



COLLEGE OF MEDICINE AND HEALTH SCIENCES
EAC REGIONAL CENTRE OF EXCELLENCE FOR
VACCINES, IMMUNIZATION, AND HEALTH SUPPLY
CHAIN MANAGEMENT (EAC RCE-VIHSCM)

**EVALUATION OF THE PERFORMANCE OF HEALTH SUPPLY
CHAIN MANAGEMENT IN RURAL HEALTH FACILITIES. THE
CASE OF NYARUGURU DISTRICT IN SOUTHERN PROVINCE OF
RWANDA.**

A dissertation submitted in partial fulfillment of the requirements of the Degree of Master of Health Supply Chain Management (MSc HSCM) in the School of Medicine, College of Medicines and Health Sciences, University of Rwanda.

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February 2022

DECLARATION

I, **SIMBIZI Mathieu**, hereby declare that the dissertation entitled “*Evaluation of the performance of health supply chain management in rural health facilities. The case of Nyaruguru District in Southern Province of Rwanda*” is my work and has been written by me without any external unauthorized help, that it has been neither presented to any institution for evaluation nor previously published in its entirety or in parts. Any parts, words or ideas, of the dissertation, however limited, which are quoted from or based on other sources, have been acknowledged as such without exception.

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SUPERVISORS APPROVAL

This is to certify that this dissertation has passed through the antiplagiarism system and found compliant and this is the approved final version of the dissertation: *Evaluation of the performance of health supply chain management in rural health facilities. The case of Nyaruguru District in Southern Province of Rwanda.*

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ABSTRACT

Background

Various studies recognize that an effective and efficient Supply Chain Management (SCM) is an impressive tool for achieving a cost-effective outcome for entire parties inside and outside any institution, as well as customer service satisfaction. Despite considerable efforts made in ensuring the availability of health commodities, according to an assessment done in rural districts of Rwanda, there have been identified that ineffective performance can lead to health commodities stock-outs and wastage. However, there are not many research outputs conducted to assess the performance of Health Supply Chain Management (HSCM) in Rwandan Rural health facilities.

The general objective of this study was to assess the performance of health supply chain management in rural public health facilities

Methods

To evaluate the performance of HSCM in public health facilities located in the Nyaruguru district of the southern province of Rwanda, the researcher used a cross-sectional study design. The purposive sampling approach was used to determine the study sample size. The data was collected using questionnaires and a checklists with the guide from Logistics Indicator Assessment Tool (LIAT). After collecting the data, the researcher used SPSS software to analyze the data before being presented.

Results

The study showed that rural health facilities in Nyaruguru district consist of 1 district hospital and 16 health centers, all serving as service delivery points (SDPs). All staff responsible for supply chain management(HSCM) received at least 1 or more trainings on HSCM (100%) and their work experience are rated below 1 year (18%), 1-5 years (65%), 6-10 years (6%), 11years and above (12%). The performance of storage practices is efficient as revealed by results of this study with mean deviation of 4.58, standard deviation 0.594, and represented by 92%. The study findings revealed that 35% of Rural Health Facilities have inventory inaccuracy while 65% have inventory accuracy. The study revealed that 100% of Health commodities are delivery by supplier's vehicle, and the distribution is done monthly as represented by 94%.

The study results showed that all health facilities are using electronic logistic Management Information Systems (e-LMS) as provided by all population of this study (100%), and all reports are submitted to a higher level as represented by 100%. Most reports are submitted before the 6th day of the month as represented by 94%, and within the last month represented by 6%. The study showed that 53% of Health facilities, with last 2 months, received 3 to 5 invoices and 41% are invoiced 0 to 2, 6% are invoiced 6 and above.

Conclusion

The major findings showed that there is performance in Health Supply Chain Management in Nyaruguru Rural Health Facilities which hard-pressed to conclude that all objectives were achieved and research questions were answered. It should also conclude that for all variables (dependent and independents) there is a significate relationship.

There is a need for other researchers to expand this study to address the important parameters like the role of health supply chain management in health quality deliveries.

Keywords: Health Supply Chain Management, performance, health commodities, rural health facilities, performance evaluation.

DEDICATION

I most humbly dedicate this research project to my mother in remembrance of her caring treatment, my lovely wife **NIYONSABA Mariam**, and my children **INEZA SIMBI Sheylla, and SIMBI Asher Pedro**. Without them, this work would not have come into existence.

ACKNOWLEDGMENTS

First and foremost, I will thank The Almighty God, the compassionate, who kindly helped me to reach this step in my studies. I would like to express my sincere appreciation, especially to my supervisors **Prof. Dr. Egide KAYITARE, Ph.D.**, and **Mr. Jurdas SEZIRAHIGA** for their valuable support, encouragement, and kindness towards me towards the successful completion of this research project.

My gratitude also goes to the **EAC Regional Centre of Excellence for Vaccines, Immunization, and Health Supply Chain Management at the University of RWANDA** academic staff for their continued support and knowledge acquired from them during my studies. I am grateful for the recommendation, and encouragement from my former Employer, the **Mayor of NYARUGURU DISTRICT, Mr. HABITEGEKO François**, during my studies.

I am also grateful for the assistance and support from my family namely the lovely Wife **NIYONSABA Mariam** and my offspring, my lovely kids **INEZA SIMBI Sheylla, and SIMBI Asher Pedro, and my Mother NYIRAMAKUBA Françoise**, your love, motivation, and support when much needed; helped me to come out with this beautiful work. My warm gratitude also goes to my **Classmate at the University of Rwanda**, you have been a blessing and encourager to this work.

Finally, this research project is dedicated to my working team and my different friends, I will always appreciate all you have done, your encouragement, and different kinds of support. I am sure you accept my deepest and humble thanks.

LIST OF SYMBOLS AND ACRONYMS

HSCM: Health Supply Chain Management

SCM: Supply Chain Management

SC: Supply Chain

MoH: Ministry of Health

RMS Ltd: Rwanda Medical Supply Limited

RBC: Rwanda Biomedical Center.

HF: Health Facility

HC: Health Center

HR: Human Resources

DH: District Hospital

NCDs: Non-Communicable Diseases

e-LMIS: electronic Logistic Management System

SOPs: Standard Operating Procedures

LIAT: Logistics Indicator Assessment Tool

CMHS: College of Medicine and Health Sciences

IRB: Institutional Review Board

U.S.: United State

USA: United State of America

WHO: World Health Organization

MPPD: Medical Production and Procurement Division

VPDD: Vaccine Preventable Disease Division

DHSST: District health System Strengthening Tool

SPSS: Statistical Package for the Social Sciences

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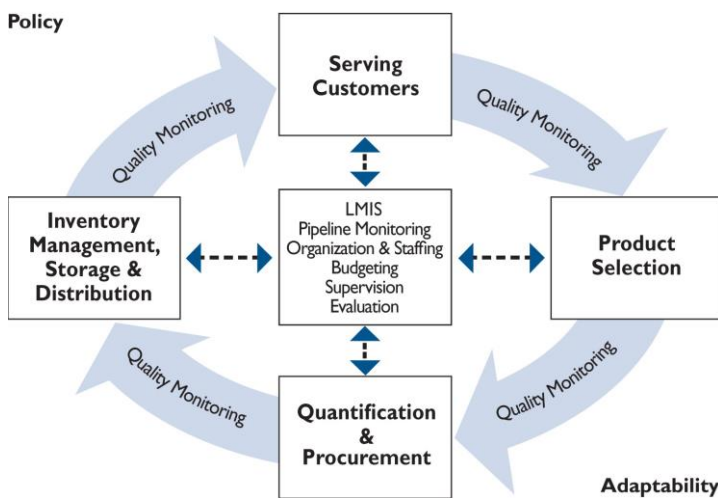
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CHAPTER ONE: INTRODUCTION

1.1 Background

The USAID DELIVER PROJECT Logistics Handbook, a Practical Guide for the health supply Chain Management, describes the logistics cycle as a version for illustrating the relationship between the activities in a logistics system.

Figure 1.1: The Logistics Cycle



Source:(1)

The supply chain can be defined as the life cycle processes that products go through from the manufacturer to the point of payment and use.(2)

A well-functioning health supply chain should ensure that all activities of logistics cycle including distribution, serving customers, procurement, quantification, storage, inventory

management, selection, and management support (LMIS, pipeline monitoring, organization and staffing, budgeting, evaluation and supervision) are conducted efficiently and effectively.

Assessing the performance of the entire supply chain is a complex task, due to the complexity of supply chain structure and operations.(3)

In health supply chain, the essential contributors encompass manufacturers (medical supplies, medical equipment, and drugs), medical service provisions, distributors, medical companies, insurance corporations, users of health care services, employers, government regulators, and government groups.(2)

The efficient functioning of the health supply chain is important to ensure access to health commodities as well as to achieve successful health outcomes. That is especially essential in maximum sub-Saharan African nations, where the mission and public health sectors do a large proportion of the people.

In 2010, Rwanda's logistics management Information system (LMIS) was plagued by dysfunction and inefficiencies, including a lack of poor data quality and information. Without basic data, it was impossible to conduct evidence-based quantification of commodity needs and make informed and timely decisions at all supply chain levels. Nowadays, but, in public health, an integrated supply chain links all those concerned within the management of essential medicines into a cohesive supply chain management institution, in the long run assisting customers get quality health supplies and services.(4)

This study seeks to evaluate supply chain management performance in public rural health facilities in Nyaruguru district of Southern Province, Rwanda. It will cover the assessment of the performance of Inventory management, storage, distribution, LMIS, financial management as are primary activities required in all district Health facilities. The study will not cover the assessment of the performance of other remaining logistics cycle activities due to limited time and means.

1.1.1 Health Supply Chain Management

The health supply chain management relates to the procurement and distribution of services, and products moving from the storage room to the customer or patient. It comes with a set of its issues, but the most prominent issues are expirations, demand, and stock-outs for specific types of inventory products.(5)

Different agencies have variously defined the supply chain management. The SC Council defines Supply Chain Management as demand, and supply management, parts and raw material sourcing, warehousing, manufacturing, order entry, order management, inventory tracking, distribution, and delivery to the customer. (6)

1.1.2 Supply chain performance

Supply chain performance can be considered as the extent to which supply chain activities efficiently and effectively ensure the realization of the objectives and goals of any organization.(4) SCM measures can be broadly categorized into quantitative measures, such as response time, order turnaround time, flexibility, resource utilization, and delivery performance, and qualitative measures, such as customer satisfaction and product quality. (7)

The significance of getting drugs and other health commodities available in the health facility cannot be overstated, and their regular availability relies upon on how poorly or nicely the supply chain is acting. However, to enhance the performance of the supply chain, you need to realize how it is far currently performing, i.e., you need to evaluate it. (8)

1.1.3 Problems of access to healthcare in rural areas

Rural area/region refers to a geographic area located outside the cities or towns. It can have a legal delimitation and definition, either at the national level or by bilateral agreement.(9)

Overall, Access to health services is essential for good health, but rural areas face several barriers to access. Rural areas are characterized by some burdens on the region's economic, social, and health infrastructure, health and social-economic challenges such as health workforce shortages, ineffective supply chain management, high fees, poverty, limited access to healthcare, restricted water supply, and lack of safe drinking water, adequate housing and proper sewage systems. For example, it is not uncommon for patients in rural areas along the US-Mexico border with chronic conditions such as diabetes and cancer to seek health care from both countries for treatment due to the limited geographic distance of health resources and specialists. (10)

These populations often experience challenges and barriers related to financing, health insurance, access to medical records, essential medications, and finding appropriate treatment facilities. Residents along the US-Mexico border had less access to health care than their counterparts in the interior.(10)

1.1.4 Health Facilities in Nyaruguru district of the southern province of Rwanda

According to the Rwanda Health sector performance report of 2019-2020, in Rwanda, there are 510 Health Centers, 37 District Hospitals, 4 Provincial Hospital, 8 National Referral Hospitals, in total 559 public Health facilities, dispatched in all 30 Districts of the country. Nyaruguru District covers in total 17 Health Facilities, including 1 District Hospital, and 16 Health Centers.(11)

1.2. Problem Statement

Various studies recognized that an effective and efficient Supply Chain Management is a powerful tool for achieving a more profitable outcome and a cost advantage for all parties inside and outside an organization and customer service satisfaction. Therefore, a SCM assessment is essential for health facilities to achieve good service delivery and financial management. (O, 2016).

However, according to an assessment of stock-outs of essential medicines in health facilities in Burera district, Northern Province of Rwanda, conducted in 2015, both health service providers and patients raised complaints highlighting the unavailability of essential health products in public health facilities to high levels of stock-outs of essential health products. In rural health Centers of the Burera District, up to 73% of health facilities faced an issue of stock-outs of essential health commodities.

According to an evaluation of the availability of essential drugs for asthma, hypertension, and diabetes, in rural Rwanda, 2018 conducted in March 2021 in Kirehe District, it has been shown that rural health facilities faced frequent stock-outs of NCDs with an average

duration of one week, and their supplier (District Pharmacy) order fill rates were 67%, 42%, 67% for respective captopril, metformin, and salbutamol.(12);

Weak supply chain control system in health facilities has proven to be one of the factors of drug wastage in public health facilities in the south western zone of Shao, Ethiopia.(13)

Above all, the literature lacks any study that specifically assessed the performance of Health Supply Chain Management (HSCM) at the health facility level in a rural area of Rwanda. Thus, there is a need for assessing the HSCM performance in rural health facilities as the leading cause of stock-outs and wastage is inefficient and ineffective HSCM.

1.3 Purpose of the Study

Although patients are the ultimate and primary health facilities customers, and health providers exist to meet the client's needs, the internal processes quality of providers determines how to meet those needs.

This study was carried out by effective collection, organization, and dissemination of data on HSCM performance in healthcare facilities. This will influence the creation and renewal of the new policies or the revision of existing ones, especially in the Ministry of Health and more generally Rwanda's government.

1.4 Objectives

1.4.1 Main Objective

The general objective of this study is to assess the performance of health supply chain management in rural public health facilities.

1.4.2 Specific Objectives

1. To explore rural health facilities characteristics and staffing
2. To measure the performance of storage, inventory management and Distribution practices in rural health facilities
3. To assess the performance of the Logistic Management Information System (LMIS), and financial management in rural health facilities.

1.5 Research Questions

1. How are rural health facilities characterized and staffed in terms of HSCM?
2. How is inventory control, storage practices and distribution managed in rural health facilities?
3. How is the Logistics Management Information System (LMIS) and financial management implemented in rural health facilities?

1.6 Significance and Anticipated Output

The findings of this study will be helpful for health facilities to be aware of the area of improving SCHM key performance indicators, local and national leaders to make decisions according to the identified research findings. This study will also serve as a baseline for other researchers and general readers. Thus, it is hoped that it will provide new information on this area of interest and serve as a useful reference source.

1.7 Delimitations of the study

1.7.1 Content scope

The study is imperfect to find out strong understanding of the performance of Health Supply Chain Management in Rural Health Facilities, A case study of Nyaruguru District. It emphasized on how the use of Health Supply Chain standards in Nyaruguru Health Facilities. It sets up the correlation between the supply chain management and performance of Health Facilities in Nyaruguru District and at the end of this study, the researcher will provide recommendations for addressing illustrated gaps.

1.7.2 Geographical scope

This study was concerned with the performance evaluation of Health Supply Chain Management in Rural Health Facilities especially in Nyaruguru District.

1.7.3 Time scope

This study covered the period of 1 year and 6 months, from July 2020 to December 2021. This time was very suitable and appropriate for the researcher to get the required data to perform data analysis.

1.8 Limitation of the Study

The few numbers of government institutions have the confidentiality policy and data protection limited most of staffs from responding some surveys since it considered to be con-

tradition of the institutions ' data protection policy and confidentiality to expose the institutions performance matters. This was resolved by promising the HFs of a highest privacy and disclosing for pure academic purpose only.

Another limitation was that some of the staff who were supposed to answer the questionnaire of HF and to provide checklist data were not willing to complete questionnaires or provide checklist data and gave some matters being misinterpreted, some inadequate responses to the questions, and unanticipated occurrences like staff's preparation to go on their leaves before completing the surveys. This was mitigated and resolved through reminder to the staff before their departure.

CHAPTER TWO: LITERATURE REVIEW

2.1 Overview of the topic

The purpose of this chapter is to review the work that other researchers and scholars have done in relation to supply chain management. Empirical and theoretical reviews are conducted leading to a conceptual framework that aims to guide the research. The chapter begins with an assessment of the theories underpinning the concept of logistics and supply chain management. This chapter provides an empirical assessment of supply chain performance evaluation in general and specifically in healthcare institutions. The conceptual research framework adopted is discussed.

2.2 Theoretical Perspective of Supply Chain Management performance measurement

The concept of supply chain management is inevitable for the effective resources utilization in the modern institution. (14)

2.2.1 Supply Chain Management

According to Silene et Leite, supply chain management is a set of approaches used for effective and efficient integration of stores, warehouses, manufactures, and suppliers to produce and distribute services and products to the clients and customers at the right time, quantities, places, and cost while satisfying the requirements of service level.(15)

For effective and efficient supply chain management implementation, all involved parties must be considered, such as the retailers, distributors, suppliers, any party contributing in

the organization's market share promotion, and different functions within the manufacturing organization. (16)

According to Mentzer et Al. efficient and effective supply chain management increases organizational effectiveness and leads to improved revenue, resources utilization, and improved customer value.(16) Luthra et Al. revealed that, for an efficient and effective supply chain management; the entire supply chain management should be evaluated, therefore the resources of the entire chain members must be efficiently combined to generate competitively cost-effective services and products.(17)

2.2.1.1 Characteristics and staffing of rural health facilities

Following the thirty fifth consultation of the WHO's African Regional Committee, held in Lusaka in 1985, Rwanda adopted a health improvement approach based on district-level care and decentralized management. The process of decentralization commenced with the creation of health workplaces (offices) at the provincial levels for managing the health system. Finally, this process of decentralization has moved towards district level.(18)

Rural communities frequently have issues of keeping qualified and sufficient health workforce, making it tough to provide the vital care to patients or to satisfy the staffing necessities in their facilities.(18)

2.2.1.2 Inventory management in Rural Health Facilities

Maintaining an accurate record of an organization's inventory is essential to managing its assets. A periodic inventory system is usually based on a physical inventory count. Inventory information is updated periodically when a physical count is performed.(19)

A study conducted in Jubek State South Sudan revealed that some primary health facilities showed good storage and inventory management practices, while others were rated as poor or fair.(19) Most of the items evaluated scored 37% in the warehouse evaluation, while the items evaluated for inventory management practices scored less than 75%. Kebede et al. BMC Health Services Research (2021)(19)

2.2.1.3 Storage Practices in rural health Facilities

Maintaining proper storage conditions in healthcare facilities is critical to decrease pharmaceutical wastage resulting from environmental factors.(20)

The study conducted in west Wollega zone of Ethiopia, revealed that among 23 health facilities assessed, 13(68.42%) health centers 17 (73.91%) (4(100%) hospitals fulfilled required storage conditions. Store rooms of hospitals had furniture and equipment, fulfilled desirable storage conditions, while, there was no compliance with required storage conditions for most of health centers ‘store rooms.(20)

2.2.1.4 Distribution in rural health facilities

The supply chain distribution practices play an important role for all organizations striving for providing exceptional supply chain performance.(21)

According to Samuel Ofofu Awuah, in primary health facilities in Hubei of china, overall, the new distribution system did not improve the distribution of essential health commodities to health facilities. On the contrary, the research revealed that a 7.78-19.85 percentage point decrease ($p < 0.01$) in distribution rates to rural health facilities. Similar results were

obtained using the indicator for rates received, with a decrease of 7.89-19.65 percentage points ($p < 0.01$).⁽²¹⁾

2.2.1.5 Logistics management information system in rural health facilities

The efficiency and effectiveness of supply chains depends on the performance of LMIS. Availability and accuracy of LMIS data are essential for avoiding stock outs and overstocking, distribution planning along the supply chain, and quantification processes.⁽²²⁾

⁽²²⁾showed that in public health facilities of East Wollega Zone, Oromia regional state, Ethiopia, shortage of skilled workforce and low staff commitment were identified as the main bottlenecks to the logistics management information system performance.⁽²²⁾

2.2.1.6 Financial Management in rural health facilities

In low-income countries, tracking rural health facilities financial data is difficult due to the absence of effective systems for monitoring health financial information and non-standardized accounting practices.⁽²³⁾

The research found that, in Rwanda, while information on cash flow could be obtained for the most parts of the health facilities, much of the data on in-kind assistance had to be obtained from health service providers. For instance, in 2009 and 2010, health centers received most of their drugs (without making payments) directly from District Pharmacies, the MPPD (Rwanda Medical Production and Procurement Division), and the VPDDD (Rwanda Vaccine Preventable Disease Division. Health centers had no transactions records, and providers retained delivery notes. Relying solely on the reports of the healthcare

facilities' accountants (as DHSST does) will not capture the value of unpaid drugs and, as a result, will drastically underestimate the value of unpaid drugs.(23)

2.2.2 Supply Chain Performance Measurement

The supply chain is a network of retailers, distributors, manufacturers, and suppliers acting together to manage, monitor, and improve overall supply chain performance. The most critical and important part of decision-making is the identification of the different supply chain performance aspects.(24)

Supply chain performance evaluation refers to evaluating the performance of purchasing, manufacturing, planning, distribution, and marketing of organizations.(25)

The evaluation of health supply chain management performance has become extremely relevant as healthcare systems have begun to struggle for enhancing operational efficiency and costs reduction.(4)

According to (26), to achieve effective Supply Chain Management, Supply Chain performance should be evaluated first. Only if Supply Chain performance is evaluated objectively, and accurately, can existing problems of this Supply Chain be identified, and hence, corresponding solutions be found and SC competitiveness is improved ultimately.

Mentzer et Al. illustrated that one of efficient supply chain obstacles is inadequate measurement of supply chain management. That is why it is required to measure supply chain performance in order to improve its performance.(16)

2.2.3 Health Supply Chain Performance evaluation tools

To assess the health supply chain performance, there are two tools approved by World Health Organization (WHO) namely the Logistics System Assessment Tool (LSAT) and the Logistics Indicators Assessment Tool (LIAT).(27)

LIAT is a quantitative data collection tool used to conduct any health facility survey to measure the performance of pharmaceutical supply chain management and to assess the availability of health products in health facilities. While LSAT is a qualitative data collection tool used to evaluate system's environment and a logistics system. (28)(27)

2.3 Summary of Literature Review

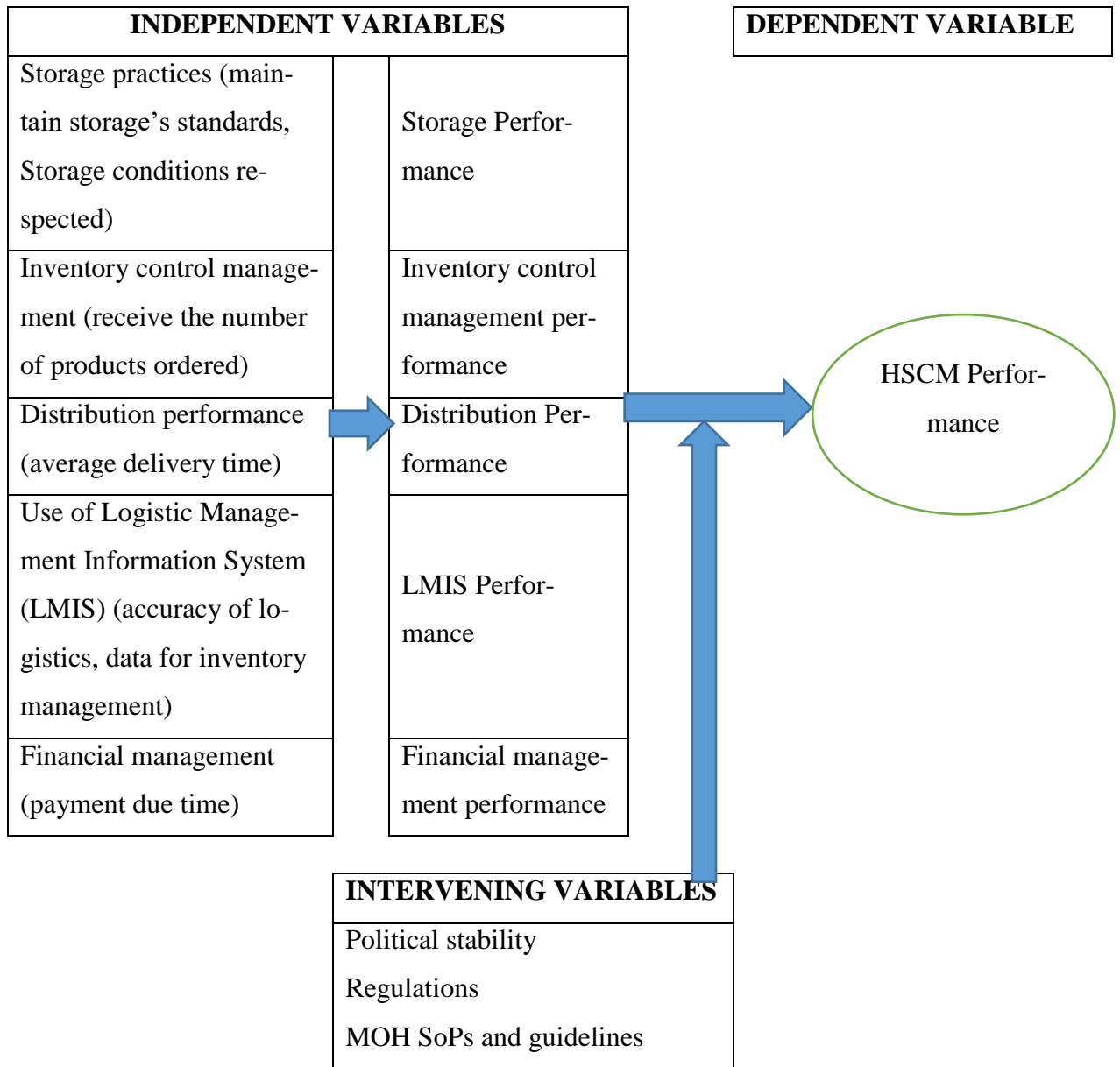
Health supply chain management (HSCM) is an important element of operational performance. HSCM can be applied to customer satisfaction and organizational success.

HSCM impacts on the effective resources utilization and the achievement of organizational objectives and goals. Evaluation of HSCM results in addressing gaps and improving the quality of the whole SC process.

2.4 Conceptual Framework

The conceptual framework reveals the relationship between the study variables; a variable is a measurable characteristic that assumes particular values throughout subjects. The relationships between the analysis variables are presented in the figure beneath. This study's conceptual framework is based on the relationship between the dependent and independent variables. This study aims to evaluate the performance of health supply chain management in rural public health facilities.

Figure 2.2: Conceptual Framework



CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Study Design

This study was conducted using a quantitative descriptive cross-sectional study, which allowed a large amount of data to be collected from a sizable population in a shorter period of time. Data were obtained from a group of participants with varied characteristics and demographics in selected rural health in Nyaruguru district of Rwanda. Both questionnaires and checklists were used for data collection.

3.2 Study Area and Period

The study was conducted in the Nyaruguru district of the southern province of Rwanda, specifically in the rural public health facilities located in the aforementioned area. This area consists of 16 health facilities and 1 district hospital. Nyaruguru district was chosen as the study area because it is one of the rural districts in Rwanda that the researcher needed to assess the performance of health supply chain management in its health facilities (16 health centers and 1 district hospital). The study was conducted between July 1, 2021 and January 31, 2022, followed by the presentation of the results in March 2022, where the data was collected especially between December 1, 2021 and January 15, 2022.

3.3 Study Population

This research project was conducted in public health facilities located in Nyaruguru district, in the southern province of Rwanda, and the study population was 17 health facilities, including 1 district hospital (Munini district hospital) and 16 health centers located in this area.

3.4 Sample Design

In this study, the researcher used a purposive sampling design, as he relied on his own criteria when choosing the members of the population to participate in the survey. The selected hospital was Munini District Hospital, while the remaining 16 health facilities were health centers. All health centers in Nyaruguru district were selected, making the sample size equivalent to the entire population of 17 health centers, since Nyaruguru district has all its health facilities located in rural areas and accessible to the researcher. The selected health facilities were drawn from the Ministry of Health list for sampling purposes.

3.5 Inclusion Criteria

In this study, the inclusion criterion was being public health center and District hospital located in the study area.

3.6 Exclusion Criteria

In this study, the exclusion criteria were being public health facilities located outside the study area and private health facilities.

3.7 Data Collection Method

The researcher used a questionnaire and checklist, guided by the Logistic Indicator Assessment Tool (LIAT), to capture all the necessary data prior to analysis. The data were collected and analyzed by the researcher himself at the sampled health facilities. During data collection, questionnaires were distributed to key health supply chain staff at the health

facilities to capture data regarding health facilities characteristics and staffing and the researcher filled in the necessary storage practices, order fill rate, stock according to plan, LIMIS, and financial data in the checklists. In addition, the personnel selected to complete the questionnaires at each health facility was one of those responsible for the management of the health supply chain, as they were in a good position to manage the health commodities at the health facilities and to prepare and keep the logistics data.

3.8 Pre-Testing, Validity, and Reliability

In this study, to establish the reliability and validity of the questionnaires and checklists, the researcher conducted a pilot study. After the pilot study, the researcher identified unclear statements or ambiguous questions that needed to be modified to get an idea of the time taken to complete the questionnaires and checklists and adjust it to a reasonable period.

To ensure the reliability and validity of the instrument, the researcher reviewed the questionnaires and checklists to confirm the clarity, consistency, intelligibility, and conciseness of the wording.

3.9 Data Analysis and Presentation of Results

The researcher checked and edited the collected data for accuracy prior to analysis. The researcher used the SPSS version 18 software, to perform multiple regression analysis and estimated the beta values of the factors and F-test statistics to determine their significance at 95% confidence level. The results of this study were presented in graphs and tables. It was then reinforced with a brief description.

3.10 Ethical Considerations

To protect the research participants' interests, the approval of this research's ethical aspects was done by College of Medicine and Health Sciences (CMHS) Institutional Review Board (IRB). In this process, the participants were given a consent form to read and sign if they agreed to participate in the study. The consents have also helped to guarantee the confidentiality of responses from Health Facilities. It was ensured that the health facility's name and respondents' names did not appear on the questionnaire or checklist.

The information provided by the respondents was treated confidentially and was only used for academic purposes. The researcher ensured that the administration of health center and each hospital was contacted before starting data collection.

CHAPTER FOUR: RESULTS OF THE STUDY

4.0 introduction

Chapter four presents the analysis of study findings on the evaluation of the performance of health supply chain management in rural health facilities. the case of Nyaruguru District in Southern Province of Rwanda.

4.1 Respondent rates

In survey research, the response rate or completion rate is the number of staff who answered or completed questionnaires of the survey over the number of people who received the questionnaires (the sample), then multiply by 100 to enable them to express the rate in percentage.

In this study, the sample was composed of 17 health facilities and all were surveyed. Only one staff in charge of health supply chain management at each health Facility was given a questionnaire and helped the researcher to get the data to fill out on the checklists. Out of the 17 issued questionnaires, 17 questionnaires were answered, completed representing by 100% of the total questionnaires distributed were returned fully completed. It can be concluded that the response rate was excellent. The response rate of 70% and over is excellent for the data analysis and reporting on the opinion of the entire population (Fowler, 2004).

Table 4.1: Response rate

HF	Questionnaires		Response rate (%)
	Distributed	Returned	
District Hospital	1	1	100
Health centers	16	16	100
Total	17	17	100

Source: Primary data, 2022

4.2 Demographic characteristics of HFs

This section discussed the study findings on the general information on the evaluation of the performance of health supply chain management in rural health facilities, in Rwanda, especially in Nyaruguru District in the southern province.

4.2.1 Health Facility level

According to the level of health facility, the results showed that among 17 health facilities surveyed 1 was at District Hospital level represented by 6% and 16 were at Health centers level as presented represented by 94% as presented below in Table 4.2.

Table 4.2: Health Facility level

Health facility level	Responses	Percentage (%)
District Hospital	1	6
Health centers	16	94
Total	17	100

Source: Primary data, 2022

4.2.2 Health Facility type

The researcher wanted to assess the type of the health facility and the results revealed that all health facilities surveyed were SDPs (Service Delivery Points) as represented by 100%.

Table 4.3: Type of Health facility

Health facility type	Responses	Percentage (%)
District Hospital	1	6
Health centers	16	94
Warehouse	0	0
Total	17	100

Source: Primary data, 2022

4.2.3 Health facility infrastructures

To perform well in medical commodities, supply chain management, there is a need for strong infrastructures. The researcher wished to assess the availability of water and electricity at the health facility level. All health facilities surveyed have water and electricity which are facilitating them in supply chain management.

Table 4.4: Health facility infrastructures

Health facility infrastructures	Facility Level		Percentage (%)
	District Hospital	Health Center	
Availability of electricity	1	16	100
Availability of water	1	16	100

Source: Primary data, 2022

4.2.4 Staff of HF's experience in supply chain management

The staff in health facilities were asked to indicate the number of years they had worked in the supply chain management services in health facilities. The results presented in Table 4.5 revealed that 65% had worked in the supply chain management for 1-5 years, while 11% of them had worked for below one year, 12% had worked for 11 years and above and 6% had worked between 6 and 10 years in in the supply chain management. This is an indicator that shows the majority of the health facilities are composed of employees who have competent skills and experience in the field of supply chain management

Table 4.5: Experience in supply chain management

Experience	District		Health Centers		Total	Percentage (%)
	Hospital		Nurse	Other		
	Nurse	Other	Nurse	Other		
Below one year	0	0	2	0	3	18
1-5 Years	0	0	9	2	11	65
6-10 years	0	0	1	0	1	6
11 years and above	1	0	1	0	2	12
Total	1	0	13	2	17	100

Source: Primary data, 2022

4.2.5 Supply chain management responsible

The study wanted to analyze the responsible who manage the logistics of health commodities at a health facility. The results in Table 4.6 showed that most of the responsible persons are nurses as represented by 88%, while others represented by 12%.

The results revealed that no Pharmacist is responsible to manage health facilities' storage as in MoH SoPs and guidelines required to have at least one Pharmacist to the District level who is in charge of capacity building for nurses in other health facilities.

Table 4.6: Health Supply chain management responsible

Staff	District Hospital	Health Center	Percentage
Nurse	1	14	88
Others	0	2	12
Total	1	16	100

Source: Primary data, 2022

4.2.6 Training on supply chain management

To increase the company productivity, the training contributes to the improvement of efficiency and productivity of employees in the organization. In this context, the health facilities were assessed on the staff training on supply chain management themes. The results represented in Table 4.7 showed that both hospitals and health centers responsible for supply chain management are trained.

Table 4.7: Training on supply chain management

Attribute	Facility Level	
	District Hospital	Health Center
Training on supply chain management	1 (6%)	16 (94%)
Total	1 (6%)	16 (94%)

Source: Primary data, 2022

4.2.7 Health facilities' staff qualification

According to the qualification of health facilities qualification, the results of this study showed that 88% of staff had a diploma academic qualification (A1), while 12% had undergraduate (bachelor's degree A0). The results highpoint that the knowledgeable and had huge information on supply chain management in health facilities.

Table 4.8: Health facilities' staff academic qualification

Attribute	District Hospital	Health Center	Total	Percentage (%)
Bachelors A0	0	2	2	12
Diploma A1	1	14	15	88
Total	1	16	17	100

Source: Primary data, 2022

4.3 Presentation of the study findings

This section highlights the findings of the study on the performance of storage, on the performance of inventory management, on the distribution performance, the performance of Logistic Management Information System (LMIS), and the performance of financial management in Rural District Health facilities.

4.3.1 Performance of storage practices in Rural Health Facilities

The study wanted to assess the effectiveness of the storage practices in rural district health facilities. The storage practices refer to a set of the different strategies and tools that are interrelated to ensure that both are serving the common purpose of meeting the performance of health facilities in rural areas.

To assess the stock performance and management in rural health facilities, different variables, therefore, were considered and employed by the five points scale as rated as follows: Strongly Disagree 1, Disagree 2, Neutral (not sure) 3, Agree 4, and to Strongly Agree 5.

Based on the findings in table 4.10, the storage performance and management in rural district health facilities are efficient as revealed by the results of this study with the mean of 4.58, St Deviation 0.594, and represented by 92%.

Products in rural health facilities are ready for distribution and well-arranged so that identification labels expiry dates and/or manufacturing dates are visible (mean 4.7, St. Deviation 0.470, represented by 94%). The products are stored and organized in a manner accessible for first-to-expire, first-out (FEFO) (mean 4.76, Standard Deviation 0.437 represented by 95%).

The cartons and products are in good condition, not crushed due to mishandling (mean 4.65 St. Deviation 0.493, represented by 93%). The facilities have a practice of separating damaged and/or expired products from usable products and removing them from inventory (mean 4.59, St. Deviation 0.795, represented by 92%).

The products are protected from direct sunlight at all times (mean 3.94, St. Deviation 0.966, represented by 79%). Cartons and products are protected from water and humidity all the time (mean 4.59, St. Deviation 0.795, represented by 92%). There are no insects and rodents (mean 4.88, St. Deviation 0.332, represented by 98%) and the storage areas are secured with a lock and key (the access is limited to authorized personnel only (mean 4.59 St. Deviation 0.795, represented by 92%). The products are stored at the appropriate temperature during all seasons according to product temperature specifications (mean 4.94, St. Deviation 0.243, represented by 99%).

The roofs of the stores are always maintained in good condition to avoid sunlight and water penetration (mean 4.29, St. Deviation 0.985, represented by 86%), and storerooms are maintained in good condition (clean, all trash removed, sturdy shelves, organized boxes) (mean 4.65, St. Deviation 0.702, represented by 93%)

The products are stocked at least 10 cm off the floor (mean 4.88, St. Deviation 0.332, represented by 98%), stocked at least 30 cm away from the walls and other stacks (mean 4.59, St. Deviation 0.507, represented by 92%) and are stocked no more than 2.5 meters high (mean 4.88, St. Deviation 0.332 represented by 98%).

Table 4.9: The storage performance and management

Attributes	Success rating (1 lowest & 5 highest)					Mean of score	Std. De- viation	Percentage (%)
	1	2	3	4	5			
Drugs arrangement permitting visibility of manufacture and expiry dates on labels	0	0	0	5	12	4.71	0.470	94
Respect of first-out (FEFO) counting	0	0	0	4	13	4.76	0.437	95
Conditions of products in cartons	0	0	0	6	11	4.65	0.493	93
separation of damaged and/or expired products from usable products.	0	0	3	1	13	4.59	0.795	92
Products protection from direct sunlight.	0	0	3	1	13	3.94	0.966	79
Cartons and products protection from water and humidity.	0	0	8	2	7	4.59	0.795	92
Protection of storage area harmful insects and rodents	0	0	0	2	15	4.88	0.332	98
storage area security (with a lock and key.)	0	0	3	1	13	4.59	0.795	92
Appropriateness storage temperature.	0	0	0	1	16	4.94	0.243	99
Maintenance of store room roof in good condition	0	0	6	0	11	4.29	0.985	86
Maintenance of store room in good condition.	0	0	2	2	13	4.65	0.702	93
Sufficiency of storage space	0	0	5	9	3	3.88	0.697	78
Stacking of products at minimum distance from the floor	0	0	0	2	15	4.88	0.332	98
Stacking of products at minimum distance from the wall and other stacks.	0	0	0	7	10	4.59	0.507	92
Stacking of products at required height	0	0	0	2	15	4.88	0.332	98

Availability and accessibility of Fire safety equipment.	0	0	0	4	13	4.76	0.437	95
Separate storage of products from insecticides and chemicals.	0	0	3	5	9	4.35	0.786	87
						4.58	0.594	92

Source: Primary data, 2022

4.3.2 Performance of inventory control management in Rural Health Facilities

A well-thought-of inventory management system means that inventory control management is updated at all times. This gives accurate evidence to ensure the performance of inventory control management is being respected

In this regard, HFs were asked to indicate how they are using tools and state the status of the health facility storage to ensure the performance of storage practices.

Table 4.10: Rate of use and fill the stock card and daily register

Management of health commodities	District Hospital		Health Center		Total
	Yes	No	Yes	No	
Use and fill the stock card forms	1 (6%)	0 (0%)	16 (94%)	0 (0%)	17
Use and fill daily register forms	1 (6%)	0 (0%)	16 (94%)	0 (0%)	17
Use and fill other logistics forms	1 (6%)	0 (0%)	15 (88%)	1 (6%)	17

Source: Primary data, 2022

The study wanted to analyze the performance of inventory control management, the findings presented in table 4.11 revealed that all HFs indicated that the stock cards are recorded using the smallest unit of count, the quantities dispensed to inpatients and outpatients are recorded as represented by 100%.

Table 4.11: Performance of inventory control management

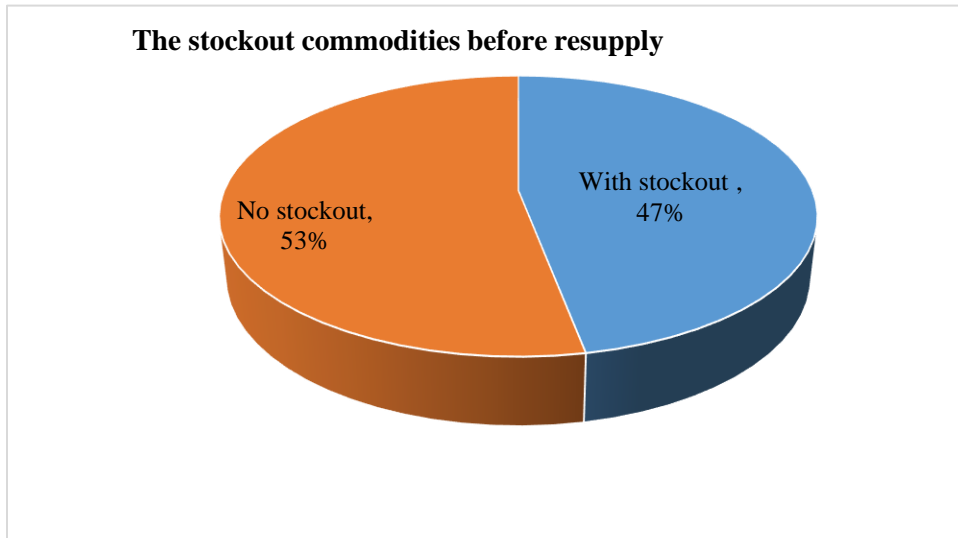
Attributes	District Hospital		Health Center		Total
	Yes	No	Yes	No	
The stock cards are recorded using the smallest unit of count	1 (6%)	0 (0%)	16 (94%)	0 (0%)	17
The quantities dispensed to inpatients are recorded	1 (6%)	0 (0%)	16 (94%)	0 (0%)	17
The quantity dispensed to outpatients are recorded	1 (6%)	0 (0%)	16 (94%)	0 (0%)	17

Source: Primary data, 2022

4.3.2.1 The stockout of commodities before resupply

According to the state of the stockout of commodities in rural health facilities. The results presented in Table 4.12 indicated that health facilities experienced one or more stockout of some commodities within three last months as represented by 47%.

Figure 4.3: The stockout of commodities before resupply



Source: Primary data, 2022

4.3.2.2 The most stocked-out commodities

The results presented in Table 4.12 revealed that some most commodities that experienced more stockout are Abacavir 600 mg + Lamivudine 300 mg Tab represented by 41%, followed by Amoxicillin 125mg represented by 12% and others are less than 10%.

Table 4.12: The most stockout of commodities

Most stocked-out commodities	Responses	Percentage (%)
Abacavir 600 mg + Lamivudine 300 mg Tab.	7	41
Phénobarbital 100mg Tab.	1	6
Amoxicillin 125mg Tab.	2	12
Etonogestrel 68mg Tab.	1	6
Biperiden 2mg Tab.	1	6
Calcium gluconate 100mg/ml 10ml inj.	1	6

Chlorpromazine 25mg/ml 2ml inj.	1	6
Cimetidine 400 mg Tab.	1	6
Cimetidine 400 mg Tab.	1	6
Cloxacillin 250 mg capsule	1	6
Total	17	100

Source: Primary data, 2022

This study wanted to analyze the rate of expiration of commodities in the last three months and the results were summarized in Table 4.13.

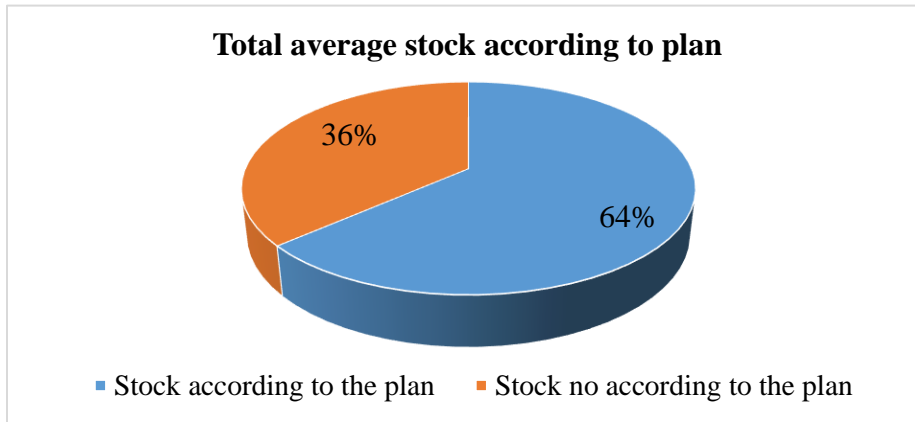
Table 4.13: Commodities expiration in last 12 months

Question	District Hospital		Health Center		Total
	Yes	No	Yes	No	
Commodities expiration in last 12 months	1 (%)	0 (0%)	16 (94%)	0 (0%)	17

Source: Primary data, 2022

During this study, the Researcher analyzed the stock status according to the plan, and study findings revealed that 64% of health facilities have a stock of health commodities according to the plan while 36% have no stock of health commodities according to the plan.

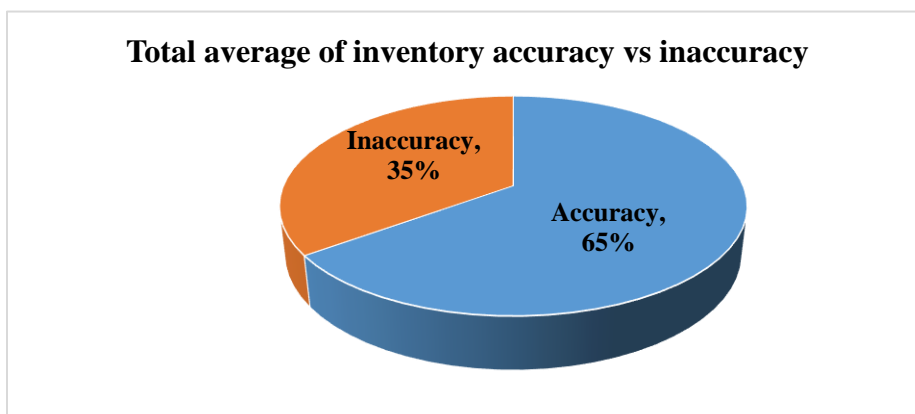
Figure 4.4: Stock status according to the plan



Source: Primary data, 2022

Managing the commodities inventory in rural health facilities plays an essential role in the supply chain management of health commodities. Inaccurate inventory of health commodities is problematic because it can translate to incorrect orders, a lack of product, robbery, damages, loss in the rural health facilities. The following figure 4.6 shows that 35% of rural health facilities have inventory inaccuracy while 65% have inventory accuracy.

Figure 4.5: Total average of inventory accuracy vs inaccuracy

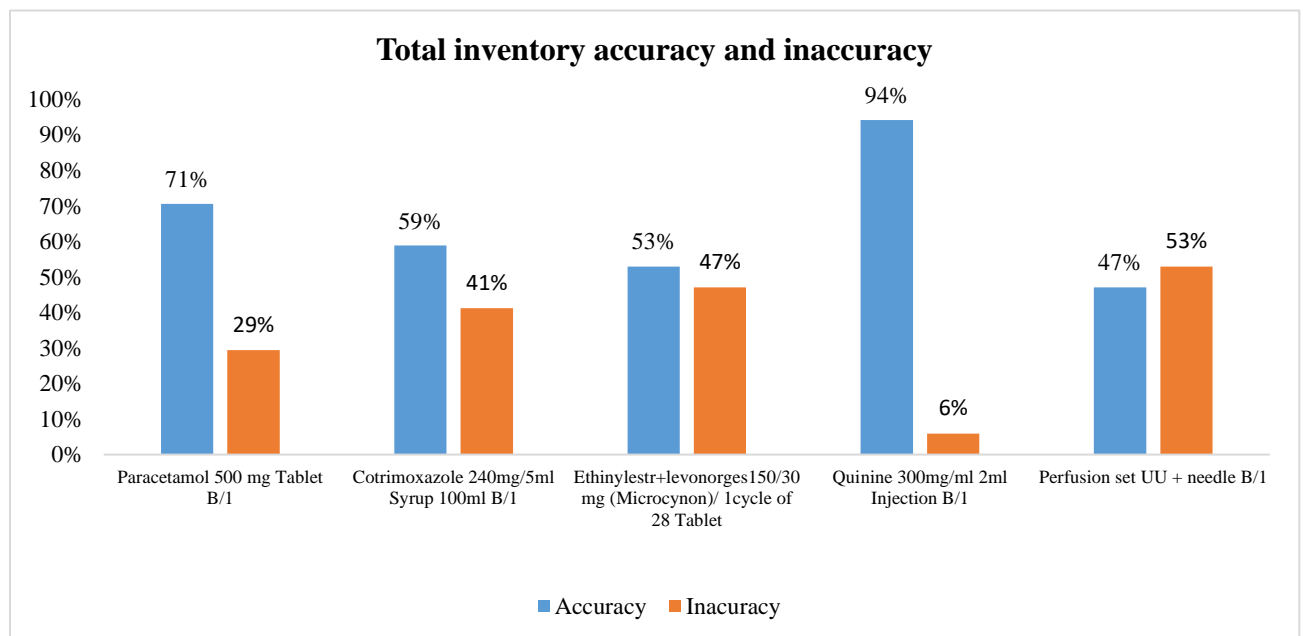


Source: Primary data, 2022

The following figure 4.4 shows the comparison total inventory accuracy between 5 products randomly selected from Nyaruguru Health facilities. The results showed that Quinine 300mg/2ml injection B/1 is the first product with inventory accuracy with 94%, followed by paracetamol 50mg Tablet B/1 represented by 71%, Cotrimoxazole 240mg/5ml Syrup 100ml B/1 represented by 59%, Ethinylestr+levonorges150/30 mg (Microcynon)/ 1cycle of 28 Tablet represented by 53% and Perfusion set UU + needle B/1 represented 47%.

Researcher wished to analyze the total inventory inaccuracy and found that most commodities which have an inaccuracy in health facilities stocks. The first commodity with inaccuracy is Perfusion set UU + needle B/1 represented 53%, followed by Ethinylestr+levonorges150/30 mg (Microcynon)/ 1cycle of 28 Tablet represented by 47%

Figure 4.6: Total inventory of 5 products

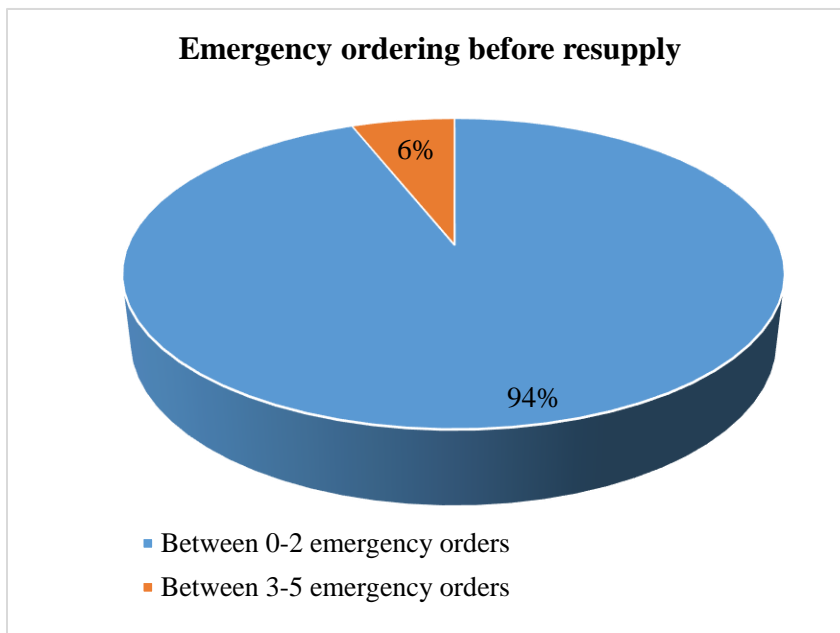


Source: Primary data, 2022

4.3.2.3 The Emergency ordering before resupply

The results presented in figure 4.9 showed that there are emergencies orders done by health facilities before resupply. Between 0 and 2 orders represented 94% and between 3 and 5 orders represented 6%.

Figure 4.7: Emergency ordering before resupply



Source: Primary data, 2022

4.3.2.3 Order fill rates (quantity ordered vs quantity supplied)

Quantity Ordered is the total health commodities ordered in the initial order (without any changes) while quantity supplied is the total amount of health commodities that suppliers delivered.

During this study, the Researcher wanted to analyze the fill rate which is the difference between quantity ordered and quantity supplied (received). According to the results of the study, the quantity of 5 medicines ordered during 3 months by health facilities is received at 77% while 23% of 5 medicines ordered during 3 months by health facilities are not received.

Figure 4.8: Order fill rate (quantity ordered vs quantity supplied)



Source: Primary data, 2022

4.3.3 The Performance of distribution of health commodities

Performance of distribution of health commodities refers to a continuous, uninterrupted supply of quality-assured health commodities in Rural Health facilities, especially Nyaruguru District Facilities. This needs to be supervised regularly to ensure the performance of distribution is well maintained and respected (effectiveness and efficiency).

The general results revealed that there is the Performance of distribution of health commodities. The results showed that 100 % of health facilities are supplied using the supplier (Rwanda medical Supply)'s Vehicle. The most health commodities distribution is done within 1 month as represented by 94%, and within 3 months represented by 6%.

Table 4.14: Performance of distribution of health commodities

Frequency	District Hospital	Health Center	Total	Percentage (%)
Within the last month	1	15	16	94
Within the last 3 months	0	1	1	6
Within the last 6 months	0	9	9	53
Total	1	16	17	100

Source: Primary data, 2022

4.3.4 Performance of Logistic Management Information System (LMIS)

Proper LMIS in the supply chain improves healthcare performance by maintaining timely and accurate information. The objective of this study was to evaluate the performance of health supply chain management in rural public health facilities.

The findings in Table 4.15 The study results revealed that all health facilities are not using country-specific forms both HD and HCs as represented by 100% and but they are only using electronic logistic Management Information System (e-LMS) as provided all HF's (100%) and all facilities reports are submitted to a higher level as represented by 100%.

Table 4.15: The use of Logistic Management Information System (LMS)

Use of LMS	District Hospital		Health Center		Total
	Yes	No	Yes	No	
The use of Country-specific forms in LMIS forms for reporting/ordering	0 (0%)	1(6%)	0 (0%)	16(94%)	17
Use of electronic Logistics Management Information System(e-LMIS) for reporting/ordering	1(6%)	0 (0%)	16(94%)	0 (0%)	17
All reports are submitted to a higher level every month	1(6%)	0 (0%)	16(94%)	0 (0%)	17

Source: Primary data, 2022

The findings in Table 4.16 showed that most reports are submitted before the 6th day of the month as represented by 94% for Health Centers, and within the last month represented by 6% for District Hospital.

Table 4.16: Frequency of reports submission

Attributes	District Hospital	Health Center	Total	Percentage (%)
Before the 6 th day of the month	0	16	16	94
Within the last month	1	0	1	6
Total	1	16	17	100

Source: Primary data, 2022

4.3.5 Performance of financial management in Rural Health Facilities

This study identifies the difference between invoices submitted and invoices paid in the last 2 months and examines whether the difference may be attributed to the performance management of Rural Health Facilities.

The results presented in Table 4.17 revealed that the invoices are received from the supplier during two months 53% are between 3 to 5 invoices, 41% are invoiced between 0 to 2, and 6% are 6 invoices and above.

Table 4.17: Medical invoices received at health facilities during the last two months

Number of invoices received	District Hospital	Health Center	Total	Percentage (%)
0-2 invoices	0	7	7	41
3-5 invoices	1	8	9	53
6 and above invoices	0	1	1	6
Total	1	18	17	100

Source: Primary data, 2022

The results of this study as presented in table 4.18 revealed that invoices 0 to 2 are paid in the last two months as represented by 41%, invoices 3 to 5 are paid as represented by 29% and 29% also are not paid in two last months.

Table 4.18: The invoices paid by health facilities

The number of invoices paid	District Hospital	Health Center	Total	Percentage (%)
No invoices	0	5	5	29
0-2 invoices	0	7	7	41
3-5 invoices	1	4	5	29
Total	1	16	17	100

Source: Primary data, 2022

CHAPTER FIVE: DISCUSSION AND CONCLUSION

3.1 Study design

This study used a descriptive cross-sectional quantitative study, which allowed the data collection.

The study was conducted in Nyaruguru district health Facilities, Southern province of Rwanda. This sample was composed of 16 health centers and 1 District hospital. To select a sample, the purposive sampling design was used and relied on the judgment when choosing members of the population to participate in the survey. The sample size for this study equaled the whole population of 17 Health Facilities including 1 District Hospital and 16 Health centers

The data was collected through designed questionnaires and checklists, guided with logistic indicators assessment tool (LIAT), to capture every necessary data before analysis. Data were analyzed by the researcher by using SPSS V18 and MS Excel. The study results have been presented in tables, figures, and graphics.

5.2 Specific results

The objective of exploring rural health facilities characteristics and staffing

In this study, the response rate was excellent as it was 100%(17/17). Response rate of 70% or more is excellent for data analysis and for reporting the opinion of the entire population. (Fowler, 2004). According to the level of health facility, the results showed that among 17 health facilities surveyed 6%(1/17) was at District Hospital level, while 94%(16/17) were

at Health centers. All (100%) surveyed health facilities were service delivery points (SDPs). Considering infrastructure availability at health facility level, the study results showed 100% of Health facilities had both water and electricity supply, which helps Health facilities to perform well supply chain related activities.

In terms of the experience of health facility staff, the results revealed that 65% had worked in supply chain management between 1 and 5 years, while 11% had worked less than one year, 12% had worked 11 years or more, and 6% had worked between 6 and 10 years in supply chain management. This is an indicator that shows that the majority of health facilities are composed of employees who have competent skills and experience in the field of supply chain management.

The results of the study showed that most of the staff responsible for healthcare supply chain management activities are nurses, represented by 88%, while the others accounted for 12%. Among them, there was no pharmacist responsible for warehouse management in health facilities across the district, who should be responsible for supervising and training other supply chain managers, and this may decelerate the overall performance of Health supply chain.

The results showed that both hospitals and health centers responsible for health supply chain management have received at least one training on health supply chain management.

Regarding the qualification of health facility staff, the results of this study showed that 88% of the staff had a diploma (A1) academic qualification, while 12% had a bachelor's degree (A0 degree). The results showed that the staff were knowledgeable and highly informed about health supply chain management.

In 2003, similar research on the characteristics of U.S. rural health centers revealed that 97% of them are located in areas with limited primary care services. They are characterized by problems with recruitment processes, staff retention and incentive policy, with 18% of respondents reporting physician vacancies in the past year, and 20% other positions.(18)

The objective of measuring the performance of storage, inventory management, and distribution practices in rural health facilities

The performance of Storage practices in rural health facilities.

The storage performance and management in rural District Health Facilities are efficient as revealed by the results of this study represented by 92%. Products in rural health facilities are ready for distribution and well-arranged so that identification labels manufacturing and/or expiry dates are visible by 94% both DH and HCs.

The products are organized and stored in a way accessible for FEFO practice represented by 95% and products in cartons are in good condition represented by 93%.

The facilities (DH and HCs) have a practice of separating expired and/or damaged products from usable products represented by 92%.

The products are protected from direct sunlight at all times: 79%. Cartons and products are protected from water and humidity all the time as represented 92%. There are no insects and rodents represented by 98% and the storage areas are secured with a lock and key (the access is limited to authorized personnel only, represented by 92%. The products are stored at the adequate temperature represented by 99%.

In contrast to our results, the study conducted in the western Wollega zone of Ethiopia in 2021 revealed that among the 23 health facilities assessed, 73.91% of the hospitals respected the required storage conditions, while 68.42% of the health facilities only complied with the required storage conditions. (20) Thus, several health center warehouses did not meet the required storage conditions. The main problems identified were lack of manpower and poor infrastructure.(20)

The performance of inventory management in rural health facilities

The performance of inventory control management in Rural Health Facilities was analyzed to give accurate evidence to ensure the performance of inventory control management is being respected. The findings revealed that all health facilities are recording the stock cards by using the smallest unit of count and the quantities dispensed to inpatients and outpatients are recorded as represented by 94% at Health Centers and 6% at District Hospital.

The survey results showed that 47% of health facilities, including hospitals and health centers, ran out of stock of at least one or more health products during the three months prior to the survey period.

The most medicines products with high stockout is Abacavir 600 mg + Lamivudine 300 mg tab represented by 41% and Amoxicillin 125mg dispersible tab with 6% other commodities are less than 10%.

Regarding the expiration rate of health commodities, in the twelve-month period surveyed, 100% 100% of health facilities have not experienced any expiry.

The study findings revealed that 35% of Rural Health Facilities (DH and HCs) have inventory inaccuracy while 65% have inventory accuracy.

The comparison of total inventory accuracy between 5 products randomly selected from Nyaruguru Health facilities showed that Quinine 300mg/2ml injection B/1 is the first product with inventory accuracy with 94%, followed by paracetamol 50mg Tablet B/1 represented by 71%, Cotrimoxazole 240mg/5ml Syrup 100ml B/1 represented by 59%, Ethinylestr+levonorges150/30 mg (Microcynon)/ 1cycle of 28 Tablet represented by 53% and Perfusion set UU + needle B/1 represented 47%. The results of inventory management practices revealed good performance, although there is a need to limit the shortage of stock of some commodities.

A similar study undertaken in Jubek state, South Sudan revealed Some health facilities showed good storage and inventory management, while others were rated poor or average. The evaluation of storage practices scored 37%, while inventory management scored less than 75%.(19)

The Performance of distribution of rural health facilities

The overall results revealed that there is a performance in the distribution of health products. The results showed that 100% of the rural health facilities are supplied by the supplier's vehicle (Rwanda medical Supply). Most of the distribution of health products is done within one month, representing 94%, and within last three months, 6%. This shows that the distribution of health commodities to rural health facilities in Rwanda is well carried out thanks to the uninterrupted availability of transport vehicles at the supplier level (RMS Ltd) and monthly distribution practices.

A similar study in China revealed that, on average, rural health facilities are more demanding and geographically dispersed compared to their urban counterparts, which can impose higher distribution costs.(21)

The objective of assessing the performance of the Logistic Management Information System (LMIS), and financial management in rural health facilities

The performance of LMIS in rural health facilities

The survey results showed that all health centers do not use country-specific forms, but only use electronic logistics management information system (e-LMS), as provided by 100% of health facilities (DH 6% and HCs 94%), and all reports are submitted to a higher level as represented by 94% for Health Centers and 6% District Hospital.

Most reports are submitted before the 6th day of the month as represented by 94% in Health Centers and 6% in District Hospital within the last month.

In contrast to previous findings, (22) revealed that in East Wollega Zone, Oromia Regional State, Ethiopia, health facility reporting rates require quality improvement. The poor performance of LMIS is due to several factors, including a lack of pharmacy professionals and low staff commitment.(22)

The performance of financial management rural health facilities

To assess the performance of financial management in Nyaruguru Health Facilities. The researcher analyzed the difference between invoices submitted and invoices paid in the last 2 months. The results showed that during two months 53% including HD 6% and HCs 47%

of invoices submitted are between 3 to 5 invoices, 41% in HCs of invoices between 0 to 2 are submitted in HCs and represented 6% and above of invoices in HCs are 6 submitted.

The HCs invoices 0 to 2 are paid in the last two months as represented by 41%, invoices 3 to 5 are paid as represented by 29% including 6% at DH and 23% and 29% also are not paid in two last months in HCs.

Overall results showed that there a number of health facilities that received invoices of health commodities, but did not paid them as wished. This coincide with the results from Tracking Rural Health Facility Financial Data in Resource Limited Settings: A Case Study of Rwanda that revealed that in 2010 and 2009, health facilities received most of their medicines (without making payments) directly from the VPDD, and MPPD.(23)

1.1 Conclusion

The study entitled “Evaluation of the performance of health supply chain management in Rural Health Facilities, a case of Nyaruguru District in the Southern Province of Rwanda” was designed to evaluate the performance of health supply management in rural Health Facilities.

The major findings showed that there is performance in Health Supply Chain Management in Nyaruguru rural Health Facilities which hard-pressed to conclude that all objectives were achieved and research questions were answered. It should also conclude that for all variables (dependent and independents) there is a significate relationship.

5.4 Recommendations

Based on the major findings of the study, the following recommendation was proposed:

- The health facilities should assess the stock status and make it the primary function of guiding the decisions related to resupply. The stock status should be conducted regularly at least monthly to avoid stock-outs before resupply.
- The inventory characterizes the highest suitable stock level needed to satisfy the demand of beneficiaries until the next order after the current one is received. The health facilities should not exceed the maximum level to avoid the inaccuracy of inventory
- Health facilities to respect MoH guidelines and protocols of staffing in health commodities management
- The health facilities increase their income to pay invoices on time.

5.5 Limitations and implications for future research

During this study, the researcher faced different limitations which impacted or influenced the interpretation of findings from the research. Limitations of the study are constraints imposed on the ability to generalize from the results, further description of applications to practice, and/or related to the usefulness of the findings that are the result of how the study was initially chosen to be designed or the method used to establish the internal and external validity of the result of unforeseen challenges that arose during the study.

The limitations of the study are the following:

Resources: Due to limited time and insufficient resources, the study was limited to only one district among 30 districts of Rwanda.

Time: Time limitations affected the study negatively. This happened as the target population (Nyaruguru District Health facilities) were dispersed and located in different places which delayed the data collection

Future research: This study was not analyzed all supply chain management parameters. The study results are only from the evaluation of the performance of health supply chain management in Rural Health Facilities and did not achieve all health supply chain management.

It is in this regard we are encouraging future researchers to expand this study to address the important parameters like the role of health supply chain management in health quality deliveries.

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VII. APPENDICES

A. Ethical approval

Active
Go to

 UNIVERSITY of RWANDA COLLEGE OF MEDICINE AND HEALTH SCIENCES
DIRECTORATE OF RESEARCH & INNOVATION

CMHS INSTITUTIONAL REVIEW BOARD (IRB)

Kigali, 3rd/11/2021
Ref: CMHS/IRB/326/2021

SIMBIZI Mathieu
Master's in Health Supply Chain Management
CMHS, University of Rwanda

Dear SIMBIZI Mathieu


RE: ETHICAL CLEARANCE

Reference is made to your application for ethical clearance for the study entitled "*Evaluation of The Performance of Health Supply Chain Management in Rural Health Facilities. The Case of Nyaruguru District in Southern Province Of Rwanda*"

Having reviewed your application and been satisfied with your protocol, your study is hereby granted ethical clearance. The ethical clearance is valid for one year starting from the date it is issued and shall be renewed on request. You will be required to submit the progress report and any major changes made in the proposal during the implementation stage. In addition, at the end, the IRB shall need to be given the final report of your study.

We wish you success in this important study.


Dr Stefan JANSEN
Ag Chairperson Institutional Review Board,
College of Medicine and Health Sciences, UR



Cc:

- Principal, College of Medicine and Health Sciences, UR
- University Director of Research and Postgraduate studies, UR

Email: researchcenter@ur.ac.rw P.O Box 3286 Kigali, Rwanda www.ur.ac.rw

Scanned with CamScanner

B. Consent/Assent forms

Title: “Evaluation of the performance of health supply chain management in rural health facilities. The case of Nyaruguru district in southern province of Rwanda.”

PART I: Information Sheet

Introduction

I am conducting a research in Health Facilities to assess the performance of health supply chain management in rural public health facilities on Nyaruguru district in Southern Province of Rwanda. The health professionals working in rural health facilities of Nyaruguru district who have expertise in health supply chain management will be requested to participate in the study after having explanation about the study.

As one of health professionals working in Health Facilities and having expertise in health supply chain management, you are kindly requested to participate in this study. All information will be kept confidentially and securely. Names are not allowed to be written on questionnaire. Your participation is voluntarily and you are allowed to participate freely as you have right to refuse or withdraw at any time even without any effects. However, your participation is highly demanded and will be appreciated.

Purpose of the research

The study will evaluate the performance of health supply chain management in rural public health facilities located in Nyaruguru districts in southern province of Rwanda and come up with the findings and recommendations that will help the decision makers and stakeholders to focus on the priorities areas and gaps in planning future performance of Public health facilities.

Selection of participants

In this study, you have been selected as potential participant because you are one of Health professionals working in the health facility and having expertise in Health. That is why you are kindly requested to voluntarily participate in this study.

Voluntary Participation

Your participation in this study is voluntary. It is your choice whether to participate or not. The choice that you make will have no bearing on your professional standing or your everyday life. You may change your mind later and stop participating even if you agreed earlier.

Procedures

This study will include to complete the questionnaire and review of key supply chain management documents. I am inviting you to take part in this activity, because I feel that your experience can contribute much to my understanding about the performance of Health supply chain management in rural health facilities of Rwanda. If you accept, you will be asked several questions related to the study topic. You will not be asked any personal or sensitive questions or share any knowledge that you are not comfortable sharing. I anticipate that this session will last for about thirty minutes' maximum.

Duration

The group interview will each take approximately 15 minutes of your time.

Risks and Discomforts

Your participation in this research is voluntary. It is your choice whether to participate or not. If you choose not to participate, there will be no negative consequences to you. If you decide to participate, you may change your mind at any time and withdraw with no negative consequences. The risks associated with participating in this activity are therefore deemed minimal.

Benefits

There will be no direct benefit to you, but with your participation we hope to improve the performance of health supply chain management in role public health facilities, by the information you will provide.

Reimbursements/ Incentives

You will not receive any payment or any other benefit to take part in this study, but your participation in this research is essential. Only will refund the transportation fees if any

Confidentiality

We will not share information about you and your institution/company to anyone outside of the team undertaking this activity. The information that we collect will be kept

private. All collected data will be stored in a database accessible only by the principal investigator. Any information about you will be identified by a number on it instead of your name/your institution. You do not have to take part in this activity if you do not wish to do so, and choosing to participate will not affect your job.

Sharing of Research Findings

We will in the future publish on the process and the results, but you and your feedback will remain anonymous.

Right to refuse or withdraw

To reiterate, you do not have to take part in this research if you do not wish to do so, and choosing to participate will not affect your job or job-related evaluations in any way. You may stop participating in the interview at any time that you wish without your job being affected.

Whom to contact in case you have questions about your rights as a research participant

All research on human volunteers is reviewed by College of Medicine and Health Sciences (CMHS) Institutional Review Board (IRB) that works to protect your rights and welfare. If you have questions or concerns about your rights as a research subject, or if you would like to obtain information or offer input, you may contact the IRB through the:

Chairperson:

Prof Kato J NJUNWA

Mobile phone: 0788 490 522

e-mail: researchcenter@ur.ac.rw

Secretary:

Francois Xavier SUNDAY

Mobile phone: 0788 563 312

e-mail: fsunday@khi.ac.rw

If you have any questions about this research, you may address your query to lead investigators:

Local Lead Investigator: SIMBIZI Mathieu, Tel 0783527482, e-mail: simbizim27@gmail.com.

Supervisor: Dr. KAYITARE Egide, Tel 0782172937, e-mail: egide.kayitare@gmail.com.

If you choose to be part of this research study, I will also give you a copy of this consent form to keep for yourself.

Do you have any questions?

PART II: Certificate of Consent

I have been asked to participate in **Evaluation of the performance of health supply chain management in rural health facilities. The case of Nyaruguru district in southern province of Rwanda.**

I have read the information provided above. I have asked all the questions; I have at this time. I voluntarily agree to participate in this research study. I may withdraw my consent at any time and stop participation without penalty. By agreeing to be in this research, I have not given up any of my legal rights.

I consent voluntarily to be a participant in this study: Yes / No

I agree to be recorded : Yes / No

Print name of participant:

Signature of participant:

Date (day/month/year):

Print name of Researcher:

Date (day/month/year):

If illiterate:

A literate witness must sign (if possible, this person should be selected by the participant, not be a parent, and should have no connection to the research team). Participants who are illiterate should include their thumb print as well.

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Print name of witness:

Signature of witness:

Date (day/month/year):

Thumb print of participant:

I have accurately read or witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Print name of Witness:

Signature of Witness:

Date (day/month/year):

Copy provided to the participant

C. Data collection tools

QUESTIONNAIRE/IBIBAZO BY'UBUSHAKASHATSI

Research Title/ Izina ry'ubusahakashatsi:

“Evaluation of the performance of health supply chain management in rural health facilities. The case of Nyaruguru District in Southern Province of Rwanda. “

Name and Contact information of principal investigator/Izina n'ibiranga ukora ubushakashatsi:

SIMBIZI Mathieu, Student at University of Rwanda, College of Medicines and Health Sciences.

Phone number: +250783527482, e-Mail: simbizim27@gmail.com

This questionnaire is intended to gather information to assist in analyzing the research under the current study. Kindly help me out to fill in this questionnaire accordingly. / Ibi bibazo bigamije gukusanya amakuru azifashishwa muri ubu ubushakashatsi. Mudufashe gusubiza ibibibazo nk'uko bikwiriye.

The following questionnaire will be completed with voluntary participation as consent. / Ibi bibazo bikurikira birazagusubizwa kubushake.

Instructions/Amabwiriza

1. This questionnaire to collect data is composed of two parts: Part I and Part II. /Ibi bibazo bigizwe n'ibice bibiri by'ingenzi.
2. Participant is requested to answer all questions. /Murasabwa gusubiza ibibibazo byose.
3. Answers have to be provided in appropriate and mentioned space. /Murasabwa gusubiriza mu mwanya wateganyijwe.

4. You are not allowed to mention your name on this questionnaire. /Murasabwa kutandikaho izina ryanyu.

I. Facility Identification/characteristics

Facility location

Aho ivuriro rihereye.

Country/Igihugu:

Province/Intara:

District/Akarere:

Sector/Umurenge:

Code of the Facility /Kodey'ivuriro:

Facility Type/ Ubwokobw'ivuriro (1=Warehouse, 2=SDP):

Type of the Facility/Ubwoko bw'ivuriro (1=District Hospital, 2=Specialized Hospital, 3=Health Center, 4=Other):

Operating authority/Urwego ruriyobora (1=MoH, 2=NGO):

Facility characteristics. / Ibiranga ivuriro

Operational electricity on day of visit? / Umuriro urahari (0=no; 1=yes):

Operational water in the building on the day of visit? /Amazi arahari (0=no; 1=yes):

II. Information about Interview

Date/Itariki: /...../20.....

Interviewer(s)/Ubaza:

1. Can we continue? (1=Yes, 0=No): If No Stop, If Yes Continue.

2. Title of person interviewed for this section:

3. Number of years and months you have worked at this facility? Years Months

4. Who is the principal person responsible for managing medical supplies at this facility?

- Nurse.....1
- Clinical Officer.....2
- Pharmacy Technician3
- Pharmacy Assistant4
- Pharmacist5
- Medical Assistant.....6

- Other (specify).....7
5. Do you use and fill the following logistics forms to manage health commodities?
- Stock Card (1=Yes, 0=No):
 - Daily Register Form (1=Yes, 0=No):
 - Other (1=Yes, 0=No):
6. Are stock cards recorded using the smallest unit of count? {1=Yes (always), 0=No (not always)}:
7. Is there a record where quantity dispensed to patients is recorded for inpatients? (1=Yes, 0=No):
8. Is there a record where quantity dispensed to patients is recorded for outpatients? (1=Yes, 0=No):
9. What LMIS forms do you use for reporting/ordering?
- Country-specific forms (1=Yes, 0=No):
 - electronic Logistics Management Information System(e-LMIS) (1=Yes, 0=No):
 - Other {1=Yes (specify.....), 0=No):
10. How often are you supposed to send these reports to the higher level? (Circle all that apply.)
- Monthly..... A
 - Quarterly..... B
 - Semi-annually.....C
 - Annually..... D
 - Other (specify.....)W
11. When was the last time you sent a report for products at this facility? (Circle all that apply.)
- Before 6th day of this Month1
 - Before 6th day of the last Month2
 - Within the last month3
 - 2 months ago 4
 - More than 3 months ago 5
 - Never 6
12. How many orders do this facility entered during the recent resupply period?
13. Among the orders placed by this facility during the recent resupply period, how many those are entered correctly?
14. How many orders are placed through electronic ordering system during the recent resupply period?
15. Who is responsible for transporting products to your facility? (Circle all that apply.)
- Local supplier delivers A
 - Higher level delivers B
 - This facility collects C
 - Other (specify.....) W
16. During recent resupply period, how many orders were delivered at this facility?

17. During recent resupply period, how many orders were delivered by requested time?
18. How many invoices of medicines received at this facility, during last month?
19. How many invoices of medicines received at this facilities, during last two months?
20. How many invoices of medicines received during last 2 months and already paid?
21. How did you learn to complete the forms/records used at this facility? (Circle all that apply.)
- Never learned A
 - During a logistics workshop B
 - On-the-job training C
 - On-the-job (self-learning) D
 - Other (specify.....) W
22. How many emergency orders for Essential medicines have you placed in the last 3 months?
- None 0
 - NA 1
 - 1 2
 - 2 3
 - 3 4
 - More than 3 5
23. How are the facility's resupply quantities determined?
- Formula (specify.....) 1
 - Don't know 2
 - Other means 3
24. When did you receive your most recent supervision visit? Check visitors book, if necessary.
- Within the last month 1
 - Within the last 3 months 2
 - Within the last 6 months 3
 - More than 6 months ago 4
 - Other (Specify.....) 5
25. Are there certain commodities that you always stock out of before resupply? (1=Yes, 0=No)

If No, skip the question

26. List the commodities you stock out of most frequently (up to 3 products).
1.
 2.
 3.

Thank you for your time and information. You have been very helpful. Our remaining questions will require looking at products in the storeroom and speaking with the person who oversees the store.

Storage condition Checklist.

No	Product Description			Com- ment
		No	Yes	
1	Products that are ready for distribution are arranged so that identification labels and expiry dates and/or manufacturing dates are visible.			
2	Products are stored and organized in a manner accessible for first-to-expire, first-out (FEFO) counting and general management.			
3	Cartons and products are in good condition, not crushed due to mishandling. If cartons are open, determine if products are wet or cracked due to heat/radiation (fluorescent lights in the case of condoms, cartons right-side up for Depo-Provera®)			
4	The facility makes it a practice to separate damaged and/or expired products from usable products and removes them from inventory			
5	Products are protected from direct sunlight at all times of the day and during all seasons.			
6	Cartons and products are protected from water and humidity during all seasons.			
7	Storage area is visually free from harmful insects and rodents. (Check the storage area for traces of rodents [droppings or insects].)			
8	Storage area is secured with a lock and key, but is accessible during normal working hours; access is limited to authorized personnel.			
9	Products are stored at the appropriate temperature during all seasons according to product temperature specifications.			
10	Roof is always maintained in good condition to avoid sunlight and water penetration.			
11	Storeroom is maintained in good condition (clean, all trash removed, sturdy shelves, organized boxes).			
12	The current space and organization is sufficient for existing products and reasonable expansion (i.e., receipt of expected product deliveries for foreseeable future).			
13	Products are stacked at least 10 cm off the floor.			
14	Products are stacked at least 30 cm away from the walls and other stacks.			
15	Products are stacked no more than 2.5 meters high.			
16	Fire safety equipment is available and accessible (any item identified as being used to promote fire safety should be considered).			
17	Products are stored separately from insecticides and chemicals.			

Inventory accuracy check list

No	Product	Physical Quantity at day of visit	Record quantity on stock records
1	PARACETAMOL 500 MG TABLET B/1		
2	COTRIMOXAZOLE 240MG/5ML SYRUP 100ML B/1		
3	ETHINYLESTR+LEVONORGES150/30 MG (MICRO-CYNON)/ 1CYCLE of 28 TABLET		
4	QUININE 300MG/ML 2ML INJECTION B/1		
5	PERFUSION SET UU + NEEDLE B/1		

Stock according to plan Check list

No	Product	Stocked according to max/min level (Yes or No)
	PARACETAMOL 500 MG TABLET B/1	
	COTRIMOXAZOLE 240MG/5ML SYRUP 100ML B/1	
	ETHINYLESTR+LEVONORGES150/30 MG (MICRO-CYNON)/ 1CYCLE of 28 TABLET	
	QUININE 300MG/ML 2ML INJECTION B/1	
	PERFUSION SET UU + NEEDLE B/1	