



*College of Medicine and Health Sciences
School of Public Health*

**AVAILABILITY OF HEALTH COMMODITIES FOR PUBLIC SECTOR IN RWANDA:
CASE STUDY OF MEDICAL PRODUCTION AND PROCUREMENT DIVISION, MPPD**

**A Dissertation submitted in partial fulfillment of the requirements for the Master's degree
in Science of Epidemiology, College of Medicine and Health Science
University of Rwanda**

By:

MAJORO Juvenal

Supervisor:

Ass. Prof. Manassé NZAYIRAMBAHO, Msc, PhD

December 2016

Excellence in Education and Service to the People

DECLARATION

This thesis is my original work and has not been presented for the award of a degree in any other academic institution.

Majoro Juvenal: PG 213004168 Date: 01 December 2016

This thesis has been submitted with the approval of my Supervisor:

Ass. Prof. Manassé NZAYIRAMBAHO, Msc, PhD Date: 01 December 2016

School of Public Health

College of Medicine and Health Sciences

University of Rwanda

ACKNOWLEDGMENTS

First, a very special and enormous thanks to my supervisor, Ass. Prof. Manassé NZAYIRAMBAHO, who generously gave his precious time and suggestions as well as putting me in the right track of the research. I would like to express my gratitude to the family of Jacques Cassier and Lidia Serina for moral and financial support to my studies at the College of Medicine and Health Sciences, University of Rwanda.

Sincere thanks also go to all the School of Public Health lecturers for their valuable academic inputs and especially to my colleagues at school for the support and encouragement that they have provided me along this path. I am grateful to all the people I meet especially MPPD staff who generously offered me their time during my field work.

Finally, I am forever indebted to my wife Verediane for her love, care, understanding, endless patience and constant encouragement when it was most needed.

MAJORO Juvenal

DEDICATION

I would to dedicate this work to my wife and children for their encouragement, understanding and moral support while carrying out the study.

ABSTRACT

INTRODUCTION

Medical Production and Procurement Division (MPPD) is the only public central medical store with mission to ensure the availability of health commodities for public health sector in Rwanda. To fulfill this mission MPPD has to perform successfully the supply chain processes through procurement, storage and distribution of health commodities to the public health institutions in the country. In Rwanda, the Supply Chain system is built in such way public health institutions are supposed to be supplied either straight by the central medical store or through the district pharmacies. In line with the above, the performance of the business process in MPPD has an impact to ensure uninterrupted availability of health commodities for public sector in Rwanda. To meet its goal of satisfying the customer's needs, MPPD should always ensure not only the availability of health commodities but also keep the order fill rate higher by improving internal procurement, storage and distribution processes. This study aims to explore the supply chain processes within MPPD as national central medical store and assess the issues related to timely availability of health commodities in order to provide more understanding of the problem and identify potential areas for improvement.

METHODS

During this descriptive cross-sectional study, qualitative methods were applied. In addition to a comprehensive document review on supply chain processes improvement, the information was gathered through interviews with MPPD staffs and key informants in the different operational units of the central medical store and its stakeholders.

The research participants were made up of various groups according to the operational units affecting functionality and MPPD business processes. Purposive sampling was used to select the key players vis-à-vis the subject under study. We have also interviewed other key informants from district pharmacies, Ministry of Health and Non-Government Organizations for whom we knew that they hold relevant information on MPPD functionality and availability related issues of health commodities in MPPD.

Then, the review of data, the thematic approach and SWOT analysis were conducted to better understand the supply chain processes performance of MPPD.

RESULTS

The findings of this study have shown that problems of the low availability of health commodities at MPPD is crucial and is more likely to affect the health system because it is not capable to satisfy the pharmaceutical needs for public sector in the country. The possible reasons of this problem are mainly the rigid and long procurement processes, warehousing capability issues including lack of reliable logistics data for quantification. Then, the results of our study have recommended a full business review of MPPD which advocate for the change MPPD current legal status. Further to that, this study has recommended other researches which could be extended to the entire supply chain system in Rwanda.

CONCLUSION

MPPD is facing a serious problem of low availability of health commodities and this situation impacts negatively on the national supply chain performance. To overcome this issue, some actions are recommended including review of legal framework of MPPD and the overall review of warehousing and inventory management processes. This could contribute to the optimization of the effectiveness and efficiency during planning of country needs or when handling customer's requisitions or commands of health commodities.

TABLE OF CONTENTS

DECLARATION.....	i
ACKNOWLEDGMENTS	ii
DEDICATION.....	iii
ABSTRACT	iv
LIST OF TABLES.....	ix
LIST OF FIGURES	x
ABBREVIATIONS AND ACRONYMS.....	xi
I. INTRODUCTION.....	1
I.1 DEFINITION OF KEY SUPPLY CHAIN CONCEPTS OF THE CENTRAL MEDICAL STORE.....	2
I.1.1 HEALTH COMMODITIES.....	2
I.1.2 PROCUREMENT PROCESSES	2
I.1.3 STORAGE PROCESSES.....	3
I.1.4 DISTRIBUTION PROCESSES	3
I.1.5 ORDER FILL RATE AND SATISFACTION OF CUSTOMERS’ NEEDS	4
I.1.6 AVAILABILITY OF HEALTH COMMODITIES	4
I.2 BACKGROUND	5
I.3 PROBLEM STATEMENT	7
I.4 SUPPLY CHAIN NETWORK FOR HEALTH COMMODITIES IN PUBLIC HEALTH SECTOR IN RWANDA	9
I.5 RESEARCH QUESTIONS OF THE STUDY	10
I.6 STUDY JUSTIFICATION	10
I.7 LITERATURE REVIEW	11
I.7.1 ACCESS AND AVAILABILITY OF HEALTH COMMODITIES IN COUNTRIES WITH LIMITED REOURCES.....	12
I.7.2 PUBLIC PROCUREMENT OF HEALTH COMMODITIES IN DEVELOPING COUNTRIES.....	12
I.7.3 AVAILABILITY OF HEALTH COMMODITIES THROUGH CENTRAL MENDICAL STORE IN RWANDA	15
I.8 STUDY OBJECTIVES.....	16
I.8.1 MAIN OBJECTIVE.....	16

I.8.2	SPECIFIC OBJECTIVES	16
I.8.3	CONCEPTUAL FRAMEWORK.....	16
II.	RESEARCH METHODOLOGY	18
II.1	STUDY AREA DESCRIPTION	18
II.2	STUDY DESIGN.....	18
II.3	SPECIFIC OBJECTIVES ACHIEVEMENT	21
II.4	STUDY VARIABLES	21
II.5	ANALYSIS PLAN	23
II.6	STUDY POPULATION	23
II.7	SAMPLING TECHNIQUE	25
II.8	DISTRIBUTION OF RESEARCH PARTICIPANTS	25
II.9	STUDY TOOL.....	26
II.10	DATA COLLECTION	27
II.11	UTILIZATION OF FINDINGS.....	27
III.	RESULTS	28
III.1	CHARACTERISTICS OF RESPONDENTS.....	28
III.2	MAGNITUDE OF THE PROBLEM RELATED TO THE NON-AVAILABILITY OF HEALTH COMMODITIES IN MPPD	29
III.3	DESCRIPTION OF RECEIVING AND PHYSICAL INSPECTION, STORAGE AND DISTRIBUTION PROCESSES FOR HEALTH COMMODITIES IN MPPD.....	31
III.3.1	RECEIVING AND STORAGE OF HEALTH COMMODITIES IN MPPD	31
III.3.2	PHYSICAL INSPECTION OF HEALTH COMMODITIES ON ARRIVAL IN MPPD.....	33
III.3.3	DISTRIBUTION PROCESS OF HEALTH COMMODITIES IN MPPD.....	34
III.3.4	MANAGEMENT OF EXPIRY PRODUCTS IN MPPD	35
III.3.5	QUALITY ASSURANCE OF HEALTH COMMODITIES IN MPPD	36
III.4	REASONS BEHIND THE PROBLEM OF AVAILABILITY OF HEALTH COMMODITIES IN MPPD.....	37
III.4.1	LEGAL FRAMEWORK AND LACK OF FLEXIBILITY IN PROCUREMENT PROCESSES	37
III.4.2	LACK OF COLLABORATION AND DATA RELATED ISSUES	38
III.4.3	LACK OF LOCAL PHARMACEUTICAL PLANTS	39
III.4.4	DELAY OF TENDER AND APPROVAL PROCESSES	39
III.5	SWOT ANALYSIS.....	41

III.6	PROPOSED SOLUTIONS TO THE PROBLEM OF NON-AVAILABILITY OF HEALTH COMMODITIES IN MPPD	43
III.6.1	REVIEW OF LEGAL STATUS AND BUSINESS PROCESSES OF MPPD.....	43
III.6.2	INCREASED CAPACITY BUILDING FOR STAFF INVOLVED IN SUPPLY CHAIN PROCESSES IN MPPD.....	44
III.6.3	IMPROVED COLLABORATION AND COMMUNICATION BETWEEN OPERATIONAL UNITS	45
IV.	DISCUSSION.....	46
IV.1	MAGNITUDE OF THE PROBLEM OF HEALTH COMMODITY AVAILABILITY IN MPPD.....	46
IV.2	SUPPLY CHAIN PROCESSES AND RELATED ISSUES AFFECTING AVAILABILITY OF HEALTH COMMODITIES IN MPPD	46
IV.3	PROPOSITION OF SOLUTIONS TO ADDRESS NON-AVAILABILITY RELATED ISSUES IN MPPD	48
IV.4	LIMITATIONS OF THE STUDY.....	48
V.	CONCLUSION AND RECOMMENDATIONS.....	49
V.1	CONCLUSION.....	49
V.2	RECOMMENDATIONS	50
VI.	REFERENCES	51
VII.	APPENDICES	53
VII.1	APPENDICE 1: Interview guide.....	54
VII.2	APPENDICE 2: Consent form	58
VII.3	APPENDICE 3: Request for permission for data collection.....	62
VII.4	APPENDICE 4: Permission for data collection obtained from Division Manager of MPPD	62

LIST OF TABLES

Table 1: Distribution of participants to the research	26
Table 2: Characteristics of respondents	29
Table 3: Strengths, Weaknesses, opportunities and Threats of MPPD business processes	41

LIST OF FIGURES

Figure 1: Supply Chain Network for Health commodities in Rwanda..... 9

Figure 2: Conceptual Frame work of the study 17

ABBREVIATIONS AND ACRONYMS

CAME: Central d'Achat des Medicaments Essentiel

CHUK : Centre Hospitalier Universitaire de Kigali

CMS: Central Medical Store

CMST: Central Medical Stores Trust

CPDS: Coordinated Procurement and Distribution System

DP: District Pharmacy

FEFO: First Expiry First Out

GMP: Good Manufacture Practice

HIV: Human Immuno Deficiency Virus

IRB: Institutional Review Board

JMS: Joint Medical Store

LMIS: Logistics Management Information System

MCCH: Maternal Community and Child Health

MOH: Ministry of Health

MPPD: Medical Production and Procurement Division

MSD: Medical Store Department

NGO: Non-Governmental Organization

NMS: National Medical Store

PO: Purchase Order

QA: Quality Assurance

RBC: Rwanda Biomedical Center

RMS: Regional Medical Store

RPPA: Rwanda Public Procurement Authority

RRA: Rwanda Revenue Authority

SC: Supply Chain

SDP: Service Delivery Point

SOP: Standards Operation Procedures

SWOT: Strength, Weaknesses, Opportunities and Threats

TB: Tuberculosis

UCMB: Uganda Catholic Medical Bureau

UNFPA: United Nations Population Fund

UPMB: Uganda Protestant Medical Bureau

UR: University of Rwanda

USFDA: United States Food and Drug Administration

UTH-K: University Teaching Hospital-Kigali

WHO: World Health Organization

I. INTRODUCTION

The improved supply chain processes of a central medical store can contribute to the availability of health commodities in public health institutions in the country. In Rwanda, the Supply Chain system is built in such way public health institutions are supposed to be supplied either straight by the central medical store or through the district pharmacies. The public central medical store is Medical Production and Procurement Division (MPPD) which operates under Rwanda Biomedical Center (RBC) with mission to procure, store and distribute health commodities for public health system. MPPD is the primary supplier of pharmaceutical commodities, including generic essential medicines, medical supplies, and laboratory reagents. It is the only supplier in Rwanda that is authorized to import antiretroviral drugs(1). In case of lack of pharmaceutical products in the public sector, with the authorization of the Minister of Health, district pharmacies can purchase medicines from private medical stores or receive donations from non-governmental organizations(2). District pharmacies, in turn, are meant to distribute pharmaceutical commodities to district hospitals and health centers. In practice, referral hospitals procure some pharmaceutical commodities from MPDD, but also rely heavily on private suppliers, including the Office for the Not-for-profit Medical Facilities in Rwanda(1). In line with the above, the business process performance of MPPD has an impact to ensure an interrupted availability of health commodities for public sector in Rwanda. To meet its goal of satisfying the customer's needs, MPPD should always ensure not only the availability of health commodities but also keep the order fill rate higher by improving internal procurement, storage and distribution processes. According to the information from some sources, MPPD is experiencing stock out on one side and over stock of health commodities resulting in the expiries or losses on the other side. However, any formal study has been conducted to evaluate the performance of MPPD's supply chain processes. The aim of this study was to fill in this gap and to propose concrete actions points to improve the availability of health commodities for public sector in Rwanda.

I.1 DEFINITION OF KEY SUPPLY CHAIN CONCEPTS OF THE CENTRAL MEDICAL STORE

I.1.1 HEALTH COMMODITIES

By health commodities we refer to any medical products including essential medicines, medical consumables, laboratory related health products and medical equipment. For each category of health facility, the WHO pre-defines the list of appropriate health commodities to be managed there. Then, the central medical stores have to ensure the full availability at least of the health commodities recommended on WHOlist.

I.1.2 PROCUREMENT PROCESSES

The Pharmaceutical procurement system is a major determinant of drug availability and total health costs. An effective procurement process ensures the availability of the right drug in the right quantities at reasonable prices, and at recognized standards of quality(3).

MPPD is the only public institution with core mission to procure the essential medicines and medical equipment for public health institutions in Rwanda. To achieve this goal, MPPD is required to pass through public procurement procedures in order to ensure availability of health commodities.

In low-income countries, the procurement process is often constrained by limited human resources, inadequate financing, an absence of information on prices and suppliers, a lack of awareness of government and donor regulations, overlapping systems, and unsynchronized or outdated rules and guidelines. These constraints can contribute to delayed shipments, high prices, and, ultimately, reduced access to essential medicines for consumers(4).

Various reports show that MPPD has problem to align the procurement of health commodities with existing public procurement procedures and ensure uninterrupted availability of health commodities for public sector. This study aims to assess the identify the issues related to the

procurement processes of MPPD and propose solutions to improve the availability of health commodities.

I.1.3 STORAGE PROCESSES

The storage is a key function of warehouse management. The storage capacity should allow orderly storage of the various categories of health commodities, namely products in quarantine, released, rejected, returned or recalled products. In MPPD, the storage capacity is one of components for which processes should be improved as much as possible in order to improve the availability of health commodities to the customers. Unperformed storage processes can affect not only the distribution of health commodities but also the increase of expiry products could happen in warehouse. The warehousing is a key element of pharmaceutical supply chain management. It ensures the constant availability and flow of essential quality health commodities, in appropriate quantities, in a timely and cost-efficient manner, through the supply chain system(5).MPPD storage processes are mostly affected by the insufficient warehouse storage spaces which can of course occur other receiving and distribution issues.

I.1.4 DISTRIBUTION PROCESSES

A well-run distribution system should maintain a constant supply of health commodities, store them in good condition, minimize losses due to spoilage and expiry, rationalize the storage points, use available transport efficiently, reduce theft and fraud, and provide information for forecasting pharmaceutical needs(6). The efficiency in distribution process requires sufficient equipment for transport, sufficient distribution area and staff for distribution should be sufficient as well. The storage and distribution areas are still insufficient for the central medical store because MPPD is still renting additional warehouses for bulk stocks.

I.1.5 ORDER FILL RATE AND SATISFACTION OF CUSTOMERS' NEEDS

The order fulfillment process involves more than just filling orders. It includes all activities necessary to design a network and enable a firm to meet customer requests while minimizing the total delivered cost(7). The Order fill rate is defined as number of orders completely satisfied without substitution or back orders over the number of orders requested. Different reports show that the order fill rate for essential medicines supplied to district pharmacies from MPPD is still around 54percent. This situation means that over 40 percent of health commodities is not covered by the public sector which is a big gap because one can assume that it is fully covered by the private sector. It is not only about product but also about the quality of service and supply chain processes as well. Filling customers' orders efficiently and effectively is a crucial step in providing good customer service(8).

I.1.6 AVAILABILITY OF HEALTH COMMODITIES

Increased order fill rate at the central medical store is one of the indicators of availability of health commodities in health public sector. In fact, a basic range of health commodities should be available throughout the country. Even though, the availability of health commodities can be improved but, on the other hand the availability is frequently a problem in distant and populated rural areas. To solve this issue, the supply chain system in Rwanda is built in such way MPPD supplies health commodities to district pharmacies through active distribution. The district pharmacies have mandate to supply public health facilities within their catchment areas. However, the effectiveness of this system depends on the availability of health commodities at upper levels. If MPPD could increase the order fill rate at 85percent at least, we would assume that the health commodities would be available for public health sector in the country.

I.2 BACKGROUND

The central medical store of Rwanda is Medical Procurement and Production Division (MPPD) of the Rwanda Biomedical Center (RBC); it is tasked by the Ministry of Health (MOH) with the role of availing quality and cost effective drugs, medical equipment, laboratory commodities and medical supplies to the Rwandan people. According to health sector structure in Rwanda, the public institutions are supposed to get health commodities from MPPD. However, the National Supply Chain assessment conducted in 2013 highlighted that the warehousing capability and inventory management of MPPD were 52 percent and 41 percent at the health facility level which can also impact the availability of health commodities in public sector. Consequently, the public procurement and warehousing functions and processes of MPPD have shown some gaps over time that adversely impact operational efficiency and the availability of health commodities in public sector. The shortage of health commodities and medical supplies at national central medical store is a challenge facing many health systems in low and middle income countries. This contributes to the provision of poor quality health services and consequently to increase of number of deaths with the population.

In Tanzania, drug and medical supply availability at health facilities remain uncertain. Some assessments and drug tracking studies have reported poor availability of drugs and medical supplies, with the facilities at the lower level of the health system being more affected (9).

Most of time, the inefficiencies of a CMS may result from its model of functionality which can frustrate the stakeholders because they would seek to depend on the CMS's models or procedures to support the public health interventions in the country.

On the other hand, many reasons can be given to the dysfunctions found in CMS operations, including the interference with government institutions and lack of both operational management capacity and infrastructure resources or funding.

From 1970, the CMS of Uganda was responsible for procurement, storage, and distribution of all health commodities in the public health system in the country. In 1993, by an act of parliament, the government granted the CMS semi-autonomous status and renamed the National Medical Stores (NMS); however, its mandate did not change. Symptoms of CMS dysfunction included

frequent and prolonged stockouts of essential medicines at the national level. Later, it was created a joint medical store (JMS) having a full autonomous status and flexibility in procurement of health commodities(10).

Instead of depending on the NMS as the sole source of medicines for the non-profit sector, two faith-based organizations— Uganda Catholic Medical Bureau (UCMB) and Uganda Protestant Medical Bureau (UPMB)— formed the Joint Medical Store (JMS) in 1979 to procure and distribute health commodities to their SDPs. Although, initially, the JMS was only intended to supply health units belonging to the two bureaus, it evolved into an institution that supplies all SDPs in the country because of the unreliable service from the NMS(10).

Using its own procurement and distribution processes instead of the CMS's has enabled the JMS to have higher availability of commodities than the CMS (10).

The other sources of CMS inefficiencies can be linked to its protected status in healthcare procurement and poor accountability for performance results. The literature has shown many inefficiencies and outperformances linked either to internal warehouse operations or procurement procedures of the Central Medical Store for various countries.

In Sudan, an average of 12 percent failure rate is recorded during last six years for Central Medical store's samples of imported medicines which have been tested by the National Control Laboratory. In addition, 38 percent of the samples tested for approval failed the quality test in 2005(11).

The central medical store in Benin (CAME) lacked the storage capacity to handle the volume of products purchased by various healthcare service collaborators; as a result, poor stock management practices occurred (12).

In line with the above, many reasons have been given for the dysfunctions found in CMS operations, including the government's undue political interference; lack of both operational management capacity and infrastructure resources, including funding; the CMS' preferred and protected status in healthcare procurement; and poor accountability for performance results (10).

The literature shows that as governments improve their public health programs, they recognize the need to strengthen supply chains. Thus, the demand for technical assistance, training and research in the field of health management is increasing. A review of current Supply Chain

Management capacity revealed weaknesses in the skills required to quantify needs for health products; appropriately order, receive and store products; and accurately record inventories(13).

There is a need for improved access to health commodities through strengthened health system in public sector. Therefore, the challenges within the central medical store that prevent access to these health commodities have to be addressed. This study aims to explore the supply chain processes within MPPD as national central medical store and assess the issues related to timely availability of health commodities in order to provide more understanding of the problem and identify potential areas for improvement.

I.3 PROBLEM STATEMENT

An essential component of a robust health system is an effective public health supply chain management system which provides quality services and ensures timely availability of vital medicines and other public health commodities.

According to the literature and information from different sources, MPPD is experiencing stock out on one side and overstock of health commodities resulting in the expiries or losses on the other side. However, any formal study has been conducted on this situation, and this has raised our curiosity and interest to conduct a study which aim to determine the magnitude and the causes of that problem; then, propose some solutions which can be applied atMPPD to improve Supply Chain processes and ensure an interrupted availability of health commodities for publichealth.To run effectively, a public health supply chain requires to process efficiently every customer request and to fulfil properly related supply chain functions. In addition to that, the decision making processes should positively impact public health supplies availability and supply chain operations.

This study will focus on MPPD's areas of improvement for core warehouse management processes and thereafter design of alternative customized processes in line with international and marketable best practices. These areas include but not limited to: procurement, storage and distribution processes. The warehouse management area has also a critical party which is the receiving business function. The scope of this function includes physical inspection, unpacking and verifying incoming products before being entered into the warehouse system. Historically,

this has been a bottleneck process that has led to slow down of operations, or deviations from procedures in place to expedite MPPD business processes. Additionally, the historical organizational structure of MPPD has been fragmented with individual units focused on individual business area of the value chain and no one had end-to-end responsibility.

Another critical key area that requires improvement is the inventory management process because the current inventory management processes of MPPD do not support the organizational objectives and fall short of the Key Performance Indicators.

Furthermore, the current replenishment business operations are classified as more reactive other than prospective, leading to delays and inefficiencies. Therefore, the replenishment process becomes one of the critical business areas that require redesign and improvement.

This study will assess whether the improvement of supply chain processes within MPPD can be observed by ensuring a continuous measurement of MPPD performance for supply chain processes and quality of services in order to improve the availability of health commodities for public health sector.

According to Rwanda National Supply Chain Strategic Plan conducted in 2013, the order fill rate was 47% and on-time delivery 54 percent was from MPPD to the district pharmacies. From these statistical data, there is a big gap for MPPD as central medical store to satisfy the needs of its clients and ensure the availability of health commodities for public sector in the country.

After reviewing the existing Supply Chain related issues from different documentations, I realized that Supply Chain is not standardized, and the public health institutions have different ways of meeting their needs of health commodities, for the portion which is not covered by the central medical store. Looking at the above statistical data, I have been interested to investigate in deep and find out whether this stock out is associated to the supply chain processes within MPPD and whether this situation can affect the availability of health commodities in public sector.

Therefore, this study will discuss the causes of non-availability of health commodities in MPPD and will propose solutions for improving the performance of supply chain processes aiming to achieve uninterrupted availability of health commodities for public health sector.

I.4 SUPPLY CHAIN NETWORK FOR HEALTH COMMODITIES IN PUBLIC HEALTH SECTOR IN RWANDA

The supply chain system in Rwanda is designed by one central medical store which is Medical Procurement and Procurement Division (MPPD), thirty (30) district pharmacies, Referral and provincial hospitals, District Hospitals, then Health centers. Throughout active distribution system, the MPPD supplies health commodities to all district pharmacies which are mandated to supply also district hospitals, health centers and health posts as well. The referral hospitals supply themselves for some specific products but, they procure other health commodities from MPPD. The chart below describes the supply system of health commodities in Rwanda.

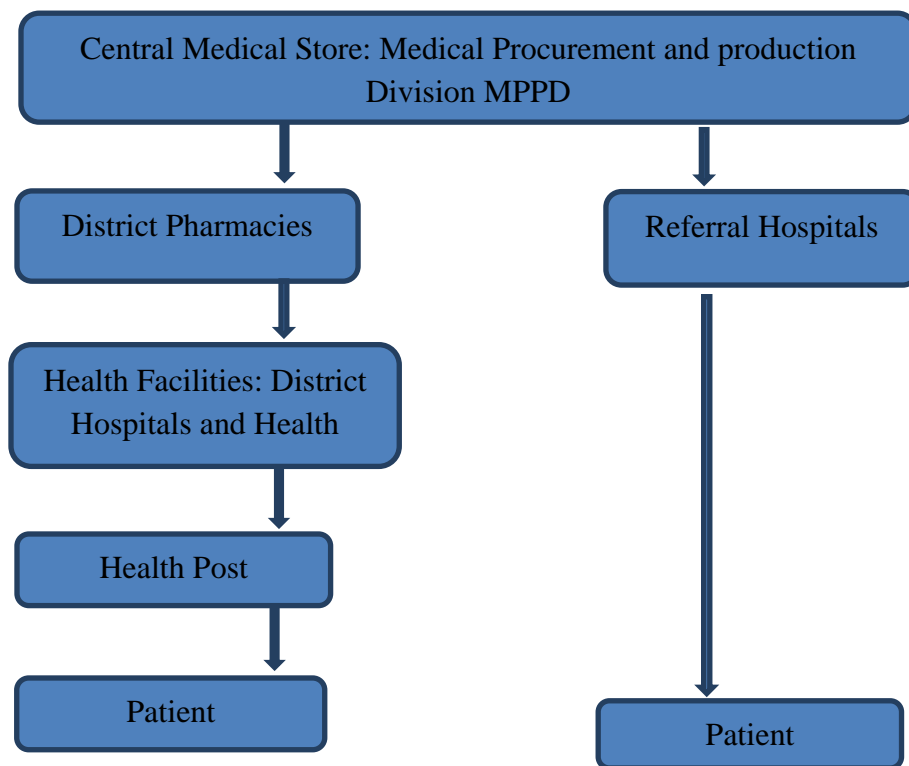


Figure 1: Supply Chain Network for Health commodities in Rwanda

I.5 RESEARCH QUESTIONS OF THE STUDY

The study aims at evaluating the factors affecting the efficiency of Supply Chain processes of MPPD and the availability health commodities for public sector with specific reference health system in Rwanda. In fact, our hypothesis is that the improved Supply Chain processes in MPPD may contribute to the availability of health commodities for public sector in Rwanda.

In line with the above, the following two main questions guided our data collection and analysis:

1. What is the magnitude of the issue of health commodities availability in MPPD?
2. What are the possible reasons of health commodity unavailability in MPPD?

The result from this study will help MPPD to improve performance and the availability of health commodities in the country.

I.6 STUDY JUSTIFICATION

The public institutions involved in supply system in Rwanda especially the district pharmacies are mainly supplied by MPPD as a public central medical store which has a mandate to procure, store and distribute health commodities in public sector. The district pharmacies have an intermediate role with the responsibilities to supply hospitals and other health facilities within their catchment area. When health commodities for public sector are not available at MPPD, the district pharmacies are obliged to request for approval from Ministry of Health before processing the procurement of missed items through private sector which does not necessarily put most emphasis on vital products because of prioritizing fast moving products. Obviously, the re-supply processes take longer when products are not found at MPPD; this process affects the availability of health commodities at the lower level of the supply chain system in Rwanda. The shortage of health commodities at MPPD has been attributed to various factors including unperformed supply chain processes including procurement related issues and the visibility of products under shipment process in pipeline. On the other hand, the poor performance of the central medical store for storage, inventory management, and distribution processes can hinder the timely availability of health commodities to its customers.

Coming back to MPPD, the assessment report of Medicine Quality Assurance in Rwanda conducted in 2009 has shown that even though the central medical store in Rwanda was provided with a computerized system for stock management of medicines, but the paper-based system was still active during this transition period(14). In addition to that, a visit to the central medical store warehouse revealed that there is room for further improvement in terms of storage practices and we believe that such improvement is still needed in order to streamline the CMS processes to ensure timely availability of health commodities in public sector(14).

In line with the above, we believe that there is need to assess whether MPPD supply chain processes affect the availability of health commodities in public sector. Then after, a business processes review is required in order to provide appropriate recommendations as contribution to the improvement of supply chain processes and availability of health commodities for public health institutions especially District Pharmacies which have mandate to supply both district hospitals and health centers.

The results of this study would be utilized by policy makers, developers, implementers and other stakeholders to identify area of intervention to review business processes and strengthen capacity building of MPPD so that it can increase the efficiency for uninterrupted availability of health commodities for public health sector. Moreover, documenting this aspect would contribute to further studies to improve supply chain system in Rwanda.

I.7 LITERATURE REVIEW

This part summarizes the literature review we went through during the research. The literature review was done in order to explore the documentation around the issue of health commodities availability in the country but elsewhere. It describes the access and availability of health commodities and the public procurement of health commodities in developing countries.

I.7.1 ACCESS AND AVAILABILITY OF HEALTH COMMODITIES IN COUNTRIES WITH LIMITED REOURCES

The available literature suggests that there is significant inequity in access to medicines in many resource-poor countries, propagated by inadequate public spending, a lack of or adequate health insurance coverage, poor availability of essential drugs, poor affordability and high Out of Pocket (OOP)expenditure(6).

The mean availability of essential medicines is lowest in the World Health Organization (WHO) Africa Region, followed by the WHO South East Asia Region, the regions which account for all but two of the least-developed countries of the world(15).

Although different national procurement models exist across developing countries, the provision of essential medicines to many of these populations relies heavily on public monies, international funding mechanisms and donor agencies (4). The mean availability of select medicines is also consistently lower in the public sector than in the private sector across all WHO regions (2). Actually, the median availability is still less than 60percent in Africa, South-East Asia and the Western Pacific(6). The public entities largely responsible for the procurement of essential medicines often lack the technical capacity to efficiently and strategically carry out the procurement process; inadequate planning and forecasting and the use of archaic methods of procurement contribute to high drug costs and commodity insecurity (4). The need for maximum efficiency and increased value-for-money in the public procurement of health commodities cannot be overstated in these resource-limited environments(15).

Studies have shown that from 30 percent to 46 percent of hospital expenses are invested in various logistical activities and that almost half of the costs associated with supply chain processes could be eliminated through the use of best practices (16).

I.7.2 PUBLIC PROCUREMENT OF HEALTH COMMODITIES IN DEVELOPING COUNTRIES

An interrupted availability of health commodities in public health institutions remain a challenge in sub Saharan African countries. To face these challenges, the WHO has recommended the

establishment of central medical stores (CMS) in low-income countries with mission to ensure availability and affordability of health commodities to the public health institutions.

The literature shows that the supply chains for essential medicines and health products in developing countries are complex networks, often with multiple different funding sources, procurement agents and warehousing and distribution plans for the different health commodities(15).

In most developing countries, the ministries of health and/or centralized government agencies (central medical stores) are largely responsible for the procurement, warehousing and distribution of medicines and health commodities(17).

However, the inability to procure medicines for distribution from the central medical stores (CMS) has also prompted some countries to decentralize drug procurement to lower levels of the distribution system. Providing some degree of autonomy in purchasing to the health facilities, district or regional medical stores increases the speed and flexibility of procurement but entails the loss of the price advantages from central procurement and makes it difficult to monitor quality (18).

It has been shown that many reasons have been given for the dysfunctions found in CMS operations, including the government's undue political interference; lack of both operational management capacity and infrastructure resources, including funding; the CMS' preferred and protected status in healthcare procurement; and poor accountability for performance results(10).

In the low-income countries, the central medical stores (CMS) usually the backbone of public health procurement, storage and distribution models; these CMSs have traditionally been completely government-owned enterprises; but, more recently, they have been given management autonomy, with government oversight(10).In most developed countries, there are a few privately owned national wholesalers who maintain a stock of the full range of pharmaceutical products from multiple manufacturers and distribute to clinics, hospitals and pharmacies(18).

Generally, the roles of the CMS have included the national procurement of healthcare commodities, storage and handling of inventory commodities, and distribution to various

sections of the national public health system; and, in some cases, the private-sector health system. However, most of them fail this mission because of various factors which lead to unavailability of health commodities for public sector.

As has been observed in many state-run services around the world, CMSs were characterized by inefficiency and poor performance. There is indisputable evidence that centralized CMSs in Africa have experienced serious problems with procurement, financial and logistics management, security, and storage. As with other public institutions, CMSs in Africa have failed to adapt to the increasing complexity of the global pharmaceutical market. Shortages of trained staff have been exacerbated by bureaucratic rigidity and poor incentives. In addition, there is evidence of corruption, lack of transparency, leakage, and rent-seeking in the system, which is frequently politically influenced(19).

On the other hand, the literature shows that the solutions for improving the performance of the CMS have included introducing autonomy, exposing them to the market, holding them accountable for their performance, and giving them residual claim on surpluses from its operations. These solutions continue the emphasis on the CMS and its management within a more public sector–based mindset(10).

Furthermore, when health commodities are stocked out at central medical store, it may contribute to a large number of challenges in health sector. In Malawi, where health facilities experience stock-outs of essential medicines, they may be available only at private providers. As a result, medicines are more expensive (and may be less available). Service users do not receive free essential medicines: they may be forced to use these private or informal providers or have to go without. Moreover, there appears to be significant district- level variation in terms of availability and cost of medicines, which results in inequity of service delivery(20).

An efficient public health supply chain performance is essential for assuring access to health supplies, and thus for positive health outcomes; this is particularly important in most countries in sub-Saharan Africa where large proportion of the population is served by the public and mission health sectors(21).

In Ghana, the average percentage days out of stock for 20 tracer medicines was also found to be greater than 50 percent at both the Central Medical Store(CMS) and Regional Medical Store

(RMS), which may partially explain the prevalence of private sector purchases at lower-levels(15).

The general stock availability and storage space within Medical Store Department (MSD) in Tanzania, has been historically problematic, and stock-outs were attributed to product delivery delays and insufficient forecasting by the MSD and its zonal stores (15).

The literature highlights that inadequate technical and contract management capacity was commonly cited as a weakness of national procurement systems and may serve as a more salient barrier to the use of strategic contracting practices within many developing countries(15). This weakness of procuring entities in developing countries appears as the main cause of stock out at central medical store level and has an adversely impact on the availability of health commodities in public sector institutions.

I.7.3 AVAILABILITY OF HEALTH COMMODITIES THROUGH CENTRAL MEDICAL STORE IN RWANDA

A study conducted in Sub Saharian Africa 5 countries including Rwanda has shown that the estimates of current availability for a sampled list of 32 medicines was 46.1 percent in public sector(22). This percentage means that there is a gap of 53.9 percent of unavailability of health commodities. The analysis of annual requests made by UTH-K (CHUK) to MPPD as central medical store indicated that MPPD availed only 44 percent, 65 percent and 33 percent of the requested items for the year 2012/2013, 2013/2014 and 2014/2015 respectively. This means that 67 percent of drugs and medical supplies needed in UTH-K for the year 2014-2015 were not availed, resulting in further delays for CHUK to obtain undelivered proportions(23).

Apart from the stock out at MPPD, the General Auditor report 2015 has shown the delays identified in submitting requests for replenishments and lengthy procurement process for drugs and medical supplies. According to the report, there were delays by the hospital to submit requests to MPPD for replenishment of drugs and medical supplies over last 3 years, with delays ranging from 5 to 7 months. These requests were sometimes submitted while there was no stock or the stock available could not serve for at least 6 months (minimum time required for procurement process at MPPD). Further analysis of procurement documents from MPPD

revealed that their procurement cycle sometimes exceeds 6 months, with delays ranging between 8 and 132 days in processing tenders of acquiring drugs and medical supplies(13).

I.8 STUDY OBJECTIVES

I.8.1 MAIN OBJECTIVE

Assess the supply chain processes performance of MPPD to ensure the availability of health commodities for public sector in Rwanda.

I.8.2 SPECIFIC OBJECTIVES

There are 4objectives of this study:

1. To determine the magnitude of the issue of health commodities availability in MPPD
2. To describe the receiving, warehousing and quality assurance processes for health commodities in MPPD
3. To identify the possible reasons ofhealth commodity unavailability in MPPD
4. To propose feasible improvements to the identified causes.

I.8.3 CONCEPTUAL FRAMEWORK

The conceptual framework of this study is based on the relationship between dependent and independent variables.This study aims to assess the relationship between the availability of health commodities in public health institutions and the procurement, storage and distribution processes of the MPPD.

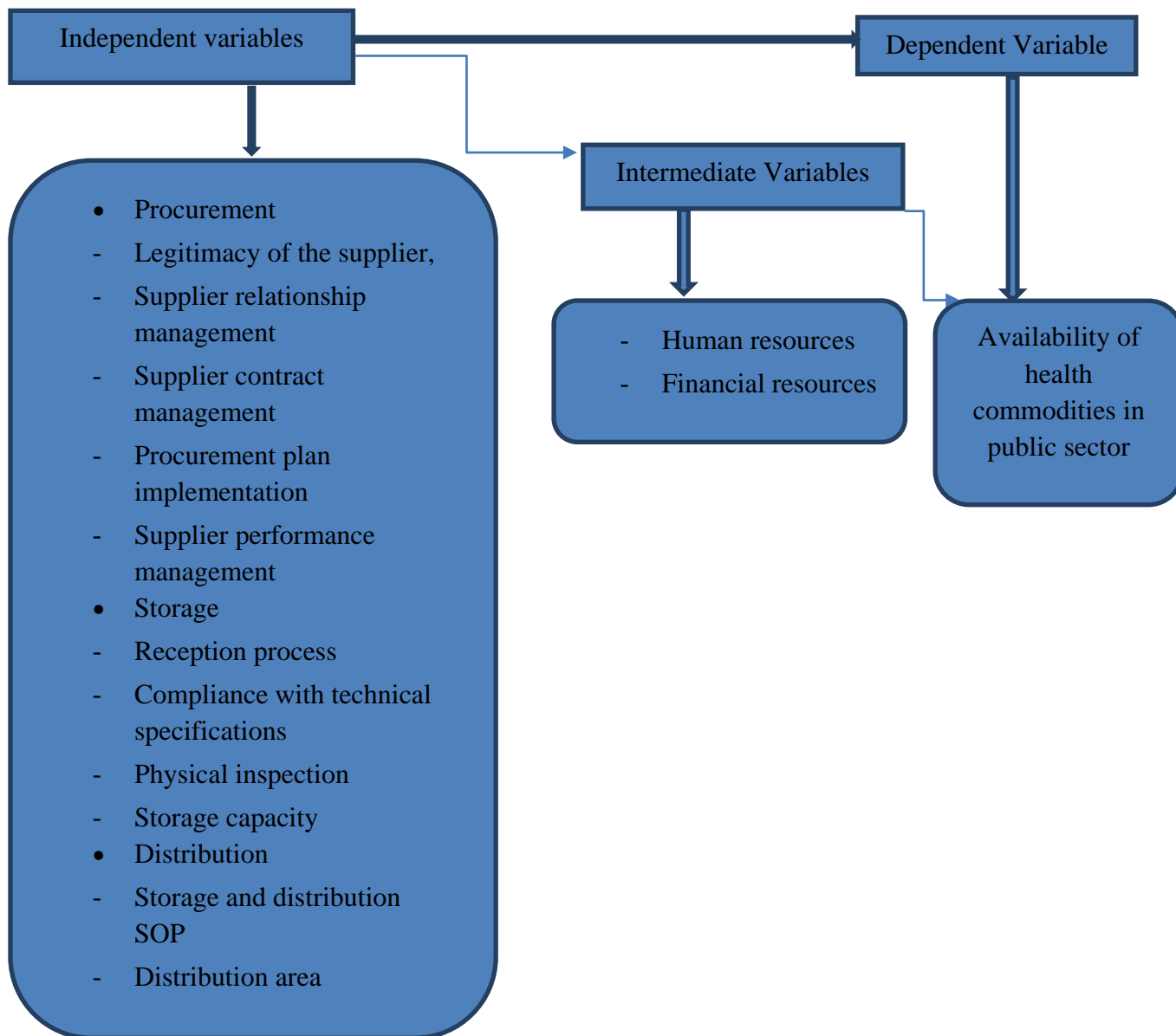


Figure 2: Conceptual Framework of the study

Therefore, this study consists of assessing the magnitude of the issue of unavailability of health commodities and propose feasible actions which can improve the MPPD supply chain processes, then assess whether improved supply chain processes of MPPD can contribute to the availability of health commodities for public health institutions in Rwanda.

II. RESEARCH METHODOLOGY

This chapter described the study area and provided details on the research design and process to achieve the specific objectives, description of study variables, identification of study population and sampling technique, research tool and data collection procedure, utilization of findings and ethical consideration during the study.

II.1 STUDY AREA DESCRIPTION

The study has been conducted in the Medical Procurement and Distribution Division (MPPD) which is a national procurement agency under the Rwanda Biomedical Center (RBC). The Ministry of Health of Rwanda has given a mission to MPPD to procure, store and distribute health commodities for public health institutions. Hence, MPPD is positioned at the upper level of the supply chain system in Rwanda. According to the normal supply chain system in Rwanda, MPPD procures, stores and distributes health commodities to district pharmacies which are also supposed to supply the lower levels of the health system. Our research participants were purposively selected among MPPD staff and we have reached them there in order to conduct interviews aiming to achieve our research objectives. However, we have interviewed other key informants for whom we thought they could help to achieve our objectives by providing key information on the supply chain processes within MPPD. The key informants included some District Pharmacy Directors as potential clients, MOH and RBC officials who oversee supply chain activities and MPPD performance to avail health commodities for the public sector. Then, we have interviewed also some Supply Chain advisors working with NGOs or development partners involved in the supply chain system in Rwanda.

II.2 STUDY DESIGN

This is a descriptive cross-sectional study in which qualitative methods were applied. A comprehensive document review on supply chain processes improvement was conducted.

The information was gathered through interviews with MPPD staffs and key informants in the different operational units of the central medical store and its stakeholders as well.

The qualitative data helped us to present and describe the supply chain related issues which hinder the availability of public health commodities in MPPD. We have also collected qualitative data on the causes of unavailability of public health commodities and propose possible solutions in line with supply chain processes performance in MPPD and improvement of availability of health commodities for public sector in Rwanda. The research participants were made up of various groups according to the operational units affecting functionality and MPPD business processes.

After review of documentation and exploration of the magnitude of the problem related to the unavailability of public health commodities, we have proceeded to the identification of key persons to interview on the supply chain processes which can affect the order fill rate in MPPD and the availability of health commodities for public sector in Rwanda.

Data collection was done using in-depth interviews but some participants preferred to answer interview questions using soft copy. For this category of participants, the interview guides and answers were exchanged through emails. Proceeding by one-on-one interviews, this technique helped us to optimize data collection on individuals' perspectives and experiences on the subject. The review of data, the thematic approach and SWOT analysis were conducted to further assess the issue and its main causes and recommend practical solutions. The SWOT analysis consisted of identifying among the answers from respondents the Strength, Weakness, Opportunities and Threats of MPPD vis-à-vis Supply Chain improvement and the availability of health commodities.

Purposive sampling was used to select the key respondents. We have conducted sampling according to key positions on MPPD structure starting by the staff with top positions involved in the decision-making processes, staff from intermediate positions or direct supervisors of supply chain operations. Then, we have extended the interview to the technical staff involved in a day to day transactions and operations. Depending on the position of MPPD staff, questions from our interview guide were addressed to key players in each unit including the staff in quality assurance unit; quantification unit; procurement Unit; warehouse unit, sales and marketing unit and staff from Finance Unit.

On the other hand, we have interviewed other key informants whom we knew that they hold relevant answers to the specific questions along our interview guide. Among them, we have identified three categories of key informants to focus on:

Main clients of MPPD for essential medicine which are mostly used in public sector: In line with our specific objectives, we have interviewed 3 district pharmacist directors; one from the Kigali area where MPPD is located and other one from remote area but closer to Kigali and the third one from remote area far from Kigali. Normally, the District pharmacies (DP) are the main clients of MPPD; The Ministry of Health instructs the DP to first procure health commodities from MPPD and process to private sector for only the products missed or stocked out in MPPD.

The top leaders from the Bodies having an oversight on the functionality of MPPD: As a public health institution, MPPD implements the Ministry of Health policy regarding the availability of health commodities for public sector. Based on that, we have interviewed some Ministry of Health Officials for whom we thought that they have key information on the public health commodities availability related issues and strategic actions to propose for improvement of supply chain processes in MPPD.

As the third category of key informants, our interview was directed also to MPPD stakeholders in supply chain system. As independent bodies, we believe that the Non-Government Organizations working closely with MPPD can provide relevant information on the current situation of availability of public health commodities and propose concrete solutions which can help to improve supply chain processes in MPPD and availability of public health commodities as well. We have interviewed WHO staff in charge to provide technical assistance to MPPD working on supply processes for nutrition commodities, then 1 staff from Partner in Health working as supply chain specialist.

For each group of participants, we have used interview guide designed to collect qualitative data, then we were asking open ended questions to people towards the saturation point.

II.3 SPECIFIC OBJECTIVES ACHIEVEMENT

The study has 4 specific objectives. The first objective is to determine the magnitude of the issue of health commodities availability in MPPD. This objective was achieved by providing details on the transactions and processes within each department. To achieve this objective, specific questions were included in the interview guide to be answered by MPPD staff on the flow of activities within the department. The key informants gave also their insight on the problem of health commodities availability for public health sector.

The second objective aims to provide detailed description of some key SC functionalities including receiving and physical inspection of incoming health commodities as well as storage and distribution processes in MPPD. Accordingly, the interview guide included open-ended questions which allowed the respondents to detail their opinions on processes went through in order to make sure that the incoming health commodities are ready and distributed appropriately.

The third objective is to identify the reasons behind the non-availability of health commodity in MPPD. The interview guide was distributed, and included questions aiming to know the causes of non-availability of health commodities in MPPD.

The fourth objective is to propose feasible improvements to the identified gap of non-availability of health commodities. Based to the standards procedures and norms of supply chain, this study came up with applicable recommendations to improve availability of health commodities in MPPD.

II.4 STUDY VARIABLES

The main outcome from this study is the availability of health commodities for public sector in Rwanda. Other variables of the study are linked to the supply chain operations of MPPD from different departments: Procurement, quantification, distribution, sales and marketing.

The interview guide was designed based on the main independent variables of our research. The main components of supply chain operations of MPPD are linked to the storage and distribution

transactions; and procurement which works most of time with finance especially when it comes to the management of contracts for internal and external customers.

Regarding the procurement processes, our study has focused on the legitimacy of suppliers/vendors in order to ensure traceability and confidence in the quality of pharmaceutical products. Then, we have interviewed staff on the quality aspect to make sure that MPPD receiving team processes the quality inspection on arrival using appropriate quality manual.

The storage process in a central medical store is preceded by the receiving. Normally, an appropriate receiving area should be designed and equipped to allow the cleaning of containers of incoming health commodities before storage.

The receiving and quality inspection teams of a central medical store should ensure that the incoming health commodities are checked for quantity, quality, damaged containers, type, conditions and expiry dates.

This study has also analyzed the storage capacity for the central medical store. The storage capacity should allow orderly storage of the various categories of products, namely products in quarantine, released, rejected, returned or recalled products. The security system should at least ensure the availability of minimum security equipment such as fire extinguishers, fire-fighting equipment, smoke detectors; fire alarm linked to the local fire brigade, and First Aid Box.

The floor areas: to assess whether they are sufficient and organized to facilitate adequate security, efficient flow of work and people, effective communication/supervision and optimum service delivery to clients.

Regarding the compliance to the technical specifications, the receiving team should always check incoming shipments using appropriate documentation and tool including packing lists, supplier invoices, copy of contract and purchase orders. Then, the receiving team should share the completed receipt forms with procurement and warehouse management teams.

Development and use of Standards Operations Procedures (SOPs) is a requirement for each section of central medical store. Receiving, inspection, return and other operations should normally be performed according to the internal SOPs.

The storage condition should be checked to ensure compliance with the labeling/package insert, which is based on the results of stability testing as specified by the manufacturer at each packaging material of product.

Regarding the efficiency in distribution process, we have asked questions aiming to assess the level of sufficiency for the transport equipment, the distribution area and the staff for distribution.

During the distribution process the missing products or products which are not yet recorded in the management system can affect the performance of the central medical store because it implies the manual delivery, or delay to process customer request waiting for goods in process in the system or delay for non-availability approval process.

II.5 ANALYSIS PLAN

Throughout interviews with MPPD selected staff and others key informants, the qualitative data was collected and captured using Ms Office packages. The thematic approach was used to analyze data and categorize the information gained. SWOT analysis was applied to evaluate the strengths, weaknesses, opportunities and threats of MPPD regarding the availability of health commodities for public sector in Rwanda.

II.6 STUDY POPULATION

In order to achieve the objectives of this study, the participants to the study were selected among MPPD staff. The identification and recruitment criteria of potential participants in the study were based on the role assigned to them within operational units in MPPD.

Quality Assurance Unit: The quality assurance is much involved in the receiving process of health commodities at MPPD. So, the readiness of staff from this unit can impact on the availability of commodities the management system of MPPD and/or district pharmacy as well.

Quantification Unit: The staff for quantification unit are much involved in gathering MPPD distribution data, make aggregation of needs and compile them to elaborate a procurement plan which should be implemented in order to avoid shortage or stock out.

Procurement Unit: The procurement staff was selected to participate in the study because they are involved in the implementation of the procurement plan and they are responsible of follow up of procurement processes which contribute very much to the availability of health commodities in MPPD.

Warehouse Unit: The performance in warehouse operations is key element for the availability of health commodities at both levels MPPD and public sector in general. The Warehouse staff should perform successfully all transactions of replenishment, picking, packing and dispatching health commodities in order to optimize the availability health products against the district pharmacy requests. Further to that the replenishment process from bulk warehouse to MPPD distribution warehouse should not delay because it can impact negatively the fulfillment of customers' orders.

Sales and marketing Unit: The sales and marketing staff is involved in handling customer needs and requests. The customer care team under sales and marketing unit is normally tasked to receive and validate the DPs requisition and orders. The staff under sales and marketing unit should then make sure every item requested is processed otherwise they may create picking lists with less number of items than what is available for distribution. The sales and marketing is a strategic unit which should always update not only the management team of MPPD on the products in risk of shortage but also the district pharmacies on the availability of health commodities needed for public health.

Finance unit: The finance unit contributes to the availability of health commodities because its staff is involved in handling suppliers' invoices for payment of supplied goods. They also manage the credits notes and payment status for district pharmacies which can also impact the availability of health commodities at MPPD or district pharmacy level.

The recruitment methods of participants were:

- Identification of targeted units or services;
- Review of lists of staff and organogram chart of the targeted units and the in charge or potential actors involved in MPPD supply chain processes;
- Review of keys transactions and processes which influence customers' orders and requisition satisfaction.

II.7 SAMPLING TECHNIQUE

The purposive sampling method was used because we believe it would be an appropriate approach for data collection. Purposeful sampling means that we have intentionally selected participants among MPPD staff who have experience of working on procurement, storage and distribution processes and transactions.

Therefore, the population for our research was the total number of staff for MPPD. Participants was grouped according to preselected criteria relevant to our research questions (as shown above in the study subjects). A sample size of 27 participants was reached during this study.

The total number of 19 civil servants inside MPPD was selected throughout 5 Units. The interview was conducted to 2 staff in Quality Assurance Unit, 2 staff in Quantification Unit, 4 staff in procurement Unit, 6 staff in warehouse Unit, 4 staff in sales and marketing Unit and 1 staff in Finance. To maximize the change of getting full information, we have conducted interviews to 8 others key informants for whom we believe they work with MPPD; and have an oversight on supply chain system or advisory role on the availability of health commodities for public health sector.

II.8 DISTRIBUTION OF RESEARCH PARTICIPANTS

The table below describes different categories from which we have selected participants to our research. The table shows also the number of participants for each intervention area.

Table 1: Distribution of participants to the research

No	Operational Unit	Area of intervention	Number
1	Procurement	Procurement coordination	1
		Procurement processes	2
2	Quality Assurance	Quality assurance coordination	1
		Visual inspection/ Sample analysis	1
3	Quantification	Essential Medicine	1
		Vertical programs	1
		Laboratory commodities	1
4	Warehouse	Inventory Management	1
		Storage and Physical inventory	4
		Picking and Packing	2
5	Sales and Marketing	Order validation and processing	2
		Distribution processes	1
6	Finance	Supplier Payment process	1
7	Other key informants	DP: Kicukiro, Rusizi and Kayonza	3
		RBC: MCCH	1
		NGO intervening in supply chain system: PIH and WHO,	2
		MOH: CPDS, Supply Chain Specialist	2
TOTAL			27

II.9 STUDY TOOL

In depth interview was conducted as data collection method for our research. Accordingly, the interview guide was developed for qualitative data collection. Based on that, each research participant was interviewed until the researcher reaches the saturation point.

II.10 DATA COLLECTION

Based on the information from comprehensive document reviews, the data was collected using an interview guide which was distributed among concerned staff in MPPD. The internet consultation and reading different works and standards about availability of health commodities and required improvement constituted our search engine for most information to use in writing our thesis. The data was collected using interview guide with questions grouped in 5 key categories of informants for featuring the MPPD business processes. The interview guide has served to orient discussions and answers from our research participants. Some questions from the checklist were set to evaluate the supply chain processes, while others concerning quality documentation system were selected in order to evaluate MPPD compliance.

II.11 UTILIZATION OF FINDINGS

This study is among the first studies about supply chain management system in Rwanda; it would help and guide decision makers and researchers interested by Supply Chain Management System. The gaps were identified and this would help decision makers to review and improve MPPD processes and harmonize efforts to be able to tackle and solve challenges faced in fulfilling customer orders and requisitions of health commodities for public sector in Rwanda.

The recommendations from this study would help to advocate for and speed up the update of MPPD operations manuals and to accelerate the improvement of supply chain processes within MPPD. The findings from this study would contribute also to the availability of health commodities for public sector in Rwanda.

III. RESULTS

The findings from this study allowed us to generate opinions from the study respondents on the magnitude of non-availability issue of health commodities and the factors affecting the availability of health commodities in MPPD. Using an open-ended interview, the opinions of the respondents were collected and analyzed. The results of the study are presented below.

III.1 CHARACTERISTICS OF RESPONDENTS

The findings of this study showed the characteristics of the respondents were detailed based on their identification and profile within their respective workplaces.

Table 2: Characteristics of respondents

Identification	Profile	Number	
Staff level in MPPD	Manager and Specialist	7	
	Professional and team leader	9	
	Technical staff	3	
Gender	Female	8	
	Male	19	
Level of education	Master's Degree	10	
	Bachelor's Degree	15	
	A1	2	
Institution	MPPD	Warehouse	7
		Sales and Marketing	3
		Quantification	3
		Quality Assurance	2
		Finance	1
		Procurement	3
	District Pharmacy	3	
	Ministry of Health	2	
	MCCH	1	
	WHO	1	
	Partners in Health	1	

III.2 MAGNITUDE OF THE PROBLEM RELATED TO THE NON-AVAILABILITY OF HEALTH COMMODITIES IN MPPD

During this study, the respondents revealed their perceptions on the problem of availability of health commodities in MPPD. Most of them confirmed that this is a serious issue faced by the

MPPD and they added that the problem is affecting the health system performance in public sector. The magnitude of the issue can be seen throughout the respondents' statements recorded during the interviews.

Explaining the problem of availability of health commodities in MPPD, a professional man working Non-Government Organization stated that *“Problems of health commodities availability are an unfortunate reality. They affect mostly the essential medicines and hospital commodities funded by hospitals or MPPD itself. Special programs funded by donors, like HIV commodities, TB commodities, and Malaria commodities... are also subjects to shortages and stock outs but to a much lesser extent. The shortages at MPPD lead to shortages at peripherals levels of the supply chain, and the health facilities. The patients are the ultimate victims of this chain of problems”*.

The findings of this study showed also that not only the problem is complex but it would affect other principal pillars of health care system. *“The problem of Health Commodities availability in MPPD is complex, it is stemmed in whole supply chain in the country due to either lack of strong coordination, inadequate quantification, no strong and concise logistic management information system, no accurate data, the local market which is very weak, landlockedness of the country, inadequate law on procurement (the law referred to is a general law on public procurement which does not cover all challenging issues related to health commodities: all of those hinder overall efficiency in responding to the needs of health commodities for the country ”* (a staff in MPPD working under procurement stated).

To highlight the magnitude of the issue of non-availability of health commodities in MPPD, some respondents tried to estimate the stock out rate for essential medicines. *“The problem of health commodities at MPPD is critical. MPPD is the Rwanda Central Medical Store, that procure and distribute the health commodities to the District Pharmacies an intermediary level before the health commodities reach the services delivery points. MPPD is facing a problem of low availability of medicines, as it is capable to provide for 40 percent or less of the health commodities needed in the country. District Pharmacies will have to purchase the rest of the commodities in the private sector. This situation impacts negatively on the national supply chain performance, causing delays to get the health commodities to service delivery points, forcing the districts pharmacies to use a parallel channel to go purchase the medicines in the private*

wholesalers in Kigali instead of benefiting of the established active distribution. This situation causes to the DPs a waste of time in procurement procedures as they have to duplicate the work” (a professional man working under the Ministry of Health stated).

III.3 DESCRIPTION OF RECEIVING AND PHYSICAL INSPECTION, STORAGE AND DISTRIBUTION PROCESSES FOR HEALTH COMMODITIES IN MPPD

The unavailability issue of health commodities in MPPD was assumed to be originated by internal or external factors. Among the internal factors, this study aimed to assess the performance of warehouse inventory management related issues. Accordingly, the results of this study revealed some gaps and area of improvement for receiving, storage and distribution processes within MPPD.

III.3.1 RECEIVING AND STORAGE OF HEALTH COMMODITIES IN MPPD

According to the findings from the interviews, we have realized that the sequence of activities to receive incoming health commodities in MPPD being long process its self. To give more details on that a women working in warehouse at MPPD has listed the following stages went through during receiving process for incoming shipment.

- *“Receiving team is informed by procurement team for the coming shipments, with dates of deliveries*
- *At the arrival, the staff verify if all required documentations are presented by the supplier*
- *For sealed trucks, RRA is there to open and lead the offloading of products*
- *The offloading process starts, separating products by products and when it is one product in the truck, we offload separating lot by lot*
- *The offloading is done in the receiving area (physical zone reserved for this purpose)*
- *After offloading, there is signature of the received number of cartons between receiving staff and the supplier representative*
- *The unpacking process starts to compare the received quantity by lots, by pack size with what is declared in documents (packing list).*

- *Physical inspection of the product is done: poor labelling, presence of particles in liquid, damaged product or damaged packaging are rejected*
- *For some specific products, each lot number is verified (for example physical inspection for mosquito nets)*
- *For other products, a sample is taken at reception to be sent to WHO qualified laboratories for quality control and testing.*
- *A report is done on an excel sheet, showing what is physically received and highlighting any deviation to the requested quantity, pack size and technical specifications*
- *The acceptance report is signed by receiving staff, quality assurance staff, finance, procurement and the supplier or his/her representative when applicable. Otherwise, the report is sent to the supplier for approval”.*

At the receiving area of incoming shipments of health commodities in MPPD, the receiving team works together with physical inspection team in order to speed up the process. However, there are still other steps required through warehouse management system to make sure products are ready for distribution. During interview, a woman working under receiving team of MPPD stated that *“When health commodities are checked and accepted by both receiving and quality assurance team, they are entered into warehouse management system of MPPD, in the receiving bin, as non-inspected products. Then, one sampled lot number is entered for the whole quantity of the same product and a good receipt note is automatically produced from the warehouse management system.*

- *The physical products, good receipt note from the system, and receipt note from unpacking process are then handed over to checking team which locates physically products in shelves (bin locations), separating quantity by lot number.*
- *A bin to bin transaction from receiving bin to physical bin locations is done in the warehouse management system, then the product is checked as inspected in the system in order to make it available for distribution”.*

III.3.2 PHYSICAL INSPECTION OF HEALTH COMMODITIES ON ARRIVAL IN MPPD

The physical inspection is another process to be performed before releasing the health commodities for distribution. According to the findings from this study, the quality assurance team of MPPD checks the technical specifications of the incoming health commodities against the documentation available. *“Required documentation for quality assurance checking are certificate of analysis, the copy of the purchase order and the receipt note; but also we check the packaging style or material of each product and we control batches labeled on the outer packaging”* (a woman working under quality assurance unit said). The quality assurance team proceed then to the calculation of shelf life of each incoming shipment. *“The calculation of shelf life of the product is based on the manufacturer date, arrival date and the expiry date. For the shelf life above 75 percent, the product is accepted but below that range the product is rejected except when there is a special request from the end user ensuring the use of the product before expiration”* (a woman processing physical inspection stated).

The physical inspection team is also involved in sampling processes for products to be submitted to independent laboratory for chemical or microbiological testing of incoming health commodities. *“Regarding the packaging, the quality assurance checks the physical status of the product and the compliance of the inner and outer packaging. At this stage, the quality assurance takes sample to be submitted for chemical testing”* (a women working under procurement process said).

Further to that, the quality assurance team cross-checks the physical condition of the cartons when health commodities are being received in bulk stock. *“During the physical inspection process, we check also the details of product labelling to verify key information required such as the manufacturer, his address, manufacturing date, lot number, expiry date, quantity by carton, particles in liquids, particular color of the liquids or tablets”* (a woman processing physical inspection stated).

III.3.3 DISTRIBUTION PROCESS OF HEALTH COMMODITIES IN MPPD

According to the findings of the study, the distribution process of health commodities in MPPD is a pull system. There are two ways of processing customers' requests: LMIS paper based or electronic-LMIS requests. Most of time, customer requests are handled according to the active distribution calendar. All requests (requisitions or commands) are received and oriented by the customer care services of MPPD.

“Any request received by the customer care team is either for essential medicine which is directly submitted to order processing or program products request which requires validation before being processed. The order processing team makes sure all items are captured in order to create a pick list with maximum products with quantities requested by the customer. After picking the products on shelves and other storage area, there is checking process which ends up with product delivery to the customer” (a woman working under validation team stated).

To ensure the completeness during order processing, the distribution team of MPPD always compares the processed items and quantities with the requested quantities. However, the completeness during order processing is measured only for essential medicine. For program commodities, they customers are supposed to be given feedback report. After issuing delivery note for essential medicine, the team is requested to produce a list of non-available health commodities. This exercise allows to compare the products and quantities delivered against the requisitions/demands from the client. *“We ensure the completeness of the order processed by making sure that all items requested are passed through and verified its availability in master file then after the pick list is printed and taken to picking section; validation and order processing teams crosscheck carefully and compare picking lists against initial requisitions to ensure customers are served according to their needs” (a woman working under order processing team clarified).*

According to findings from the study, the availability of health commodities in MPPD is clearly affected by the delay of distribution processes. *“The order processing and dispatch processes take very long time and this contributes much to the delays recorded in distribution system of MPPD” a man working in warehouse said.* Furthermore, the finding from our study have shown

that there are a number of reasons behind delay of distribution processes in MPPD such as clients who may delay to submit their requisitions and commands through management system or delay to confirm what had been given on a proforma invoice. The internet connection is also one of the reasons to delay because the management system used by MPPD is a web based for which the speed of internet connectivity is a requirement.

III.3.4 MANAGEMENT OF EXPIRY PRODUCTS IN MPPD

According to the finding from this study, the warehouse management system of MPPD enables to remove expiries commodities systematically along the distribution processes. *“The warehouse management system in MPPD allows distribution process of health commodities applying First Expiry First Out (FEFO) principle. Normally the expiry dates appear on the picking list; the distribution team checks for expiry dates before delivery; in case of short shelf life of the product, the checking staff contacts the customer in order to adjust the quantity to issue accordingly. The expired products are removed from the system on regular basis during distribution process. Then, the expired products are cross-checked later with quality assurance team and later are taken for incineration” (a man working in warehouse stated)*

On regular basis, the warehouse management team conducts physical control of expiries in order to report them to finance team and recommend for incineration.

During our interviews we were informed that A monthly checking of expiries is done in system followed by physical removal from the good stock; the joint physical checking is done with warehouse, quality assurance and finance teams; then the team members sign to approve the list of expired health commodities. An inter warehouse transfer is regularly processes for expired products in order to move them from the good stock to the stock of expiries. Then the finance team uses the list of expiries to report them as loss and to adjust the usable stock of health commodities.

III.3.5 QUALITY ASSURANCE OF HEALTH COMMODITIES IN MPPD

During the interviews, most of respondents confirmed that MPPD deals with legitimated suppliers of health commodities. The QA requirements are established in advance and followed along the procurement process of health commodities. *“MPPD procures health commodities from prequalified suppliers or Manufacturer; this prequalification is conducted by international recognized bodies for programs related health commodities. Throughout its own supplier prequalification process, MPPD conducts prequalification process and elaborates its prequalification list of suppliers for essentials medicines. The prequalification process includes the supplier/Manufacturer and products assessment prior to the procurement process or any tender award” (a professional woman working under quality assurance unit stated).*

According to findings, minimum quality assurance requirements elaborated to be put in the bidding document as instructions to suppliers of health commodities. *“The quality assurance unit collaborates with procurement staff in checking what are the required quality related provisions or requirements to be set in tender document and/or in contract agreement” (a professional man working as procurement specialist said).*

The evaluation criteria are always based of quality assurance requirements to make sure that only eligible and legitimated suppliers are awarded tender for health commodities. *“To ensure that health commodities are procured from legitimate suppliers, specific requirements are put in tender /bidding document so that only eligible suppliers will be awarded the tender. Some of those requirements are setting evaluation criteria in such a way the bidder provides the following documents:*

- *Good Manufacturing Practice Certificates (GMP), especially for drugs;*
- *Certificate of Pharmaceutical Products, esp. for drugs;*
- *Free Sale Certificates, esp. for drugs;*
- *ISO certificates, for other medical supplies;*
- *Manufacturer Authorization*
- *Registration/Incorporation Certificate;*
- *Documents allowing working in health sector*

In addition, there is a process of prequalification conducted by MPPD itself and/or referring to pre-qualifications conducted by international recognized organizations or bodies like WHO, the Global Fund, UNFPA, USFDA, etc” (a man working as procurement specialist stated)

III.4 REASONS BEHIND THE PROBLEM OF AVAILABILITY OF HEALTH COMMODITIES IN MPPD

This study explored the possible reasons of the problem of availability of health commodities in MPPD. The respondents provided their opinions not only on the magnitude of the issue but also on the possible internal and external reasons of the no availability related issues.

III.4.1 LEGAL FRAMEWORK AND LACK OF FLEXIBILITY IN PROCUREMENT PROCESSES

Stating on the possible reasons behind the non-availability of health commodities in MPPD, some respondents tackled the legal status issue on MPPD, lack of flexibility in procurement process and the institutional structure as well. *“The problems of the low availability of medicines at MPPD are in my opinion due the legal status of the organization which is a public institution under another organization the RBC. The status of the MPPD requires to abide to public procurement laws which are claimed to be non-flexible, as it does not give special consideration to the procurement of the health commodities. From that situation there are different issues associated with the procurement, from the tender processing, the purchasing, delivery and contract management especially when it comes to establishing good relations and trust with suppliers. Some tenders fail due to lack of suppliers or issues in contract management; this situation forces the MPPD to renew the whole tender process and cause delays in deliveries. Besides that, the legal status of the institution there are issues related to proper planning for an uninterrupted flow of the commodities. Although the institution is facing issues related to not having financial and administrative autonomy, there is a possibility to plan properly by anticipating lead times in the procurement that might be caused by the laws and procedures that govern the entity” (a professional in the Ministry of health said).*

Given the current legal status of MPPD, the respondents confirmed that the procurement processes of health commodities are abided to the generic Rwanda public procurement law and regulations with lack of flexibility and special consideration of health related emergencies. Accordingly, a man working in procurement unit of MPPD stated during interview that *“In order to procure health commodities, MPPD as a public institution follows the public procurement law and regulation (Law N°05/2013 of 13/02/2013 Law modifying and completing the Law n°12/2007 of 27/03/2007 on Public Procurement) and/or partner’s regulations where applicable”*.

III.4.2 LACK OF COLLABORATION AND DATA RELATED ISSUES

The findings of this study revealed also that MPPD failed to focus on its mission to ensure an interrupted availability of health commodities for public sector. Some statements from our respondents revealed that MPPD shows poor collaboration with institutions which are supposed to provided data for estimation of needs. *“I think those problems are there because MPPD is unable to fulfill its mission of availing health commodities in the country in a timely manner. The procurement processes simply take too long to be completed. An international procurement takes 6 months to be concluded, and that is in the best of the scenarios. In my opinion, MPPD has too broad of a mission for its size”* (a procurement specialist in MPPD said).

In addition to that, some respondents have been specifics during the interviews on the reasons of storage space issues and non-availability of health commodities in MPPD. *“Non-availability of health commodities in MPPD is the result of two main issues: (1) Poor quality of data (refer to three basic logistic data, namely Consumption data, Stock on hand data and losses/adjustment data) that directly and dramatically affect the usefulness of the current improvement in inventory visibility throughout the supply chain; (2) Lack of a robust management style among the key pillars of the entity that is underpinned by inflexible administrative procedures especially those related to procurement of health commodities”* (a technical procurement staff stated).

The issue of follow up was also highlighted during the interviews among the possible reasons of the shortage for health commodities in MPPD. The findings of the study have shown that the lack of ownership and responsibility on logistics data quality which may cause the under

estimation of the need during national quantification of health commodities. For some respondents, MPPD does not proactively assess needs of clients as well as the risk associated to issue of non-availability of health commodities for public sector; *“MPPD does not collect the quality logistics data that informs quantification of all health commodities and district pharmacies or sites have no ownership in the quality of the data” (a technical staff in warehouse stated).*

III.4.3 LACK OF LOCAL PHARMACEUTICAL PLANTS

The results of this study highlighted that MPPD is always required to pass only through international tender processes for health commodities as single option which is also one of factors of delay in acquisition of pharmaceutical products. Not only some potential suppliers of health commodities are not represented in Rwanda but also there are no local pharmaceutical plants on which can MPPD rely to shorten lead time during procurement process or in case of emergencies. In line with this, a man working as procurement specialist in MPPD stated that *“the various procurement methods used are referred to and as defined in the governing public procurement law and regulations: International Competitive Bidding, International Restricted Tendering, and Single Source Procurement. There are no local pharmaceutical plants in the country and all health commodities are procured from abroad. MPPD uses to apply framework contracts with suppliers of health commodities in order seek for flexibility to speed up the processes when it is applicable”.*

III.4.4 DELAY OF TENDER AND APPROVAL PROCESSES

The findings of the study revealed that the respondents agreed that the delays of tender processes of health commodities and the approval process of purchased order affect the incoming shipments of products in MPPD and the availability of health commodities for public sector in general. As stated by some respondents during our interviews the procurement processes under MPPD take long. *“The period taken by the tender process is very long considering the sensitivity and emergency of the commodities. This period is much more governed by the law which is not*

flexible in regard to the time line of tender process. In addition, most of the procured commodities (health commodities) are imported (not local made) and this will also lead to the long lead-time. The long time affect negatively the availability of commodities and on lives of citizens” (a procurement specialist said).

Emphasizing on the delay in procurement of health commodities in MPPD, some respondents have been even specific on the period taken by this procurement process. *“I do not appreciate it as the approval (administrative) takes also a longtime” and “It takes longtime to approve the purchasing order due to bureaucracy” (a professional in procurement unit of MPPD stated).*

Another explanation given by respondents as reason for shortage of health commodities in MPPD is the time spent between opening of tender for health commodities and purchase order stage which is also too long. From the results of our study, one respondent stated that *“I do not appreciate it as it really takes a long time as in average it can take between 60 – 80 days; It takes more time than what is mentioned in Rwanda public procurement law”” (a procurement specialist from MPPD).*

Coming back to the internal administrative procedures which can hinder the availability of health commodities in MPPD, the finding of this study have shown that not only approvals of purchase orders is the issue, but all approval processes in general are too long. For any procurement document to be approved, it will pass through a number of levels for checking and assessment regardless the sensitivity or emergency required for a particular procurement of health commodities. On the other hand, the finding from our study have shown that the delay can come from the supplier side depending on the size of the tender. Some respondents explained that for the tender processes which require to wait for the performance guarantee from the awarded supplier and the speed of process does not depend only MPPD internal processes but also the workload on the side of the supplier. *“The approval process for the order form takes a little more time especially when the value of the market exceeded the threshold of 10,000 Rwf. This requires to wait for at least three weeks for the supplier to provide execution guarantee and one week taken to complete internal procedure. Hence, this gives at least 1 month before placing the order to awarded tenders for health commodities in MPPD” a woman working as procurement specialist stated.* All reasons explained to be behind the delays of processes have a negative impact of the availability of health commodities and inventory management but also on the order

fill rate and customer satisfaction. During our study, we were also interested to know the reasons behind delay in placing purchase order when suppliers are awarded tenders to supply health commodities in MPPD. In addition to the complexity of health commodities related tenders, the finding shown that the shortage of staff in the procurement unit of MPPD and bureaucracy or long administrative processes constitute the main reasons to delay order placement process. *“The procurement is time bound. So, in addition to the law requirements in terms of time line, I can see that also the long chain of approvals is another issue to the delay. Again the workload of procurement officers is heavy to allow them a regular and serious follow-up on all dossiers under their charge” (a man working as technical staff in procurement unit stated).*

III.5 SWOT ANALYSIS

Table 3: Strengths, Weaknesses, opportunities and Threats of MPPD business processes

Strengths	Weaknesses
<ul style="list-style-type: none"> • Production of list of non-available products through comparison of products delivered against the customer’s requisitions or commands. • Existence of Standards Operations Procedures (SOP) to guide receiving process of health commodities • Collaboration between receiving and quality assurance team to speed up the receiving process and to avoid duplication during checking process of incoming health commodities. • Smooth collaboration and communication between quantification and procurement teams. 	<ul style="list-style-type: none"> • No feedback report is produced for program products. No list of non-available products is issued and no communication channel between distribution and quantification teams for planning purpose. • Storage capacity issue which affect the speed up required during active distribution. • Sometimes the tender evaluation process is too long beyond the range provided procurement law • The approval process of purchase orders is too long due to the bureaucracy • Insufficient number of staff and lack capacity building.

Opportunities	Threats
<ul style="list-style-type: none"> • Existence and use of public procurement law and procedures to procure health commodities • MPPD is well structure with sufficient and experienced staff involved in Supply Chain activities, • MPPD has got a tool to track the purchase orders placed. The tool is an excel based called “Active PO”. This tool allows the procurement officers to track the suppliers and the status of their orders. The status will automatically change and its colour once the set limit is reached. Then, the procurement officer can remind the suppliers. 	<ul style="list-style-type: none"> • Lack of local pharmaceutical plants in the country which means that all health commodities are procured from abroad, • When there is delay in receiving process of health commodities or management system issues like network issue, distribution may have processed using manual delivery notes which create warehousing and inventory management issues, • A web based management system used by MPPD requires high speed of internet connectivity not only in MPPD itself but also the clients should be able to place their requisitions and order electronically through the system.

III.6 PROPOSED SOLUTIONS TO THE PROBLEM OF NON-AVAILABILITY OF HEALTH COMMODITIES IN MPPD

With this study, findings came up with propositions of solutions which could address the issue of non-availability of products availability for public sector. The following section summarizes the opinions revealed by respondents as solutions of health commodities in MPPD.

III.6.1 REVIEW OF LEGAL STATUS AND BUSINESS PROCESSES OF MPPD

According to the findings of this study, there should be customized procurement procedures for health commodities. On the other hand, each part among stakeholders should play its role to ensure uninterrupted availability of health commodities. Accurate data should be collected and available regularly on time. The stock status should be monitored at MPPD and districts pharmacies being potential customers.

Furthermore, the quantification exercise should be regular and based on accurate data; MPPD should consult or use the list of non-availability of products to predict the needs for the customers in health commodities for the future. More importantly, the review of MPPD business processes was recommended to address the issue on non-availability of health commodities in MPPD. *“A full assessment of the MPPD operations would give guidance, on what is being done that can be corrected. From the procurement processes, warehousing, inventory control system, delivery, Information systems management and human resource management. Once issues at each level are identified, it shall be possible to engage different stakeholders in solving the problems. Some issues can be solved by the institution leadership, and other may need the involvement of other institutions. There is a need of changing the legal status of the organization to make it a non-profit making entity with full financial and administrative autonomy that is using special internal procedures for the procurement of the health commodities and ensure reasonable flexibility to procure needed medical products. There is a need to improve the planning, contract management and issues related to the operations in the institution. Although MPPD claim that there is no problem related to funds, it is also important to look at what extent*

the delays in payments from the DPs affect the operations at this institution” (a professional man working with the Ministry of health stated).

As long term solution, our findings have shown that MPPD should be supported to become not only a business oriented central medical store but also a data driven institution. Most of respondents emphasized on data collection process and data quality improvement as main strategies which would help MPPD to avoid poor planning and shortage or stock outs of public health commodities. *“Strategies or solutions for improvement would include: (1) a more relaxed and easier logistic data capturing procedure especially at the service delivery point level (including the use of smart supply chain dashboards that could allow a very quick access to key logistic data for decision making) (because poor quality of data from lower levels is one of the main causes of poor planning and unavailability of health products at MPPD), and (2) Change in the status of the institution towards a more autonomous and business-oriented model” (a man working with MPPD stakeholders as supply specialist stated).*

III.6.2 INCREASED CAPACITY BUILDING FOR STAFF INVOLVED IN SUPPLY CHAIN PROCESSES IN MPPD

The findings of this study revealed that solving capacity building issues could improve the availability of health commodities in MPPD as long as whenever the staff is overloaded the productivity is low. During the interviews, the respondents clarified that one of the weaknesses found in MPPD is the capacity building program for staff involved in the supply chain processes within different operational units. Most of the respondents said that there are no induction or orientation sessions of new employees. Further to that, MPPD staff is rarely trained on how they can improve efficiency and better perform their work. *“It is unfortunate that nothing is done in term of capacity building of MPPD staff or induction/orientation-training for new staff. Only self-coaching is made” (a man working under procurement unit said).*

Despite the issue of lack of trainings, the findings from the study revealed also that MPPD has hard working staff. Therefore, one of the solutions to delays and unavailability of health commodities in MPPD would be staff motivation and increased capacity building of staff

involved in procurement processes and various operational units. This was confirmed by data collected from different units of MPPD during the interviews. *“The staff are dedicated to the work with energy, hardworking and professionalism” a woman working in warehouse stated. In addition to that a man working as technical staff in procurement stated that “In terms of quality, qualification and technical skill, the staff dedicated to procurement unit is very strong and performing. But, in terms of number, the staff needs to be increased to the number of dossiers and workload” (a procurement staff in MPPD stated).*

III.6.3 IMPROVED COLLABORATION AND COMMUNICATION BETWEEN OPERATIONAL UNITS

The results from the study revealed also that the collaboration and coordination of procurement and quantification teams are always mandatory in order to make procurement plans based on demands and needs of health commodities in the country. A man from the quantification team stated that *“MPPD collaborates periodically with its special customers to get needs for essentials medicines which are aggregated by the quantification team. Based on the procurement plans, MPPD proceeds to the different tender processes of health commodities depending on the nature of products”.*

During the study, we have found that the coordination of quantification and procurement specifically focuses on the review of stock status and supply plan review to adjust the needs of health commodities. The procurement staff contributes to quantification process by providing required data in line with quantities in pipeline or in transit and the estimated lead time of each item under procurement process. Further to that, the procurement unit provides information on prices proposed by the suppliers of health commodities as well as the update on shipments progress. This information helps the quantification team to take actions and determine the quantity and cost of health commodities to be procured within a certain period. Such collaboration would be helpful in data collection processes and aggregations of health commodities needed for the country.

IV. DISCUSSION

The results of this study showed that there is a serious problem of availability of health commodities in MPPD; but the same result showed that this situation can be improved by reviewing supply chain processes and legal framework of the institution.

IV.1 MAGNITUDE OF THE PROBLEM OF HEALTH COMMODITY AVAILABILITY IN MPPD

The findings of this study showed that the high magnitude of non-availability issue of health commodities in MPPD with a poor satisfaction percent of its customers for essential medicines. On this aspect, our results are similar to the findings of the study conducted in Malawi where the results showed a strong decrease in stock-out days for CMST after the change (from an average of 82 days to an average of 42 days stock out days per drug per year) which was statistically significant(24).According to the study in Malawi aiming the improved availability of medicines in central hospitals, it was observed after changing of Central Medical Stores (CMS) to an autonomous supply chain agency named Central Medical Stores Trust (CMST).

IV.2 SUPPLY CHAIN PROCESSES AND RELATED ISSUES AFFECTING AVAILABILITY OF HEALTH COMMODITIES IN MPPD

Most of respondents revealed that the supply chain processes within MPPD are too long and the order fill rate is consequently affected by warehouse management system or poor performance of the inventory management processes. In line with the above, the non-availability related issues result from various internal and external factors and the problem becomes more complicated for essentials medicines fully procured and managed by MPPD; there is no clear mitigation strategy to handle stock out related issues towards an improved order fill rate. According to the findings, the quantification exercise does not consider the total needs of health commodities in the country and the lists of non-available products elaborated when distributing health commodities to customers are not used to inform the quantification processes. In addition to that, there is no clear reporting system for the essential medicines, which would facilitate MPPD to get accurate data

from the customers on regular basis in order to optimize the forecasting and supply planning of health commodities in the country. The findings showed that the quantification process is the source of perennial stock out of essential medicines in MPPD because it is not based on the real needs of the country. Fortunately, MPPD has an operational unit of quantification; this one should normally identify and collect required data to be use for planning and prevent stock out of health commodities in public sector.

Briefly, various opinions from the findings of this study showed that the problems related to the non-availability of health commodities in MPPD can be categorized into two:

Internal problems characterized by long procurement process, unsuccessfulness award of health products to potential suppliers, shortage of staff working with MPPD sensitive units including storage distribution where most of SC processes are performed. The findings of this study revealed that the storage and distribution areas are not sufficient in MPPD. This has a negative impact on the successfulness of warehousing processes and customers order fulfilment in general. This finding is similar to what has been confirmed with the findings of survey conducted in Ghana where it is stated that the optimal storage areas for specific functions must ideally be designated and constructed in warehouses because where specific and designated areas exist the flow of goods becomes seamless and this facilitates the identification or location of certain types of products and improves the efficiency of warehouse operations(3).

External problems which are mainly due to the non -reliable suppliers who refuse to deliver the awarded items, no respect of supplier lead time, poor quality of delivered health commodities and lack of local manufacturer plants for health commodities.Further to that, there are no reliable data which capture pharmaceutical needs to be used through quantification exercise of health commodities in MPPD. Basically, the existing of reliable data from lower levels of supply chain system is mandatory to enable MPPD to plan for pharmaceutical needs for public sector. The third health sector strategic plan hasshown that the data quality and submission may be affected by the low capacity of staff involved in supply chain activities at health centers level. The inadequate quantification capacity at facility levels is partly responsible for MPPD's inability to predict and procure adequate supplies on a timely basis (1).This situation has been associated with inability to quantify medical supplies appropriately and in timely fashion at health facility level resulting in imprecise forecasting of pharmaceutical requirements by the MPPD(2).

IV.3 PROPOSITION OF SOLUTIONS TO ADDRESS NON-AVAILABILITY RELATED ISSUES IN MPPD

The study came up with proposition to make MPPD an autonomous central medical store. According to the findings, there is a need of changing the legal status of the organization to make it a non-profit making entity with full financial and administrative autonomy that is using special internal procedures for the procurement of the health commodities and ensure reasonable flexibility to procure needed medical products. This finding can be aligned with the results of a study conducted in Malawi which showed that to change a traditional central medical store into an autonomous one can be reduced stock out of health commodities significantly. On average, stock-out days in Central Medical Store Trust decreased from 80 to 42 days, corresponding to a reduction of 47percent and was statistically significant(24).

A party from the legal status of MPPD and its organizational structures, this institution has failed also its focus to satisfy the health public sector in quality and affordable essential medicines because it was assigned later to procure for referral hospitals which were supported to process procurements of health commodities themselves as autonomous health related institutions. In line with this, some respondents have recommended to release MPPD from procurement of health commodities on behalf of referrals hospitals and other autonomous health institutions.

There is a need to improve the planning, contract management and issues related to the operations in the institution. Although MPPD claims that there is no problem related to funds, it is also important to look at what extent the delays in payments from the districts pharmacies affect the operations at this institution and its relationship with potential suppliers of health commodities.

IV.4 LIMITATIONS OF THE STUDY

The discussion of the theory of supply chain processes of MPPD showed that supply chain management stretches from the original source, through all the processes and organizations, to the final consumer, and back. However, this study has focused only on the processes and procedures experienced at one stage of the supply chain, namely at MPPD.

Although the problems may originate upstream from the supply-side or downstream from the customer-side, the problems are judged from the perspective of MPPD. Throughout the interviews, the qualitative questions did not yield sufficiently rich information for more in-depth insight into the problems. As we were conducting an academic study, we had constraint of budget and time as well. Consequently, this study did not assess the perception of the lower levels of supply chain, even though we know that from there, we would get an important information which can help to improve the quality of service from MPPD and increase the availability of health commodities for public sector. This study should therefore be followed up with a quantitative study at various stages of the supply chain system in Rwanda, and with the different parties, in order to pinpoint the origin of the identified problems. Furthermore, MPPD is not the only source of health commodities for public sector.

V. CONCLUSION AND RECOMMENDATIONS

V.1 CONCLUSION

The study indicated that MPPD does not currently satisfy the needs of the country in health commodities for public health sector. The most interviewed health professionals stated that they are aware of the high magnitude of non-availability related issues for health commodities in MPPD. According the findings, MPPD is facing a problem of low availability of essential medicines, as it is not capable to satisfy the commodities needed for public sector in the country. Many documentations highlighted the poor performance of MPPD regarding keys supply chain indicator such as order fill rate and on-time delivery from central level to the district pharmacies. Given this situation, the district Pharmacies will have to purchase the rest of the commodities in the private sector. This situation impacts negatively on the national supply chain performance, causing delays to get the health commodities to service delivery points, forcing the districts pharmacies to use a parallel channel to go purchase the medicines from private wholesalers

instead of benefiting of the established active distribution system. This would be a waste of time in procurement procedures for DPs as they have to duplicate the work. The main reasons behind the shortage issues of health commodities in MPPD are the long and rigid procurement processes, the failure of supplier to fulfil their commitment and lack reliable dataset for needs-based quantification. In addition to that the findings of this study revealed also the issue of long approval processes, failure to fulfil contract requirements with potential suppliers of health commodities and lack plan for capacity building of staff. To overcome the issues on unavailability of health commodities in MPPD, the results of our study recommended some action points focusing at the overall review of warehousing and inventory management processes in order to optimize the effectiveness and efficiency during planning of country needs or when handling customer's requisitions or commands of health commodities. Not only the results of our study proposed the change of legal status of MPPD to make it a non-profit central medical store with full financial and administrative autonomy; but also the findings recommended a continuous data quality assessment and improvement to inform the quantification exercise of health commodities for public sector. Future researches need to be conducted to study the frequency and the reasons for shortages of health commodities along the whole supply chain system of Rwanda.

V.2 RECOMMENDATIONS

This study was designed to determine the magnitude of the problems of availability of health commodities in MPPD, the reasons behind that problem and the solutions which could be recommended. Even though the possible reasons of non-availability were identified during this study, a full review of the supply chain processes would be recommended in order to dig deeper on what is being done that can be corrected along supply chain system in Rwanda. The Supply Chain issues identified in MPPD are crosscutting and affect not only SC operations but also the availability of health commodities. According to our findings, each component would be tackled properly from the procurement processes, warehousing, inventory management system, delivery, management information systems and human resource management. Then, it is mandatory to engage different stakeholders in solving identified problems. Based on the mitigations strategies proposed during the interviews, some issues can be solved by the MPPD leadership, and other

may need to involve other institutions. As long term solution to the problem of availability of health commodities for public sector, this study came up with the following recommendations:

To MOH:

- To change the legal status of MPPD to make it a non-profit central medical store with full financial and administrative autonomy,
- To facilitate MPPD to have approved internal procurement procedures specific to the procurement of health commodities ensure reasonable flexibility required when dealing with special commands and health related emergencies,
- To assess the feasibility of involving the private wholesalers in inventory management of health commodities.

To RBC

- Ensure continuously data quality assessment and improvement to inform the quantification exercise of health commodities for public sector,
- Review the warehousing and inventory management processes in order to optimize the effectiveness and efficiency during planning of country needs or when handling customer's requisitions or commands of health commodities.

To MPPD

- To focus on a limited number of health commodities and closely monitor the balance between supply and demand,
- To improve the supplier's prequalification process to update the database of legitimate and competent suppliers to be contacted when needed,
- To improve the collaboration and relationship in term of respecting its part of contractual obligations towards suppliers or manufacturers,
- To strengthen and support capacity building for staff including the internal evaluation committee of procurement tenders (internal tender committee).

VI. REFERENCES

1. Rwanda M of H. THIRD HEALTH SECTOR STRATEGIC PLAN. 2012;(July).
2. Nditunze L, Makuza S, Amoroso CL, Odhiambo J, Ntakirutimana E, Cedro L, et al. Assessment of Essential Medicines Stock-Outs at Health Centers in Burera District in Northern Rwanda. 2015;2(1):2013–6.
3. Ghana M of H of. Ghana Assessment of Medicines Procurement and Supply Management Systems in the Public Health Sector A Country. 2009.
4. Context CS. Procurement Strategies for Health Commodities An Examination of Options and Mechanisms within the. 2006;(July).
5. (TRT) S and ATRT and MS for H, Abbreviations. Promising Practices Warehousing and Inventory Management. 2014;1–16.
6. Yadav P, Lega Tata H, Babaley M. Storage and Supply Chain Management. World Med Situat 2011. 2011;
7. Lambert DM. Supply Chain Management: Processes, Partnerships, Performance. 3rd Edition. 2008;
8. Croxton KL. The Order Fulfillment Process. 2002;107.
9. Mkoka DA, Goicolea I, Kiwara A, Mwangu M, Hurtig A. Availability of drugs and medical supplies for emergency obstetric care: experience of health facility managers in a rural District of Tanzania. BMC Pregnancy Childbirth. 2014;14(1):108.
10. Project UD. Alternative Public Health Supply Chains : Reconsidering the Role of the Central Medical Store. 2013;(June).
11. Khalafallah G, Pg M, Omer AM. Privatization of the Sudanese Corporation : Why not ? Central Medical Supplies Public. 2008;3(April):61–76.
12. Chenin B, Onyango C, Davoh M. Assessment of Governance , Transparency , and Operations of the Central Medical Stores of Benin : Summary and Recommendations. 2009;
13. Al VB&. Workforce Excellence in Health Supply Chain Management : Literature Review. 2010;
14. Mustapha Hajjou, Ph.D. P, Abdelkrim Smine, Ph.D. P, Veerle Coigneux, MA, MPH U. Assessment of Medicine Quality Assurance in Rwanda: Findings and Recommendations. 2009;00:0–19.
15. Miller R, Wilkerson T, Wilkerson T. Improving Procurement Practices in Developing

- Country Health Programs FINAL REPORT With significant inputs from Acknowledgements. 2014;(January):1–30.
16. Manso JF, Annan J, Anane SS. Assessment of Logistics Management in Ghana Health Service. 2013;(August):75–87.
 17. Miller R, Wilkerson T, Wilkerson T. Improving Procurement Practices in Developing Country Health Programs FINAL REPORT With significant inputs from Acknowledgements. 2014;(January):1–25.
 18. Yadav P, Tata HL. THE WORLD MEDICINES SITUATION 2011 STORAGE AND SUPPLY. 2011;
 19. Govindaraj R, Herbst CH. Applying Market Mechanisms to Central Medical Stores Experiences from Burkina Faso , Cameroon , and Senegal. 2010.
 20. Wild L, Cammack D. The supply and distribution of essential medicines in Malawi Problem identification : chronic stock-outs of Diagnosis : political economy dynamics that. 2013;(January).
 21. SIMON SAUNDU MUNGU SUPERVISOR: SUPPLY CHAIN MANAGEMENT PRACTICES AND STOCK LEVELS OF ESSENTIAL DRUGS IN PUBLIC HEALTH FACILITIES IN BUNGOMA EAST SUB-COUNTY, KENYA. 2013;(November).
 22. Choi Y, Ametepi P. Comparison of medicine availability measurements at health facilities : evidence from Service Provision Assessment surveys in five sub-Saharan African countries. 2013;
 23. Finances O of the AG of S. REPORT OF THE AUDITOR GENERAL OF STATE FINANCES FOR THE YEAR ENDED 30 JUNE 2015. 2015;(June).
 24. Khuluza F, Kadammanja P, Simango C, Mukhuna M. Did drug availability in Malawian central hospitals improve after the conversion of central medical stores to a trust? 2016;10(9):145–50.

VII. APPENDICES

VII.1 APPENDICE 1: Interview guide

Section 1: Letter to Respondent

Dear Sir/madam,

I am a Master candidate in School of Public Health at the University of Rwanda, option of Science in Epidemiology. Among the requirements to get my Master degree is a research project. For that purpose, I would like to focus my research on the Supply Chain processes improvement in MPPD in order to contribute to the availability of health commodities in Public Sector in Rwanda.

I kindly request you to take 30 minutes of your precious time to respond to this research questionnaire. Every given response in this study will be appreciated and treated with confidentiality.

Please, accept our thanks in advance for your cooperation.

Juvenal Majoro

Section 2: Responder identification

Specify staff category you belong

Staff Level: 1. Managers (DG, HOD, Director, Head of Desk, Specialist)

2. Professional (Team leaders)

3. Technical staff (all remaining staffs)

Working Unit: 1. Warehouse es and Marketing Quality Assurance

2. Quantification 4. Procurement hers

Education level: Master's and Up Bachelor's A1A Ot

Sex: Female Male

Phone number:

Email:

Section 3: Procurement

1. How does MPPD proceed to procure health commodities?
2. How does procurement unit of MPPD process tenders for health commodities?
3. How does the procurement staff contribute to the quantification process of health commodities?
4. How does the coordination work between procurement and quantification personnel in MPPD?
5. How does MPPD plan the procurement process of health commodities?
6. How does MPPD evaluate the performance of the procurement process?
7. How do you appreciate the period taken by a tender process of health commodities in MPPD?
8. How do you appreciate the approval process of purchase order when tender process is closed?
9. How do you appreciate the time taken between tender opening and purchase order stage?
10. What do you think about the reasons behind the delay in placing a purchase order for awarded suppliers for procurement of health commodities and how can they be solved?
11. How does MPPD track the suppliers who do not comply with shipment period mentioned in their contract for health commodities? Explain
12. How do you follow up the order for which the vendor has delayed to deliver or ship according to the plan?
13. How do you deal with supplier who surpass the shipment period included in the contract?
14. How do you appreciate the staff dedicated to the procurement unity of MPPD?

15. How does MPPD capacitate its procurement staff?
16. How do you appreciate the induction/orientation-training program for new employees for procurement staff of MPPD?
17. On your opinion, what are the reasons behind the possibility of delay in procurement process of health commodities and how can they be solved?
18. How do you think about the problems of health commodities availability in MPPD? Explain
19. For you, why are those problems there?
20. For you, what could be the causes of possible non availability of health commodities in MPPD?
21. What could you propose as solution to the issue of unavailability of health commodities in MPPD?

Section 4. Storage

22. How is receiving processed for incoming health commodities?
23. How does receiving team proceed when a new shipment arrives to make available for distribution?
24. How do you perform the physical inspection of health commodities on arrival?
25. How do you appreciate the staff dedicated to the receiving of MPPD?
26. How does MPPD staff comply with the correct receiving procedures?
27. How do you appreciate the storage areas of MPPD vis-à-vis the categories of products to be stored?
Explain
28. How do you appreciate the security system and protection of health commodities stored in MPPD?
Explain
29. How do you think that the average time taken by the receiving process can affect the availability health commodities in MPPD?
30. On your opinion, what are the reasons behind the possibility of delay in receiving process of health commodities and how can they be solved?
31. How do you appreciate the staff dedicated to the storage unit of MPPD?
32. How does MPPD capacitate its staff appointed to the storage unit?

33. How do you appreciate the induction/orientation-training program for new employees for storage unit of MPPD? Explain
34. How does the receiving team check the compliance of health commodities the required technical specifications? Explain
35. How and where does the receiving team handle the completed receipt forms?
36. How do you think about the problems of health commodities availability in MPPD? Explain
37. For you, why are those problems there?
38. For you, what could be the causes of possible no availability of health commodities in MPPD?
39. What could you propose as solutions to the issue of no availability of health commodities in MPPD?

Section 5. Distribution

40. How is distribution of health commodities initiated in MPPD?
41. How do you ensure the completeness during order processing?
42. How do you proceed for missing products or when products do not appear in the management system?
43. How do you appreciate the storage capacity and distribution area of MPPD?
44. How are cartons of health commodities are carried for distribution within warehouses? Explain
45. How do you appreciate the compliance of MPPD to the distribution calendar for health commodities? Explain
46. How do you track and manage the expiry products?
47. How do see the reasons behind the delay in distribution process and how can they be solved?
48. How do you think about the problems of health commodities availability in MPPD? Explain
49. For you, why are those problems there?
50. For you, what could be the causes of possible no availability of health commodities in MPPD?
51. What could you propose as solutions to the issue of no availability of health commodities in MPPD?

Section 6. Quality assurance

52. How does MPPD ensure that health commodities are procured from legitimate suppliers?
53. How does the quality assurance Unit collaborate with procurement staff to assure quality of health commodities along the procurement process?
54. How does MPPD manage the issues related to suppliers who may deliver health commodities with poor quality?
55. How does MPPD manage its relationships with suppliers for health commodities?
56. How do you think about the problems of health commodities availability in MPPD? Explain
57. For you, why are those problems there?
58. For you, what could be the causes of possible no availability of health commodities in MPPD?
59. What could you propose as solutions to the issue of no availability of health commodities in MPPD?

VII.2 APPENDICE 2: Consent form

INFORMED CONSENT FORM

Name of principal investigator: Juvenal Majoro

Name of proposal: *“Availability of health commodities for public sector in Rwanda: Case Study of Medical Production and Procurement Division, MPPD”*.

A. Information sheet

Introduction

The study on the Availability of health commodities for public sector in Rwanda: Case Study of Medical Production and Procurement Division, MPPD aims to determine the factors associated to the non-availability of health commodities in MPPD and propose solutions to the gap. The recommendations from this study will help to improve the supply chain processes of MPPD in order to ensure uninterrupted availability of health commodities for public sector in Rwanda.

Purpose

The purpose of this study is to find out gaps to supply chain process in MPPD and propose solutions to ensure uninterrupted availability of health commodities for public sector in Rwanda.

The objective of MPPD is normally to ensure that health commodities are available and accessible to the public health institution. To achieve that MPPD should perform correctly not only procurement, storage and distribution processes but quality assurance process as well.

Type of research intervention

This is a case study where after a comprehensive document review, the qualitative research methodology will be used, and data collection will be done using in-depth interviews. The data analysis will be done using a thematic approach to analyze the data. Then, SWOT analysis will be used to evaluate the performance of MPPD for the availability of health commodities.

Participant selection

The participants will be selected among MPPD staff. The criteria for identification and recruitment of potential participants for this study are from the following units:

- Quality Assurance Unit
- Quantification Unit
- Procurement Unit
- Warehouse Unit
- Sales and marketing Unit

- Finance unit

Voluntary participation

The participation to this study is voluntary.

B. Description of the process

Duration

The study will last for 2 months after the approval of the research protocol. The interview will last between 30 minutes and 1 hour for each participants.

Risks

This study doesn't represent any physical risk. Even if there is no high emotional risk forecasted during this research, unexpected sensitive questions can cause trouble. To minimize those risks, the name and addresses of participants will not be highlighted in the report or any document and they will be free to stop their participation at any time of the study.

Benefits

This study will inform and guide decision makers on the possible improvements to make for MPPD in order to ensure interrupted availability of health commodities for public sector in Rwanda

Incentives

No per diem or any kind of incentives are to be provided to the participants attending the interview. No transport refund will be available as it is considered that the researcher will be conducted to participants at their workplace.

Confidentiality

The research team will maintain the confidentiality of the collected data especially the respondent personal information.

Sharing the results

The results of the study will be scientifically published and shared through other different and relevant communication ways.

Right to refuse or withdraw

The participation is voluntary and the participant has the complete right to refuse or withdraw from the study.

Contacts:

Juvenal Majoro (Principal investigator)

Candidate for Master's Degree in Science of Epidemiology

Phone: +250 788866871

Email: majorojuvenal@gmail.com

Ass. Prof. Manassé NZAYIRAMBAHO, Msc, PhD(Supervisor)

Lecturer at the School of Public Health

Phone: +250 785255388; Email: mnzayira@nursph.org

C. Certificate of consent

I have read the foregoing information. I have had the opportunity to ask questions about it and any question that I have asked have been answered to my satisfaction. I consent voluntarily to participate as a participant in this research and understand that I have the right to withdraw from the research at any time.

Name of Participant:

Signature of Participant:

Date:

Certificat de consentement

J'ai lu les informations ci-dessus. J'ai eu l'occasion de poser des questions à ce sujet et toute question que j'ai posée a été répondue à ma satisfaction. Je consens volontairement à participer en tant que participant à cette recherche et comprends que j'ai le droit de se retirer de la recherche à tout moment.

Nom du participant :

Signature du participant :

Date:

VII.3 APPENDICE 3: Request for permission for data collection

VII.4 APPENDICE 4: Permission for data collection obtained from Division Manager of MPPD