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Vaccines, Immunization and Health Supply
Chain Management (EAC RCE-VIHSCM)**

**ASSESSMENT OF STORAGE AND INVENTORY PRACTICES TO IMPROVE MEDICINE
SUPPLY**

CHAIN IN JUBEK STATE SOUTH SUDAN

*Thesis submitted to the University of Rwanda, in partial fulfilment of the
Requirements for the degree of Masters in Health Supply Chain Management (MSc HSCM)*

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DECLARATION

This research project is my original work and has not been presented to the University of Rwanda or any other Institution for any award.

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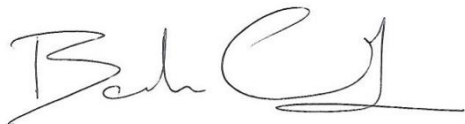
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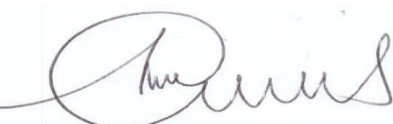
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DEDICATION

This proposal is dedicated to my family and especially for their moral support and encouragement when I was writing this research work.

ABSTRACT

Introduction: The study to Assess storage and inventory Practices to improve Medicine Supply chain in South Sudan was conducted in 12 health facilities in within the vicinity of Juba City.

Objectives of the study: The research mainly focused on the specific objectives which include; to assess medicine store rooms and inventory management practices in selected health facilities in Juba City, to assess the knowledge of the health workers working in the store and inventory management and to give recommendation to different stakeholders on how to improve storage of medicines and medical supplies.

Methodology: The study used a descriptive survey in laying more emphasis in determining the frequency with which the variables are implemented. The study population comprised of 12 Health Centers in Juba where inventory management was practiced. The study questionnaires and observation guides to collect information from the pharmacies about store room condition and inventory management. Interview was used in the health Centers that had drug stores to collect information from the store keepers on their knowledge about their knowledge regarding store and inventory management. Data was analyzed using descriptive statistics in SPSS and Excel to generate tables and graphs.

Results: The study found that store and inventory management practices varied in the different health facilities. Hospitals and Central medical stores exhibited good and average inventory and store room management practices and PHCs' exhibited good, average and poor inventory and store room management practices assessed through self-assessment and observation assessment by the researcher. There was great similarity between the observation assessment and the self-assessment made than the difference.

KEY WORDS

Inventory: Coyle et al. (2003), defines Inventory as raw materials, work-in-progress, finished goods and supplies required for creation of a company's goods and services. The number of units and/or value of the stock of goods a company holds.

Inventory management: the scope of inventory management concerns the balance between replenishment lead time, carrying costs of inventory, assets management, inventory forecasting, inventory valuation, inventory visibility, future inventory price forecasting, physical inventory, available physical space, quality management, replenishment, returns and defective goods and demand forecasting (Wikipedia nd)

Knowledge - described as information, skills and understanding that have been gained through Learning or experience (Longman, 2006:845)

LIST OF SYMBOLS AND ACRONYMS

CMS	Central Medical Store
FE-FO	First-Expired-First-Out
FIFO	First-In- First-Out
MOH	Ministry of Health
NGO	Non-Governmental Organization
LIFO	Last-In-Last-Out
WHO	World Health Organization
USAID	United States Agency for International Development

TABLE OF CONTENTS

DECLARATION	i
ACKNOWLEDGEMENT	ii
DEDICATION.....	iii
ABSTRACT	iv
KEY WORDS	v
LIST OF SYMBOLS AND ACRONYMS.....	vi
LIST OF TABLES.....	ix
LIST OF FIGURES	xi
CHAPTER ONE.....	1
1.0 Introduction.....	1
1.1 Background.....	1
1.2 Problem Statement	2
1.3 Research Purpose	2
1.4 Objectives:	2
1.4.1Main objective	2
1.4.2 Specific objective:.....	2
1.5 Research Questions:	3
1.6 Significance of the Study:	3
1.7. Scope of the study	3
17.1 Geographical scope:	3
17.2 Sample scope:.....	3
17.3 Conceptual scope:	4
18. Conceptual Framework	4
CHAPTER TWO	6
LITERATURE REVIEW.....	6
2.0 Introduction.....	6
2.1 Medicine Storage and management	6
2.1.1 Store infrastructural condition	7
2.1.2 Procedures for Medicine Storage.....	8
2.1.2 Storage Requirements	10
2.1.3 Temperature Requirements for medicines storage	10
2.1.4 Factors Affecting Medicine Storage	11
2.1.5 Storage Security.....	11
2.2 Inventory Management.....	12
2.2.1 System for inventory practices	13
2.2.2 Inventory Management Techniques of Medicines.....	13

2.2.3 Inventory Management policies.....	14
2.2.4 Inventory Practice.....	14
2.3 Staff capacity for storage management and inventory practices	15
CHAPTER THREE.....	17
RESEARCH DESIGN AND METHODOLOGY	17
3.0 Introduction.....	17
3.1 Research design.....	17
3.2 Target Population	17
3.3 Sampling Design	18
3.4 Data Collection	18
3.4.1 Data collection instrument.....	18
3.4.2 Data collection Procedure	19
3.5 Data Analysis	19
3.7 ETHICAL COSIDERATION	19
CHAPTER FOUR.....	21
RESEARCH FINDINGS PRESENTATIONS AND DISCUSSIONS.....	21
4.0 Introduction.....	21
4.1 Response Rate	21
4.2 Assessment of Store room	21
CHAPTER FIVE	29
DISCUSSION, CONCLUSION AND RECOMMENDATION	29
5.0 Introduction.....	29
5.1 To assess medicine store rooms and inventory management practices in selected health facilities in Juba.....	29
5.2 To assess the knowledge of the health workers working in the store and inventory management.	32
5.3 Conclusion	33
5.4 Recommendation to different stakeholders on how to improve storage of medicines and medical supplies	33
5.5 Limitations of the Study:	34
Reference	34
APPENDIX I: (QUESTIONNAIRE)	38
APPENDIX II: (INTERVIEW GUIDE)	41
APPENDIX III: OBSERVATION GUIDE.....	42

LIST OF TABLES

Table 1: Results showing the good store room conditions at the Hospital and CMS and Poor in the PHCU.....	21
Table 2: Results showing excellent inventory and storage management in the hospitals and CMS and average in the PHCU.	23
Table 3: Results showing Expiry drugs management practices in the hospitals, CMS and PHCUs were good	24
Table 4: Good inventory and store area management practices from observation made in Hospitals, CMS and PHCUs.....	25
Table 5: Similarities between Observation and Questionnaires	26
Table 6: Knowledge of respondents in regards to Education and training on store and inventory management.....	27

LIST OF FIGURES

Figure 1: Conceptual Framework.....	4
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CHAPTER ONE

1.0 Introduction

The study was conducted on assessment of the storage conditions and inventory management practice in central medical store and different health facilities in Juba, South Sudan. The study focused on evaluation of medicine store rooms at selected facilities, assessing management of stock, assessing knowledge of staff on inventory management practices through questionnaire and how it affected the quality of the services and supply chain in Juba city.

This research study drew in literature review in medical journals, government report and in addition, health workers were interviewed to determine their influence in storage management practices.

1.1 Background

A third of the world population cannot access essential medicines (WHO, 2018).[1] and the reasons contributing to this lack include poor medicines management practices and unsuitable storage conditions, whereby medicine can be affected by light, humidity, ventilation, temperature, sanitation; and bad storage rooms infrastructure (Ismail.A, 2016).[2] In order to deliver quality health services you need to have safe, effective, affordable and quality medicines in adequate quality at right time and appropriate dose. Inappropriate storage conditions, poor infrastructure, poor medicines management practices may lead to stock damage, limited essential medicines, poor medicines quality, theft and expiration (Ismail A, 2016). [2]

Following the signing of the Comprehensive Peace Agreement in 2005, South Sudan health services were unable to provide proper health services to its citizens as a result of long unending wars (South Sudan NGO forum. nd). At the time of war in South Sudan, the non-government organizations (NGOs) played a very important part in helping South Sudan by providing health care services, procuring medicines on behalf of government and management of the health facilities in remote areas. Apart from general lack of services, health care services were also compromised due to poor roads infrastructure which severely affected patients as they could not access any health facilities. (NGO forum. nd). [3]

The South Sudan constitution mentioned that health care services is a human right which should be respected at all time (The transitional constitution of Republic of South Sudan 2011). [4] The South Sudan Ministry of Health (MOH) has provided and implemented policy which includes ensuring enough

quantities of quality essential medicines and health supplies are stocked according to the rational use at the different health facilities levels, adopting efficient procurement methods, storage and supplying of health supplies to the health facilities. (National Health Policy 2016 -2026, pg 19). [5]

1.2 Problem Statement

After the break away of South Sudan from Sudan, there was insufficient health care facilities, poor medicines storage conditions and poor medicines management in various facilities across the country which affected health facilities in Juba City.

It is also noted that throughout the year, temperatures are extremely high which affect medicines storage due to high humidity, exposure to light and poor ventilation

1.3 Research Purpose

The study purpose is to assess medicine supply management practices in the selected health facilities in Juba, South Sudan in order to ascertain the availability of quality medicine storage and inventory management practices in the health facilities in South Sudan.

1.4 Objectives:

1.4.1 Main objective

The main objective of this research is to assess the storage conditions and inventory management practices for the medicines and its impact on medicines supply chain in South Sudan (Juba).

1.4.2 Specific objective:

- To assess medicine store rooms and inventory management practices in selected health facilities in Juba.
- To assess the knowledge of the health workers working in the store and inventory management.
- To give recommendation to different stakeholders on how to improve storage of medicines and medical supplies.

1.5 Research Questions:

1. What are the challenges that affect the good storage practices in the different facilities?
2. What are the factors affecting the performance of the staff?
3. How does staff capacity affect storage and inventory management practices of medicines to improve supply chain management?

1.6 Significance of the Study:

It is important that medicines are stored properly and inventory management practices are adhered to in line with the South Sudan's medicines supply management policies which include the South Sudan National Health Policy 2016-2026 and the Health Sector development plan 2011-2015 and hence the need to conduct the study. The study will seek to establish current practices and identify challenges relating to storage and inventory management of medicines supply in the health care facilities. Findings from the study may equip pharmaceutical services with current information that helps to improve storage conditions and inventory management practices. The study findings can also be used for literature review on South Sudan storage and inventory management practices.

1.7. Scope of the study

17.1 Geographical scope: The research to assess storage and inventory Practices to improve medicine supply chain in South Sudan was conducted in 11 of the 19 health facilities and 1 Central Medical Store in the vicinity of Juba City, South Sudan. This makes a total of 12 facilities. The facilities assessed were Juba teaching hospital, Al Sabbah children hospital, Central Medical store, Malakia Primary health care Centre, St Kizito Primary health care centre, Mahat Primary health care centre, Nyakuron Primary health care centre, Munuki Primary health care centre, Gurei Primary health care centre, Lologo Primary Health Care Centre and Kator Primary Health Care Centres and Jubek State Pharmaceutical Department.

17.2 Sample scope: The research sampled only store keepers and pharmacists working in the selected health facilities and stores in Juba. This is because of their direct responsibility in storage and inventory management in the health facilities stores and pharmacies.

17.3 Conceptual scope: The research assessed storage and inventory management practices of medicines supply chain in the health facilities targeted.

18. Conceptual Framework

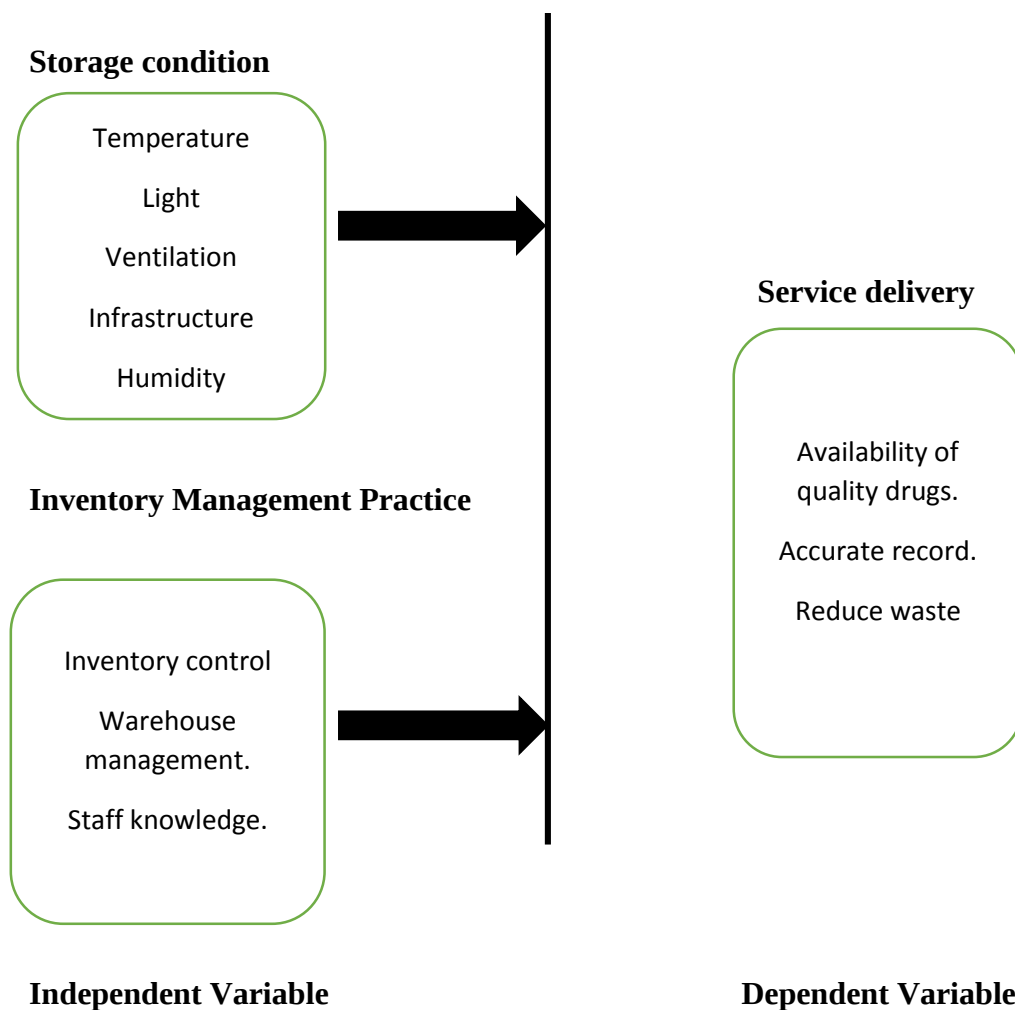


Figure 1: Conceptual Framework

Storage Conditions: Storage areas should have sufficient capacity to enable the orderly storage of the various categories products such as bulk and finished products, products in quarantine, and released, rejected, returned or recalled products. Temperature of the storage area should not exceed 30%. Rooms should be secure. Securing a store is precaution measures concerning provision of fire safety equipment that can function properly.

Inventory management practices: This involves a proper system for inventory control, good and secure facilities for storage and a proper process for Quantification and selection. This improves the availability of medicines and minimizes spoilage. But appropriate inventory management at various levels of supply chain is important for effective distribution from the various warehouses. This requires training of staff to manage it well.

Service delivery: Good storage conditions and inventory management practices results into improved service delivery. It ensures availability of quality drugs, reduces wastage through expiry and enables accurate record for planning.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

Medicines are complex chemicals that need proper care when handling them. The procedure of receiving and storing medicines must be strictly followed to guarantee that quality is maintained until the time of their usage (Ministry of Health government of Uganda, 2012). [6] Gebremariam and Unade (2019), [7] stated that the importance of medicine supply management ensures provision of essential medicines at reduced cost, in budget line as well as proper management and rational use. The study further indicated that one of the aims of inventory management is to secured stored medicinal products from loss, damage and theft.

2.1 Medicine Storage and management

In medical supply systems, storage of medicines involve keeping medicines safe and no damage to the medicines throughout the supply cycle (USAID: Deliver Project, 2011; World Health Organisation, 2017). [8,9] In case medicines are damaged or stolen, lack of supplies or stock outs may occur in the health centers since damaged medicines would not be remove from the supply pipeline (Lufesi, Andrew & Aursnes, 2007). [10]

Storage of Medicines in the warehouse generally needs appropriate security and temperature conditions in the storage area. Better inventory management practice is important in ensuring adequate stock levels, practices such as regular inventory, reconciliation of inventory, dispatching of medicines according to expiry and tracing of the batches numbers (Schopperle 2013). [11] Medicines storage is one of the most important responsibility that can be best handled by a pharmacist. (Kausar et al. 2013). [12] However in South Sudan, it has been approximated that only 10% of the staffing norms were filled by right well trained health workers. This makes proper storage of pharmaceuticals to be questionable.

Aziz et al. (2018) [13] stated that for proper medicine action in the body, proper storage and distribution of medicines is essential and that all storage areas should have enough size to allow efficient storage of all the different types of stock including manufacturing, packaging, unpacked materials, finished products, released products, banned products, returned products and quarantine products. The study further indicated

that the storage areas should be modified to safeguard good storage conditions and pharmaceutical products should not be placed on the floor, pharmaceuticals are to be properly set apart to allow easy means of cleaning as well as assessment of medicines on periodic basis. Unnecessary opening of the store doors has to be avoided. Proper storage direction needs to be provided for medicines in the storage areas.

2.1.1 Store infrastructural condition

According to Kausar et al., (2013), [12] in order to store products such as bulk, finished, quarantined, released, rejected and returned or recalled products in orderly manner, there should be adequate capacity in the storage area. Areas for storing medicines need to be designed or adapted to be clean, dry and to have the required temperature limit to make sure good storage conditions. In case special the conditions for storage as demand on the label (e.g. temperature, relative humidity), these have to be provided and checked.

Storage of Pharmaceutical products have to be on panels or shelves not directly on the floor, one meter away from the wall, properly spaced to allow cleaning and inspection. A written sop standard operating procedure is necessary to indicate how frequent cleaning is done and which methods to use in cleaning premises and the storage area. The handling and storage of Pharmaceutical products should not cause contamination, mix-ups and cross-contamination. International conventions and national laws and regulations should be followed in the storage of narcotic drugs. Dedicated storage areas with safe and secure measures should be used to store materials of radioactivity, psychotropic substances, drugs that are dangerous and cytotoxic drugs. [12]

A study in Nigeria by the ministry of health found that health centers were having good storage infrastructure, good ventilation and secure store. However, stock cards, tracing of batches numbers, defined maximum or minimum levels of stock were mostly in the hospitals. Most Health centers did not have temperature charts for cold chains control (Federal Ministry of Health, 2010a and (Habiya mbere and Wertheimer, 1993). [14,15]

In South Sudan The infrastructure network of the health sector is huge with more than 1.377 Primary Health Care Units s, 277 Primary Health Care Units, 25 hospitals and connected buildings (stores, staff houses, etc.), training institutions and Ministry of Health offices at Central, State and County levels. Investments in infrastructure and equipment have been inadequate to meet the demand for reconstruction

and modernization or renovation. Of the 1.024 functional Primary Health Care Units, 24% require slight renovation, 17% crucial renovation and 23% need to be reconstruct (Health Sector Development Plan report 2011-2015). [16]

2.1.2 Procedures for Medicine Storage

For easy identification of medicines in the store there is need to ensure that the medicines are safe, well arranged and organized (Barraclough and Clark 2010). [17] One of the most important aspects of a store used for pharmaceuticals is to monitor and evaluate operations as well as identification of problems that can be addressed [12]. Snow, (2003) [18] stated that there should be a medicine classification and organization system in medical stores and employees should be acquainted with it. The document further stated that a standard list of items with specifications of all products such as forms and quantity per package in medical store have to be maintained and updated from regularly and its distribution to other subunits should be done. (Kausar et al. 2013) [12] Stated that all medicines must be stored in appropriate and auditable environments.

Ten (2010) [19] suggested that every activity undertaken in medical store must be documented in form of records that include handling of expired medicines. Records should be established for every delivery including proper labelling of containers specifically medicines brought in large containers should be labelled with essential information such as directions about usage, of the product and expiry dates.(

According to Ministry of Health government of Uganda (2012) [6], if selection of a few key medicines is done in a proper way, storage will be easier. Barraclough and Clark (2010) [17] suggested that in the process of storage, first boxes should be arranged in a way that arrows should point up for the labels to be easily identified and so that dates of expiry, and dates of manufacturing can be seen and if possible the product name and expiry date should be clearly written on the side that is visible. The study found that while in the storage, checking the dates of expiry and ensuring that the dates could be seen is extremely important.

According to the guideline for Pharmaceutical management support system (nd), there are several systems for arrangement of medicines stock. Therapeutic classification, alphabetical order, dosage form and others. In the process of arranging stock according to therapeutic classification, similar items should be stored in one place. Similar medicines such as external, internal and injectable including the form of preparation

(dry or liquid medicines) should be stored together. In stores that use the alphabetical. In the dosage form system, the sequence of arrangement follow the pattern of external, internal, and injectable, then shelve liquids and ointment in one area then products that are frequently used or move quickly through the store are placed in front of the room. Dosage form system should be used in combination with other systems.

A study carried out by Monica B et al. (2015) [20] in stores in Kundapur and Karkala areas in India, it was found that the medicines were kept on shelves in the master store and only a little number of PHCs in Udupi had close cupboards to keeping supplies. There were labelled shelves and FEFO/ FIFO methods were used to dispatch drugs. Arrangement was being done according to the pharmacologic – therapeutic order this proved the finding where the organization of the drugs were not in alphabetical order. The dosage arrangement according to Monica B. et al. (2015) was done in such a way that tablets and capsules were stored together, there was separate arrangement of injections, oral liquids, creams and topical liquids, ointment. Open racks, cupboards and steel shelves were available for storing drugs and other supplies. The study also found that the storage of the drugs in loose boxes hampered drug details visibility. Regular Inspection and housekeeping were not being done. Cold storage facilities were provided for storage of vaccines that require temperature controlled storage. Fire emergency service was insured using Metal buckets filled with sand.

In the alphabetical order system, Organization of each group of medicines should be arranged in alphabetical order in order to improve store organization and simplifies stock management. In the storage setup, top shelves should contain dry medicines such as capsules, tablets and oral rehydration but if the top shelf is close to the ceiling then medicines sensitive to heat should not be placed there. The middle shelf should contain liquids and the bottom shelf should contain supplies such as surgical and laboratory items. Lastly all storage commodities should be organized in a manner that facilitates first expiry first out (FEFO) policy for easy stock management, therefore in the process of storing medicines stock should be grouped according to FEFO.

In a study conducted in Bugoma Kenya, it was found that FEFO method was preferred when issuing medicines than FIFO. According to the study, FEFO method allows medicines which are about to expire to be dispatched and spares the ones with long expiry dates, (Shadrack M et al., nd). [21]

Also Barraclough and Clark (2010) [17] further stated that storage of highly expensive products should be stored in closed cabinets. Medicines that are damaged or expired should be kept separate from the unexpired ones without delay, and should be disposed-off using established procedures.

2.1.2 Storage Requirements

According to Kausar et al., (2013), [12] Medicines storage areas should be provided with proper lighting, ventilation, humidity, temperature and security. The products need to be stored according to the directives of the manufacturers that is under the terms of authorization of the product. Stored medicines must be kept in manufacturer's original package which needs protection against contamination, direct sunlight rays, atmospheric moisture and high temperatures. The study further stated that conditions for storage of medicinal supplies adhere to the labelling described on the label of the product. It further advised that products that require cool temperature must be stored in refrigerators [12].

2.1.3 Temperature Requirements for medicines storage

Kausar et al. (2013) [12] grouped the categories of medicines according to their temperature requirements. The first group of medicines requires to be stored in a freezer at temperatures between -25°C – 10°C followed by the category that requires temperatures between 8°C – 15°C .

The study also further classified medicines according to their different storage conditions that is grouped as follows:

- Tablets usually require cool temperatures, protection from direct sunlight and moisture.
- Capsules require cool temperature and dry place,
- Emulsions need closed sealed containers, protection from sunlight, high temperature or freezing.
- Suspensions require cool dry places that is protected from direct sunlight with temperature not exceeding 30°C .
- Ointment needs well closed containers, protection from high temperatures or direct sunlight.
- Pastes require well closed containers cool place and prevention from moisture. Injection needs to be stored below 30°C and protected from direct sunlight.
- The last and more sensitive group is the group of vaccines; Vaccines are too sensitive to any temperature change therefore precautions need to be provided in order to maintain its effectiveness because for any programme of immunization to succeed, effective vaccines should be administered. [12]

2.1.4 Factors Affecting Medicine Storage

Medicines have to be stored under favorable conditions in order to maintain their quality (Care inspectorate 2016). Schopperle (2013) [11] pointed that one of the best procedures of storing medicines is that medicines should be stored in warehouses equipped with suitable temperature conditions because storage temperatures directly affects medicine stability. The two most important factors that affect the quality of stored medicine usually takes place during medicine transit because this activity often exposes the stock to temperature change and humidity if precautions are not preserved [6].

According to Gebremariam and Unade (2019), [7] poor medicines storage takes place when there is lack of system for stock arrangement, when there is dust and pest within the area of storage, when the protection from direct sunlight is not adequate, absence of charts for monitoring temperature and temperature equipment to monitor room temperature. The study also stated that poor storage conditions reduce medicines efficacy. Kausar et al. (2013) [12] pointed that air quality, time interval and characteristics of production have significant impact on the ultimate quality of medicines. Barraclough and Clark (2010) [17] stated that the ground surrounding the facility area must be clean, free from health care waste because it is essential that the surrounding area of pharmaceutical storage and other health supplies be kept clean to reduce pest, rodents and avoid injury.

According to Ten (2010) [19] storage areas should have proper ventilation which can be provided by air conditioner, a fan, or a small window and medicines such as vaccines that requires low temperatures can be stored in fridge or ice box.

2.1.5 Storage Security

Ten (2010) [19] pointed issues of security in storage area. That unauthorized persons should be prevented from entering medicine storage areas. The security of the store is improved by storing excess medicines in a separate room enforced by a lock. Then a daily rooster should be developed and handed over to the responsible staff assigned to hold the store room keys and monitor excess medicine. Barraclough and Clark (2013) [17] further stated that security areas should be set up with an activated alarm in case products are not accessed properly and that only senior staff should be allowed to enter such areas and the number of keys provided for the controlled location must be limited with a list of people who have keys.

Ministry of health government of Uganda (2012) [6] indicated that another aspect of securing a store is precaution measures concerning provision of fire safety equipment that can function properly with the help of training the staff working in the storage areas on how to use the fire extinguisher, information on protection of the store such as putting off fire before it spreads, also knowledge on how to use alternatives in absence of extinguisher such as water, sand or soil.

Barracough and Clark (2013) [17] indicated that National essential medicines Lists (NEML) that include several narcotics, Other opioid and strong analgesics, psychotropic drugs and strong tranquilizing medicines are under different grouping. These medicinal items mentioned to be handled under international control because they need greater attention. Medicines that include antiretroviral for treatment of HIV/AIDS, need to be stored in a controlled facility, for the reason that they are scarce hard to find, with high priced, and have high demand.

The most important reason of managing a store is to fulfill the receipt, holding and releasing of stock .The responsibility of store management is to assist in the movement of medicine supplies from the origin to the ultimate user in the most dependable and cost effective without quality loss, wastage or stealing.

2.2 Inventory Management

A proper system for controlling requires secure facilities for storing medicines, suitable Quantification and process of selection improves availability of medicines and reduces medicines getting wasted and spoilt. But good inventory management at different supply chain level is important for efficient distribution and delivery. There are often several tiers between National level medical stores and health centres in holding inventory and handling orders from lower levels resulting in high stock levels, involving higher labour to process orders, and leading to high inventory costs and numerous logistical tasks for health workers. [8]

According to research done in Nigeria by (Transaid 2010), [21] bad planning and forecasting, limited information and details about consumption and current stock levels, funding and capacity constraints and a poor infrastructure are reasons for inappropriate stock levels. [21] It was found that Nigerian Public warehouse infrastructure consisted of National level medical store, district level medical stores and Health Centres, whereas challenges increase further down the supply chain.

In Nigeria the number of National level medical stores which faced challenges of leaking ceilings, mroofs, drains or taps, inappropriate capacity for cold storage was 8. [11] and the warehoused which is not having designated areas for receiving, delivering and separating medicinal products. However, special storage area for dangerous and narcotic medicine was available. There were medicinal products that required cold storage and stores were protected from direct sunshine. The study also found that manual system was used for management of Stock using stock holding cards and followed the first-expired-first-out (FE-FO) system of dispatching stock. [11]

2.2.1 System for inventory practices

Inventory Management forms is necessary to collect information from the stores such as consumption data stock level to identify successes and efficiency constraints. [21] Data collection in store management and inventory practices comprises stock levels, actual consumption, need, adjustments and losses information all these information is important for decision making and planning resupply. Approaches that are Paper-based do not necessitate implementation of expensive software. However, paper-based systems cannot be able to calculate updated data about consumption. Furthermore, the costs of labour is expensive due to the data quantity to be surveyed on higher levels. A research conducted by WHO found that most countries of sub-Sahara are using Logistical Management Information Systems to improve order fulfillment, to reduce lead times and to make standard of reporting forms (Bossert et al., 2007). [22]

According to (W.H.O 2007), [9] dispersal of pharmaceutical drugs is critical in ensuring effectiveness in any healthcare facility. The availability of the right drugs in the right quantities at the right time is facilitated by an efficient drug distribution system which subsequently improves the quality of the services.

2.2.2 Inventory Management Techniques of Medicines

Monica B et al. (2015) [20] in their study evaluation of Pharmaceutical Store and Inventory Management in Rural Public Health Facilities in India found that the pharmaceutical commodities management in all the health facilities(PHCs) are on a comparable stand. Found available were the Medicines conscripted in the essential drug list. It was found that, there was practice of settling commodities receipts with interchange of provisions and issuing with the other health facilities. (Monica B. 2015) [20], further explained movement of stock was documented using Bin cards and stock ledgers book in the health facilities targeted. Bin cards are using for recording all the information about the product. A documenter of bin card document batch numbers for stock removed for consumption or restocked.

Monica B et al. (2015) [20] in their study in India further found that Stock ledgers were kept to register all the specification of each product with differing batch numbers provided to the health facilities or store. Preservation of ledger records represented a constant inventory system, as it traced and tracked the most recent the number of stock in hand. Monica et al. (2015) [20] detected that no systematize formulas were applied to calculate reordering frequency, safety stock or reordering quantity. Cases of stock out remained the same in most of the PHCs. Due to unobtainability of need medicines the patients were mandatory to buy medicines from domestic pharmacies, rising expenditure.

2.2.3 Inventory Management policies

According to the World Health Organization (WHO), a proper functioning healthcare system requires a strong financing mechanism; a well-trained and adequately paid workforce; reliable information and policies on which decisions could be based and well maintained facilities and logistics to deliver quality medicines and technologies.

In, Kenya Health policy strategic plan (2014 – 2030) states that the Kenyan government through the ministry of health works closely with the public health facilities in Kenya to ensure that there is timely goods and services delivery which in turn results into quality health care provision.

(Bowersox, Closs and Cooper 2002) [23], have acknowledged four policies in assessment of the management of inventory. An inventory control is the administrative procedure for implementing an inventory policy. The liability aspect of control measures units on hand at a specific location and tracks additions and deletions. Liability and tracking are performed on a manual or computerized basis. [23]

Inventory control defines how often inventory levels are reviewed to determine when or how much to order. It is performed on either a long-lasting or a period basis. Clodfelter (2003: 278) [24] added that the control system allows you to determine mistakes that have been made or identify areas that need your immediate attention. According to Francis .M (2005) [25], there should be timely information on the system for controlling inventory for decisions to be made while correction of problems is taking place.

2.2.4 Inventory Practice

Margaret W. Njoroge (October 2015) [26] found that challenges facing public hospitals in Kenya ranged from implementing adequate inventory practices, insufficient funding from the government, poor infrastructure and lack of training for the health workers.

2.3 Staff capacity for storage management and inventory practices

According to the World Health Organization (2010) [27], however human resource still a challenge in the pharmaceutical sector. As the sector grows, there is need to have a mix of skills as opposed to the traditional pharmacy skills. Apart from the pharmacy skills, the personnel are also expected to be equipped with other skills such as regulatory, quality assurance and public policy issues. A study by Codeliver and Terevail (2012) [28], in Tanzania cited poor logistic skills as a factors contributing to hospitals drug stock outs.

A study carried out in Zimbabwean public health facilities, Job training, frequent supervisory visits and assistance of pharmacist's technicians in checking of stock records, management of stock, setting stock levels improved management of inventory. (Moloto, 2005) [29], management of supply by nurses under the supervision of pharmacy technicians, showed that the introduction of a record keeping system allowed for improved quantification resulting in more readily available pharmaceuticals.

A study on availability of essential medicines in Kenya's public hospitals by Mwathi & Ben (2014) [29], found out that among the factors that play a part in stock outs is the irrational use of medicins which is caused by insufficient training of the prescribers. According to Dorothy, Esther & Elizabeth (2015) [30] poor performance of Kenyatta National Hospital (KNH) is contributed by the fact that there is inadequate trained staff in the inventory department. Dorothy, Esther & Elizabeth (2015) [30], recommend, there is need to take the staff in the pharmacy department through inventory management training for quality service delivery in the hospital and hence improved performance.

In a study carried out in Mpumalanga, South Africa, it was found that the health worker engaged in supplies management are not following and register the process of stock activities on the stock cards. This included recording stock movement start from receiving the stock from orders placed, to the dispensing room. Upon receipt of an order from store the responsible health worker did not check the stock received to ensure it matched the invoices and the order they had placed. As a result, stock levels were not followed and is not up to date at these clinics. These two clinics were also the ones which according to their district pharmacists reported greater proportions of stock outs. [30]

A study in Pakistan to assess storage and dispensing of practices of government drug stores found that the drug stores were operating below standard which compromised storage conditions. 19.3% of the stores

met license requirements of competent staff. Only 12% of the staff were found to have diploma or degree, (Sayed S., 2012). [31]

According to the South Sudan Health Sector Development Plan 2005-2016, the shortage of human resources was enormous and the health work force had poorly trained low level professional and auxiliary staff and an absolute shortage of clinicians, Midwives, medical officers, Nurses and Pharmaceutical technicians existed. It was approximated that just 10% of the staffing norms are filled by appropriately trained health workers

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.0 Introduction

This section gives an outline of the research methodology that was used for the study. It comprises the research design, target population, data collection, sampling design, data analysis, measurement of validity and reliability and Ethical consideration.

3.1 Research design

A research design is the overall plan for gathering data in a research study (Brink, Van der Walt & Van Rensburg, 2012). [32] A descriptive survey was applied in determining the frequency with which the medicine store rooms and inventory management practices in selected health facilities in Juba answered the research questions. Questionnaires and interviewing were the tools used to collect the data.

3.2 Target Population

The target population for this study include one pharmacist and 11 store keepers and assistants, from Juba teaching hospital (2), Al Sabbah children hospital (1), Central medical store (1), Jubek medical store (1) and the 8 PHCU (8). All were selected from Juba because Juba City has most of the health facilities serving diverse population from the different ethnic groups and nationalities. The major focus of the study was health facilities with semi-autonomous storage and inventory management system. The targeted health centers were drawn from the Ministry of Health list for the purpose of sampling.

The 12 staff from the facilities were assessed using questionnaires regarding store and practices of managing inventory at the health facilities. This was because they have specific information about medicines storage and inventory practices. In addition, 4 store keepers and 1 pharmacist were interviewed using interview guide for their knowledge and capacity in inventory practice and management.

Lastly, observations were carried out in each of the facilities visited.

Type of Facility	Target population questionnaire	Target population interview
Hospitals (2)	2	2
Medical stores (2)	2	1
Primary health care center (8)	8	2
Total	12	5

3.3 Sampling Design

A purposive sampling design was used in the study. Purposive sampling was used to draw the 12 health facilities out of the total 19 health facilities in Juba City. The use of the purposive sampling design selected central medical store (CMS), Juba teaching hospital drug store, Al Sabah Children Hospital, Jubek State Pharmaceutical Department and 8 primary health care units in Juba City.

3.4 Data Collection

3.4.1 Data collection instrument

The study used three instruments for data collection. Namely questionnaire and interview guide and observation.

Questionnaire: The questionnaire was used to collect data by filling the answers out after reading out the questions to the respondents. The questionnaire comprised of two sections, namely section “A” which had questions about assessments of store rooms and section B which assessed inventory practices of the selected health centers and hospitals. The questionnaire is included in appendix I.

Interview guide: Interview guide collected information on knowledge of management of inventory in CMS, Malakia PHCU, Juba teaching hospital and Al Sabbah children hospital stores. The interview guide is attached in appendix II.

Observation: the researcher also used observation to assess the inventory and store management practices in the facilities

3.4.2 Data collection Procedure

The researcher obtained an authorization letter from the Ministry of health South Sudan. Authorization letter was presented to the administration of each health facilities and hospital to enable the researcher to interview the targeted respondents to collect the required data for purpose of the study. The researcher then approached the purposively selected respondents. Questionnaires and interview guides were presented to the respondents to answer the questions relevant to the research.

3.5 Data Analysis

Data collected using questionnaire was edited, coded and entered into SPSS 20. Descriptive statistics were used to explain the study objectives. Descriptive statistics was presented with the tables and graphs and narrative analysis was also used to explain the qualitative results of the survey.

Recorded Data collected using interviewing was sorted, edited and analyzed. To capture the expression of the interviewees, the information was later summarized in a narrative form to illustrate major findings. This helped the researcher to compare with the responses from the general questionnaire survey so as to arrive at informed analysis and conclusions about the subject of the study.

3.6 Measurement of Validity and Reliability

Validity is the degree to which results obtained from the analysis of a data actually represented the phenomena under study (Winter 2000). [33]

Reliability is the degree to which an assessment tool produces stable and consistent results (Colin P. and Julie W 2005). [34]

To ensure the validity and reliability of the data collection instruments; the questionnaire and interview guide was developed under close supervision of the researcher's supervisor from the school of Public health, University of Rwanda. Questionnaires and interview guide underwent several corrections before being proved suitable.

3.7 ETHICAL COSIDERATION

The information that the respondents provided was treated confidentially at the highest order and was used only to serve academic purpose. The researcher made sure that the anonymity and confidentiality of

the respondent was maintained. This was through ensuring that the name of the health facility and respondents did not appear in the questionnaire. An official authorization was sought by the researcher from ministry of health South Sudan to carry out data collection in the targeted hospitals and health facilities. The researcher ensured that the administration of each hospital and health facilities was approached before any data collection started.

CHAPTER FOUR

RESEARCH FINDINGS PRESENTATIONS AND DISCUSSIONS

4.0 Introduction

This chapter covers a detailed presentation and discussion of research findings relating to the study objectives based on assessment of stores and inventory management systems of health facilities in South Sudan. Data was analyzed using SPSS and excel to generate tables that helped to interpret the results of the study.

4.1 Response Rate

The target population for the study was 12 respondents who are pharmacists and store keepers in health facilities South Sudan. The total questionnaires filled by the researcher was 12. The response rate is 100%. 12 observation guides were also used to collect information. Four interviews were done to assess knowledge of the store keepers on inventory management.

4.2 Assessment of Store room

Table 1: Results showing the good store room conditions at the Hospital and CMS and Poor in the PHC

		Hospital		CMS		PHC	
		Yes %	No %	Yes %	No %	Yes %	No %
1	is the store room for the medicines having enough space for storage	50.0%	50.0%	100.0%	0.0%	25.0%	75.0%
2	There is adequate storage equipment	0.0%	100.0%	100.0%	0.0%	0.0%	100.0%
3	Drug products are protected from sunlight	100.0%	0.0%	100.0%	0.0%	50.0%	50.0%
4	Products stored in a systematic way (in alphabetical order, systematic)	100.0%	0.0%	100.0%	0.0%	62.5%	37.5%
5	There are windows in storage area that can be opened	50.0%	50.0%	50.0%	50.0%	75.0%	25.0%
6	windows have curtains and are secured with grills	100.0%	0.0%	50.0%	50.0%	37.5%	62.5%
7	Store ceiling is in good condition without any dampness	100.0%	0.0%	100.0%	0.0%	25.0%	75.0%
8	Air is moving freely in the store; fans and screens are in good condition	50.0%	50.0%	100.0%	0.0%	37.5%	62.5%
9	There are proper fire prevention and extinguishing equipment present	100.0%	0.0%	100.0%	0.0%	25.0%	75.0%
10	Store is kept locked at all times when not in use	100.0%	0.0%	100.0%	0.0%	75.0%	25.0%
11	Adequate security measure to avoid theft	50.0%	50.0%	50.0%	50.0%	87.5%	12.5%
12	Doors with adequate locks and keys	100.0%	0.0%	100.0%	0.0%	75.0%	25.0%
13	is there proper lighting in the store room for the medicines all the time	100.0%	0.0%	100.0%	0.0%	37.5%	62.5%
14	is the store room for medicines well ventilated	100.0%	0.0%	100.0%	0.0%	25.0%	75.0%
15	there is a method to monitor temperature	50.0%	50.0%	100.0%	0.0%	25.0%	75.0%
16	Dispensing is not done from the main warehouse	100.0%	0.0%	100.0%	0.0%	37.5%	62.5%
17	There is a cold chain maintained in storage	50.0%	50.0%	100.0%	0.0%	75.0%	25.0%
18	is there refrigerator and cold chain for storing temperature sensitive drugs	50.0%	50.0%	100.0%	0.0%	75.0%	25.0%
19	Store is free of pests (i.e cockroaches, rats, mice) with no sign of infestations	100.0%	0.0%	50.0%	50.0%	75.0%	25.0%
20	Store is tidy, shelves are dusted, floor is swept and walls are clean	100.0%	0.0%	50.0%	50.0%	62.5%	37.5%
21	Narcotic and psychotropic substances are stocked in separate double locked storage space	50.0%	50.0%	50.0%	50.0%	0.0%	100.0%

In table 1 above, the hospitals were found to have excellent store room management in protection of drugs from sun light, good arrangement of products in alphabetical order, windows secured with curtains and grills, good store ceiling condition that had no dampness. There was also proper fire prevention and extinguishing equipment in place. The stores were found to be locked at all times with adequate locks and keys when not in use. The lighting and ventilation in the store rooms of the hospitals were found to be good. The researcher found the store rooms tidy with shelves dusted, floors swept and walls clean with no signs of infestation of pests as reported by the pharmacists.

In the CMS, finding in table 1 above shows that good store room condition that scored 100% each in the Central medical stores and Jubek State Pharmaceutical Department of Juba. The scores reveal that the store room for the medicines have enough space for storage, there was adequate storage equipment at the medical stores, medicines were protected from direct sunlight, Products were stored according to alphabetical order, or systematic, the ceiling was in good condition without any dampness, There are proper fire prevention equipment present in the place, Store is always closed all the times while not in use with adequate locks on the doors, there was proper lighting and ventilation in the store room for the medicines all the time and there was a method to monitor temperature in the stores. There is a refrigerator for storing temperature sensitive medicines.

In the PHCs, there was poor and average store room conditions in the PHCs assessed. A score of less than 50% “Yes” is a poor practice while a score of 50% “yes” is an average practice. Poor store conditions include store rooms not having enough space, inadequate storage equipment’s, windows not well secured with curtains and grills, the ceiling condition not good, ventilation not good (air not moving freely), no proper fire extinguishing equipment’s, lighting is not good, there is not proper method to monitor temperature.

Table 2: Results showing excellent inventory and storage management in the hospitals and CMS and average in the PHCs.

		Hospital		CMS		PHC	
		Yes %	No %	Yes %	No %	Yes %	No %
1	Pharmacist is responsible for stocking and receiving medicines	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
2	stock cards exist for each item in the store	100.0%	0.0%	100.0%	0.0%	62.5%	37.5%
3	stock card kept on the same shelf as the item	100.0%	0.0%	100.0%	0.0%	62.5%	37.5%
4	Drugs requisition by various departments are recorded	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
5	Traceability of batches is assured	50.0%	50.0%	100.0%	0.0%	25.0%	50.0%
6	Do you use the following stock keeping forms to manage health products in this facility	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
A	Stock card/bin card/inventory control	50.0%	0.0%	50.0%	50.0%	87.5%	12.5%
B	Bin card	50.0%	0.0%	100.0%	0.0%	0.0%	87.5%
C	Stock ledger	50.0%	0.0%	50.0%	50.0%	12.5%	75.0%
7	Do logistic information management system report forms include the following	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
A	stock on hand	100.0%	0.0%	100.0%	0.0%	75.0%	25.0%
B	Quantities used	100.0%	0.0%	100.0%	0.0%	75.0%	25.0%
C	losses and adjustments	100.0%	0.0%	100.0%	0.0%	75.0%	25.0%
8	Does the health care maintain minimum stock level of drugs in the store	0.0%	100.0%	50.0%	50.0%	75.0%	25.0%
9	Does the health facility dispatch stock based on the following	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
A	First in First out (FIFO)	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
B	Last in Last out (LIFO)	0.0%	50.0%	100.0%	0.0%	87.5%	0.0%
10	is physical count made at regular intervals (at least once a month) and regularly in the health facility	50.0%	50.0%	100.0%	0.0%	37.5%	62.5%
11	Monitoring stock levels, stock quantities and safety stocks	0.0%	100.0%	100.0%	0.0%	37.5%	62.5%

In the hospitals assessed, table 2 above shows that hospitals had good inventory management practices. The inventory and store rooms management practices in the hospitals assessed pharmacists were responsible for stocking and receiving medicines, stock cards existed for each item in the store, stock cards were kept on the same shelves as the items, drugs requisitions by the various departments were recorded, including all the logistic management, and the hospitals dispatched stock based on First In First Out.

In the CMS, table above shows good inventory and store room management practices in the medical stores assessed, all scored 100%. In the medical stores, Pharmacist and store controller are responsible for stocking and receiving medicines, stock cards exist for each item in the store, stock card were kept on the same shelf as the item, Drugs requisition by various departments are recorded, Traceability of batches is assured, there was availability of bin card stock keeping forms to manage health products, information management system report forms included inventory good on hand, quantities used forms and losses and adjustments forms, stock health dispatch was done according to FIFO and LIFO. Physical count is done regularly at least once a month and there is monitoring of stock levels, stock quantities and safety stocks in the medical stores.

In the PHCs, overall result shows average inventory management. The store keepers or the assistant pharmacist, nurse his duty is to receiving medicines and stoking, stock cards exist and is preserved on the same place on the shelf as the product, Drugs requisition by various departments are recorded, stock card/bin card/inventory control forms to manage health products are available, information management system report forms include losses and adjustments, stock on hand and quantities used forms, the health care maintains minimum stock level of drugs in the store, stock health dispatch is according to FIFO and LIFO.

Table 3: Results showing Expiry drugs management practices in the hospitals, CMS and PHCs were good

		Hospital		CMS		PHC	
		Yes %	No %	Yes %	No %	Yes %	No %
1	Do you have a record for expired drugs in the facility	100.0%	0.0%	100.0%	0.0%	87.5%	12.5%
2	Are the expired drugs in the health facility stored separately from the unexpired drugs	100.0%	0.0%	100.0%	0.0%	75.0%	12.5%
3	is there any set procedure for disposal of expired drugs in the facility	0.0%	100.0%	100.0%	0.0%	62.5%	37.5%
4	Are there bold expiry labels on all the drugs	50.0%	50.0%	100.0%	0.0%	62.5%	25.0%

In the hospitals finding in figure 2 above shows good expiry management practices in the hospitals and CMS than in the PHCs which include; good record for expired drugs in the hospitals assessed, separate storage of unexpired drugs from expired drugs were done well in the hospitals assessed. There were average store room practices that include; availability of expiry drugs labels in 50% of the hospitals assessed. Procedures for disposal of expired drugs in the hospitals was found to be poor.

Table 4: Good inventory and store area management practices from observation made in Hospitals, CMS and PHCs.

		Hospital		CMS		PHC	
		Yes %	No %	Yes %	No %	Yes %	No %
	Medicines are classified on the shelves by dosage forms or therapeutic classification	100.0%	0.0%	100.0%	0.0%	75.0%	12.5%
	Tablets and other drug medicines (e.g. oral rehydration solution) are stored unopened and in airtight containers	50.0%	0.0%	100.0%	0.0%	37.5%	50.0%
	Supplies are arranged on the shelves in alphabetical order by generic name	100.0%	0.0%	50.0%	50.0%	62.5%	37.5%
	Items are grouped in quantities that are easy to count	100.0%	0.0%	100.0%	0.0%	87.5%	12.5%
	There are no expired medicines on the shelves	100.0%	0.0%	100.0%	0.0%	62.5%	0.0%
	Medicines with shorter expiry dates are placed in front of those with later expiry dates	50.0%	0.0%	100.0%	0.0%	75.0%	12.5%
	Expired and damaged medicines are quarantined and separated from items in the storage area	100.0%	0.0%	100.0%	0.0%	62.5%	25.0%
	Temperature sensitive items are stored in a refrigerator	100.0%	0.0%	100.0%	0.0%	62.5%	25.0%
	Supplies with an expiry date are stored according to First Expiry First Out (FEFO)	100.0%	0.0%	100.0%	0.0%	75.0%	0.0%
	Supplies with no expiry date are stored in the order in which they were received	100.0%	0.0%	100.0%	0.0%	62.5%	0.0%
	There are no damaged containers or package on the shelves	100.0%	0.0%	100.0%	0.0%	50.0%	25.0%
	No over stocked or obsolete items are on the shelves	100.0%	0.0%	50.0%	50.0%	50.0%	50.0%
	there is a stock card for each item in the storage area	100.0%	0.0%	50.0%	50.0%	62.5%	37.5%
	An information on stock card is up to date and accurate	50.0%	50.0%	50.0%	50.0%	25.0%	75.0%
	The stock card is kept on the same shelf as the item	50.0%	50.0%	50.0%	50.0%	75.0%	25.0%
	Information is recorded on the stock card at the time of stock movement	50.0%	50.0%	0.0%	100.0%	87.5%	12.5%
	there is an accurate running tally kept in the balance column	100.0%	0.0%	0.0%	100.0%	25.0%	62.5%
	A physical count is made at regular interval such as once a month (pike tow stock card randomly	0.0%	50.0%	0.0%	100.0%	25.0%	62.5%
	Facility is well maintained- no cracks, holes, or signs of water leakage	50.0%	50.0%	100.0%	0.0%	62.5%	37.5%
	Store ceiling is in good condition without any dampness	50.0%	50.0%	100.0%	0.0%	50.0%	50.0%

Table 4 above shows good inventory and store room management practices at the medical stores assessed through observation in the Central medical stores and the hospital that performed exceptionally well compared to the PHCUs. From the observation, Medicines are distributed on the shelves by dosage forms or therapeutic classification, Tablets and other medicines (e.g. oral rehydration solution) are stored in sealed and in un opened container , Items are assembled in quantities that are simple to count, There are no expired medicines on the shelves, Medicines with shorter half-life are arranged in front of those with later expiry date, Expired and damaged commodities are quarantined and separated from items in the storage area, Temperature reactive medicines are kept in a refrigerator, Supplies with an expiry date are stored according to First Expiry First Out (FEFO),There are no damaged containers or package on the shelves, Facility store area is well managed without any signs of water leakage, the condition of the ceiling is good, no cracks, holes.

Table 5: Similarities between Observation and Questionnaires

		Hospital		CMS		PHC	
		Questionnaire (yes)	Observation (yes)	Questionnaire (yes)	Observation (yes)	Questionnaire (yes)	Observation (yes)
1	Supplies are arranged on the shelves in alphabetical order by generic name	100.0%	100%	100%	50.0%	100%	75%
2	Medicines with shorter expiry dates are placed in front of those with later expiry dates	100.0%	50.0%	100%	100.0%	100%	75%
3	Expired and damaged medicines are quarantined and separated from items in the storage area	100.0%	100.0%	100%	50.0%	100%	62.5%
4	Temperature sensitive items are stored in a refrigerator	00	100 %	100%	100.0 %	75%	62.5
5	A physical count is made at regular interval such as once a month (pike tow stock card randomly	50	0%	100%	100.0%	37.5%	25%

The similarities between observation and self-assessment in the hospitals include; Supplies are arranged in alphabetical order, expired medicines are separated from unexpired items in the store, expired and damaged medicines are quarantined and separated from items in the storage area. However, the difference is that The similarities between observation and self-assessment in the hospitals include; Supplies are arranged in alphabetical order, supplies were stored in sequence in which they came in the stores (FIFO), expired and damaged medicines are quarantined and separated from items in the storage area.

Similarities in the Medical stores between observation and self-assessment include; Medicines that easily react to the temperature are stored in a refrigerator. First in First out and Last in Last out was used in dispatch of medicines. Expired and damaged medicines are quarantined and separated from items in the storage area.

However in the medical stores assessed, there was difference between self-assessment and observation assessment which include; Physical count is done regularly at least once a month from the self-assessment which differed from the observation made on the documents in which physical count was observed to be poor. In the self-assessment, Products were stored in a systematic way, which differs from the assessment made using observation in which products arrangement in alphabetical order was average.

In the PHCUs, similarities between self-assessment and observation assessment include; Sensitive items are kept in a refrigerator, Supplies with an expiry date are stored according to First Expiry First out (FEFO). Expired and deteriorated medicines are quarantined and separated from items in the storage area. Store ceiling condition was poor in 50% of the PHCs

Similarities in the Medical stores between observation and self-assessment include; Medicines that are sensitive to temperature are stored in a refrigerator. First in First out and last in Last out was used in dispatch of medicines. Expired and damaged medicines are quarantined and separated from items in the storage area.

However in the medical stores assessed, there was difference between self-assessment and observation assessment which include; separation of expired medicines from the unexpired at from the self-assessment 100% said that separation was done while from the observation assessment, which differed from the observation made separation is not done in 50% of the stores. In the self-assessment, Products were stored on the shelves in a systematic way (in alphabetical order, systematic) which is similar to the assessment made using observation.

In the PHCUs, similarities between self-assessment and observation assessment include; Sensitive items are stored in a refrigerator, supplies with an expiry date are stored according to First Expiry First out. Medicines which are damaged and expired were quarantined and separated from items in the storage area.

Table 6: Knowledge of respondents in regards to Education and training on store and inventory management

Education background		Fre.	% (5)	Remark
What is your background qualification	Pharmacist	1	20%	Good
	Registered Nurse	1	20%	Good
	primary certificate	1	20%	Poor
	secondary school certificate	2	40%	Poor
For how long have you worked in the pharmacy/medical store	11 years	1	20%	Good
	3 years	1	20%	Good
	41 years	1	20%	Good
	36 years	1	20%	Good
	Nine months	1	20%	Moderate
Training received				
Have you received any training on	No training	1	20%	Poor
	Yes, but the training are not related to my job (procurement)	1	20%	Moderate
	Yes, how to dispense drugs from store and pharmacy	2	40%	Good
	Yes, stock management	1	20%	Good
Did the training equip you to carry out your roles in medicine stock management	it helped a lot to carry out my work	2	40%	Good
	it helped a lot to organize my work	2	40%	Good
	No, because most of the courses are not relating	1	20	Poor

Table 6 above presents the finding on education and training of the store keepers on store and inventory management. Overall result indicates that there is good knowledge received by the store keepers from educational and training programs as shown above.

The interviewees said that they have good working experiences. Majority of the interviewees had working experiences of 3 years and above. The interviewees also said that there is training that they received on how to dispense drugs which is helpful to their job.

There was poor education knowledge from the interviewees. Of the store keepers interviewed, there was only one professional pharmacist. Majority had lower education level.

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATION

5.0 Introduction

The chapter covers discussion of the findings, based on the different objectives of the assessment of store and inventory management practices in health facilities of South Sudan and the results and conclusion.

The research main objective was assessment of storage conditions and inventory management practices for the medicines and its impact on medicines supply chain in South Sudan (Juba). The summary is based on each of the specific objectives of the study that include, To assess medicine store rooms and inventory management practices in selected health facilities in Juba. To assess the knowledge of the health workers working in the store and inventory management. To give recommendation to different stakeholders on how to improve storage of medicines and medical supplies. The summary discussed assessment based on the three levels of medical facilities which include; hospitals assessed, central medical stores assessed and Primary health care units assessed.

5.1 To assess medicine store rooms and inventory management practices in selected health facilities in Juba

The hospitals were found to have excellent store room management in protection of drugs from sun light, good arrangement of products in alphabetical order which is similar to the assessment made using observation in which it was observed that supplies are arranged in alphabetical order on the shelves, windows were secured with curtains and grills, good store ceiling condition assessed that had no dampness this differed from the results of the observation made were store ceiling condition in the hospital was average for it is right to say that store ceiling in one hospital was good and in another was not good. There was also proper fire prevention and extinguishing equipment in place. The stores were found to be locked at all times with adequate locks and keys when not in use. The lighting and ventilation in the store rooms of the hospitals were found to be good. The researcher found the store rooms tidy with shelves dusted, floors swept and walls clean with no signs of infestation of pests as reported by the pharmacists. This result backs up the report in Nigeria by the Federal Ministry of Health, (2010) [14] which reported that health centers are usually run with a good store condition, with good infrastructure regarding storage, ventilation and security.

Regarding inventory management practices in the hospitals, pharmacists were responsible for stocking and receiving medicines, stock cards existed for each and every product in the store, stock cards were kept on the same shelves as the items, drugs requisitions by the various departments were recorded, logistic management system report forms included quantities used, losses and adjustments, stock on hand forms and the hospitals dispatched stock based on First In First Out this is similar to the observation made by the researcher in which supplies were stored in the order in which they came in the stores (FIFO). Traceability of batches, use of stock keeping forms such as stock card, bin card, and stock ledger and the regular physical count of medicines stock at the hospitals assessed were average which differed from the result of the observation made in which physical count was poor. Expiry management practices which include; good record for expired drugs in the hospitals assessed, separate storage of unexpired drugs from expired drugs were done well in the hospitals assessed this is similar with the observation assessment made by the researcher in which expired and damaged medicines are quarantined and separated from items in the storage area.

However, there were average store room practices that include; availability of expiry drugs labels in 50% of the hospitals. There was inadequate storage equipment in the hospitals assessed. Poor practices were found in maintenance of minimum stock level of drugs in the store that was not being done and poor monitoring of stock levels, stock quantities and safety stock of medicines. Procedures for disposal of expired drugs in the hospitals was found to be poor assessed.

In the medical stores assessed there was excellent store room and inventory management practices. Regarding store room, store room for the medicines had enough space for storage, there was adequate storage equipment at the medical stores, medicines were protected from direct sunlight, and Products were stored in alphabetical order or systematic order. This slightly differs from the assessment made using observation in which products arrangement in alphabetical order was average. Ceiling was in good condition without any damage and this result similar to the assessment made using observation by the researcher in which it was excellent. There are proper fire prevention in the place presented by fire extinguishing ,the store is kept closed at all times when not in use with adequate locks on the doors, there was proper lighting and ventilation in the store room for the medicines all the time and there was a method to monitor temperature in the stores. There is a cold chain and refrigerator for storing temperature sensitive medicine this is similar to the assessment made using observation by the researcher in which items sensitive to temperature are stored in a refrigerator.

Regarding inventory management practices in the medical stores, Pharmacist or store controller is responsible for stocking and receiving the supplies, stock cards exist for each item in the store, stock card were kept on the same shelf as the item, Drugs requisition by various departments are recorded, Traceability of batches is assured, there was availability of bin card stock keeping forms to manage health products, information management system report forms included stock on hand, quantities used forms and losses and adjustments forms, stock health dispatch was done according to FIFO and LIFO this is similar with the results of the observation done using observation assessment in which First in First out and Last in last out was used. Physical count is done regularly at least once a month this differed from the observation made in which physical count was observed to be poor and there is monitoring of stock levels, stock quantities and safety stocks in the medical stores. A record for expired drugs in the facility was proper, there was separate storage of unexpired drugs from expired drugs were done well in the medical stores as assessed this is similar to the assessment made using observation in which expired and damaged medicines are quarantined and separated from items in the storage area. Availability of expiry drugs labels also scored well. Procedures for disposal of expired drugs in the hospitals was found to be also good.

However, in the medical stores, use of stock keeping forms such as stock card, bin card, and stock ledger were average. Average practices were found in maintenance of minimum stock level of drugs in the stores assessed. There was no poor store room and inventory management practices assessed in the medical stores.

In the PHCs' store rooms assessed, the best practice at the PHC is the availability of adequate security measure to avoid theft in the stores. Other good practices include; availability of cold chain and refrigerator for storing temperature sensitive drugs which is similar to the observation assessment made in which temperature sensitive items are stored in a refrigerator. The store room was tidy and there was no pests' infestations.

Regarding inventory management in most of the PHCs assessed, assistant Pharmacist, nurse is duty to run stocking and receiving medicines, stock cards existed for each item in the store, stock card is kept on the same shelf as the item, Drugs requisition by various departments are recorded, stock card/bin card/inventory control forms to manage health products are available, information management system report forms include stock on hand, quantities used forms and losses and adjustments forms, the health care maintains minimum stock level of drugs in the store, stock health dispatch is according to FIFO and LIFO this is similar to the observation assessment made by the researcher in which Supplies with an expiry date are stored according to First Expiry First Out (FEFO). A record for expired drugs in the facility existed, separate storage of unexpired drugs from expired drugs were found proper in the PHCUs assessed which is similar to the assessment made by the researcher in which expired and damaged medicines are quarantined and separated

In the storage area. Availability of expiry drugs labels also scored well. Procedures for disposal of expired drugs in the hospitals was found to be also good.

In the PHCs' however, store rooms were not having enough space, there was inadequate storage equipment's, windows were not well secured with curtains and grills, store ceiling were not in good condition which is similar from the observation assessment made in the PHCU by the researcher in which store ceiling condition was poor in 50% of the PHCUs, ventilation were not good (air not moving freely), there was no proper fire extinguishing equipment's, lighting was not good, there was no proper method to monitor temperature and narcotics and psychotropic substances were not stocked in separate double locked storage space in most of the Primary health care units assessed. Traceability of batches, use of stock keeping forms such as stock card, bin card, and stock ledger and the regular physical count of medicines stock and monitoring of stock levels, stock quantities and safety stock of medicines at the PHCUs assessed were poor. The lack of regular physical count is similar to the observation made in which 50% of the PHCUs did not conduct regular physical count.

5.2 To assess the knowledge of the health workers working in the store and inventory management.

In the hospitals assessed, over 66.6% of the store keepers knew their roles in the stores as to monitor flow of medicines and to receive medicines and check the stock card. The store keepers most often reviewed stock levels every month at least twice. Majority of the store keepers had a lot of experience of up to 36 years that is enough to perform their duties.

However there were not enough qualified staff in the hospitals as reported by 66.7% and there are no standard operating procedures in the hospitals stores as reported by 100% of the store keepers interviewed. The level of Education of the store keepers in the hospital's medical stores was low. Majority only completed secondary school. There was also poor training received by 66.7% of the store keepers only 33.3% received training on stock management that helped a lot to carry out work. This backs up the report of South Sudan Health Sector Development Plan 2005-2016 that estimated that just 10% of the staffing norms are filled by appropriately trained health workers.

In the central medical stores assessed, regarding general knowledge, the store keeper was knowledgeable about their roles as store keeper in overseeing incoming supply, the monitoring of stock levels at the store is done every month which is good. The store keeper in the CMS was well educated as a pharmacist with

Experience of 41 years and received training on how to dispense drugs which helped to organize work. This means that the CMS had knowledgeable store keeper

However, the calculation of stock is not being done due to use of push system, there are enough staff but not qualified in inventory management and there is no standard operating procedures in the medical store.

In the PHCs assessed, store keeper was knowledgeable about the roles as to request the drug and add buffer stock and to request in advance and according to the consumption. Stock level monitoring is done twice a day which is excellent. Stock level is calculated by using the amount that is issued and how many remain then subtract from the total sum. There are also enough qualified staff at the PHCs. The store keeper had good education background with good experience of 2 years and received training that helped in organizing work. This means that the store keeper in the PHC was knowledgeable in the duties entrusted.

However, there was no standard operating procedure in the PHCs store

5.3 Conclusion

In conclusion, store room conditions, practices of management of inventory and knowledge of the respondents on management of store and inventory varied in the different health facilities. Hospitals and Central medical stores exhibited good, average and poor inventory and store room management practices assessed through self-assessment and observation assessment by the researcher. There was a great similarity between the observation assessment and the self-assessment.

5.4 Recommendation to different stakeholders on how to improve storage of medicines and medical supplies

Based on the findings, the researcher recommends the following to be improved in storage of medicines and medical supplies.

To Ministry of Health: As reported by the respondents, Poorest practices include; responses that include, adequate store space, storage equipment's are inadequate in the medical facilities, no traceability of batches assured, physical count is not made at regular interval.

Regular supervision of health facilities should be made by the inspectors of ministry of health to ensure that stores and health facilities respect and adhere to set guidelines.

Ministry of health South Sudan should share the finding with the different stakeholder Health Pool Fund, Health link to improve the services provide to the people of south Sudan.

To the Health Facilities: Knowledge of the health workers in the facilities is moderate. Health facilities should request for training on inventory control from the ministry of health.

5.5 Limitations of the Study:

The research was conducted in only 11 out of the 19 health facilities and 1 Central Medical Store that are found in the vicinity of Juba City. This is not enough to generalize the result to the whole of South Sudan which has more than 19 health facilities located in Juba alone and others located in the up country towns.

There is very limited literature on storage and inventory management practices in South Sudan. This made the researcher to use literature from other countries.

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APPENDIX I: (QUESTIONNAIRE)

Consent Letter

Date: 7th August, 2019
Adut Jervase Manyuat
Nimule Hospital
+211912483337
djervase@yahoo.com

Dear participant:

My name is Adut Jervase am a pharmacist I am doing a research on **Assessment of Storage and Inventory practices Management to Improve supply Chain of Medicine in South Sudan (Jubek).**

The purpose of this study is to assess medicines storage condition and inventory practices in selected health facilities in Juba, South Sudan in order to ensure availability of quality medicines to the people to improve health services. The study is a requirement as a partial fulfillment for a master in Health supply chain management.

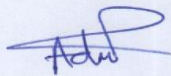
I am going to use, questionnaire, and structure interview and it will take one hour.

You may decline to answer any or all questions and you may terminate your involvement at any time if you choose.

Participant data will be kept confidential. Your responses to this project will be anonymous. Assigning code names/numbers for participants that will be used on all research notes and documents.

Your participation in this study is voluntary. If you decide to take part in this study, you will be asked to sign a consent form. After you sign the consent form, you are still free to withdraw at any time and without giving a reason.

Best regards



Researcher Adut Jervase
Contact: +211912483337

Hospital Code:

This questionnaire has been designed for the sole purpose of collecting data on Assessment of Storage and Inventory Practices to Improve Medicine Supply Chain in South Sudan. The data collected will be treated with a very high degree of confidentiality and it is meant for academic purpose only.

SECTION A: ASSESSEMENT OF MEDICINE STORE ROOMS

Please indicate the extent to which you agree with the following statements on the store room. Please tick **yes** if you agree or **No** if you don't agree.

S/N	Questions		
	Store room assessment	YES	NO
1.	Is the store room for the medicines having enough space for storage		
2.	There is adequate storage equipment.		
3.	Drug products are protected from direct sunlight.		
4.	Products stored in a systematic way (in alphabetical order, systemic)		
5.	There are windows in storage area that can be opened.		
6.	Windows have curtains and are secured with grills.		
7.	Store ceiling is in good condition without any dampness.		
8.	Air is moving freely in the store; fans and screens are in good condition.		
9.	There are proper fire prevention and extinguishing equipment present.		
10.	Store is kept locked at all times when not in use.		
11.	Adequate security measures to avoid theft.		
12.	Doors with adequate locks and keys.		
13.	Is there proper lighting in the store room for the medicines all the time.		
14.	Is the store room for medicines well ventilated		
15.	There is a method to monitor temperature.		
16.	Dispensing is not done from the main warehouse.		
17.	There is a cold chain maintained in storage.		
18.	Is there refrigerator and cold chain for storing temperature sensitive drugs		

19.	Store is free of pests (i.e. cockroaches, rats, mice) with no sign of infestations		
20.	Store is tidy. Shelves are dusted, floor is swept, and walls are clean.		
21.	Narcotic and psychotropic substances are stocked in a separate double-locked storage space.		

SECTION B: ASSESSEMENT OF INVENTORY MANAGEMENT PRACTICES

Please indicate the extent to which you agree with the following statements on the inventory management practices used.

S/N	Questions	YES	NO
	Stock management		
1	Pharmacist is responsible for stocking and receiving medicines		
2	Stock cards exist for each item in the store.		
3	Stock card kept on the same shelf as the item		
4	Drugs requisitioned by various departments are recorded		
5	Traceability of batches is assured.		
6	Do you use the following stock keeping forms to manage health products in this facility?		
a)	Stock card/bin card/ inventory control.		
b)	Bin card.		
c)	Stock ledger.		
7	Do Logistic Information Management System report forms include the following		
a)	Stock on hand		
b)	Quantities used.		
c)	Losses and adjustments.		
8	Does the health care maintain minimum stock level of Drugs in the store		
9	Does the health facility dispatch stock based on the following		
a)	First in first Out (FIFO)?		
b)	Last in Last Out (LIFO)?		
10	Is Physical count made at regular intervals (at least once a month) and regularly in the health facility?		
11	Monitoring stock levels, stock quantities, and safety stocks.		
12	Updating back-up file for computerized inventory control records.		
	Practice of Drugs Expiry management		
13	Do you have a record for expired drugs in the facility		
14	Are the expired drugs in the health facility stored separately from the unexpired drugs?		
15	Is there any set procedure for disposal of expired drugs in the facility?		
16	Are there bold expiry labels on all the drugs in the store?		

The End

APPENDIX II: (INTERVIEW GUIDE)

Section A: Interview on knowledge of store and inventory management

General questions

1. Can you please tell me about your role as the pharmacist/ store keeper in ensuring the availability of medicines at store?
2. How often do you check the stock levels at the store?
3. How is the stock level calculated?
4. Do you think there are enough people involved in the management of medicine stock? If yes or no, please explain.
5. Are there Standard Operating Procedures (SOP) in the store? Verify by asking for a copy of the guidelines

Education and experiences

7. What is your background qualification?
8. For how long have you worked in the pharmacy/medical store?

Training received

9. Have you received any specific training on?
 - a) Mentoring on inventory control
10. Did the training equip you to carry out roles in medicine stock management?
11. How often are you visited for supportive supervision by;
 - a) Central Medical stores
 - b) Ministry of Health

APPENDIX III: OBSERVATION GUIDE

Hospital Code:

This observation has been designed for the purpose of data collection in central Medical Store and Health Facilities stores.

S/N	Description		
1.	Medicines are classified on the shelves by dosage forms or therapeutic		
2.	Tablets and other drug medicines (e.g. oral rehydration solutions) are stored unopen and in airtight containers.		
3.	Supplies are arranged on the shelves in alphabetical order by generic name		
4.	Items are grouped in quantities that are easy to count		
5.	There are no expired medicines in the shelves.		
6.	Medicines with shorter expiry dates are placed in front of those with later expiry dates		
7.	Expired and damaged medicines are quarantined and separated from items in the storage area		
8.	Temperature sensitive items are stored in a refrigerator		
9.	Supplies with no expiry date are stored in according to first expired first out (FEFO)		
10.	Supplies with no expiry date are stored in the order they were received		
11.	There are no damaged containers or packages on the shelves		
12.	No over stocked or obsolete items are on the shelves		
13.	There is a stock card for each item in the store area		
14.	An information on stock card is up to date and accurate		
15.	The stock card is kept on the same shelf as the item		
16.	Information is recorded on the stock card at the time of stock movement		
17.	There is an accurate running tally kept in the balance column		
18.	A physical count is made at regular interval such as once a month		
19.	Facility is well maintained no cracks, holes or signs of water leakage		
20.	Store ceiling is in good condition without any dampness		