of the variables used in the calculation for computing reorder quantity. The projective method, which is based on previous consumption, the causal method, which is based on external factors such as epidemics and market structure, the judgmental method, which is based on estimates from experienced staff, and the morbidity method, which is based on disease incidence and standard treatment guidelines, are all methods used to forecast demand.. The hospital wasusing the projective method.

4.2.3 Stock keeping records and reporting practices

Record-keeping and reporting procedures Stock records were kept for each ARV drug, regular stock counts were conducted using the whole inventory counting method, and stock records were used as the source data for requisition and reporting.. Half of (50%,) had accurate and up-to-date inventory data The most important logistical data that was collected consumption, stock on hand, losses, and modifications was reported(100%).Reports were compiled at the end of two months each review period.

4.2.4 Safety stock policy and storage

When asked about their safety stock policy, pharmacists said they kept a buffer stock on hand. A rough estimate was used in acquiring the safety stock. The staffs confirmed that their facilities have designated storage areas for ARV medications.

4.3 ARV inventory management performance

Stock level monitoring was evaluated in this study to identify the capacity of the health-care system to keep a variety of products in stock. The effectiveness of stock level monitoring was determined by the length of stock outs during the previous 100 days and the availability of pharmaceuticals on the day of the assessment. The survey gathered information on stock from the stock record ledger and physical count, as well as stock outs on the day of the visit and in the previous 100 days.

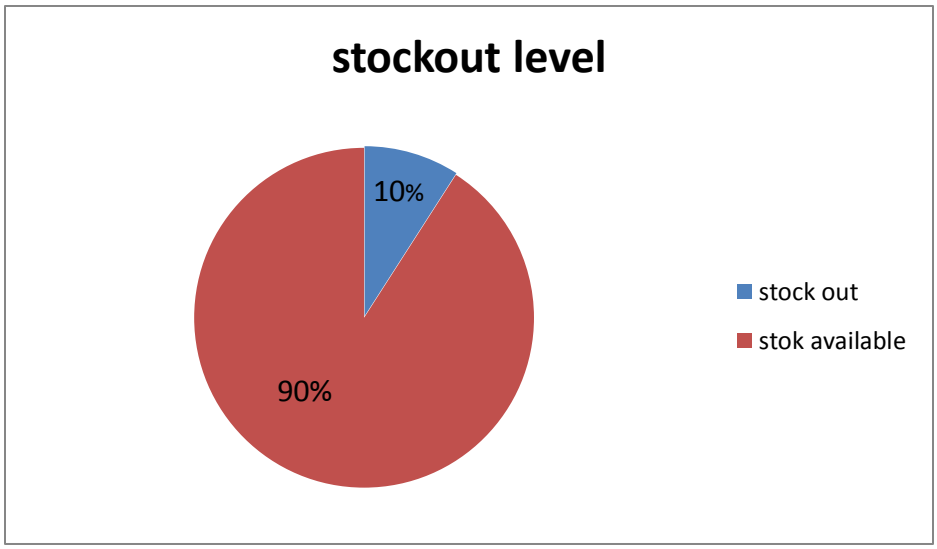
As a result, stock out is calculated as the average percentage of time that products are out of stock, indicating the system's ability to maintain a consistent supply of products over time by minimizing stock out duration. Product availability is measured as a percentage of products in stock, which indicates how well the system keeps a variety of products in stock.

Percentage of tracer products available on the day of assessment:

Percentage of tracer products available on the day of assessment: Product availability was expressed as the percentage of ARV goods available in a given facility on the day of assessment. According to the findings of the study, the health facility has all the ARV drugs (100%) stock on the day of assessment.

The average percentage of time that ARV drugs that are out of stock.

Stock out within the last 100 days was expressed as the average percentage of time that products were out of stock in a particular facility. Within the last 100 days, a number of medications had run out of supply. According to the survey, 10% of the time was spent out of stock.in AFCRH.



4.1. Average percentage of time that tracer products were out of stock

Accuracy of logistics data for inventory management

The study assessed the quality of record keeping system in hospital . In this study, Record-keeping was assessed to determine the accuracy of record-keeping of the facility . Two indicators measure the accuracy of record-keeping.

Percentage of stock records that is accurate:

The accuracy with which records are kept Accuracy of stock records as a percentage of total: After adjusting for recent issuance and receipts (within 7 days), a stock record was judged accurate if it balanced with the physical count of the stock on the day of the visit. The average percentage of stock keeping records that were correct was discovered in the study was 50%.

Percentage of stock records that is greater than physical count.

According to the findings, health facilities possessed an average of 40% more records than ph ysical counts. This means that the final balance on 40% of the reviewed records was higher th an what was actually on the shelves in these facilities on the day of the assessment.

Percentage of stock keeping records that was less than physical count of the stock.

According to the findings, health facilities had an average of 13% less records than physical counts. This means that the final balance on 13% of the records analyzed was lower than what was really available on the shelves in these facilities on the day of the assessment.

Ratio of inventory variation to total stock:

shows the degree of record-keeping errors: the inventory variation to total stock ratio or the inventory variation to total stock ratio? According to the statistics, the average inventory variation to total stock ratio is 17.2 %.

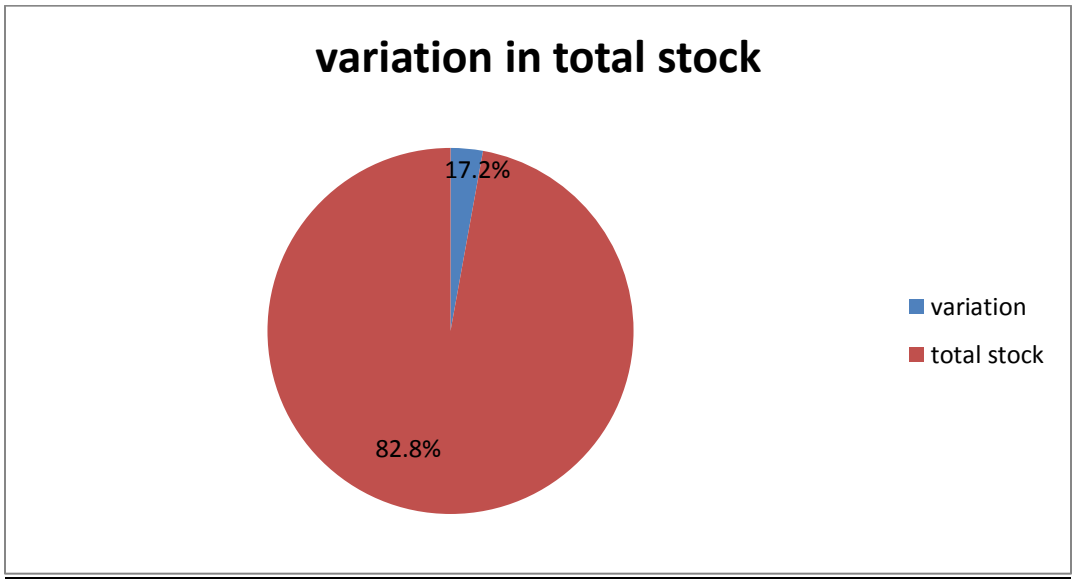


Figure 4.2 The ratio of inventory variationto total stock.

ARV storage conditions in the surveyed Hospital

The study looked at the storage conditions in the facility's storage area, as well as the amount of adherence to proper storage requirements.. The hospital storage condition was assessed based on seventeen (17) principles.

For the health facility, the least satisfied conditions were; Inventory is protected from harmful temperatures according to product requirements, and the storeroom is kept in good shape (clean, garbage eliminated, solid shelving, and orderly boxes),, inventory is appropriately labeled., Inventory is organized in a way that allows for counting and general administration, and it is organized in a way that allows for first-to-expire, first-out (FEFO),,

The Storage site, on the other hand, can be securely locked, access to the storage and pharmacy is restricted to authorized people only, and packages and containers are sealed.

In overall, the findings of this analysis reveal that the hospital used unacceptably poor storage practices (58.8 %).

Table 4.1 . Facility Storage Condition Observation

No.	**Description**	no	yes
1	Storage site can be securely locked. (Inspect both the storeroom and the pharmacy)		✓
2	Only a authorizedpeople have access to the storeroom and pharmacy. (are there any locks on the doors, who has keys, who is allowed in and who authorises entry)		✓
3	Storeroom is maintained in good condition (clean, all trash removed, sturdy shelves, organized boxes.)	✓	
4	Inventory is protected from harmful temperatures according to product specifications (is there an air conditioner in both? What temperature is it kept at? Should be around 25 degrees Celsius. For fridge items 2-8 degrees)	✓	
5	Inventory is protected from excessive humidity according to product specifications. (Look for signs of dampness on boxes and walls)		✓
6	Inventory is protected from harmful light sources according to product specifications. (Must not be in direct sunlight)		✓
7	Inventory is protected from corrosive materials	✓	
8	Storage site is visibly free of dirt and pests	✓	
9	Physical dimensions of storage site meet appropriate standards. (Shelves must be at least 30 cm above the floor, and no drugs must be stored on them, there must be sufficient space for stock available)		✓
10	Sufficient inventory is present at the site, based on facility's indicated criteria (check stock card of selected ARVs, ensure quantities are above min stock level/buffer amount)		✓
11	Inventory is appropriately labelled. (Check that medicines are labeled with the generic name and that they are stored with the	✓	

	correct label. NB some medication is labelled according to name dosage and pack size)		
12	Inventory is within expiry date. (Check all packs under each label		✓
13	Inventory is arranged in manner accessible to counting and general management (Are medicines arranged according to generic name, alphabetically as well as dosage strength and pack size)	✓	
14	Inventory is arranged in manner accessible for first-to expire, first out (FEFO). Check if medicines are arranged such that those with the shortest expiry dates are at the outermost and first to be dispensed)	✓	
15	Packages and containers are closed (Only check immediate packages and containers)		✓
16	Packages are clean in both pharmacy and store room		✓
17	Packages and boxes are not crushed		✓

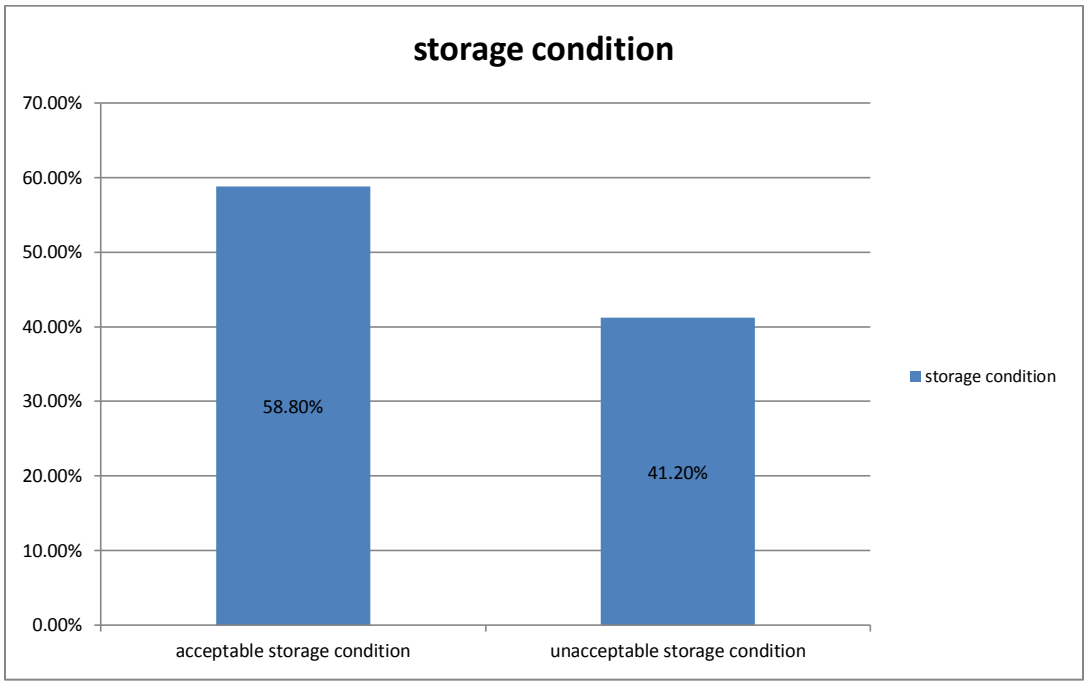


Figure 4.3.percentage ofART storage condition.

4.4 .Challenges in inventory management practices

The main challenges identified in inventory management activities at health facilities were a lack of human resources, a budget constraint to hire professionals, a lack of staff commitment to implementing inventory management activities, insufficient inventory management training, a lack of supportive supervision, a lack of shelves and adequate storage space, and personnel-related challenges.

4.5. DISCUSSION

The availability and utilization of logistics tools is critical in logistics system to capture criticallogistics data which are used for crucial decision-making at all level of logistics management. This study revealed that the availability of logistics reporting tools (RRF &IFRR) was 100% in the hospital .The information obtained from the interviewee supported this result that it is a must to use RRF will not distribute items unless an RRF report is submitted every two months, according to PFSA. The availability of recording tool (bin card and stock card) was also 100% .The finding is also in line with similar study conducted in East Shewa zone where the availability of logistics recording and reporting formats was 100% (Gurmu et al ,2017). This is may be because PFSA accepts requisitions only on the above reporting and requisition formats .

The planned (forced order) system was the inventory control mechanism utilized in AFCH to manage ARV drugs. The key informants stated that this strategy was favored since it prevented stock outs and was logistically feasible because orders were only placed once at the end of the review period. These advantages are in line with what has been stated in the literature including in Kenya Nyamira County, inventory control model used in managing ARV medicines(80.95 %) the scheduled (forced order) system (Johnson ,2019).).

It was discovered that the projective forecasting methods were used in determining order quantities, which is consistent with MSH recommendations for quantifying health commodities with trustworthy data on consumption using maximum-minimum method(WHO,2021). Inadequate information quality in inventory management is a sign of poor stock management in inventory management. Proper stock recording helps significantly to the accuracy of the data that may be used to make future decisions. Poor record keeping was common, and record accuracy was low, In checking of the physical count and the bin card ,a total of only 50% of the records were found to be correct. Bin cards regularly updated and stock cards were updates on every two weeks and served as the source data for ARV requisition to the EPSA.

According to a study conducted in Ethiopia's south Wollo region to analyze stock out and inventory management issues in public hospitals, 62 %of public hospitals had stock out and inventory management concerns. (Tariku Mohammed,2018) and According to a study conducted in Uganda, having accurate stock cards available for each stock keeping unit was critical in assessing stock levels and conditions(PFSA,2015). The difference is may due to high work overload of the pharmacist at AFCRH and lack of supervision manual data entry, also contribute for the inaccuracy of records.

As advised by USAID|DELIVER, the most important logistical statistics reported on were quantity dispensed, stock on hand, and losses and adjustments as recommended by USAID|DELIVER (USAID,2020). From the results of this study It was obvious that 40% of the recorded balances exceeded the physical counts, implying that the supply recording was inadequate. Inadequate training, inadequate staff, oversight, and staff turnover were identified as common reasons of erroneous stock records, as were manual data entry, theft, and the pace with which data is updated. According to a study conducted in the United States, inaccuracy at one level of the supply chain has a negative impact on inventory performance at other levels.(Rogers,2011). Low accuracy reveals a lack of inventory management, which can be linked to a lack of understanding and awareness of what inventory management entails. As ordering decisions are based on inadequate ground information, this leads to ad hoc decisions about ordering frequency and quantities.. This results in ad hoc decisions about ordering frequency and quantities, as ordering decisions is based on weak ground information. Logistics recording and reporting formats such as bin cards, stock cads, RRF and IFRR were available in the hospital . Automated records were not available in the hospital. Bin cards, RRF &IFRR utilization was 100% in hospital this also contribute for the inaccuracy of records.

According to the research, the percent of products available on the day of the assessment was 100 %. However the hospital had six emergency orders in the past 100 days and According to the survey, ten percent of the time was spent out of stock. in AFCRH in the last 100 days. The study done in 2016 by Berhanemeske et al on HIV/AIDS related commodities supply chain management in17 public health facilities of Addis Ababa, Ethiopia: revealed that Overall, nearly 3/4th of the health facilities faced stock-out of one or more ARV medicines and test kits on the day of visit. While all of hospitals had emergency order more than 3 times within 6 months prior to the study (Brhanemeskel et al, 2016).AFCRH had high number of

emergency orders compared to the other hospital in Addis Ababa was due to the current conditions of the country there were a lots of causalities form the war in the northern part of Ethiopia coming to this referral defense hospitals and result in unpredictable ARV drugs need.

ARV medicines was stored in dedicated stores separate from other essential medicines or medical supplies. This finding contrast those of a similar study done in where nearly half of the surveyed facilities lacked dedicated stores for keeping essential medicines(PFSA,2013). This may be due to special emphasis is given by hospital administrator and have separate building for ART clinic which include ART pharmacy store. However . The study looked at the storage conditions in the facility's storage area, as well as the amount of adherence to proper storage requirements. The state of hospital storage was assessed based on seventeen (17) principles.

For the health facility, the least satisfied conditions were; Inventory is protected from dangerous temperatures according to product specifications, and inventory is kept in good shape (clean, garbage eliminated, solid shelving, and arranged boxes) , inventory is appropriately labeled., Inventory is organized in a way that allows for counting and general administration. It is also organized in a way that allows for first-to-expire, first-out (FEFO)the facility , however, guarantee that the storage site may be securely locked, that access to storage and pharmacy is limited to authorized people only, and that packages and containers are closed..

Facilities that fulfilled at least 80% of the storage condition were acceptable and considered to be complied with good storage practices In general, the results of this study show that the hospital practiced unacceptable storage condition (58.8%). This means that ARV medications aren't kept in the right conditions to maintain their efficacy while also keeping them safe.Astudy in Addis Ababa health facilities by Brhanemeskel et.al revealed that the storagefacilities both in hospitals and health centers were far fromadequate(Brhanemeskel et al,2016) and In selected public health facilities in the west wollega zone, inventory management methods for human immunodeficiency virus (HIV) drugs and test kits were observed by Gemechu Asmara revealed that26.1% of the assessed health facilities were fulfilled good storage criteria(Gemechu,2018)and also a research conducted in east shewa

zone by Gurmu et al where 25% of theassessed health facilities were full filled good storage condition criteria(Gurmu et al,2017).There are different factors that can affect adherence to good storage practices. However, our study identified lack of budget, training and supervision as the affecting factors of adherence to good storagepractice.

The main challenges identified in inventory management activities at health facility were found to be a shortage of human resource, budget limitation to employ professionals, lack of staff commitment in implementing inventory management activities, inadequate training on inventory management , lack of supportive supervision, absence of shelves & adequate storage space, Personnel related challenges

The key informants pointed that absence of adequate human power and unscheduled requests from dispensing units increased workload on the store managers. The number of staffs and their commitment are important for the successfulness of an institution. For every activity in an institution, adequate qualified personnel are required. The failure of a program is also inevitable unless an adequate number of personnel were assigned for its implementation. The hospital was suffering from absence of pharmacy professionals as reported by the key informants. This was may be due to the overload of the work associated with the current situation of the country as it is military hospitals causalities were flooded due to ongoing war On northern part of Ethiopia.

Inadequate training on inventory management (Capacity building related challenges) On-job training, training on IPLS, supportive supervision and experience sharing with good performing institutions are the methods of building the capacity of staffs and motivating them to increase their commitment, responsibility and accountability towards their profession. The fulfillment of infrastructures is a must in order to have good pharmaceuticals inventory management performances. The hospital assessed was lack of adequate storage space, shelves and racks. In most of the storerooms, the products were stored on the floor in congested storerooms. Similarly ,the challenges of inventory management of ARV drugs and HIV test kits in health facilities of East Shewa Zone , Oromia Regional State , Ethiopia, includes Limited storage capacity, lack of reliable data, lack of adequate human resource and poor performance of health care workers (Gurmu,2017).

During the in-depth face-to-face interview, viable solutions for the highlighted inventory management difficulties were also addressed. The majority of the of the key informants trust that the top managers will tackle the inventory management issues. The top managers are responsible to recruit professionals and make decisive actions for malpractices under their leadership. Accordingly, the key informants stressed that top managers at every level of the health care system should recognize and believe in the importance of pharmacy service. Recruiting the required number of pharmacy professionals is also mandatory if an effective logistics management activity has to be existed at the health facilities. Training and supportive supervisions are also important to improve inventory management performances

CHAPTER FIVE

5. SUMMARY OF KEY FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF KEY FINDINGS

The study's overall goal was to assess the effectiveness of antiretroviral medicine inventory management practices in armed forces referral and comprehensive hospital. This study had the following three objectives: To identify the inventory management practices used for ARV medicines, To evaluate the inventory management performance of ART medicines, To identify the challenges affecting inventory management of ARV medicines Armed Forces referral and Comprehensive Hospital, Addis Ababa ,Ethiopia. The following are the primary findings from the preceding chapter's discussion of the results..

Inventory management practices

According to the findings, the most common inventory management practices in AFRCH include using a scheduled inventory control model, forecasting demand using previous consumption data, keeping stock records for each product, including essential logistical data in reports such as safety stock, and keeping ARV medicines in dedicated stores.

Pharmaceutical Availability

According to the study's findings, the visited hospital's ARV medications had run out in the previous 100 days. In the assessed institution, the percent of products available on the day of assessment was 100 %t, according to the report.

Pharmaceutical Stock Out

The study has found the hospital had experienced stock out of a number of drugs within the last 100 days. The study found that the percent of time out of stock was 10 in AFCRH.

Stock-Keeping Records Accuracy

The study discovered that 50% of stock keeping records were reliable, that health facilities had on average 40% more records than physical counts, and that health facilities had on average 20% less records than physical counts.**Ratio Of Inventory Variation**

According to the statistics, the average inventory variation to total stock ratio is 17.2 percent. This indicates that the accuracy inaccuracy is significant, making the data less useful for inventory decisions.

Pharmaceutical Storage Conditions

The study also revealed that the health facility practiced unacceptable storage condition (58.8%). This analysis revealed poor inventory management in terms of general record keeping quality, space allocation, and overall structure.

Challenges in inventory management practices

The main challenges identified in inventory management activities at health facility were found to be a shortage of human resource, budget limitation to employ professionals, lack of staff commitment in implementing inventory management activities, inadequate training on inventory management, lack of supportive supervision, absence of shelves & adequate storage space, Personnel related challenges

5.2. CONCLUSIONS

- In terms of record keeping, stock level monitoring, and storage condition, ARV drug inventory management was lacking.
- The stock keeping records in the AFCRH surveyed were not perfect. There were instances when stock records counted more than what was actually available in stock, as well as instances where stock records counted less than what was actually available in stock. Stock outs, leaks, and expiration of medications were all raised as a result of this approach.
- Poor stock management, particularly in terms of updating and maintaining accuracy in record keeping, was discovered to be a serious issue in the health facility's ARV inventory management.
- The absence of correspondence between the records and a physical stock count was caused by incorrect stock status, which was characterized by a lack of timely entries and errors on the logistics tools.
- The ARV storage condition in AFCRH was not up to snuff. However, all health facilities had locked up their drugs and only authorized employees had access to the storage chambers. Labeling was discovered to be a difficult undertaking in terms of storage conditions, as several labels were required for the same medicine.

shortage of human resource, budget limitation to employ professionals, lack of staff commitment in implementing inventory management activities, inadequate training on inventory management, lack of supportive supervision, absence of shelves & adequate storage space, Personnel related challenges were the main challenges identified in inventory management activities at health facility .

➢ 5.3 RECOMMENDATIONS

The researcher makes the following recommendations based on the study's findings:

1. In order to be effective, electronic dispensing and inventory tracking should be implemented in the hospital to promote data visibility and data accuracy.The use of computers in inventory management improves the efficiency and efficacy of inventory management and record tracking 2 since these facilities manage a very high number of products.
2. Keeping an up-to-date inventory and management information system requires regular submissions and the tracking of issues on logistical tools. Following manual inventory verification, found quantities should be compared to inventory records' stock quantities, and the records should be changed to produce a perfect match with real stock quantities.
3. Up to date tools for reporting and inventory management should also be made available to all reporting facilities.
4. Improvements in storage conditions should be encouraged in terms of labeling, with a label for each brand/pack quantity, and appropriately storing ARV.
5. Physical conditions in the store should be improved at the facility to provide shelves and pallets and air conditioner to the storeroom
6. Ministry of Defense shall employ the required number of pharmacy professionals under ART pharmacy unit for effective ARV inventory management practices
7. Regular supervision by the chief pharmacist, as well as regular monitoring and evaluation of the product, are required.
8. Regular supervision by the head pharmacist is needed, regular monitoring and evaluation of the Staff should be pooled in order to identify training and other needs.

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APPENDICES

Appendix 1. List Of ARV Products

S/N	ITEM NAME	
1.	Efavirenz-Lamivudine-Tenofovir disoproxil fumarate 600+300+300MG/tablet	
2.	Abacavir- Lamivudine- Efavirenz 300+300+ 600 tablet	
3.	Doltugravil - Lamivudine-Tenofovirdisoproxil fumarate 50 +300+300 mg tablet	
4.	Zidovudin –lamuvidin + Doltugravil 300+300+50 mg tablet	
5.	.Zidovudin-lamuvidin-atanaviar boosted ritronavir 300+300+200/50mg tablet	
6.	Tenofavair-lamuvidin-lopnanavir boosted ritronavir	
7.	Tenofavir-lamuvidin-emitricitabin 300+300+200mg tablet	
8.	Abacavair-lamuvidin-emitricitabin 300+300=200mg tablet	
9.	Atazanavil boosted ritronavir –doltugravil-tenofavir –lamuvidin 300/100+50+300+300mgtablet	
10.	Abacavir –tenofavir-efavrenaze 300+300+600 mg tablet	
11		
12		
13		
14		
15		

Appendix 2. Inventory Data Collection Form

Inventory management assessment tool (IMAT) organization
Data calculation and calculation sheet today" date

A	**B**	**C**	D	E	F	G	**H**
Sn	**Name of product**	**Unit**	Days of stout within the last 100 days. starting date	Lack stock balance recorded on stock card (don't correct it)	Physical quantity (based on actual count)	Difference between physical quantity and recorded quantity (E-F)	Absolute value of G

I number of products in the study
I Count of records that are accurate (number of zeros in column G)
J Count of records less than physical counts (numb. of negative results in column G)
K Count of records greater than physical counts (numb. positive results in column G) *The maximum for L is N, the number of products in the study.*
L Total products in stock (total number of products present (not zero) in column F)

Appendix 3. Facility Storage Condition Observation Check List

Facility Name: _____ Facility type: _____
District: _____ Name of the Data
Collector;_____
Date: _____

No.	Description	no	yes
1	Storage site can be securely locked. (Inspect both the storeroom and the pharmacy)		
2	Only a authorizedpeople have access to the storeroom and pharmacy. (are there any locks on the doors, who has keys, who is allowed in and who authorises entry)		
3	Storeroom is maintained in good condition (clean, all trash removed, sturdy shelves, organized boxes.)		
4	Inventory is protected from harmful temperatures according to product specifications (is there an air conditioner in both? What temperature is it kept at? Should be around 25 degrees Celsius. For fridge items 2-8 degrees)		
5	Inventory is protected from excessive humidity according to product specifications. (Look for signs of dampness on boxes and walls)		
6	Inventory is protected from harmful light sources according to product specifications. (Must not be in direct sunlight)		
7	Inventory is protected from corrosive materials		
8	Storage site is visibly free of dirt and pests		
9	Physical dimensions of storage site meet appropriate standards. (Shelves must be at least 30 cm above the floor, and no drugs must be stored on them, there must be sufficient space for stock available)		
10	Sufficient inventory is present at the site, based on facility's indicated criteria (check stock card of		

	selected ARVs, ensure quantities are above min stock level/buffer amount)		
11	Inventory is appropriately labelled. (Check that medicines are labeled with the generic name and that they are stored with the correct label. NB some medication is labelled according to name dosage and pack size)		
12	Inventory is within expiry date. (Check all packs under each label		
13	Inventory is arranged in manner accessible to counting and general management (Are medicines arranged according to generic name, alphabetically as well as dosage strength and pack size)		
14	Inventory is arranged in manner accessible for first-to expire, first out (FEFO). Check if medicines are arranged such that those with the shortest expiry dates are at the outermost and first to be dispensed)		
15	Packages and containers are closed (Only check immediate packages and containers)		
16	Packages are clean in both pharmacy and store room		
17	Packages and boxes are not crushed		

Appendix 4: Questionnaire for Pharmacists

Introduction

This survey was created with the sole objective of gathering information on the impact of inventory management methods and supply chain performance of ARV pharmaceuticals in AFRTH. The information gathered will be kept in strict confidence and will only be used for academic reasons.

Section A: General Information

Please mark with a tick (✓)in the applicable box

1. Gender

[1]Male [0]Female

2. Please indicate the age bracket you belong to

[1]Below25years [2]Between25and35years

[3]Between36and45years [4]Above45years

3. For how long have you been working in your organization?

[1]Below1year [2]Between1and5years

[3]Between5and10years [4]Above10 year

Section B: Inventory management practices Used in ARV Medicines

Provided below are some statements about inventory management. State whether they are in use (**YES**) or not (**NO**) in your facility. Please mark with a tick (✓)in the applicable box.

Statements on inventory management practices	Yes	No
Inventory control models		
Trigger for ordering ARVs at the end of the reporting period *(Forced order system)*		
Trigger for ordering ARVs is when minimum stock is reached *(Continuous review system)*		
Trigger for ordering ARVs is the end of reporting period for ARVs that have reached minimum stock level *(Standard system)*		
Determination of order quantities		
Previous consumption data is used to forecast demand of ARVs (*Projective method)*		
Forecasts are based on external factors like epidemics, change in health system structure and size (*Causal method)*		
Forecasts are based on individual judgment of experienced staff (*Judgment method)*		
Forecasts are based on HIV prevalence, incidences and expected number of attendances (*Morbidity method)*		
Stock keeping record and reporting		
All ARV medicines have stock records		
Stock records for ARVs are accurate and up to date		
Regular stock counts are done minimum once every reporting period for ARVs		
Entire inventory of ARV medicine is counted at one go in each stock take(*Full count)*		
Inventory of ARVs is divided into counting groups, with each group being counted per stock taking session(*Cyclical count)*		

Reports for ARV medicines are compiled at the end of each reporting period		
Data on consumption is included in every report		
Data on stock on hand is included in every report		
Data on losses and adjustments is included in every report		
Data on commodities near expiry is included in every report		
Safety stock policy		
A safety/buffers tock is kept for every ARV product		
A standard formula is used in calculating safety stock		
A rough estimate is used as safety stock		

Section C: Inventory Management of ART Medicines in AFRTH, Addis-Ababa, Ethiopia: Challenges Please use the Likert scale to indicate or assess the issues that your health facility encounters in inventory management of ARV drugs (disagree, neutral, agree). Please indicate the appropriate box with a check ().

Challenges affecting Inventory Management	**Disagree**	**Neutral**	**Agree**
Lack of proper storage			
Lack of a good inventory control system			
Inadequate staff			
Poor recordkeeping			
Poor reporting			
Incompetent staff			
Unreliable supply of medicines			
Inadequate training on inventory management			
Lack of commitment by top management			
Poor inventory infrastructure			
List and rate any other Inventory management challenges in thee spaces provided below		l	

Appendix 5: Key Informant interview guide for storekeepers

- How do supply chain managers of ARV medicines determine which items should be held in stock and which ones should be ordered as needed?
- How frequently are ARV medicines ordered by the hospital?
- Do the hospital health facilities have dedicated stores for keeping ARV medicines?
- Explain the various inventory control models that have been used in managing ARV medicines?
- Which inventory control model has been most effective and why?
- Which stock keeping records are mostly used in managing inventory of ARV medicines?
- Are stocks keeping records of ARV accurate and current in the AFRTH?
- If not, what are some factors that from your experience contribute to inaccurate stock records?
- What data from ARV medicines reports do you use for decision making?
- What measures do you incorporate in managing ARV medicines inventory to prevent stock outs?
- How do you think inventory management affects?
    a) Stock availability
    b) Order lead time
    c) Ratio of usable to unusable stock
    d) Reporting rates
- From your experience, what are some challenges that affect inventory management of key ARV medicines in the hospital?

Appendix 6: Questionnaire for Hospital administrators and facility in charges

Introduction

This questionnaire has been designed for the sole purpose of collecting data on the effect of inventory management practices ART medicines .The data collected will be treated with a very high degree of confidentiality and it is meant for academic purposes only.

Section A: General Information

Please mark with a tick (✓)in the applicable box

1. Gender

[ ]Male [ ]Female

2. Please indicate the age bracket you belong to

[ ]Below 25years [ ]between 25and35years

[ ] Between36 and45years [ ]above 45years

3. For how long have you been working in your organization?

[ ]Below 1year [ ]between1and5years

[ ]Between 5and10years [ ]above 10years

Section B: Inventory Management Practices

1.The facility determines for itself the type and quantities of ART medicines that it orders according to its needs

Yes-----

No------

2. The facility has stock keeping records for of ART medicines available and staff are trained on how to use them

Yes-----

No------

3. The facility compiles reports on the stock position of ART medicines routinely

Yes-----

No------

4. The facility has staff dedicated to managing inventory of ART medicines

Yes-----

No------

5. The facility has a dedicated store for keeping of ART medicines

Yes-----

No------

6. Orders for ART drugs are reviewed and approved by the administration before being submitted

Yes-----

No------

7. There have been no shortages of ART medicines in the hospital in the last quarter

Yes-----

No------

8. The time from when orders are placed and received is reasonable

Yes-----

No------

9. There were no expiries of ART medicines realized within the last quarter

Yes-----

No------

10. Reporting rates and reporting on time for this facility in the last quarter has met the targets

Yes-----

No------