

**DETERMINANTS OF HEALTH PRODUCTS AND TECHNOLOGIES MANAGEMENT
IN LEVEL FOUR AND FIVE HOSPITALS IN NYERI COUNTY**

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THE CONFERMENT OF MASTERS DEGREE IN HEALTH SYSTEMS
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DECLARATION

I declare this thesis is my own work and has not been presented to any other university for the award of any degree.

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HSM-3-1554-3/2020

Signed

Date

Approval

This thesis has been submitted for examination with our approval as university supervisors.

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Signature.....

Date

DEDICATION

I would like to dedicate this thesis to my husband and children who inspired me to pursue higher education.

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This thesis took a lot of effort and support from my supervisors; Prof. Wanja Tenambergen and Mr. Fredrick Kimemia through guidance. I also thank Kenya Methodist University for giving me the chance to pursue master's degree in health system and medical education. I cannot afford to not thanking my classmate who we supported each other in classwork. Ultimately, I thank my God for good health and spirit.

ABSTRACT

As Kenya moves toward universal health coverage, ensuring the constant availability of quality medicines and technologies in primary health facilities is essential. Effective management of Health Products and Technologies (HPTs) requires proper planning, organization, and leadership. Nyeri County has made efforts to improve HPTs management by establishing dedicated HPT units, passing legislation (Supplement No. 16, Acts No. 5), and investing in the development of 9 rural health facilities and 2 health centers. Despite these efforts, HPTs management remains ineffective, with high maternal mortality rates (110/100,000), infant mortality rates (30/1,000), and a fully immunized population at 68%, compared to the national rate of 75%. This study sought to determine the influence of financing, health worker factors, supply chain practices, and health management information systems (HMIS) on HPTs management in level 4 and 5 hospitals in Nyeri County which was based on management theory. The study was located in Nyeri County. A mixed-methods research design was employed, using both descriptive cross-sectional surveys and interviews. The study targeted 51 health professionals through a census method and 6 key informants were purposively selected. Data was collected using interview schedules and interview guides. Prior, the study pre-tested the tools in Laikipia County on 30 respondents. Quantitative data was analyzed by use of SPSS and presented in tables while qualitative data was analyzed thematically and presented verbatim. The study adhered to research ethics. The study found the model explained 43.3 per cent of the variance on management of HPTs and 43.9 % when controlled for by leadership practices. The regressed model was; Management of HPTs = 20.162 + 0.321 Financing + 0.090 health workers' factors + 0.007 supply chain practice + 0.331 health management information system. HMIS provided the highest unique contribution on total variance on management of HPTs. The study concluded financing and HMIS provided significant influence on management of HPTs in level 4 and 5 hospitals in Nyeri County while health workers factors and supply chain practices had no significant influence on management of HPTs in level 4 and 5 hospitals in Nyeri County. From the multiple linear regression analysis conducted to establish the underlying prediction of the model financing, health worker factors, supply chain practices and health management information system on management of HPTs, it was observed that the model explained 43.3% on total variation in HPTs management. This implied that there are other factors accounting to 56.7 % which influence HPTs management in level four and five hospitals in Nyeri county. Therefore, the study recommended a further study should be conducted to interrogate the probable factors such as regulatory environment, patient needs and preferences, healthcare provider adoption, healthcare infrastructure and global health challenges in these hospitals in Nyeri county and across the board. The findings support existing health system theories and have significant policy implications, urging stakeholders to prioritize these factors for effective HPTs management in hospitals. Additionally, the study highlighted the importance of proper budgeting, staffing, motivation strategies, inventory optimization, and HMIS in improving HPTs management practices.

TABLE OF CONTENT

	Page
DECLARATION.....	ii
DEDICATION.....	iii
ACKNOWLEDGEMENT.....	iv
ABSTRACT.....	v
LIST OF TABLES	ix
ABBREVIATIONS AND ACRONYMS.....	xiii
CHAPTER ONE	1
INTRODUCTION.....	1
1.1 Background to the study.....	1
1.2 Statement of the problem.	1
1.6 Justification of the Study.....	8
1.7 Limitation to the Study.....	9
1.8 Delimitation to the Study	9
1.9 Significance of the Study	10
1.11 Operational Definition of Terms	10
CHAPTER TWO	13
LITERATURE REVIEW	13
2.1 Introduction	13

2.2 HPTs financing and Management of Health Products and Technologies	13
2.3 Supply Chain Practices and Management of HPTs	19
2.5 Health Information Management Systems and Management of HPTs.....	33
2.6 Leadership practices and Management of HPTs	42
2.3 Theoretical Framework	47
CHAPTER THREE	53
RESEARCH METHODOLOGY	53
3.0 Introduction	53
3.2 Research design.....	53
3.5 Target population	54
3.11 Data Analysis and discussion.....	60
3.12 Ethical issues and considerations	66
CHAPTER FOUR.....	67
DATA ANALYSIS AND DISCUSSION	67
4.1 Introduction	67
4.2 Response Rate	67
4.2 Reliability Test	68
4.3 Demographic data	69
4.4 Financing of HTP in Public Hospitals in Nyeri County	72
4.5 Health workers factors and management of HTP in Nyeri County Public Hospitals	75

4.6 Descriptive statistical analysis: Supply chain practice	79
4.7 Descriptive statistical analysis: Health management information system	83
4.8 Descriptive statistical analysis: Leadership practices	88
4.9: Descriptive statistical analysis: Management of HPTs	90
4.10 Results on Diagnostic Tests	93
4.11 Inferential statistics analysis: Correlation analysis	96
4.12 Inferential statistics analysis: Hierarchical Multiple Regression	99
SUMMARY, CONCLUSION AND RECOMMENDATION	105
5.0 Introduction	105
5.1 Summary of the study	105
5.2 Conclusions	108
5.3 Recommendations	110
5.4. Implications of the Findings on Theories, Practices and Policies	112
5.5 Recommendations for further Studies	112
REFERENCES.....	114
APPENDICES	138
Appendix I: Informed Consent Template.....	138
Appendic IV: Introduction Letter.....	156
Appendix V: Introduction Letter to NACOSTI	157
Appendix VI: NACOSTI RESEARCH PERMIT	158

Appendix VII: Research Authorization Letter 159

LIST OF TABLES

Table 3.1: Target population	Error! Bookmark not defined.
Table 3.2: Key Informants	56
Table 3.3: Level 4 and five hospitals in Nyeri County	56
Table 3.4: Hypotheses testing summary table	64
Table 4.1: Reliability statistic	68
Table 4.2: Reliability statistic for variables	69
Table 4.3: Summaries of Demographic Data.....	70
Table 4.4: Respondents' Opinion on Financing of HTP in Public Hospitals in Nyeri County	73
Table 4.5: Responses on health workers factors and management of HTP in Nyeri County Public Hospitals.....	76
Table 4.6: Supply chain practice.....	80
Table 4.7: Health management information system	83
Table 4.8: Leadership practices	88
Table 4.9: Management of HPTs	90
Table 4.10: Normality tests	93
Table 11: Durbin-Watson test of Auto-correlation.....	94

Table 4.12: Multicollinearity tests	95
Table 4.13: Correlation Analysis Results	96
Table 4.14: Model Summary	99
Table 4.15: Analysis of Variance	101
Table 4.16: Coefficients	102

LIST OF FIGURES

Figure 2.1: Conceptual Framework**Error! Bookmark not defined.**

ABBREVIATIONS AND ACRONYMS

ANOVA	:	Analysis of Variance
DW	:	Durbin-Watson
EMR	:	Electronic Medical Records
H0	:	Null Hypothesis
HMIS	:	Health Management Information System
HPTs	:	Health Products and Technologies
IFRR	:	Internal Facility Request and Resupply form
KDHS	:	Kenya Health Demographic Survey
KNBS	:	Kenya National Bureau of Statistics
KNPP	:	Kenya National Pharmaceutical Policy
LMIS	:	Logistics management information systems
MOH	:	Ministry of Health
RRF	:	Report and Requisition Form
SDP	:	Service Delivery Points

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Health products are defined as medications, vaccines, and devices used in disease prevention, diagnosis, treatment, and rehabilitation, as well as surgical and medical procedures (Bhatia, 2021). Management of Health Products and Technologies (HPTs) primarily focuses on the planning, organizing, leading and controlling of HPTs (Mudogo et al., 2023). The World Health Organization WHO, (2021) recognizes effective management of HPTs as a crucial component of a functional health system, upon which the Sustainable Development Goals on health, Universal Health Coverage (UHC), and human rights on health depend. According to Uzochukwu, et al. (2020) study on "the health policy triangle framework within Ireland's diverse healthcare settings," investments in high-performance technologies (HPTs) in developed nations aim to guarantee the availability and prudent utilization of efficient, safe, and affordable HPTs.

An American study claims that the services provided by UHC were only a pipe dream until the state government reacted to inquiries regarding the difficulties in managing HPT effectively (Reid et al., 2020). In order to manage HPTs effectively, medical devices, and equipment must be legally regulated and there must be enough funding to cover the cost of operating (Reid et al., 2020; Dixit et al., 2019; Borca et al., 2021). However, a study on health products and vaccines in Asia indicated that MOH executives and programs routinely disregard the financial assistance needed for HPTs management throughout the budgeting process in favor of purchasing drugs and medical equipment (World Health Organization [WHO], 2019).

It is imperative for healthcare facilities to ensure the availability of high-quality medications in appropriate quantities, timely delivery, and efficient distribution to the intended recipients at an affordable cost. This can be achieved through the implementation of an effective supply chain, the

establishment of regulatory frameworks and the recruitment of competent healthcare personnel (Rowan & Laffey, 2020; Scala & Lindsay, 2021).

Given that medications, vaccines, and technologies are essential elements of patient care everywhere in the globe, good inventory optimization techniques in healthcare facilities are one of the crucial factors that influence the management of HPTs (Babar, 2022). It assists in ensuring a consistent supply of treatments, vaccinations, and technology for patients, preventing product stock out while lowering the expenses associated with maintaining inventory (Chan et al., 2020). Therefore, poor inventory control may result in overstocking or under stocking of HPTs, which wastes resources and increases morbidity and death due to a lack of life-saving medications. To do this, the Asian nations of Pakistan, Vietnam, Philippines, and India created a national list of health priority thresholds (HPTs), which serves as a guide for all health service providers in terms of choosing and obtaining the most necessary medications at all levels of the healthcare system at all times at a reasonable cost in the nation. To assist with inventory management, a computerized logistics management information system (LMIS) is now deployed. All supply chain levels are integrated, and recording all drug transactions is made straightforward (Wang & Mian, 2020). The LMIS, despite its significance in enhancing the efficacy of Indonesia's comprehensive inventory management procedure, is still not fully utilized (Kebede & Tilahun, 2021). Additionally, scholarly investigations indicate that standardized inventory management tools were established by certain states, including New York, New Mexico, and Texas. These tools, such as bin cards, stock cards, the Internal Facility Request and Resupply Form (IFRR), and the Report and Requisition Form (RRF), were designed to be utilized by public health facilities nationwide, regardless of whether they were operated manually or through the use of LMIS (WHO, 2019).

Human workers related factors are acknowledged as health system limitations impeding the effective management of HPTs (Snell & Morris, 2018). Medical centers were found to have

inadequate staffing, excessive absenteeism, poor productivity, and inadequate supervision, according to research on staffing levels and productivity in outlying health care facilities. Canadian hospitals and medical centers (Verger et al., 2021).

HPTs management have not proven to have made significant advances in African nations.

Research from Egypt, Tunisia, Nigeria, Ghana, and Morocco showed that African nations are wary of investing in initiatives to encourage efficient HPT management. No medications are accessible at either hospitals or primary care clinics (Addo & Adu, 2023; Boubker & Alami, 2019; Mansouri & Chibani, 2020; Ogundipe & Akintola, 2022). In terms of HPT administration and widespread acceptance, South Africa continues to lag behind. Regulatory constraints, financing constraints, user resistance, and bureaucratic decision making are among the major barriers identified to have greater impact on effective management of health products and technologies in South African healthcare system (Sriyanto et al., 2021). Another study concluded that patients in Zimbabwe lack access to critical drug information management system. Furthermore, the Namibian government has not prioritized logistics and supply chain policies to support HPT management (Mupupa & Amwele, 2021).

The Ministry of Health (MOH) in Kenya is responsible for finding and providing the resources required for the management of HPTs, enhancing supply chain management, efficient health management information systems (HMIS) and exercising stewardship over the HPT governance (Government of Kenya [GoK], 2017). However, Kenya's HPT management faces a number of issues that are common to many other developing nations (Ministry of Health [MOH], 2021). According to a study on Kenyan health information management system, a lack of an effective health management information system contributes to poor HPT management (Nyawira et al., 2022). However, Mwita and Ng'ang'a (2021) found that HMIS has a negative strong statistical association with health technology management.

Another emerging issue in the management of HPTs in Kenya is the leadership which is in reference to regulatory, policy, and Support Supervision/mentorship as outlined in the Kenya Health Policy (2014-2030). The policy regulates and encourages the improvement of procurement processes as well as availability of essential HPT (MOH, 2021). As per research on health management within public health facilities, it has been observed that the Ministry of Health (MOH) has directed the County Director for Health to ensure efficient coordination of Health Products and Technologies (HPT) activities in partnership with the county supply chain units, which are predominantly centralized (Njoroge, 2019). The second National Health Sector Strategic Plan of Kenya has acknowledged that the substandard quality of healthcare services is predominantly attributed to the dearth of medical supplies, including medications, in government-operated healthcare facilities. In terms of accessibility, the average availability of life-saving medications and fundamental diagnostics is at 14% and 19%, respectively, with only modest improvements noted over time, even after devolution. This is in support to a study by Muiruri (2017) who established that nearly 30% of deaths in Embu County result from ineffective management of essential medicines.

In Nyeri County, there has been a notable increase in the number of patients utilizing public health facilities, primarily due to their perception as providers of affordable healthcare services. However, patients frequently encounter issues with stockouts of prescribed medications, which hinders effective treatment. This underscores the critical need for effective management of health products and technologies (HPTs). Nyeri County is one of the four pilot counties under the Universal Health Coverage scheme, part of the Kenyan government's Big Four Agenda. Despite this initiative, the county has a high prevalence of non-communicable diseases, with rates reaching 26% (MoH, 2020). The most common health issues include respiratory tract infections, diarrheal diseases, skin diseases, diabetes, cardiovascular diseases, and peptic ulcer disease. Notably, the prevalence of

diabetes in Nyeri County is significantly higher than the national average, standing at 12.6% compared to 5.6%, leading to substantial health complications (Onteri et al., 2023). The frequent shortages of essential HPTs in public health centers often force patients to seek necessary medications and services from private facilities and pharmacies, which are typically much more expensive (Onteri et al., 2023).

1.2 Statement of the problem.

As the country move towards universal health coverage, ensuring that quality medicines and technologies at primary health facilities are available constantly is inevitable. Sustainable access to essential medical products, vaccines and technologies can hardly be realized without effective planning, organizing and directing of HPTs at health facility. Thus, an effective HPTs management is an essential component of effective and affordable health care services, because it affects the quality of the services, their availability and cost. As a result, county governments in Kenya have been using development funding to acquire emergency medications for their public health facilities due to a severe lack of pharmaceuticals, vaccines, and technology. For instance, a pharmaceutical agency's data showed that in Embu County, on average, hospitals reported 50% for common class drugs, while lower-level institutions had 60% of important medicines out of stock (Muiruri, 2017). To mitigate this challenge, Nyeri county government efforted at ensuring there is effective HPTs management by establishing health products and technologies units, and the gazettelement of supplement NO. 16 (ACTS NO. 5) which discusses the procurement and management of medical supplies and commodities, and which is used to set hospitals and county rules for effective management of health products and technologies. Similarly, the County Government of Nyeri invested heavily in the development and repair of health facilities, including 9 rural health facilities and 2 health centers. To assure the availability of HPTs in Kenya's public

hospitals, the Ministry of Health has issued clear, practical national guidelines on the essential steps involved in HPT administration and the establishment of regulatory standards.

Despite these efforts, effective HPTs management in public health facilities in Nyeri county leaves much to be desired. The hospitals are taking long time to mobilize and distribute HPTs during emergencies, maternal mortality ratio of 110/100, 000; Infant mortality rate – 30/1000 (37); fully immunized 68% versus 75% nationally (Kenya National Bureau of Statistics [KNBS], 2022) report. Also, long lead time taken to receive commodities coupled with low order fill rate from the Kenya Medical Supplies Authority contributes to differed services at the health facilities. Lack of a system to monitor and track stock outs of tracer commodities in health facilities, Erratic and delay on HPT supply to the health facilities, irrational use of HPTs due to lack of controls and adequate storage facilities resulted to wastage of resources. Additionally, few healthcare workers are trained on commodity management and forecasting, quantification and supply pipeline monitoring.

Therefore, issues such as stockouts of essential medications, inefficient inventory management, and inadequate training of healthcare workers would contribute to compromised patient care, leading to increased morbidity and mortality rates from preventable conditions, as patients may be forced to seek more expensive care in private facilities, exacerbating financial strain and limiting access to necessary treatments. Furthermore, poor management of HPTs would hinder timely interventions for prevalent non-communicable diseases, negatively impacting health outcomes. Nevertheless, there is paucity of knowledge on determinants for HPTs management. Thus, the study sought to determine how HPT financing, staff deployment, supply chain practice, and inventory management practices influence HPT management in Nyeri County.

1.3 Purpose of the study

The aim of the study was to establish the determinants of health products and technologies management in level four and five public hospitals in Nyeri county.

1.4 Specific Objectives of the study

- i. To determine the influence of financing on health products and technologies management in level four and five hospitals in Nyeri county.
- ii. To examine the influence of health workers factors on health products and technologies management in level four and five hospitals in Nyeri County.
- iii. To establish the influence of supply chain practice on health products and technologies management in level four and five hospitals in Nyeri county.
- iv. To determine the influence of Health management Information System on health products and technologies management in level four and five hospitals in Nyeri County.
- v. To establish the mediating effect of leadership and governance on health products and technologies management in level four and five hospitals in Nyeri county.

1.5 Research Hypotheses

The study tested the following hypotheses:

H0₁: Financing has no significance influence in health products and technologies management in level four and five hospitals in Nyeri County.

Ha₁: Financing has significance influence in health products and technologies management in level four and five hospitals in Nyeri County.

H0₂: Health work force has no significance influence in health products and technologies management in level four and five hospitals in Nyeri County.

Ha₂: Health work force has significance influence in health products and technologies management in level four and five hospitals in Nyeri County.

H0₃: Supply chain management has no significance influence in health products and technologies management in level four and five hospitals in Nyeri County.

Ha₃: Supply chain management has significance influence in health products and technologies management in level four and five hospitals in Nyeri County.

H0₄: Health management Information System has no significance influence in health products and technologies management in level four and five hospitals in Nyeri County.

Ha₄: Health management Information System has significance influence in health products and technologies management in level four and five hospitals in Nyeri County.

H0₅: Leadership and Governance has no significance mediating influence health products and technologies management in level four and five hospitals in Nyeri County.

1.6 Justification of the Study

The successful provision of healthcare services by Kenya's healthcare institutions depends on the availability of essential health products and technologies. In order for the healthcare system to work properly, HPTs must be managed in a fair, reliable, and cost-effective manner at all levels. The importance of HPTs in Kenya's healthcare system is well recognized. Given the increasing demand caused by the introduction of universal health care (UHC) in Kenya, the changing epidemiological patterns, and improved health knowledge for Kenyans, it is more important than ever to effectively manage HPTs. However, access to and control of essential HPT remain significant obstacles in Kenya's healthcare system. Efforts to resuscitate the management of HPTs at the county level have been recognized, but have not had a significant impact on improving

accessibility, affordability, and economic growth. Research is required to ascertain the factors that, above all else, the national government's efforts through law enforcement and procedures, appropriate legislation, governance, measurement, and finance, influence the management of HPT. Inadequate management of healthcare-associated infections (HPTs) can lead to increased morbidity and mortality rates, as well as elevated treatment expenses, thereby exerting a detrimental impact on the national economy. This research aimed at enhancing comprehension of the factors that impact the management of HPTs, as well as the current state of HPTs in specific regions. The objective of this study was to provide evidence-based recommendations for the effective management of HPTs, and to determine the methods by which high-quality and secure HPT stocks can be maintained at the county level.

1.7 Limitation to the Study

The respondents were not readily available during the data collection exercise despite their willingness to do so because of their respective roles and busy work schedules. The researcher made prior appointments with the appropriate respondents in advance in order to address this difficulty. The respondents cited breach of privacy and confidentiality. The study assured the participants that the data was for academic purpose only.

1.8 Delimitation to the Study

The study was delimited to determining the factors influencing management of HPTs among public level 4 and 5 hospitals in Nyeri County, because it is characterized by high incidence of non-communicable diseases (Kiragu et al., 2022). The study did not involve other 46 counties in Kenya as well as private health facilities in Nyeri County. The study was based on mixed research approach; descriptive cross-sectional research design and exploratory design. Descriptive cross-sectional research design allows the research to arrive at conclusive findings employing probabilistic approaches that is analyzed statistically. Further, the study arrived at results that can

be generalized to other counties in Kenya. However, such generalization must proceed with a lot of caution due to peculiarities of each county hospital setting. Therefore, the study did not apply other research designs. Further, the study was grounded on Utilization Management Theory and Goldratt's Theory of Constraints.

1.9 Significance of the Study

The study would benefit Nyeri county hospitals administration because would help them understand how resources like qualified HPTs staff, financing, and warehouses; supply chain management, a health management information system, inventory optimization affects management of HPTs. When developing regulations, policies and main procedures for the efficient management of HPTs, they would base their decisions on the findings. The study would set the groundwork for future academic, scholarly, and research endeavors.

1.10 Assumptions of the Study

The study assumed that the respondents provided unbiased and accurate response to the questionnaire based on their own perception, knowledge, and experience of HPTs management. Since this study was conducted in healthcare facilities that employ various HPT management strategies under various county administrations, it was assumed that the responses would not be impacted by the various styles of county leadership.

1.11 Operational Definition of Terms

Governance: Refer to the way a system implements policies and makes decisions.

Health commodity supply chain- All actions related to sourcing and procurement, tendering, conversion, and making HPTs available to consumers are planned and managed under this heading.

Health products- the medications, equipment, and surgical and medical procedures utilized in the early detection, diagnosis, treatment, and rehabilitation of disease

Health System Governance for UHC- In order to ensure the viability of strategic policy frameworks, effective monitoring, coalition-building, regulation, a system-design focus, and accountability are all necessary.

Health technology- the use of structured information and abilities to create systems, technologies, drugs, vaccinations, procedures, and other health-related products that solve health issues and enhance quality of life.

Healthcare facilities: This refers to all hospitals that have both outpatient and inpatient services at county levels

Health Information Management System: It is a complete information support system that helps healthcare facilities handle patient, clinical, auxiliary, and financial information.

Policy- precise declaration that was developed based on present legislation and then adjusted to meet changing market demands. It is a rule, policy, administrative action, incentive, or voluntary practice of governments and other organizations, the results of which are typically reflected in the distribution of resources.

Universal Health Coverage- A system in which everyone, regardless of their financial situation, may access the essential medical treatment they need whenever they need it is known as "universal health coverage." The complete range of necessary health services is included in universal health coverage, from palliative care to treatment and rehabilitation to health promotion.

Warehouse- facility or a drug store used for proper and safe storage of HPTs in order to maintain quality and facilitate access when needed.

Institutional leadership culture: This defines the manner in which health facility establishes the standard framework, leadership style, develops infrastructure, institutes public policies, and strengthens institutional capacity and processes.

Supply chain practices- This term refers to the management of the flow of HPTs from suppliers and encompasses all procedures that guarantee the HPTs are accessible at the appropriate time and in the appropriate quality and quantity. It entails actively simplifying a company's supply-side operations in order to enhance customer value and ensure that patients receive HPTs as soon as they are required.

Inventory optimization- a name for inventory management strategies that help healthcare facilities choose which HPTs to order, when, and in what amounts. From purchase to use, HPTs are monitored. The practice keeps an eye on trends and makes adjustments as necessary to make sure there are always enough HPTs to fulfill patient needs and appropriate notification of a shortage.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The chapter provided a comprehensive analysis of the existing research and theoretical frameworks relevant to HPT management. It contextualized the current study within the broader academic discourse, identifying gaps in the literature, and highlighting the contributions of this research.

2.2 HPTs financing and Management of Health Products and Technologies

2.2.1 Budgetary allocation

The effective management of HPTs is a matter of utmost importance at the global level, necessitating appropriate financial allocation to ensure equitable access to essential healthcare services. However, effective management of health products and technologies (HPTs) depends critically on the frequency of disbursement of funds. For the avoidance, detection, and management of illnesses, access to medical supplies and technology is crucial. However, these HPTs reach and price present major problems, especially in low- and middle-income nations. As a result, allocating funds has turned into an essential tactic for overcoming these obstacles and advancing universal health coverage (Nicola et al., 2020). In order to guarantee that the budgeted resources are used effectively and quickly, appropriate fund disbursement administration is essential. The availability of HPTs for those who require them most, especially fragile groups like women, children, and the old, should be ensured by a well-managed funds distribution system. The system should also make sure that the HPTs are of a high caliber and adhere to the required safety requirements.

The connection between funds and distribution and the management of HPTs has been the subject of several studies. Mueller and Knapp (2018) evaluated how funding distribution affected the availability and demand for medical supplies in low- and middle-income nations. The research discovered that guaranteeing the supply of necessary HPTs depended on the efficient and effective distribution of funds (Mueller & Knapp, 2018). Thakur et al. (2021) evaluated the effect of funding distribution on the control of TB in India in different research. The research found that assuring the supply of top-notch TB medications and tests required proper disbursement of funds distribution (Thakur et al., 2021).

Another study conducted by Peven et al. (2020) examined how newborn health products and innovations are distributed in low- and middle-income countries. The research discovered that guaranteeing the accessibility and cost of crucial infant health goods and innovations depended on the effective administration of funds distribution (Peven et al., 2020). The regularity of funding distribution is crucial in the administration of healthcare goods and tools for UHC, according to several studies in Africa. In their research, Aregbeshola and Folayan (2022) in Nigeria, a positive correlation between regular budget distribution and increased management of HPTs was established. Another quantitative study in South Africa, submitted that deficits and stock-outs of crucial medications and supplies were caused by irregular budget allocations (Ganyaupfu, 2019). Similarly, in Nigeria by Obisike et al. (2021), it was discovered that the management of HPTs was adversely impacted by irregular budget distribution and delays in payment. The research also emphasized the need for greater responsibility and openness in the budget distribution procedure to guarantee that resources are used effectively (Obisike et al., 2021).

Additionally, research conducted in Meru County, established that erratic and uncertain budget distribution had a negative impact on the management of HPTs. According to the research, a dependable and regular funding allotment is needed to maintain a constant stock of important

medications and supplies (Kesale & Swai, 2023). Kenya's decentralized system of government gives counties responsibility for providing services while keeping central government responsible for making policies and enforcing regulations. The study by Jarvis (2022). established that, the irregular disbursement of funding affects the management of HPTs in county levels. Hospitals at the county level 4 and 5 encountered difficulties with the flow of funding during the period of 2017-2018, as funds that were intended for their operations and held centrally were frequently not received by these establishments (Kairu et al., 2021). Almost a third of the authorized allocations were not received by these health institutions, according to a qualitative analysis (Kairu et al., 2021).

2.2.2 Financial Expenditure

Effective financing and management of health products and technologies play a pivotal role in shaping healthcare systems, with expenditure serving as a crucial indicator of their success. Adequate funding is essential to ensure the availability and accessibility of innovative health products and technologies, such as medical devices, pharmaceuticals, and digital health solutions. Efficient management involves strategic allocation of resources, transparent budgeting, and the establishment of robust procurement systems. Monitoring and analyzing expenditure patterns enable policymakers to assess the cost-effectiveness of interventions, identify areas for optimization, and align financial resources with health priorities (Donkin et al., 2018). A well-managed healthcare ecosystem, supported by sound financial strategies, not only facilitates the procurement of essential health technologies but also fosters sustainable development, ultimately contributing to improved health outcomes for populations.

Notably, Rebolledo and Charlesworth (2022) carried out noteworthy research on health spending in Europe, examining the funding systems and management practices of health goods and

technology in different European nations. Their research aimed to provide a comprehensive analysis of the financial landscape surrounding healthcare innovations, emphasizing the role of public and private investments (Rebolledo & Charlesworth, 2022). The study revealed that there is considerable variation in the expenditure patterns among European countries. Nordic countries, such as Sweden and Denmark, demonstrated a higher per capita expenditure on health products and technologies, reflecting a strong commitment to innovation and healthcare infrastructure. In contrast, some Southern European nations faced challenges in allocating sufficient funds, leading to disparities in the adoption of new technologies.

Zayyad and Toycan (2018) conducted an investigation of the health spending landscape in Nigeria, providing insightful information on the management approaches and financial methods used in the nation's healthcare system. Given that Nigeria is among the most populated countries in Africa, the research is a crucial case study that clarifies the complexities of healthcare administration and funding on the continent (Zayyad & Toycan, 2018). The study examined Nigeria's unique potential and challenges, taking into account variables including population demographics, socioeconomic circumstances, and the changing healthcare environment. This research adds to our knowledge of Nigeria's healthcare system by deciphering the intricacies of health spending. It also offers a more comprehensive viewpoint for developing strategies and policies that may be tailored to other African situations. Stakeholders and policymakers may better formulate targeted actions to improve the funding and management of health goods and technology across the continent with the help of this study (Zayyad & Toycan, 2018).

Similarly, Zubery et al. (2021) spearheaded a collaborative effort that made a substantial contribution to the understanding of health expenditure trends in Tanzania. This research conducted a thorough examination of financial allocations and their impact on the procurement and management of health products and technologies. The comprehensive scrutiny of expenditure

patterns yielded crucial insights, offering valuable information for policymakers and stakeholders alike (Zubery et al., 2021). This research has played a pivotal role in informing the development of strategies aimed at optimizing the financing and management of healthcare resources in Tanzania. The study's complex approach has helped improve the region's healthcare system's performance and sustainability (Zubery et al., 2021).

In addition, a study conducted by Kihara and Akoko (2019) thoroughly explored the complex landscape of funding mechanisms for health technology in Kenya. This comprehensive study, carried out at the national level, carefully examined the various models of financing that support the procurement, upkeep, and enhancement of essential health technologies in the country. Utilizing expenditure as a pivotal indicator, the researchers sought to pinpoint areas of enhancement in financial strategies, with a specific focus on sustaining health technologies within the complex framework of the Kenyan healthcare system (Kihara & Akoko, 2019). The findings of this study have not only shed light on the existing financial dynamics but have also provided policymakers and stakeholders with a wealth of evidence-based recommendations aimed at fortifying the financial management of health products and technologies in Kenya. The research outcomes serve as a valuable resource for guiding strategic interventions, fostering innovation, and ensuring the longevity of health technology initiatives within the nation's healthcare infrastructure. This comprehensive analysis makes a substantial contribution to the continuing discussion about efficient healthcare funding and emphasizes the necessity of using evidence to inform policy decisions in the field of health technology management (Okwenje & Muli., 2021).

2.2.3 Budgeting process

The management of Health Products and Technologies (HPTs) is heavily reliant on the factor of budgeting process. Healthcare Product Technologies (HPTs) encompass a diverse array of

products and technologies utilized within the healthcare sector. These include medical devices, pharmaceuticals, biotechnology advancements, diagnostic tools, and various other innovations. The establishment of reliability within budget process context holds utmost importance due to multiple reasons and exerts a substantial influence on diverse facets of healthcare administration. The significance of dependability within high-performance teams (HPTs) was underlined in research that was carried out by Mboera et al. (2021) in Tanzania. According to the findings of the study, dependability is an important factor in determining the success of such teams and the efficacy of their management (Mboera et al., 2021). Reliable team members are more likely to give results that are consistent and of a high quality, which ultimately leads to improvements in both the performance of the team and the outcomes as a whole.

Jiang et al. (2020) investigated the influence that dependability has on the administration of HPTs in China. According to the findings of their investigation, dependable team members not only improve the effectiveness and output of the team but also make a beneficial contribution to the culture of the team. Individuals that are reliable are more likely to follow through with their promises, which results in an increase in the amount of trust and cohesiveness within the team.

Gupta and Sharma (2017) carried a study in India in order to investigate the influence that reliability has on the management of HPTs. Their research demonstrated how trustworthy individuals of a team have a favorable impact on the decision-making processes that occur inside the team. Being able to depend on the contributions and areas of expertise of one's fellow team members leads to better-informed judgments and more efficient problem-solving.

Kesale and Swai, (2023) conducted research to determine the significance of dependability in the administration of HPTs in Japan. According to the findings of their investigation, dependable individuals of a team are more likely to demonstrate greater levels of commitment and devotion to

the objectives of the team. This commitment helps to build a feeling of ownership and responsibility among team members, which in turn drives the team toward more effectively attaining its goals.

2.3 Supply Chain Practices and Management of HPTs

2.3.1 Logistics

The effective management of health products and technologies is essential for the advancement of resources towards achieving Universal Health Coverage (UHC), with logistics playing a pivotal role in this process. Logistics entails the distribution of the medical supplies to hospitals, which in turn ensures that they are directly delivered to the clinics as soon as they are received. Patient load and stockout data is reported. Therefore, the logistics guarantees the appropriate provision of products and technologies, meeting the demands of patients and health facilities in terms of timing, quantity, and condition. Supply chain logistics aspects has been proved to be valid due to the increasing demand for health products and technologies across the globe. Studies submit that, government outsource logistics including health care services and health products by transferring internal services or activities to external suppliers via long-term contracts which later widely affect logistics and related aspects (Baek et al., 2018). The health care setting has there widely been affected by incompetence among supply chain departments who are mandated with the duties of sourcing as well as ensuring movement and delivery of affiliated health products and technologies to the health facilities. Poor supply chain logistics aspects in health care facilities have been proven to affect the supply of HPTs in the country (Md Hamzah et al., 2021). Major Hospitals across the globe, have embarked on hiring professional supply chain logistics managers and workers who ensure proper sourcing, handling, storage and movement of HPTs to and from the health organizations, (WHO, 2020). This not only reduces the cost of health care and improves the

efficiency during the delivery of health services but also ensure that mortality and morbidity rate in health care facilities are significantly reduced. However, in remote areas, the study depicted that logistics is widely affected by poor transport infrastructure that makes delivery of health products and technological equipment almost impossible.

Fatima (2018) conducted a study in North Africa on various factors affecting the effective management of health products and technologies advancements, and provision of essential medical care in the region. Supply chain logistics appeared to be one major challenge affecting HPTs in the region. Various health care facilities, therefore, had no transport vehicle delegated to logistics mandates, thereby making the supply of imperative and needed health products and technologies a predicament. Healthcare facilities in the Northern part of Africa have also neglected the imperativeness of procurement by only relying on local and national governments in the delivery of products leading to frustrations and poor supply chain logistics approaches in the region. With the increasing demand for health care services across the globe, governments and other institutions offering health care services are finding ways to control their budget to minimize costs and increase their profits. Through efficient supply chain logistics including procurement of products. Moshiro et al. (2018) asserted that health care facilities can effectively manage their spending. The study was done in Tanzania by Moshiro et al. (2018) depicted that, supply chain optimization in medical facilities for health products and technologies leads to improvement of healthcare services, saving costs of the healthcare facilities, and ensures satisfaction among customers. Medical facilities in rural Tanzania are vaguely aware of the effectiveness of logistics and procurement approaches towards ensuring quality management of the health products and technologies. This can be mitigated according to Daryanto (2020) by training hospital administrators on the essence of logistics and procurement in their health facilities. Alfarizi (2022) conducted a study in Malaysia that was aimed at evaluating logistics and procurement strategies in the hospitals based on products

found in the Eastern part of the country. Results depicted that health care workers were well aware of the importance of supply chain logistics but were unaware of how to apply logistics and procurement strategies in the effective management of the HPTs. This has led to poor performance towards achieving quality health care results in the region and more so, leading to a lack of satisfaction among patients, family members and Health care workers.

Hospitals across various counties in Kenya were found to be adamant towards incorporating logistics and procurement in the provision and supply of health products and technologies in their services (Gitobu et al., 2018). Further, Karanja et al. (2018) conducted a study in Kirinyaga West Sub- County, based on the implementation of logistics and procurement in hospitals found in the region. The study argues that despite the essence of well-functioning logistical systems, most hospitals have widely underestimated the aspect with little prompting to hire professional logistics and procurement personnel for HPTs. Poor logistics and procurement approaches in the county have been attributed to over-dependence on the local and national governments which have subsequently failed in allocating sufficient funds and support. Lack of transport vehicles and poor logistic approaches have been attributed to crippled logistics aspects in healthcare facilities not only in Kirinyaga West Sub County but also across most healthcare facilities in Kenya (Karanja et al., 2018). Njuguna et al. (2018) depict that only 30%-40% of the hospital across Kenya have invested in supply chain logistics activities and thereby leaving a huge proportion of hospitals with concerns on the essence of logistics and procurement in delivery and supply of quality and affordable HPTs (Maata & Ombui, 2018). Efficient supply chain activities ensure effective management of HPTs in hospitals, during the provision of essential medical care in health care systems by ensuring the needs of the patient and health care workers are met.

Within the framework of Universal Health Coverage (UHC), logistics encompasses a range of activities including but not limited to strategic planning, acquisition, warehousing, conveyance,

and dissemination of health-related commodities and technologies. Additionally, logistics entails the administration of data and assets that are essential to facilitate these operations. Achieving the goals of Universal Health Coverage (UHC) requires the efficient and effective execution of activities with a strong emphasis on quality.

2.3.2 Warehouses/Drug stores

The crucial role of health products and technologies (HPTs) in attaining universal health coverage lies in their availability and accessibility. (UHC). The effective management of HPTs is reliant on the crucial involvement of warehouses and drug stores, which are responsible for ensuring the availability, accessibility, affordability, and quality of these products. This literature study aims to better allocate resources toward the goal of universal health coverage (UHC) by examining how warehouses and pharmacies affect the management of health products and technology (HPTs). A research by Oloyede and Dada (2023) found that in Brazil, vital medications and commodities were more readily available in health institutions when a national warehouse management system was put into place. In order to improve the HPT supply chain, the study underlined the need of ensuring that pharmacy shops and warehouses have sufficient stock, supervision, and qualified employees (Oloyede &Dada, 2023).

According to research done by Bekele et al. (2022), a computerized medication inventory management system in pharmacies significantly increased the availability of important medicines and decreased stock-out rates in Ethiopia. The research findings suggest that effective management of drug inventory plays a critical role in ensuring the accessibility of vital medications, thereby facilitating the progress of Universal Health Coverage initiatives (Bekele et al.,2022).

Additionally, Lugada et al. (2022) did research in Uganda and found a number of variables that affected the accessibility of critical medications. These factors included the ability of warehouse

and drug store personnel to manage inventory, the availability of financial resources for procurement and transportation of medicines, and the presence of dependable supply chain systems. The research suggests that enhancing the drug stores and warehouses' capabilities, refining the supply chain mechanism, and guaranteeing sufficient financial resources could facilitate the progress of Universal Health Coverage (UHC) resources (Lugada et al.,2022).

2.3.3 Inventory Management practice

One key objective in WHO essential medical care services strategy is to ensure effective health products and technologies management (WHO, 2020). However, a significant barrier of management of inventories across health facilities across many nations worldwide has been recognized as unreliable inventory management systems. Inventory optimization is a technique for balancing service-level goals over a wide range of stock-keeping units (SKUs) while taking demand and supply unpredictability into consideration (Neve & Schmidt, 2022). By compiling and providing all reports for stock replenishment, inventory management ensures that there is enough stock available, identifies supply risks, and requests replenishment to enable a desired overlap between expected stock and present stock (Coslett, 2022). Inventory Optimization's primary objective is to lower healthcare costs without compromising service, often by increasing the effectiveness or productivity of the systems. As a result, hospitals maintain an inventory of their optimal levels primarily for maintenance purposes in order to repair the system and enable it to resume performing its original role (Saha & Ray, 2019). In joint systems, inventory is examined continually or infrequently, using both methods (Neve & Schmidt, 2022). When a certain need for the safety stock is reached, the inventory levels are regularly reviewed under the continuous review policy. In order to prevent stock outs, inventory management systems depend on the availability of goods (Basha et al., 2020). This is because organizations optimize their inventory systems by focusing on costs, downtime, and service levels. Three main components make up the inventory

costs. There is a holding expense that must be considered. Because the ordering cost is typically a fixed sum that is associated with each order that is placed, retaining inventory is costly because institutions do not receive interest on the blocked cash, as would be the case if the capital could be invested in other initiatives. Health facilities need inventory performance indicators because they may use them to gauge how well supply chain departments are handling HPTs. Inventory optimization attributes for categorization of items according to their significance, with the objective of enhancing inventory levels and minimizing expenses. Therefore, inventory management prioritize the acquisition and dissemination of crucial medical supplies such as essential medicines, vaccines, medical devices, and diagnostic tests, among other health commodities. The aforementioned can be regarded as a potential means of promoting the progression of Universal Health Coverage (UHC), a concept that strives to guarantee that every person and society can avail themselves of necessary healthcare services without incurring financial distress (Mohajan, 2017).

According to inventory management concept, products that were received or manufactured first should be used or sold first. Health Products and Technologies (HPTs) can benefit from FIFO by ensuring that consumables are used up before they expire, thus cutting down on wastage and increasing patients' access to lifesaving drugs and equipment. The advantages of using FIFO for HPT administration have been the subject of several recent research. Research in Nigeria, for instance, showed that FIFO for vaccines increased vaccine supply and decreased vaccine waste. Research performed in Zambia, found inventory management to enhance patient results by reducing the danger of stockouts and maintaining a steady supply of antiretroviral treatment (ART) (Rahi, 2017). However, there could be difficulties in applying inventory management to HPTs. Inaccurate inventory records and supply chain data, for instance, can make it tough to monitor stock expiration dates. In addition, healthcare employees who use the inventory management

principle may need more extensive instruction and oversight to guarantee supply chain's proper implementation (Rowan & Laffey, 2020).

High priority medications, also referred to as important medications, are vital for the treatment and avoidance of illnesses that have a major effect on the general public's health. However, providing access to HPTs (high priority treatments) continues to be very difficult, especially in low-income nations. In order to advance comprehensive health care and enhance health results, HPTs must be effectively managed (Scala & Lindsay, 2021). The administration of HPTs is significantly impacted by two important variables: the safeguard supply strategy and record-keeping. Since HPTs are frequently life-saving medicines that cannot run out of supply, the inventory management is crucial. Thus, it is crucial to keep a sufficient amount of backup storage to guarantee that there is always a sufficient number of HPTs accessible. According to research done in Tanzania, inventory management works well to decrease HPT stockouts and increase accessibility in basic healthcare institutions

The implementation of an inventory management, according to research conducted in Kenya, greatly decreased the amount of HPT stockouts in basic healthcare institutions (Mohammed & Workneh, 2020). To make sure there is a sufficient supply of HPTs accessible and to spot any problems, accurate inventory management is crucial (Shangala, 2020).

2.4 Health workers factors and management of HPTs

2.4.1 Staffing

Human resources are a crucial aspect in the administration of HPTs and the advancement of Universal Health Coverage (UHC). Sufficient staffing levels are imperative in guaranteeing the availability and accessibility of high-performance technologies (HPTs), as well as in ensuring their safe and efficacious utilization. Access to key medications and health technology is a cornerstone

of Universal Health Coverage (UHC), according to the World Health Organization (WHO). The pillar's attainment is contingent upon staffing, as healthcare providers bear the responsibility of prescribing, dispensing, and administering HPTs to patients. Insufficient staffing levels may lead to deficits in crucial medications and technologies, along with tardiness in their transportation and dispersal. In 2019, the World Health Organization conducted a literature review that identified various factors that can affect the availability and accessibility of home pregnancy tests, one of which is staffing (Lugada et al. (2022)). The study revealed that insufficient staffing levels may result in scarcities of crucial medications and technologies, in addition to inappropriate utilization of these resources owing to inadequate guidance and oversight. The review emphasized the significance of the training and education of healthcare providers, in addition to their accessibility. It is imperative for healthcare professionals to possess the requisite expertise and proficiency in utilizing HPTs in a secure and efficient manner.

Additionally, they must be capable of providing guidance and encouragement to patients to foster healthy habits and ensure compliance with prescribed treatments. The review underscored the significance of healthcare provider distribution. In numerous low- and middle-income nations, healthcare practitioners are primarily situated in urban regions, leading to a dearth of healthcare access and health-promoting technologies in rural and isolated areas. The lack of access to healthcare providers who are capable of prescribing, dispensing, and administering HPTs can potentially have a noteworthy effect on the management of HPTs, particularly in areas where patients are situated (Wentzel, 2022). Therefore, the HPT's management dilemma is a result of both an uneven worker distribution among nations and a generally low level of staffing in rural and outlying health institutions. Frequently, health personnel are understaffed hence overloaded in their workplace which according to WHO (2020) negatively influence the management of HPTs. Therefore, they are unmotivated. Similarly, low staffing levels have a detrimental effect on service

quality in addition to the small number of healthcare professionals providing care, which jeopardizes the management of health commodities. Subpar health outcomes and indicators are the inevitable result of this combination of insufficient healthcare professionals and skill in providing appropriate healthcare services (Faeni, 2023). According to a study on the pharmacy workforce around the world, Malta has 25.07 pharmacists per 10,000 people compared to 0.02 in Africa.

This ratio differs significantly between countries and is typically connected with metrics of economic development at the national level. On average, the proportion of pharmacists per 10,000 individuals in Africa is 6%, with the most significant deficit being observed in regions where this figure averages at 0.57% (WHO, 2020). The 2009 pharmaceutical human resources report for Tanzania revealed that the country had a total of 640 pharmacists, 479 pharmacy technicians, and 376 pharmacy assistants. The mean pharmacist density across the nation was found to be a mere 0.18 per 10,000 individuals. The research revealed a significant insufficiency in the pharmaceutical workforce across all categories, and an uneven distribution of skills, with a notable surplus of highly qualified personnel (pharmacists) in contrast to a limited number of personnel with rudimentary training (pharmaceutical technicians and pharmacy assistants). The aforementioned circumstance has had a noteworthy influence on the administration of HPTs within the corresponding nations. Furthermore, it is customary for pharmacists in Uganda to operate within elevated tiers of the healthcare system and in metropolitan areas. Other cadres with no background in healthcare frequently occupy positions at lower levels and in more remote locations.

2.4.2 Training

The importance of incorporating training in the management of health products and technologies in order to promote the progress of universal health coverage is of great magnitude. The adequate education of healthcare practitioners who are responsible for the acquisition, allocation, and

administration of health commodities and technologies is imperative to guarantee the secure and efficient utilization of these items. This constitutes a pivotal component in the achievement of Universal Health Coverage. Hence, the acquisition of fundamental medical principles by healthcare professionals is imperative in order to deliver healthcare services that are of superior quality and affordable (Nunes, 2021). It is crucial that healthcare professionals are capable of prioritizing their requests for HPTs from their facilities and possess the necessary expertise to forecast demand. Training is a valuable tool that can improve the competence of healthcare professionals in effectively managing health products and technologies, thereby providing a significant advantage. However, still, the biggest obstacles to achieving universal health coverage, according to WHO (2020), is the global shortage of skilled medical personnel. The training encompasses instructions on the appropriate utilization and upkeep of medical devices and equipment, the safe handling and disposal of hazardous waste, and the effective management of supply chains to guarantee sufficient access to crucial medicines and vaccines (Nunes, 2021). Training programs can enhance the proficiency of healthcare personnel, thereby mitigating errors and enhancing the standard of healthcare. This, in turn, results in superior health outcomes and augmented availability of healthcare services for the populace. Moreover, the provision of training can enhance the efficacy of the procurement and distribution systems pertaining to health products and technologies (WHO, 2020). Health systems can enhance access to essential medicines and technologies by imparting training to procurement officials and supply chain managers on the most effective techniques for managing the supply chain. This can result in a reduction of waste, enhancement of forecasting accuracy, and prevention of stockouts (GoK, 2017).

Numerous research works have provided evidence of the beneficial effects of training programs on the effective management of health products and technologies. A study conducted in Ethiopia, Malawi, and Rwanda aimed to investigate the factors that affect the accessibility of crucial medical

supplies such as vaccines and medications for community health workers (CHWs). The findings revealed that the percentage of personnel responsible for managing medical products and technologies who had undergone training on supply chain matters was over 95% in Malawi and Rwanda. In contrast, only 10% of staff in Ethiopia reported receiving such training (Kabera, & Mukanyangezi (2024); Abu, (2020). Even employees who had received supply chain training in all three countries frequently had no idea how to manage health commodities according to SOPs. Standard operating procedures were available to 16% of the workforce in Malawi, compared to 7% of the staff in Ethiopia and Rwanda (Nyang'au & Karanja, 2021). The findings of a Tanzanian study regarding the impact of pharmacy worker deployment and training on essential medication access and health outcomes suggest that a significant obstacle to the realization of universal health coverage (UHC) is the insufficient number of adequately trained personnel capable of handling high-priority tasks (HPTs). They postulate that removing the staff deployment restriction would enhance HPT management, resulting in increased availability of medical care services at public health institutions, community access to necessary medications, and improved health outcomes. Although Namibia, South Africa, and Tanzania have similar UHC systems already in place, there is minimal information available about the costs or effects of HPT management in public health facilities (WHO, 2020). Effective HPT management, then, requires suitable, well-trained, and motivated human resources as an essential aspect of a robust health system.

Similarly, a study conducted in Kenyan public hospitals revealed that providing training on medical device maintenance resulted in a noteworthy reduction in equipment downtime, ultimately enhancing the quality of healthcare (Bunyali, 2023). A potential remedy to promote the staff competency is in service training. In their review of task-shifting research, Kagwanja et al. (2020) staff training would be a useful and affordable method of management HPTs. training might raise skills while also helping to mitigate problems involving health workers (Baine et al., 2018).

Clinical health professionals like nursing aides and medical assistants handle logistics and supply chain tasks at health centers in the absence of certified staff once getting adequate in-service training. However, taking cadres away from their primary responsibility of overseeing HPTs directly has had a clear downside because no health care personnel receive training in health commodity management during their professional careers.

2.4.3 Motivation

Increasing one's level of motivation within a certain range has been shown to boost productivity in European countries (Kitsios & Kamariotou, 2021). The importance of achievement-motivation in HPT management has been verified by several academics (Jia, 2022). Intrinsic motivation also has a good effect on work satisfaction and the management of health commodities, according to a meta-analysis conducted in the area of public administration. Health systems professionals, in contrast to those in other areas, often undergo extensive education and training throughout the course of their careers. They want to get things done at their hospitals properly and quickly. As per McClelland's achievement need hypothesis, individuals with a heightened drive for achievement tend to display greater dedication towards their work. Additionally, they are inclined to attain superior levels of performance by deriving satisfaction from a dynamic work milieu that provides positive reinforcement. Recent research findings suggest that Chinese physicians' effective management of health products and technologies is positively associated with their internal drive and motivation (Nyang'au & Karanja, 2021). Based on the inference drawn, it can be posited that achievement motivation serves as a driving force for employees to strive towards accomplishing the goals of Universal Health Coverage (UHC).

Furthermore, individuals who possess a strong drive for achievement tend to exhibit a greater sense of affiliation with the healthcare institutions where they are employed. According to Ekuri (2020),

there exists a significant and positive correlation between achievement motivation and management of (HPTs) in Nigeria, as evidenced by a study conducted in the region. Furthermore, the research posited that there exists a positive correlation between achievement motivation and the management of high-performance teams (HPTs) (Ekuri, 2020). Similarly, effective reward systems can incentivize employees to work hard, be innovative, and find new and creative ways to improve the management of HPTs. Motivation also encourages employees to take ownership of their work and to be accountable for their actions. According to Ali and Anwar (2021), motivation can take the form of financial incentives, recognition, and career advancement opportunities. When employees are motivated for their efforts in managing health products and technologies, they are likely to be more committed and motivated to ensure that effective management of HPTs is achieved. A study by Makau (2021) done in Tanzania found that financial incentives were essential in motivating health workers to use health technologies effectively, resulting in improved health outcomes. As a result, rewards may be utilized to improve the administration of medical supplies and equipment, which helps move the world closer to universal health coverage (Makau, 2021). Although some research suggests that intrinsic drive to succeed might help with HPT control, the processes that support this claim remain debatable. Whether or if an unidentified intermediate variable plays a pivotal function is unclear.

2.4.4 Attitude

Management of health products and technologies, often known as HPT, is a crucial component in the pursuit of universal health coverage. For this to become a reality, the problems that plague the healthcare system's human resources must be addressed.

Dye (2020) conducted a study in the United States to investigate how human resource management (HRM) may enhance the distribution and use of medical technologies. The authors stressed the

need of continuing education and skill building for anyone working in the healthcare industry. They emphasized the need of studying throughout one's whole life in order to keep up with the rapidly evolving field of HPTs. Next, Tamene (2016) investigated the challenges of implementing UHC in developing countries, especially focusing on the administration of HPTs in a rural region of Uganda. Management of human resources and the strategic positioning of healthcare personnel were identified as two of the most important challenges by the study. They also brought attention to the need of incentives and support in order to maintain the presence of brilliant persons in underdeveloped areas (Tamene, 2016).

Sweed (2016) carried out an in-depth investigation of the global initiatives taken to promote UHC as well as the role that human resource management plays in ensuring the most efficient use of medical supplies and equipment. The study emphasized the need of equitable HPT distribution through policy measures. The research used data from a wide variety of locales. The authors emphasized how important it is to foster a happy environment at work, to provide remuneration that is fair, and to make it easier for people to communicate across different fields (Sweed, 2016). In addition, Sansone et al., (2019) did study in South Africa to assess how the various styles of leadership influenced the motivation and performance of healthcare professionals working in the context of UHC and HPT management. This research was carried out in order to answer the question "how does different leadership affect motivation and performance?" According to the findings of the research, transformational leadership is critical for successfully inspiring healthcare employees to embrace innovation and make use of new technologies. This, in turn, moves the needle closer to the goal of universal health care coverage (Sansone et al., 2019).

2.5 Health Information Management Systems and Management of HPTs

2.5.1 Collecting

Donkin et al. (2018) investigated deeply into the realm of Health Information Management Systems (HIMS) within the United States, particularly focusing on their impact on data collection processes. Their extensive research, carried out in a hospital setting, brought to light the pivotal role of user-friendly interfaces and streamlined workflows in facilitating the efficient collection of health information (Donkin et al., 2018). The study underscored the paramount importance of continuous improvement in the design of HIMS, emphasizing the necessity to optimize data collection practices for the betterment of overall healthcare management. Expanding the geographical scope, a study by Ginter et al. (2018) in Switzerland delved into the indicators associated with the utilization of health technologies in a community health setting. Collaborating with a health clinic, their research aimed at assessing patterns of usage for various health products and technologies. The findings of this study highlighted the critical nature of monitoring indicators such as adoption rates, user satisfaction, and system reliability in the realm of health technologies (Ginter et al., 2018). This valuable information serves as a guide for strategic management, contributing to the enhancement of overall healthcare delivery. Furthermore, the holistic integration of health information management systems with the oversight of health products and technologies presents a comprehensive approach to healthcare optimization. In a cross-disciplinary study, Haldane et al. (2021) explored the synergies between HIMS and health technology management. Their research, conducted across multiple healthcare institutions, brought attention to the interdependence of efficient data collection through HIMS and the effective management of health technologies. The study emphasized the necessity for a holistic approach wherein data collection processes seamlessly align with the strategic management of health products and

technologies. This integrated approach ultimately contributes to improved patient care and organizational efficiency in healthcare systems (Haldane et al., 2021).

Across the African continent, researchers have researched into the transformative effects of Health Information Management Systems (HIMS) on healthcare infrastructures, particularly with a keen emphasis on metrics associated with data collection. An illustrative investigation carried out by Adeleke et al. (2018) in Nigeria provides a compelling exploration into the deployment of HIMS to bolster data collection processes within healthcare environments. The study meticulously evaluated the efficacy of Electronic Health Records (EHRs) in the acquisition of patient information, underscoring the pivotal role of technological advancements in elevating both the accuracy and accessibility of healthcare data. As Africa navigates the complexities of healthcare management, these insights not only shed light on the potential of HIMS but also underscore the critical need for innovative solutions to fortify healthcare systems across the continent (Adeleke et al., 2018).

Additionally, a noteworthy investigation conducted by Zubery et al. (2021) in Tanzania delved into the assessment of the impact of Health Information Management Systems (HIMS) on the intricacies of inventory management for health products. This comprehensive study scrutinized how the implementation of HIMS contributed substantially to the streamlined collection of data pertaining to stock levels, expiration dates, and distribution patterns. The research findings not only underscored the potential of HIMS in averting stockouts but also emphasized its efficacy in minimizing wastage and optimizing the intricate supply chain for health products, particularly in resource-limited settings (Zubery et al., 2021). The study thus underscores the transformative power of HIMS in fortifying the resilience of healthcare supply chains, particularly in regions facing resource constraints, thereby fostering a more sustainable and efficient healthcare delivery system.

In a comprehensive investigation carried out by Ngongo et al. (2019) within the dynamic landscape of Nairobi County, Kenya, the study researched into the pivotal role of Health Information Management Systems (HIMS) in the acquisition of key indicators pertinent to disease surveillance. This research not only emphasized the significance of HIMS in gathering crucial data but also shed light on its capacity to revolutionize real-time data collection and reporting mechanisms (Ngongo et al., 2019). Through the seamless integration of electronic data capture tools into existing healthcare infrastructures, the scholars illustrated the immense potential of HIMS in bolstering the surveillance of infectious diseases. The findings underscored the transformative impact of technology on public health, showcasing how HIMS could pave the way for prompt responses to emerging health threats. The study's insights contribute valuable knowledge to the ongoing discourse on enhancing healthcare systems, with a particular focus on the proactive monitoring of infectious diseases for improved overall health outcomes (Ngongo et al., 2019).

2.5.2 Storing

Health Information Management Systems (HIMS) play a crucial role in the effective organization and storage of health-related data. These systems encompass a variety of tools and technologies designed to capture, manage, and exchange patient information. Storing health data in a structured and accessible manner is essential for healthcare providers to make informed decisions, track patient outcomes, and ensure the continuity of care. One key aspect of HIMS is electronic health records (EHRs), which digitally store patient information, including medical history, diagnoses, medications, and treatment plans (Loewenson et al., 2020). The implementation of EHRs has streamlined the storage and retrieval of patient data, promoting better communication among healthcare professionals and reducing the risk of errors associated with paper-based records.

In a study by Haldane et al. (2021) explored the transformative impact of integrating health technologies into comprehensive patient care within a multispecialty clinic setting. The research showcased the pivotal role advanced technologies played in the storage and management of health information, fostering a patient-centric approach. Notably, the study underscored the significance of interoperability and seamless data integration in establishing a cohesive health information ecosystem (Haldane et al., 2021). The emphasis on these aspects highlighted how a unified system could yield substantial benefits for both healthcare providers and patients alike. By facilitating efficient information exchange and accessibility, the integration of health technologies not only streamlined healthcare delivery but also enhanced the overall quality and coordination of patient care in a holistic manner.

In the African healthcare landscape, Health Information Management Systems (HIMS) stand as indispensable tools, playing a pivotal role in the seamless functioning of modern healthcare settings. These systems are instrumental in facilitating the efficient storage and retrieval of crucial patient data, thereby contributing significantly to the enhancement of healthcare services. Notably, scholars like Ginter et al. (2018) conducted a comprehensive study in the context of South Africa, specifically focusing on the utilization of HIMS within a hospital setting. Their research, conducted at a tertiary care facility, underscored the transformative impact of a robust HIMS implementation. The study highlighted improvements in data accuracy, accessibility, and overall patient care, illustrating how an adept HIMS fosters a dynamic healthcare environment. The findings showcased that the integration of such systems not only streamlines health information storage but also empowers healthcare practitioners to make well-informed clinical decisions, ultimately culminating in elevated patient outcomes and an overall improvement in the quality of healthcare delivery (Ginter et al., 2018).

In the context of Sub-Saharan Africa, a comprehensive study conducted by Wafula et al. (2019) in Uganda shed light on the transformative impact of Health Information Management Systems (HIMS) on the storage of Electronic Health Records (EHRs) within a large urban hospital setting. The research revealed that a well-implemented HIMS not only streamlined the storage of extensive patient data but also played a pivotal role in fortifying the security and confidentiality of electronic health records. The findings emphasized the multifaceted significance of HIMS in maintaining data integrity, ensuring adherence to privacy regulations, and safeguarding the sensitivity of health information in resource-constrained environments (Wafula et al., 2019). Furthermore, the study in Uganda illuminated how the adoption of effective HIMS contributes not only to operational efficiency but also to the overarching goal of delivering quality healthcare in Sub-Saharan Africa by leveraging technology to address unique challenges in health data management.

In the healthcare management field in Kenya, efficiently handling health products and technologies involves more than just managing patient records. It extends to effectively managing inventory and the supply chain. A thorough study by Muinga et al. (2018) focused on the crucial role of technology in optimizing inventory management, especially in hospital pharmacies. The research highlighted important factors like real-time tracking, demand forecasting, and monitoring expiration dates as crucial for improving the storage of health products (Muinga et al., 2018). Implementing advanced inventory management systems not only helped prevent situations where stocks run out but also significantly reduced wastage. These improvements ultimately made healthcare operations more cost-effective, showcasing how technology has positively transformed the way health products are stored in the Kenyan healthcare system.

2.5.3 Analyzing

Analyzing data through HIMS provides valuable insights into the utilization, performance, and overall impact of health products and technologies. These systems facilitate the collection, storage, and retrieval of patient information, treatment protocols, and outcomes. Through robust analytics, healthcare administrators can identify patterns, trends, and areas for improvement in the management of health products and technologies. In the context of health information management, analyzing data related to health products and technologies allows for better decision-making (Francula-Zaninovic & Nola, 2018). It enables administrators to assess the effectiveness of different treatments and interventions, ensuring that resources are allocated optimally. By tracking the usage and outcomes associated with specific health products, organizations can make informed decisions about procurement, inventory management, and product selection, ultimately contributing to cost-effectiveness and improved patient care.

In Korea, a notable study led by Francula-Zaninovic and Nola (2018) explored the management of health technologies, specifically in the realm of digital health records and telemedicine. The analysis concentrated on indicators such as interoperability, user satisfaction, and the integration of telemedicine into routine healthcare practices. The findings indicated that a seamless integration of digital health technologies positively impacted healthcare delivery, leading to improved patient care and satisfaction (Francula-Zaninovic & Nola, 2018). The study shed light on the importance of technological advancements in shaping the healthcare landscape in Korea, underlining the need for continued research and policy efforts to harness the full potential of health technologies in the country.

Moving to Africa specifically in Nigeria, a significant study conducted by Olu and Iyere (2020) investigated the indicators related to health information management systems (HIMS) and their

impact on maternal healthcare. The researchers focused on analyzing indicators such as data accuracy, accessibility, and utilization in the context of maternal health records. The study highlighted the critical role of well-implemented HIMS in improving maternal healthcare outcomes, emphasizing the need for targeted interventions to address challenges and enhance the overall efficiency of health information systems in Nigeria (Olu & Iyere, 2020).

A study conducted by Patel and Dyer (2020) in Tanzania sought to explore this nexus, employing an analytical framework with a specific focus on indicators. The analysis delved into the effectiveness of HIMS in facilitating the tracking and utilization of health products and technologies within the Tanzanian healthcare system. Key indicators, such as data accuracy, interoperability of systems, and the integration of health technologies, were meticulously examined. The research shed light on the pivotal role of HIMS in optimizing the management of health products, streamlining procurement processes, and enhancing the overall efficiency of healthcare delivery (Patel & Dyer, 2020). These findings underscored the significance of well-integrated health information systems in Tanzania, emphasizing the need for continued advancements and strategic planning to strengthen both HIMS and the management of health products and technologies in the country.

A noteworthy study conducted by Kihara and Akoko (2019) in Kenya delved into the intricacies of overseeing health technologies, encompassing medical equipment and pharmaceuticals. The comprehensive analysis centered around critical indicators, including but not limited to procurement processes, maintenance practices, and technology utilization within the healthcare system (Kihara & Akoko, 2019). The research findings underscored a compelling connection between the effective management of health products and technologies and tangible improvements in patient outcomes, cost-effectiveness, and the overall performance of the healthcare system.

2.5.4 Evaluating information for effective decision making

Health Information Management Systems (HIMS) serve a significant role in the successful administration of Health Promotion and Treatment (HPT) initiatives by providing a comprehensive framework for collecting, organizing, and analyzing health-related data. These systems let healthcare practitioners to access and evaluate patient information, treatment results, and population health trends, enabling informed decision-making. Through HIMS, businesses may expedite administrative operations, improve data integrity, and promote communication among healthcare practitioners, eventually increasing the quality of service (Berkowitz, 2021). The combination of sophisticated analytics and data-driven insights obtained from HIMS helps healthcare managers to make evidence-based choices, allocate resources effectively, and execute tailored HPT treatments that address particular health concerns within communities.

In a seminal study conducted by Buchbinder et al. (2019) in Malaysia, the profound impact of Health Information Management Systems (HIMS) on healthcare decision-making was meticulously investigated. The research illuminated the pivotal role played by these systems in not only aggregating but also critically evaluating information essential for informed decision-making processes within the healthcare domain. It underscored the indispensable requirement for accurate and timely data to drive effective resource allocation, devise comprehensive patient care strategies, and facilitate overarching improvements in the health system (Buchbinder et al., 2019). The findings of this study resonate not only with the Malaysian healthcare landscape but also offer valuable insights applicable to global healthcare contexts, emphasizing the transformative potential of robust HIMS in enhancing the efficiency and efficacy of healthcare decision-making at large. This research advocates for the continued development and integration of advanced HIMS to meet the dynamic needs of healthcare systems, ultimately contributing to the advancement of patient outcomes and healthcare services worldwide.

In a significant study conducted by Loewenson et al. (2020) in Zambia, an insightful exploration was undertaken into the pivotal role of Health Information Management Systems (HIMS) in effectively managing infectious diseases, with a specific focus on the Human Immunodeficiency Virus (HIV). The research shed light on the seamless integration of Health Performance Technologies (HPTs) into the healthcare system, enhancing the efficiency of data collection, analysis, and reporting. This holistic integration not only streamlined these essential processes but also played a crucial role in fostering more informed decision-making. The study emphasized the strategic allocation of resources, the development of targeted interventions, and the continuous monitoring of the overall impact on HIV management. Such integrated approaches underscored the transformative potential of HIMS, providing a comprehensive framework for healthcare professionals to navigate the complexities of infectious disease management with precision and effectiveness (Loewenson et al., 2020).

In Zubery et al. (2021) comprehensive study conducted in Tanzania, the primary objective centered around a thorough assessment of the efficacy of Health Information Technologies (HPTs) in the realm of maternal health. The researchers placed a particular emphasis on elucidating how Health Information Management Systems (HIMS) play a pivotal role in elevating the management of maternal health data, thereby fostering enhanced decision-making processes. The study not only shed light on the instrumental role of HPTs in bolstering data management but also underscored their capacity to significantly improve the monitoring and evaluation of crucial maternal health indicators (Zubery et al., 2021). This, in turn, was posited as a key driver for more informed and effective policy formulation and resource planning in the context of maternal healthcare. The findings of the study contribute valuable insights to the broader discourse on leveraging technological solutions for advancing maternal health outcomes, providing a nuanced perspective on the multifaceted impact of HPTs in healthcare settings.

In a pivotal study conducted by Kaitany et al. (2022) within the Kenyan healthcare landscape, a comprehensive exploration into the transformative effects of Health Information Management Systems (HIMS) on healthcare decision-making was undertaken. This research illuminates the intrinsic significance of HIMS in the evaluation of information, serving as a linchpin for informed decision-making. The findings underscore the indispensable role played by these systems in ensuring the availability of accurate and timely data, ultimately influencing critical aspects such as resource allocation, the formulation of patient care strategies, and overarching enhancements within the healthcare system of Ethiopia (Kaitany et al., 2022). The study thus contributes to a growing body of knowledge advocating for the integration and optimization of HIMS to foster more effective, data-driven decision-making processes, thereby facilitating substantial improvements in healthcare delivery and system-wide advancements tailored to the unique needs of the Ethiopian context.

2.6 Leadership practices and Management of HPTs

2.6.1 Communication skills

The advancement of UHC through the management of HPTs is dependent on strong leadership, as this is what ensures the systems for the system's organization, finance, and regulation, as well as those for facilitating coordination, participation, and accountability, are in place and functioning optimally. Effective leadership has to do with how hospital administrators support mentoring and oversight in various departments dealing with the management of HPTs in healthcare facilities, as well as policy and legal modeling on health commodity security in healthcare facilities, to achieve effective management of health products and technologies (Fursman, 2021), ensuring that HPTs are efficiently managed, and that they are accessible and affordable to everyone, regardless of their socioeconomic status. Studies on the leadership culture at healthcare facilities focusing on medical products, vaccines, and technologies have been carried out in Asian nations. According to a

qualitative study on health facilities in Asia, there are a number of leadership parameters that make it difficult to manage health technologies and medical commodities, amongst them, poor communication skills (Nicola et al., 2020). Communication skills are important for effective leadership in the management of HPTs for UHC. Good communication skills can ensure that there is effective communication between different stakeholders involved in the management of HPTs. Effective communication can facilitate the sharing of information, ideas, and knowledge among different stakeholders, including health professionals, policymakers, and patients. Effective communication can also help to build trust and rapport among stakeholders, which is essential for successful collaboration. According to Sharma et al. (2020) in a study conducted in Indian hospitals, communication skills are critical in creating a shared vision, ensuring that all stakeholders are aligned, and facilitating the exchange of information between teams. In addition, another study in United Nations, effective communication can help to promote transparency, which is essential in managing health products and technologies (Pilgrim & Bohnet-Joschko, 2019).

In agreement, quantitative research conducted in Mozambique on leadership and management of Health products at healthcare facilities provided that, planning, directing, controlling, coordinating, and budgeting for health commodities depends largely on institutional top management ability to communicate to employees giving directions (Hadiyanto, 2022). Another systematic review in South Africa submitted that, management of HPTs can only be accomplished with strong communication cultures among the managers of healthcare systems and workers by communicating the health facility's vision in order to motivate, inspire, support, and empower hospital staff to work toward achieving this vision. Similarly, Kohan et al. (2020) contended that through communication, managers are able to support mentorship and supervision in various departments dealing with management of HPTs in the health facilities.

A number of factors, ineffective communication skills, has presented all over Kenya connected to the institutional leadership culture in hospital, and had a significant impact on Kenya's management of health products and technologies (Jarvis, 2022). The hospital's core leadership team comprises of experienced senior professionals, such as the hospital superintendent, health services administrator, head of procurement, accountant, pharmacist, and director of nursing services. However, the county government, via the department of health, offers external leadership to the hospital (Jarvis, 2021). The functional heads of departments within the hospital, including those responsible for the laboratory, pharmacy, maternity, outpatient, general, children's, and maternity wards, are perceived as constituents of a larger leadership team beyond their immediate purview. Leadership entities possess a range of power sources, such as legitimate, referent (founded on identification), coercive, reward, and expert authority, that they can utilize to influence hospital procedures and results (Mwihia, 2020). The scope of their authority is subject to contextual variables within the healthcare industry, including institutional frameworks, policies at the national and sub-national levels, and established rules and regulations. Kisali (2021) study revealed that efficient management of health products and technologies at the county level can be facilitated by effective communication, thereby promoting UHC (Kisali, 2021).

2.6.2 The Relationship Building

The intricate nature of the healthcare industry necessitates collaboration among diverse stakeholders, including clinicians, researchers, regulatory bodies, and technology developers. A skilled leader in relationship building can effectively negotiate this intricate environment, establishing relationships that enable the smooth incorporation of health products and technological advances into the healthcare system. By fostering open communication and trust, such a leader can bridge gaps between different sectors, ensuring a holistic approach to the management of health innovations. The ability to cultivate and sustain relationships becomes a

linchpin for advancing the adoption and implementation of cutting-edge solutions, ultimately contributing to improved patient outcomes and the overall enhancement of healthcare delivery.

In a noteworthy study conducted by Berkowitz (2021) in the field of healthcare, it was highlighted how important it is to build connections in order to improve cooperation and communication amongst various stakeholders. This study, conducted in a large urban hospital, highlighted the critical role that relationship-building executives have in the development of a strong corporate culture. It was discovered that this kind of culture is essential to the smooth integration of health technology and goods, which guarantees their efficient application and use (Berkowitz, 2021). Additionally, Schneller et al. (2023) study, which examined the worldwide management of health technology, clarified the need of fostering cross-cultural relationships. Their study, which included a number of healthcare companies in many Asian nations, showed that strong relationship-building abilities may help CEOs successfully bridge cultural divides and promote a collaborative atmosphere. This is especially relevant in the field of managing health goods and technology because of their frequent participation in global partnerships and collaborations (Schneller et al., 2023).

Olu et al. (2019) performed a thorough investigation that focused on the complex leadership issues involved in implementing new health solutions in a limited-resource setting, with a particular emphasis on the healthcare system in South Africa. This study elucidates the crucial significance of connection building in overcoming the many hurdles related to inadequate infrastructure, budgetary limitations, and the adoption of new technology. The findings underscored that leaders who conscientiously prioritized the cultivation of robust relationships with both internal and external stakeholders demonstrated a heightened capacity to navigate the complexities inherent in the implementation of health innovations within African healthcare settings (Olu et al., 2019). The research looked at particular cases when good relationship building directly addressed

infrastructural difficulties, allowing leaders to establish coalitions that filled important gaps. Moreover, the research highlighted how adept relationship building facilitated access to funding sources, fostering financial support essential for the successful integration of innovative health solutions. Additionally, the study illuminated the role of relationship building in garnering acceptance for new technologies among healthcare professionals, patients, and the broader community.

Extending the scope to Sub-Saharan Africa, a parallel investigation by Patel and Dyer (2020) delved into the leadership dynamics surrounding health product implementation in Ethiopia and Uganda. Leaders who actively cultivated strong relationships within and beyond their organizations were found to be adept at navigating the intricacies of healthcare innovation adoption in contexts marked by diverse cultural, economic, and healthcare disparities. Additionally, a study by Zubery et al. (2021) examined leadership strategies in the implementation of health technologies in Tanzania. The research underscored the importance of relationship building in fostering collaboration among stakeholders and streamlining the integration of new technologies into existing healthcare frameworks. Leaders who emphasized connection development were better positioned to gain support from governmental entities, foreign organizations, and local populations, improving the sustainability of health advances in Sub-Saharan Africa (Zubery et al., 2021).

In the Kenyan context, where the healthcare landscape is diverse and often faces resource constraints, effective relationship building becomes a cornerstone for leaders in health product and technology management. Collaborative efforts between leaders, healthcare professionals, and technology developers are essential for overcoming challenges and optimizing the impact of health innovations. Muinga et al. (2018) conducted a study in the dynamic urban environment of Nairobi, Kenya, which explored the complex domain of health product management in relation to infectious

disease control. The research illuminated a crucial facet of effective leadership in this domain, shedding light on the profound impact of relationship-building strategies. The study's spotlight was on leaders who exhibited a distinct penchant for forging connections with local communities, healthcare professionals, and international partners (Muinga et al., 2018). What emerged from their findings was a resounding validation of the proposition that leaders, who prioritized these multifaceted relationships, were markedly more successful in implementing sustainable health solutions. This success, in turn, rippled through the fabric of infectious disease control initiatives.

2.3 Theoretical Framework

This research is grounded in a theoretical perspective related to identifying and mitigating issues that are affecting the effective management of health products and technologies in health care systems.

2.3.1 Management Theories

The present investigation aims to examine various management theories in order to demonstrate the influence of management factors on outcome-driven healthcare systems. Management was viewed in this study as the health facility's manager's ability to effectively ensure availability of health products and technologies, hence, providing the basis for action. A strong theoretical management foundation is essential for the successful hospital administrator. According to Bandura (2023), a management theory helps guide practice and boosts an organization's efficiency. This suggests a connection between leadership and results. Management theory involves directing practice, including decision making and the exercise of power (Musheke & Phiri, 2021). The theory's explanation of why management's choice matters for guiding efficient HPT management at level 4 and 5 hospitals is important to the present investigation.

One of the theories in management theories is the Systems Approach Theory (Musheke & Phiri, 2021). To achieve a larger purpose, several components must work together as a system. The system's whole character changes even if a single component is eliminated. Products or services, as well as results like improved quality of life, may be thought of as outputs, whereas inputs include things like raw materials, money, technology, and people. The manager of health care facilities is responsible for ensuring that the various departments within the organization work together to accomplish their stated objectives (Glouberman & Mintzberg, 2001). The Systems Approach acknowledges that, in order to achieve acceptable levels of effectiveness and efficiency, it is crucial for the manager to choose a management style that works best for him or her. However, no one management strategy provides a comprehensive answer, thus professionals must combine strategies (Boddy & Paton, 1998). The success or failure of a management strategy depends on the circumstances in which it is implemented (Omusula & Ayub, 2021).

Ofoegbu and Isiguzo (2021) include scientific management theory as yet another option among management philosophies. Frederick Winslow Taylor, writing in the late nineteenth century (Taylor, 2004), is credited as the primary proponent of Scientific Management Theory. Taylor's principal goal was to boost human productivity via the application of scientific principles to the workplace (Taylor, 2004). The ability to "decouple" mental and physical labor, as well as "expropriate and systematic collection of the dexterities and the knowledge of the worker," "independence from the disposition functions respectively control functions," and "methodical forms of the work analysis" are all necessary preconditions. Workers, the hypothesis goes, didn't perform up to their full potential because they were using technologies of accomplishment limitation (Muriuki & Mwangi, 2021). By methodically investigating work practices and setting standards, this management strategy aims to increase productivity and make work simpler. Selection of health staff and supervision may help achieve this goal (Rispele & Ramaswamy, 2021).

By providing wage incentives by directly tying compensation to results, this management technique is also useful for addressing motivation, staffing, and training. The Scientific method's presumptions concerning laborers are laid forth by Fayol, as mentioned in Hanson (2003). According to him, employees need explicit instructions from their superiors in order to understand the interrelationships of their jobs. In addition, he claims that top-down planning and direction are required for effective workplace collaboration. According to Brunsson (2017), one of the tenets of the Scientific Management method is that the manager must utilize scientific tools and measurement to identify the smallest measurable unit of labor in any given assignment. The following stages are identified Brunsson (2017) as necessary for successful management. Workers should be properly incentivized to comply with the job "science," and the management should take care to hire people with the correct skills for the task. He goes on to say that management should assist employees by facilitating their task via meticulous planning and eliminating obstacles. This strategy assumes that employees will do their best work when they have received enough training, when the organization's objectives are well-defined, and when they have the backing of upper management. Because this research is focused on optimizing healthcare facilities, the idea is directly applicable. The availability of HPTs and a subsequent decrease in mortality and disability may be achieved via careful and methodical administration.

2.3.2 Goldratt's Theory of Constraints

Eliyahu Goldratt developed the Goldratt's Theory of Constraints (TOC) in 2005 (Cox & Boyd, 2020) and it is the approach that is most frequently utilized for inventory optimization and supply chain management strategy. This is consistent with Mabin (2015) an early proponent of the idea of constraints, who saw bottlenecks as the primary causes of process inefficiency (Aineah Apwoka, 2018). The theory of constraints is based on the premise that the capacity of a system that is oriented towards achieving specific objectives is limited by one or more constraints (Cox & Boyd,

2020). The only way to raise total output and achieve the system's goals is to increase flow past the constraint(s) (Blackstone, 2010). Identifying the system restriction, choosing how to exploit it, putting everything else on hold to align the entire system, and making modifications are the next phases, assuming the system's purpose has been stated and its measurement determined (Gupta & Boyd, 2008). Health system supply chain management challenges, such as restricted availability and flow (Singh and Misra, 2018), who used the idea of constraints. The goal of this strategy is to cut down on replenishment time, lead time, and late deliveries by recognizing limits like selected stocks and record supplies and adopting management approaches to work around them. The organization of healthcare resources would benefit from any progress in these areas.

2.2.4 Action – Centered Leadership Theory

John Adair developed the Action-Centered Leadership Theory in 1973(Adair, 1973). Leaders, according to the Action-Centered Leadership Theory (Adair, 1973; Braun, Avital, & Martz, 2012), accomplish their goals through their subordinates and superiors. Adair explains that a leader who is action-centered must do three things: structure the work that needs to be done; provide assistance to the individuals who will be performing that work; and coordinate and encourage the group as a whole. Adair's well-known three-circle model simplifies the complexities of human interaction into a clear framework, emphasizing the crucial attributes of a competent leader or manager in connection to a particular task. The three circles represent the fundamental duties and characteristics that define outstanding leadership. Based on the specific circumstances, a leader must determine the most suitable course of action.

The idea is relevant to this research since the administration of HPTs is a matter of public policy and may be set by the county government of Nyeri. They need to be dedicated and familiar with their part in the administration of HPTs in terms of funding, health work organization, supply

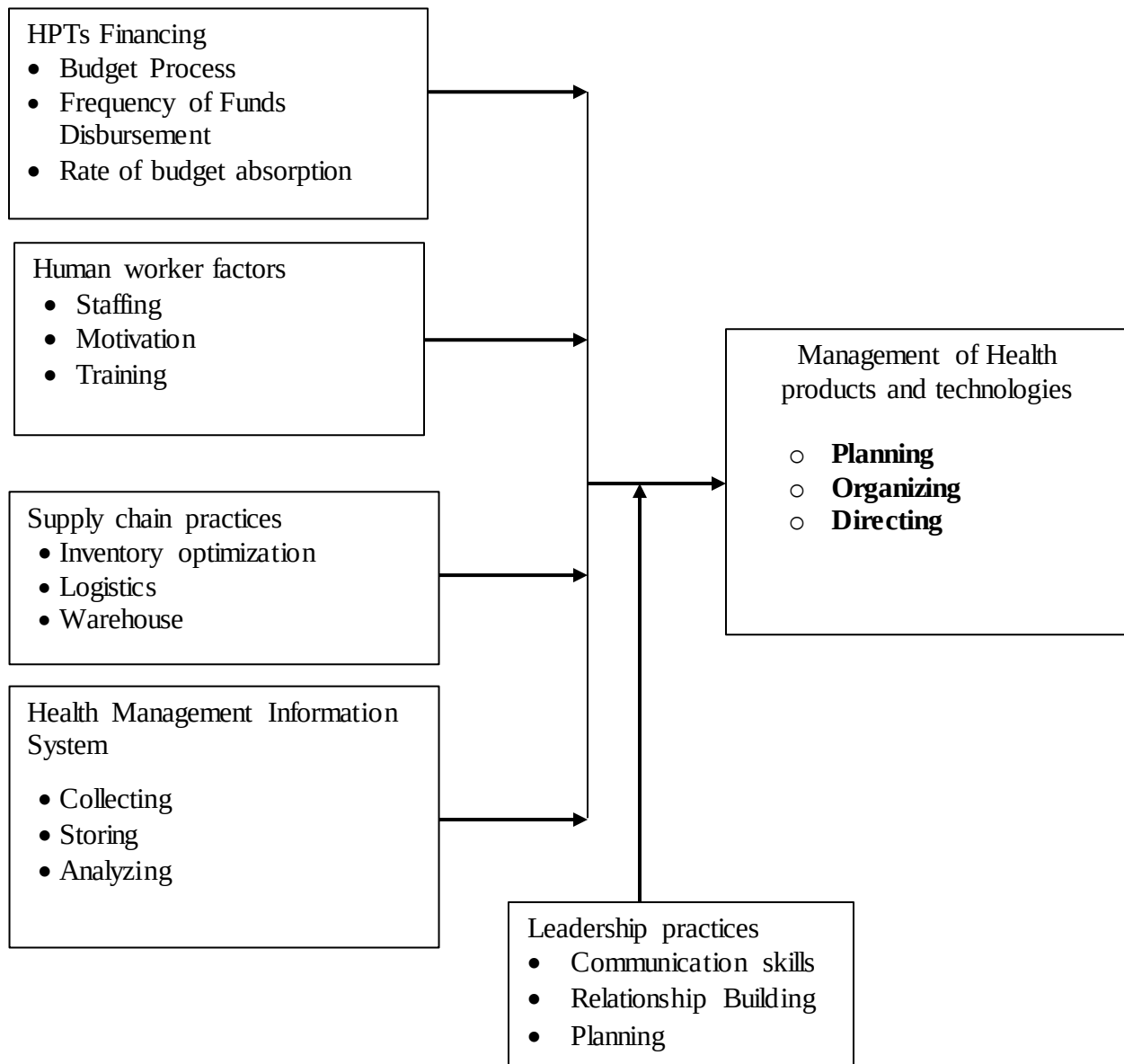
chain, inventory management, and HMIS usage. The idea centers on the concept of team management in the service of a facility's objectives. Action oriented hospital leadership and governance is essential for the successful administration of HPTs in Nyeri County.

2.4 Conceptual Framework

The conceptual framework helps the researcher see how the various explanations for the phenomena fit together (Goldsmith, 2021). It does this by laying out the interconnections between fundamental ideas and variables. Finally, a conceptual framework provides a visual representation of the connections between independent and dependent factors.

Figure 2.1

Conceptual Framework



Independent variable

mediating variable

dependent variable

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter explains the research methodologies that was used to carry out the study in realm of study location, research design, target population, sample size and sampling methods, data collection tools, data collection methods, pilot study, data analysis methods, and ethical issues are the eight subheadings that make up this chapter.

3.1 Location of the Study

The study was conducted in level four and five public hospitals in Nyeri County including Nyeri County Hospital, Othaya sub county hospital, Mukurweni sub county hospital, Karatina sub county hospital and Mt. Kenya level four hospital. The researcher selected the Nyeri County due to high prevalence of non-communicable diseases accounting for 44% of all deaths in the county (Kiragu, 2022). In addition, Nyeri County, had an estimated population of 830,296 people (KNBS, 2022). In total, Nyeri County spans an area of 2,475.4 square miles. There are eight administrative sub counties and only four level 4 hospitals and one level 5 hospital. Within a 5-7 km radius of Nyeri County, health care facilities are evenly distributed.

3.2 Research design

Research design serves as a comprehensive framework for conducting research, detailing the methods and procedures for collecting, measuring, and analyzing data (Ghanad, 2023). This study

utilized a mixed methods research design, incorporating both a descriptive cross-sectional approach and interviews. The cross-sectional design facilitated the collection of data addressing the who, what, when, where, and how of the research topic. In contrast, the interview design provided a deeper understanding of the research problem through in-depth exploration (Robinson, 2020). Given that HPT management can be monitored at both hospital and staff levels—providing extensive and detailed information this research design was considered highly suitable for the current study.

3.5 Target population

The target population is typically a collection of individuals, things, or things having a certain set of characteristics that are interesting in relation to the phenomenon being studied (Elfil & Negida, 2017). Additionally, the target population is from whom sample is drawn for measurement (Muhindi & Ngaba, 2018). The medical officers in charge, 6 health administrators, 5 commodity nurses, 1 finance officer, 10 store keepers and hospital pharmacists at level 4 and 5 hospitals in Nyeri County formed the study's target group. The study targeted the health workers responsible in the management of HPTs to give the relevant data that could be used in generalization of the findings. The study also targeted the County Director finance (CDF), director health, county supply chain officer, County Pharmacists (CP) and county health management team for the Nyeri County as the key informants for in-depth understanding of the phenomenon under the study.

Table 3.1*Target population*

County	Target population of the study
Medical officers in charge	5
Nutritionist	5
HPTs Nurses	5
Store persons	6
Laboratory Technologist	5
Physiotherapist	5
Procurement officers	5
Occupational therapy	5
Nurse managers	5
Pharmacists	5
Total	51

Source: Nyeri County staff establishment plan (2022)

Table 3.2***Key Informants***

Key informants	Target population
County financial officers	2
County supply chain officer	1
County Nursing manager	1
County chief pharmacists	1
County director for health	1

Source: Nyeri County staff establishment plan (2022)

Table 3.3***Level 4 and five hospitals in Nyeri County***

Hospital	Level
Nyeri county referral hospital	Level 5
Othaya hospital in Othaya sub county	Level 4
Mukurweni hospital in Mukurweni sub county	Level 4
Keratina hospital in Mathira East sub county	Level 4
Mt.kenya hospital in Nyeri Town sub county	Level 4

Source: Nyeri County (2022)

3.6 Sample size

A portion of the population chosen to reflect the greater population is referred to as a "sample" (Sileyew, 2019). The study's sample size was 51 respondents for quantitative research while 6 key informants formed the target population for qualitative research.

3.7 Sampling methods

The method or process the researcher uses to choose the items for the sample is known as sampling design (Kothari, 2019). According to Odhiambo et al. (2018), a sample design's effectiveness is determined by how effectively it captures the traits of the population it is intended to represent. The study sampled Nyeri county and the four sub counties which have level hospitals through purposive sampling method. Additionally, a total of 51 respondents was obtained through census method from level 4 and one level 5 hospitals across the four sub-counties and purposive sampling was used to sample six key informants from Nyeri County.

3.8 Data collection instruments

Data collection involves gathering information from study subjects to test research hypotheses (Kothari, 2020; Pandey & Pandey, 2021). The quality of the collected data hinges on the effectiveness of the tools and methods used (Gatuyu & Kinyua, 2020). This study utilized quantitative data collection tools and qualitative data collection instruments, as outlined below.

3.8.1 Interview schedules

The study utilized survey questionnaires divided into two primary sections. The first section collected data on respondent profiles to describe the characteristics of the sample. The second section focused on study variables and was further divided into five subsections. This structure was designed to ensure the validity of the data and to facilitate both the description of the study's components and the testing of hypotheses. The questionnaire, crafted to align with the study's objectives, featured closed-ended questions. These were chosen for their ease of coding and transcription, low response variability, and high response rate, making the survey questionnaire a quick and effective method for gathering information (Cheung, 2021).

3.8.2 Interview guide

To gather qualitative data, a key informant interview guide was employed, targeting the County Director of Finance (CDF), County Director of Health, County Supply Chain Officer, County Pharmacist (CP), and County Nursing Manager. These interviews aimed to gain an in-depth understanding of the phenomenon under study. The guide was meticulously crafted based on the study's objectives and key thematic areas to ensure the collection of information-rich data. The interviews were conducted in person at the respondents' workplaces, with detailed notes being taken during each session.

3.9 Data collection procedures

The investigator personally administered the questionnaires, distributing ten each day due to the geographical distances between hospitals. Consequently, the data collection process spanned five days. Key informant interviews were conducted face-to-face at the respondents' locations for their convenience, with notes taken during each session. On average, each interview lasted one hour.

3.10 Pretest of the instruments

A pretest study is a preliminary trial that is conducted prior to a more extensive investigation (Truong, 2017). Pretesting does not ascertain the reliability and validity of interview schedules; rather, it enhances or improves these qualities (Mbugua & Omagwa, 2017). A pretest study's accuracy is guaranteed by a sample size of 1 to 10%. The data collection methods were pretested in Laikipia County for this study due to its comparable geographical characteristics and prevalence of NCDs to the target county. After the pretest, the initial authors and administrators were actively engaged in the refinement of the data collection tools to guarantee that the actual study captured data that was valid, reliable, and error-free.

3.10.1 Instrument Validity

Validity refers to the extent to which an instrument accurately measures what it is intended to measure, effectively aligning with the study's goals and research hypotheses (Mueller & Knapp, 2018). Clark and Watson (2019) emphasized that a test's validity indicates how well it truly measures the intended constructs, ensuring the measurement fulfills its objectives. This study applied both construct validity and content validity to evaluate the instrument's effectiveness. To maintain a close connection to the study's conceptual framework and ensure each team assessed data with a specific goal, the questionnaire was divided into multiple sections for construct validity (Kothari et al., 2020). To guarantee content validity, the questionnaire underwent a thorough review and was appropriately modified based on the evaluation before the actual data collection began. Participant feedback was analyzed to enhance the validity of the gathered information.

3.10.2 Instrument Reliability

Reliability refers to the consistency of results that an individual would achieve if they took the test multiple times under varying conditions, using different forms, items, or raters (Mueller & Knapp, 2019). This consistency enhances openness, reduces bias, and contributes to neutrality and credibility (Mohajan, 2017). Internal consistency measures the correlations among items within the same test or subscale, determining if the scores from various questions assessing the same underlying construct are consistent (Kothari et al., 2020). Cronbach's alpha was used to evaluate the internal consistency of the questionnaire constructs. This coefficient ranges from -1 to +1, with general interpretations being: $r > 0.6$ - Doubtful, $r > 0.7$ - Acceptable, $r > 0.8$ - Good, and $r > 0.9$ - Excellent

3.11 Data Analysis and discussion

Data processing involves summarizing data from questionnaires or interview guides into a format that is manageable and easy to consume through various methods such as data handling, data manipulation, data processing, and interpretation (Meaza, 2019; Sharma et al., 2020). The objectives of the study, the measurement scale, and the type of data collected guide the data analysis process, which can be either quantitative or qualitative (Meaza, 2019). Before conducting quantitative data analysis, diagnostic tests are performed to assess any violations of assumptions.

3.11.1 Diagnostic Tests

Williams and Albers (2019) propose the use of diagnostic tools to evaluate the accuracy and consistency of an official result, with the aim of addressing different forms of bias that may arise in research. Prior to doing an inferential statistical analysis, diagnostic tests are performed to ensure that none of the assumptions have been violated. Okonji and Abidemi (2021) states that most inferential statistical approaches, such as bivariate correlational analysis, multiple regression analysis, and Chi-square tests for independence, are affected by violated assumptions.

3.11.1 Testing of Normality

In assessing the distribution of the dependent variable's scores, researchers often employ normality tests (Mishra et al., 2019). These tests provide insights into whether the distribution is normal or not, aiding in the decision between parametric and non-parametric statistical methods. One commonly used test for sample sizes below 100 is the Shapiro-Wilk statistic. If the significance value (Sig-Value) exceeds or equals 0.05, the outcome is considered nonsignificant, suggesting that the scores follow a regular distribution. Conversely, a significance value of 0.05 or less indicates departure from the assumption of normality (Knief & Forstmeier, 2021).

3.11.3 Autocorrelation Testing

Because regression analysis depends on the assumption of autocorrelation, it is deemed unreliable and cannot be used to estimate population parameters if this assumption is violated (Knief & Forstmeier, 2021). There is no correlation between the succeeding disturbances because, in accordance with the assumptions provided by the linear regression model, the random error components are equal and independently distributed. The Durbin-Watson (DW) statistic was used to examine the autocorrelation based on OLS residuals. The decision rule is that test statistic values in the range of 1.5 to 2.5 are relatively normal. Values outside this range could be cause for concern (Singh & Singh, 2022). However, the model can be altered when autocorrelation occurs to create a new, serially independent model that includes the error term.

3.11.4 Multicollinearity and Singularity

Multicollinearity pertains to the interconnections among independent variables within a statistical model. It occurs when the correlation coefficient among independent variables equals or exceeds a threshold, often set at $r=.9$. Singularities arise when a single independent variable encompasses a significant portion of the variability present in other independent variables. To detect multicollinearity, researchers commonly employ metrics such as Tolerance and Variance Inflation Factor (VIF). Tolerance measures the proportion of unexplained variability in a given independent variable that is not explained by the other variables in the model, computed as 1 minus the coefficient of determination (R^2) for each variable. Low tolerance values (below .10) indicate significant correlations with other variables, suggesting multicollinearity. Conversely, VIF is the reciprocal of Tolerance (1 divided by Tolerance). VIF values exceeding 10 indicate multicollinearity, which can pose challenges in statistical analysis.

3.11.5 Quantitative Data Management

The data was statistically analyzed using SPSS version 25 for Windows, a software specifically designed for social sciences research. Initially, the researcher examined and purified the data to identify and rectify any flaws. Both descriptive and inferential statistics were utilized in the analysis. Descriptive statistical metrics, including frequency, percentages, mean, and standard deviation, were used to summarize the data. The researcher utilized inferential statistics, specifically correlation analysis and hierarchical multiple regression analysis, to assess hypotheses and facilitate the process of drawing general conclusions. In the hierarchical multiple regression analysis, the researcher included the independent variables in two blocks, labeled as block 1 and block 2, based on theoretical considerations. The initial model incorporated variables such as financing, health worker factors, supply chain practices, and health management information systems. In contrast, the second model accounted for the influence of leadership. The statistical significance of the model was determined by the analysis and interpretation of Analysis of Variance (ANOVA).

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + e \dots$$

Where:

Y = Effective management of HPTs

{ β_i ; $i=1,2,3,4, 5,6$ The} = The coefficients for the independent variable components

X_i for;

X_1 = HPTs Financing (predictor variable)

X_2 = Health work force (predictor variable)

X_3 = Supply chain management (predictor variable)

X_4 = HMIS (predictor variable)

X5 = leadership and Governance (Mediating variable)

e is the error term which is assumed to be normally distributed with mean zero and constant variance.

The findings were presented by use of tables.

3.11.6 Hypothesis Testing

A hypothesis is a plausible assertion that a link exists between two variables or that there are differences between them (Pandey & Pandey, 2021). To effectively organize the study effort, a good hypothesis must meet specific criteria. Therefore, a hypothesis is put out for acceptance or rejection in quantitative research. A null hypothesis (H_0) and an alternative hypothesis (H_a), which can be directional or non-directional, make up a hypothesis test (Kronthaler, 2022). The null hypothesis is either rejected or not rejected depending on whether or not the p-value is below the significance threshold. Type I error rate is the probability of rejecting the null hypothesis when it turns out to be true. It's just as significant, if not more so. Type II error rate is the probability of not rejecting the null hypothesis as false. When the alternative hypothesis is valid, the power is the probability of rejecting the null hypothesis properly, which is equal to 1 minus the risk of a Type II mistake.

Table 3.4*Hypotheses testing summary table*

Null Hypotheses (non-directional) statement	Hypotheses Test	Decision Rule
H01: HPTs financing has No statistically significance influence on management of HPTs in Level 4 and 5 hospitals in Nyeri county	H0: $\beta_1 = 0$ Ha: $\beta_1 \neq 0$ -To conduct (F-test, ANOVA) to assess model significance The 95% confidence limits for the co-efficient, β_1	Fail to Accept H0: If P-value ≤ 0.05 otherwise fail to reject H01 if P- value is > 0.05
H02: Health workforce has No statistically significance influence on management of HPTs in Level 4 and 5 hospitals in Nyeri county	H0: $\beta_1 = 0$ Ha: $\beta_1 \neq 0$ -To conduct (F-test, ANOVA) to assess model significance The 95% confidence limits for the co-efficient, β_2	Reject H0: If P-value ≤ 0.05 otherwise fail to reject H01 if P- value is > 0.05
H03: Supply chain practices has No statistically significance influence on management of HPTs in Level	H0: $\beta_1 = 0$ Ha: $\beta_1 \neq 0$	Fail to Accept H0: If P-value ≤ 0.05 otherwise fail to reject H01 if P- value is > 0.05

4 and 5 hospitals in Nyeri county	-To conduct (F-test, ANOVA) to assess overall model significance	
	The 95% confidence limits for the co-efficient, β_3	
H04: Health management information systems has No statistically significance effect on management of HPTs in Level 4 and 5 hospitals in Nyeri county.	H0: $\beta_1 = 0$ Ha: $\beta_1 \neq 0$ -To conduct F-test to assess overall model significance The 95% confidence limits for the co-efficient, β_4	Reject H0: If P-value ≤ 0.05 otherwise fail to reject H01 if P- value is > 0.05
H05: Leadership practice has No statistically significance mediating effect on management of HPTs	H0: $\beta_1 = 0$ Ha: $\beta_1 \neq 0$ -To conduct (F-test, ANOVA) to assess model significance The 95% confidence limits for the co-efficient, β_2	Reject H0: If P-value ≤ 0.05 otherwise fail to reject H01 if P- value is > 0.05

3.11.7 Qualitative Data Management

The key informant interview guides were thoroughly analyzed thematically, aligning with the study objectives. The themes derived directly from the research aims. These findings were then utilized to complement and validate the quantitative data through triangulation.

3.12 Ethical issues and considerations

Ethics in research encompass a set of principles guiding researchers in their conduct (Kang & Hwang, 2021). With regards to beneficence, the findings of this study hold potential benefits for both county and national government entities, as well as for future research endeavors. It was imperative throughout the study to ensure the well-being of all participants, safeguarding them from emotional, social, or physical harm, and avoiding unnecessary risks. Every participant was treated equitably and with integrity, with full transparency in all interactions. While participants provided consent for data collection, they retained the freedom to withhold responses to specific questions, thereby preserving their privacy. Prior to commencing data collection, all necessary authorizations were obtained, including an introduction letter from Kenya Methodist University (KEMU), Ethical Review Clearance (ERC), and a research permit from the National Commission of Science, Technology, and Innovation (NACOSTI).

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

The chapter covers the findings aligned with the study objectives. It includes interpretation, discussion, and connections to previous research outlined in chapter two. It outlines the response rate and reliability of all constructs. Additionally, it presents descriptive statistics; frequencies, percentages, means, and standard deviations concerning respondent profiles and study variables. Diagnostic tests for normality, autocorrelation, and multicollinearity precede inferential statistics test; Pearson-product Moment correlation and Hierarchical Multiple Regression. The study results are presented through frequency tables.

4.2 Response Rate

The response rate is important in a quantitative study as it affects credibility, validity, dependability and reliability of the study findings due to low levels of representativeness and choice of statistical techniques for analysis (Pandey & Pandey, 2021). A total of 51 structured questionnaires were distributed to respondents at level four and five hospitals in Nyeri County. Out of which 50 questionnaires were completed, resulting to 98.0%. response rate. This was considered representative of the target population. According to Morgan (2020), a response rate exceeding 70% is indicative of population representativeness. Moreover, quantitative studies typically require a minimum sample size of 30 subjects, (Morgan, 2020). With 50 participants responding to the study, the sample size exceeded this criterion, thus ensuring adequacy for statistical data analysis. The high response rate could be attributed to the data collection procedures, in which the researcher pre-tested the tool. Further, the study used self-administration of questionnaires which allowed adequate time with respondents to participate. Informed consent and other ethical considerations were adhered.

4.2 Reliability Test

Reliability test was undertaken by use of Cronbach's Alpha coefficient, to measure the instrument's internal consistency of construct of the tool.

Table 4.1

Reliability statistic

Instrument	Cronbach's Alpha	N of Items	Comment
Questionnaire	.932	90	Dependable

The results showed data collection tool was reliable and credible for statistical analysis (Cronbach's Alpha value 0.932 on 90 constructs). A Cronbach Alpha coefficient of 0.7 and above was considered reliable and good (Schrepp, 2020).

Further, the study conducted the reliability analysis of every study variable.

Table 4.2*Reliability statistic for variables*

Variable	Cronbach's Alpha	Number of constructs	Comment
Financing of HPT	0.786	16	Reliable
Health Workers' Factors	0.877	16	Reliable
Supply Chain Practices	0.781	13	Reliable
Health Management Information System	0.891	20	Reliable
Leadership Practices	0.915	10	Reliable
Management of HPT	0.800	15	Reliable

The study determined that all the scales making up the tools (study variables) had Cronbach's alpha coefficient 0.7 was considered reliable and good (Schrepp, 2020).

4.3 Demographic data

The study conducted descriptive statistics to establish the demographic characteristics and composition of the study population.

Table 4.3*Summaries of Demographic Data*

Variable	Label	Frequency	Percentage (%)
Age groups	(25-34) years	13	26.0
	(35-44) years	13	26.0
	(45-54) years	13	26.0
	55 years and above	11	22.0
Gender	Male	12	24.0
	Female	38	76.0
Education	Diploma	30	60.0
Level	Undergraduate	9	18.0
	Postgraduate diploma	7	14.0
	Master degree	4	8.0
Experience	(1-5) Years	27	54.0
	(6-10) Years	5	10.0
	(10-15) Years	12	24.0
	(16-20) Years	2	4.0

	(21 and above)	4	8.0
	Years		
Charged with management of HPTs	Yes	38	76.0
responsibility	No	12	24.0
Frequency of budgetary allocation	Yearly	8	16.0
	Half-Yearly	5	10.0
	Quarterly	37	74.0
Disbursed amount (KSH)	Below 1	5	10.0
	million		
	(1 -5) million	24	48.0
	(6-10) million	12	24.0
	Above 10	9	18.0
	million		

The study established that majority of respondents are aged between 25-34 years; 13 (26%) equally to those aged between 35-44 years; 45-54 years, 13 (26%) respectively while 11 (22%) of the respondents were aged 55 and above. The findings were in consistence with those of Olutende et al. (2021) who determined that many nurses in Kakamega County are aged between 25 years to 50 years. Further the study established that majority of the respondents were female, 38(76%)

while 12 (24%) were male. Which agreed with the findings of, Narayanan who found the gender composition of the respondents was; female, 62.38% and 35.64% identified as male.

From the study findings more than half of the staff in level four and five public hospitals in Nyeri county attained diploma certificate (60%, n=30), (18%, n=9) undergraduates while postgraduate diploma and master's degree were (14%, n=7) and (8%, n=4) respectively.

In response to the number of years worked in the management of HPTS, the study found that more than half, 54% (n=27) had an experience of 1-5 years, 10-15 years (24%, n=12). The findings disagreed to those of Kilesi (2018) in Kajiado county, who established that majority of health staff had professional experience of between 11 and 15 years, (42.6%).

The study found out that 76%(n=38) had been charged with the management of HPTs in level 4 and 5 hospitals and only less than a quarter of the staff not charged with management in Nyeri county.

From the study findings budgetary allocation is on quarterly basis (74%, n=37) Many of level 4 and 5 hospitals in Nyeri county receives their budgetary allocation quarterly (74%, n=37), followed by yearly (16%, n=8) and half-yearly (10%, n=5). Therefore, budget allocation was not standardized across level 4 and 5 hospitals in Nyeri county with majority of these hospitals, having received on average 1-5 million (48%, n=24) and 6-10 million (24%, n=12) in the fiscal year, 2021-2022. Quarterly budget allocations are often aligned with the fiscal year or budget cycle of the government (Ren et al., 2021). By dividing the annual budget into quarters, hospitals can better plan and manage their financial resources over time.

4.4 Financing of HTP in Public Hospitals in Nyeri County

In response to the influence of financing to HPTs management the study established the following.

Table 4.4*Respondents' Opinion on Financing of HTP in Public Hospitals in Nyeri County*

Statement	SD	D	N	A	SA	Mean	Standard Deviation
We ALWAYS rely on previous budget during the budgeting process	3(6.0 %)	5(10.0 %)	9(18.0 %)	24(48.0 %)	9(18.0 %)	3.62	1.086
We ALWAYS calculate the existing revenue before we start our budget process on HPT	1(2.0 %)	2(4.0 %)	7(14.0 %)	25(50.0 %)	15(30.0 %)	4.02	.892
We ALWAYS add variable costs for HPT during the budget process	2(4.0 %)	4(8.0 %)	10(20.0 %)	27(54.0 %)	7(14.0 %)	3.66	.961
We ALWAYS rely on available data on HTP during the budget process	0(0.0 %)	1(2.0 %)	6(12.0 %)	30(60.0 %)	13(26.0 %)	4.10	.678
We ALWAYS involve all health facility stakeholder during the HTP budgeting process.	1(2.0 %)	9(18.0 %)	2(4.0 %)	21(42.0 %)	17(34.0 %)	3.88	1.136
We ALWAYS set out additional expenses as a separate spending for HPT.	4(8.0 %)	8(16.0 %)	14(28.0 %)	16(32.0 %)	8(16.0 %)	3.32	1.168
We ALWAYS receive the disbursed funds on time	15(30.0 %)	18(36.0 %)	14(28.0 %)	1(2.0 %)	2(4.0 %)	2.14	1.010
There is ALWAYS clear communication on the budget among the department.	3(6.0 %)	11(22.0 %)	10(20.0 %)	19(38.0 %)	7(14.0 %)	3.32	1.151
There is ALWAYS a clear allocation of HTP funds when funds are disbursed in the county facility.	5(10.0 %)	10(20.0 %)	13(26.0 %)	19(38.0 %)	3(6.0 %)	3.10	1.111
Funds disbursed is ALWAYS adequate to finance HPT	19(38.0 %)	18(36.0 %)	10(20.0 %)	2(4.0 %)	1(2.0 %)	1.96	.968
Unutilized funds for HPTs are ALWAYS reallocated for the next financial year	14(28.0 %)	7(14.0 %)	9(18.0 %)	15(30.0 %)	5(10.0 %)	2.80	1.400

Funds disbursement to this health facility is ALWAYS executed timely	18(36.0%)	10(20.0%)	12(24.0%)	8(16.0%)	2(4.0%)	2.32	1.236
The funds disbursed to this health facility are ALWAYS sufficient	24(48.0%)	15(30.0%)	9(18.0%)	2(4.0%)	0(0.0%)	1.78	.887
There is ALWAYS equitability in disbursement of funds to county health facilities.	14(28.0%)	16(32.0%)	13(26.0%)	7(14.0%)	0(0.0%)	2.26	1.026
Funds disbursed are ALWAYS directed to cater for HPT expenditures	6(12.0%)	14(28.0%)	14(28.0%)	15(30.0%)	1(2.0%)	2.82	1.063
We OFTEN receive significant funding from donors.	15(30.0%)	20(40.0%)	7(14.0%)	6(12.0%)	2(4.0%)	2.20	1.125

The study established that there is inadequate HPTs financing (mean=1.78; S.D =.887 untimely disbursements Mean=2.32; S.D=1.236) an equal distribution (mean=2.26; S.D = 1.026) of revenue in level 4 and 5 hospitals in Nyeri county for HPTs management. Further it was found that hospitals rely on previous budget during the budgeting process (mean=3.62;1.086) as well as calculating of the existing revenue before start of the budgeting process on HPT (mean=4.02, S. D =0.892). In other responses the study established that level 4 and 5 hospitals utilize the available data on HPT for budget process (mean= 4.10, Standard deviation = 0.678). the department (mean=3.32; S.D = 1.151).

The study findings align with those of Muriuki and Mwangi (2021) in Mombasa County, who found that hospitals often rely on historical budgets (mean=3.58, S.D=1.102) and existing revenue calculations (mean=4.05, S.D=0.895) during the budgeting process for HPTs. Similarly, Ogosi (2020) in Kisumu County reported that hospitals utilize available data on HPTs for budgeting purposes (mean=4.12, S.D=0.684) (Ogosi, 2020). However, the study disagrees with findings by Kyalo (2021) in Nairobi County, who highlighted that untimely disbursements (mean=3.45, S.D=1.304) were not a significant issue, contrary to the study's results (Kyalo et al., 2021).

Additionally, a study by Lihanda et al. (2024) in Nakuru County found an equitable distribution of revenue for HPTs (mean=3.76, S. D=1.015), which contrasts with the reported inequalities in the study.

During the interview with the Key informant number one on whether financing influence the management of HPTs in level 4 and 5 hospitals, Nyeri county, the officers were of the opinion that funds disbursed to these hospitals are not adequate. One of the officers in the interview (KI1) pointed out that:

“... From the total amount disbursed into level 4 and 5 hospitals in Nyeri County, only 20% is budgeted for commodities. Nevertheless, the timing of disbursement into respective hospital's account is delayed which affects the management of health products and technologies. The budgeting process and disbursement is controlled by the county government, assembly, hence no equitability in disbursement of funds to county health facilities...” (KII, Female, 001, 24th March, 2024)

The interviews were in support to health staffs' opinion that financing is influencing the management of HPTs. Narayanan, and Raj (2020) found that respondents agreed with there was timely financing for hospital needs. However, the respondents disagreed on that critical services such as commodities management at the hospital were well financed. Jarvis (2022) established that, the irregular disbursement of funding affects the management of HPTs in county levels.

4.5 Health workers factors and management of HTP in Nyeri County Public Hospitals

The second study objective determined the influence of health workers factors on HPTs management. Health workers were measured on staffing, motivation

Table 4.5*Responses on health workers factors and management of HTP in Nyeri County Public Hospitals*

Statement	SD	D	N	A	SA	Mean	S. D
The facility has ALWAYS sufficient staff who manage HPTs	14(28.0%)	22(44.0%)	8(16.0%)	4(8.0%)	2(4.0%)	2.16	1.057
The staff managing HTPs are ALWAYS professionals	2(4.0%)	13(26.0%)	9(18.0%)	15(30.0%)	11(22.0%)	3.40	1.212
There is ALWAYS adequate staff-mix to manage HPTs	5(10.0%)	10(20.0%)	18(36.0%)	14(28.0%)	3(6.0%)	3.00	1.069
ALL staff are provided with specific job roles to effectively manage HPT	0(0.0%)	8(16.0%)	16(32.0%)	23(46.0%)	3(6.0%)	3.42	.835
The healthcare workers have ALL requisite skills and expertise to manage HPTS	5(10.0%)	14(28.0%)	14(28.0%)	11(22.0%)	6(12.0%)	2.98	1.186
Staff are ALWAYS equally distributed to all health facilities	15(30.0%)	13(26.0%)	11(22.0%)	9(18.0%)	2(4.0%)	2.40	1.212
The healthcare staff are ALWAYS adequately	13(26.0%)	12(24.0%)	10(20.0%)	12(24.0%)	3(6.0%)	2.60	1.278

remunerated as per their job group placements.								
The healthcare staff recruitment is OFTENLY done at a regular interval of every year	21(42.0%)	13(26.0%)	6(12.0%)	6(12.0%)	4(8.0%)	2.18	1.320	
The staff promotion is ALWAYS is done on merit.	21(42.0%)	13(26.0%)	8(16.0%)	5(10.0%)	3(6.0%)	2.12	1.239	
The staff promotion is ALWAYS done regularly	18(36.0%)	21(42.0%)	10(20.0%)	0(0.0%)	1(2.0%)	1.90	.863	
ALL the staff in HPT have adequate training in HPT	13(26.0%)	19(38.0%)	9(18.0%)	6(12.0%)	3(6.0%)	2.34	1.171	
The staff working HPT are ALWAYS motivated to offer relevant services.	13(26.0%)	17(34.0%)	11(22.0%)	9(18.0%)	0(0.0%)	2.32	1.058	
The staff in the HPT sections are ALWAYS available.	9(18.0%)	9(18.0%)	16(32.0%)	11(22.0%)	5(10.0%)	2.88	1.239	
There is RARELY absenteeism among the HTP staff	5(10.0%)	7(14.0%)	18(36.0%)	17(34.0%)	3(6.0%)	3.12	1.062	
We RARELY have staff walk-outs in our facility	5(10.0%)	9(18.0%)	15(30.0%)	19(38.0%)	2(4.0%)	3.08	1.066	

In response to health workers factor the study established mixed feelings on the number of staff deployed to work in the management of HPTs. Most of the staff 22(44.0%), reported inadequate

staff ration with a mean of 2.16 and SD=1.057 similarly, the respondent moderately agreed that there is adequate staff-mix to manage HPTs (mean=3.00; S. D =1.069). Deployment of the staff was also established not be equal in all the facilities (mean=2.40; S.D =1.212). Staff motivation is low as established due to poor remuneration as per their job group placement (Mean=2.60; S.D =1.278). Other factors found to affect motivation was lack promotion which was done on merit, inadequate staff trainings, irregular recruitment leading to staff shortage within the facility and in the management of HPTs. Support supervision from the county government for HPTs management is done (mean=3.54; S.D =1.054)

The study findings disagreed with those of Granato et al. (2020) in Machakos County, who found that the deployment of staff for the management of Health Products and Technologies (HPTs) was adequate with a mean score of 3.80 (SD=0.92), indicating a sufficient number of personnel (Granato et al., 2020). Similarly, Rashid (2021) in Mombasa County observed that staff motivation was relatively high due to timely promotions and adequate remuneration, with a mean score of 3.50 (SD=1.10). However, the findings were consistent with those of Otambo et al. (2022) in Kisumu County, who reported inadequate staff ratios and low motivation, with mean scores of 2.10 (SD=1.05) and 2.50 (SD=1.20) respectively, due to poor remuneration and lack of regular training (Otambo et al., 2022). Additionally, Musabi and Kipkebut (2024) in Kakamega County also found similar issues with staff deployment and motivation, with a mean score of 2.30 (SD=1.18), attributing the challenges to irregular recruitment and inadequate staff training.

The key informant number two that: “...*The hospitals do not have adequate staff to support the management of HPTs. The staff are not trained on how to use electrical gadgets in department like supply chain control and inventory management. Actually, the staff do not understand the concept of malaria commodity management....*” (KII, Male, 002, 24th March, 2024).

Additionally, key respondent three suggested that:

“...Every facility to have at least one well trained staff on HPT management. “Staff managing HPTs in hospitals be trained and promoted. This kind of motivation to cut across all the trained staff in every health facility...” (KII, Male, 003, 24th March, 2024)

World Health Organization (2019) identified various factors that can affect the availability and accessibility of home pregnancy tests, one of which is staffing. Further, Lugada et al. (2022) revealed that insufficient staffing levels resulted in scarcities of crucial medications and technologies, in addition to inappropriate utilization of these resources owing to inadequate guidance and oversight. The study recommended for healthcare professionals to possess the requisite expertise and proficiency in utilizing HPTs in a secure and efficient manner. Moreover, Buregyeya et al. (2020) in Uganda observed that inadequate staffing and poor staff mix significantly hindered the effective management of health products, resulting in reduced service quality and accessibility.

4.6 Descriptive statistical analysis: Supply chain practice

In response to the influence of supply chain practices on HPT management. The study analysed interval data to determine the overall agreement to the statements relating to supply chain practices.

Table 4.6*Supply chain practice*

Statements		Strongly Disagree	Disagree	Medium	Agree	Strongly Agree	Mean	Std. Deviation
We	ALWAYS	1(2.0%)	8(16.0%)	12(24.0%)	24(48.0%)	5(10.0%)	3.48	.953
conduct regular inventory audits in our facility								
We	HARDLY	3(6.0%)	7(14.0%)	17(34.0%)	15(30.0%)	8(16.0%)	3.36	1.102
have cases of overstock or dead stock for HPTs								
ALWAYS	we	8(16.0%)	19(38.0%)	8(16.0%)	12(24.0%)	3(6.0%)	2.66	1.189
have adequate HPT available all the time								
We	ALWAYS	3(6.0%)	15(30.0%)	18(36.0%)	7(14.0%)	7(14.0%)	3.00	1.125
have balance service-levels for HPT in our facility								
There	are	5(10.0%)	12(24.0%)	11(22.0%)	14(28.0%)	8(16.0%)	3.16	1.251
ALWAYS regular cases of medicines and vaccines stock-out in this facility.								
This	facility	4(8.0%)	7(14.0%)	12(24.0%)	19(38.0%)	8(16.0%)	3.40	1.161
RARELY experiences cases of expired drugs and supplies.								
There	are	1(2.0%)	12(24.0%)	10(20.0%)	19(38.0%)	8(16.0%)	3.42	1.090
ALWAYS cases of late deliveries of HPT								

We ALWAYS get the HPT at right time in the facility.	7(14.0%)	15(30.0%)	14(28.0%)	9(18.0%)	5(10.0%)	2.80	1.195
The medicines and supplies stocked in this health facility are ALWAYS of high quality.	2(4.0%)	9(18.0%)	8(16.0%)	25(50.0%)	6(12.0%)	3.48	1.054
There HARDLY have cases where we get medicines and technologies in wrong quantity	7(14.0%)	8(16.0%)	14(28.0%)	17(34.0%)	4(8.0%)	3.06	1.185
The HPT are ALWAYS delivered in the right condition	3(6.0%)	5(10.0%)	11(22.0%)	23(46.0%)	8(16.0%)	3.56	1.072
The medicines and supplies stocked in this health facility are ALWAYS of high quality.	2(4.0%)	4(8.0%)	13(26.0%)	22(44.0%)	9(18.0%)	3.64	1.005
We RARELY have cases of damaged HPT during transportation	6(12.0%)	7(14.0%)	10(20.0%)	21(42.0%)	6(12.0%)	3.28	1.213

Despite having a mean 3.48 and SD=0.953 on inventory audit being done in public hospitals in Nyeri county, the study established that supply chain is not effective in the management of HPTs. The respondents also stated that there are no cases of overstocking or deadstock in these facilities. The study also found out that there are rare cases of expired drugs or supplies with a mean of 3.40 SD=1.161 Further it was established that the drugs stocked in the level 4 and 5 hospitals in Nyeri

county are of high quality which is shown with a mean 3.48 SD=1.054. The supply is delivered in good quality. It was further reported there is inadequate HPT that is available all the time (mean=2.26; S.D =1.189). The supply chain management is also crippled regular cases of medicine and vaccine stock outs in the facility with a mean 3.42; SD=1.090.

The study conducted in-depth investigation on the how management of HPTs is influenced by supply chain practices (inventory optimization and logistics). From the interviews the thematic analysis found that the hospitals have no stock systems controls which led to lack of accountability in the supply chain. The key informant said that:

“...The hospitals have no inventory modules for trace items reporting, hence, we use manual systems to manage inventories. We do guess work that makes the hospitals to order excess items as well as ordering when items are already depleted. The hospitals have no delegated department of logistics hence, items get to hospital late and without delivery notes. We recommend human resource power to be hired in these hospitals to ensure not breakage in supplies...” (KII, Female, 004, 24th March, 2024).

According to research done in Tanzania, inventory management works well to decrease HPT stock outs and increase accessibility in basic healthcare institutions

The study findings were in disagreement with those of Mudogo et al. (2023) in Vihiga county who determined that there was a steady increase in the mean score on inventory management from 42.67% to 70.83%. The study's conclusions are consistent with those of Abubakar, Dalglis, Angell et al. (2022) in Lagos, Nigeria, who noted that frequent supply chain inefficiencies in public hospitals result in frequent shortages of necessary medications and vaccinations. Similarly, Abekah-Nkrumah et al. (2021) in Ghana found that while the quality of drugs in hospitals was generally high, the availability of HPTs was inadequate, with frequent stockouts reported (Abekah-

Nkrumah et al., 2021). In contrast, the results disagree with Malakoane et al. (2020) in South Africa, who observed that public hospitals had an effective supply chain system with minimal cases of expired drugs and consistent availability of essential medicines (Malakoane et al., 2020). Additionally, a study by Lugada et al. (2022) in Uganda indicated that inventory management practices were robust, leading to very few instances of medicine and vaccine stockouts.

4.7 Descriptive statistical analysis: Health management information system

The study established the influence of HMIS on HPT management. The study analysed interval data to determine the overall agreement to the statements relating to HMIS.

Table 4.7

Health management information system

Statements	Strongly Disagree	Disagree	Medium	Agree	Strongly Agree	Mean	Std. Deviation
HMIS managers ALWAYS undertake regular quality assessments of the data collected on HPT.	3(6.0%)	3(6.0%)	14(28.0%)	24(48.0%)	6(12.0%)	3.54	.994
The facility OFTENLY use information and communication technology for data collection on HPT.	0(0.0%)	6(12.0%)	17(34.0%)	19(38.0%)	8(16.0%)	3.58	.906

The facility RARELY uses sophisticated and powerful data management applications	3(6.0%)	3(6.0%)	17(34.0%)	20(40.0%)	7(14.0%)	3.50	1.015
We ALWAYS conduct periodic in-depth data reviews timed to feed into HPT panning	3(6.0%)	13(26.0%)	14(28.0%)	16(32.0%)	4(8.0%)	3.10	1.074
Data collected on HPT is ALWAYS trustable	2(4.0%)	4(8.0%)	17(34.0%)	24(48.0%)	3(6.0%)	3.44	.884
We HARDLY make mistakes during data entry and computation.	2(4.0%)	8(16.0%)	18(36.0%)	18(36.0%)	4(8.0%)	3.28	.970
We RARELY have issues of incomplete HMIS data used in managing HPT	3(6.0%)	9(18.0%)	18(36.0%)	16(32.0%)	4(8.0%)	3.18	1.024
We ALWAYS ensure internal validity of the HMIS data	0(0.0%)	5(10.0%)	18(36.0%)	22(44.0%)	5(10.0%)	3.54	.813
we ALWAYS have on-premises (local storage systems) for HPT data storage	0(0.0%)	2(4.0%)	21(42.0%)	22(44.0%)	5(10.0%)	3.60	.728
we RARELY leverage the remote servers for HPT data storage in our facility	2(4.0%)	2(4.0%)	26(52.0%)	14(28.0%)	6(12.0%)	3.40	.904

data stored is	1(2.0%)	7(14.0%)	19(38.0%)	15(30.0%)	8(16.0%)	3.44	.993
ALWAYS							
accessible							
without delays							
our facility	3(6.0%)	6(12.0%)	26(52.0%)	9(18.0%)	6(12.0%)	3.18	1.004
HARDLY							
deploys hybrid							
storage systems							
(both on-							
premises and							
remote servers)							
to store HPT data							
we ALWAYS	2(4.0%)	3(6.0%)	21(42.0%)	13(26.0%)	11(22.0%)	3.56	1.033
shave data							
privacy and							
security							
measures (robust							
encryption,							
authorization and							
role-based access							
policies)							
we ALWAYS	2(4.0%)	4(8.0%)	22(44.0%)	13(26.0%)	9(18.0%)	3.46	1.014
store data in							
separate							
locations (data							
backup) to avoid							
data loss							
the facility	2(4.0%)	3(6.0%)	21(42.0%)	15(30.0%)	9(18.0%)	3.52	.995
ALWAYS							
complies with							
data storage laws							
to safeguard the							
HPT data							
we ALWAYS	2(4.0%)	3(6.0%)	23(46.0%)	19(38.0%)	3(6.0%)	3.36	.851
develop a plan							
for immigration							
of stored HPT							
data from the old							
system to the new							
system							

The facility ALWAYS employs qualified data analyst like biostatisticians and data scientists.	5(10.0%)	10(20.0%)	18(36.0%)	12(24.0%)	5(10.0%)	3.04	1.124
We compare the figures from different health facilities before making conclusions	6(12.0%)	8(16.0%)	20(40.0%)	13(26.0%)	3(6.0%)	2.98	1.078
There are ALWAYS cases of inadequate analysis in the facility	5(10.0%)	9(18.0%)	16(32.0%)	14(28.0%)	6(12.0%)	3.14	1.161
The analytical results are ALWAYS visualized through tables, graphs, statistics	3(6.0%)	7(14.0%)	15(30.0%)	20(40.0%)	5(10.0%)	3.34	1.042

The study further established HMIS had a mean of 3.54 and SD=0.994 on data quality. It also established that use of information and communication technologies in the HPTs data management had a mean 3.58 and SD=0.906. The study also found that several interventions are in use to support HPTs data management. These are data backups to prevent data loss, data privacy and security measures and role-based access policies. This implies there is compliance in a data storage laws with a mean 3.52 and SD=0.995 in public hospital in Nyeri county. In response to data analysis the respondents moderately agreed that the facilities employ qualified

biostatistician but rarely use sophisticated and powerful data management applications. On a mean 3.50 and SD=1.015 the facilities hardly leverage the remote servers for HPT data storage. It was found that the facilities hardly deployed hybrid systems for data storage. The data generated is not used for decision making as pointed by the respondents as they felt there is no comparison of data generated from different facility before making any conclusion represented with a mean of 3.14 and SD= 1.16.

The study findings agreed with those of Mboera et al. (2021) that HMIS enhances routine health facility-based data management in hospitals, highlighting the positive impact of HMIS on data quality and the use of ICT in HPTs data management. Conversely, the findings disagreed with those of Ndungu and Kimani (2020) in Kisumu County, who found that public hospitals frequently use sophisticated data management applications and leverage remote servers for HPT data storage, contrasting with the moderate use of such technologies indicated by the mean scores of 3.50 and 3.58 in other regions. These varying results underscore the differences in the adoption and implementation of data management systems across different counties.

The quantitative findings were consistent with qualitative study. The interview with key informants confirmed that although collecting is good, the hospitals are not able to quantify what is used in the facilities through the system

“...There is disorganization with the HMIS which always is not updated which risk loss of data and patients get delayed due to network problems. The hospitals lack qualified personnel to work with the systems like technologists. Sometimes, we require biostatisticians who can help us to analyze the data but the hospitals have not hired one...” (KII, Male, 005, 24th March, 2024).

The findings disagreed to those of Mudogo et al. (2023) who determined that on storage of health products and technologies, there was a steady increase in the mean score on storage from 68.72% to 86.13% across all the public health facilities assessed in Vihiga County. Analyzing guide in

minimizing wastage and optimizing the intricate supply chain for health products, particularly in resource-limited settings (Zubery et al., 2021). On the other hand, Kihara and Ngugi (2021) conducted a study assessing storage and supply chain practices in rural health facilities in Kisumu County, Kenya, finding a notable improvement in storage scores from 70.15% to 88.45% over two years. Their research attributed this enhancement to enhanced staff training, effective inventory management systems, increased governmental infrastructure support, and community involvement (Kihara & Ngugi, 2021).

4.8 Descriptive statistical analysis: Leadership practices

The moderating variable was considered in the management of HPTs.

Table 4.8

Leadership practices

Statements	Strongly Disagree	Disagree	Medium	Agree	Strongly Agree	Mean	Std. Deviation
We always use unwritten communication	16(32.0%)	9(18.0%)	10(20.0%)	14(28.0%)	1(2.0%)	2.50	1.266
Always our managers use informal communication channels	21(42.0%)	16(32.0%)	9(18.0%)	4(8.0%)	0(0.0%)	1.92	.966
We always employ technology in sending messages within the hospital	26(52.0%)	10(20.0%)	8(16.0%)	4(8.0%)	2(4.0%)	1.92	1.175
always our communication channels are clear	14(28.0%)	16(32.0%)	5(10.0%)	13(26.0%)	2(4.0%)	2.46	1.265

We always get problems when getting feedback from our managers	21(42.0%)	10(20.0%)	10(20.0%)	5(10.0%)	4(8.0%)	2.22	1.314
We always build and maintain healthy work relationships	19(38.0%)	12(24.0%)	4(8.0%)	13(26.0%)	2(4.0%)	2.34	1.334
We are always networked with other health facilities within the county	26(52.0%)	8(16.0%)	2(4.0%)	12(24.0%)	2(4.0%)	2.12	1.380
Our managers always ensure positive relationships	20(40.0%)	12(24.0%)	9(18.0%)	7(14.0%)	2(4.0%)	2.18	1.224
We always get external funding out of good rapport with donors	20(40.0%)	10(20.0%)	10(20.0%)	8(16.0%)	2(4.0%)	2.24	1.255
We always establish shared purpose	20(40.0%)	12(24.0%)	12(24.0%)	2(4.0%)	4(8.0%)	2.16	1.235

Further the study noted that respondents did not raise problems with leadership but rather expressed there is use of oral communication with a mean 2.50; SD=1.26, unclear channels of communication. It was also noted there are challenges in feedback mechanism in the communication. Within the facility the managers use formal communication (mean=1.92; SD=1.175). The study also revealed that there was strongly disagreement when it comes to building and maintaining of healthy work relationships (mean=2.34; SD=1.34). Network with other health facility within the county was also established to be rare.

Kumar et al. (2021) in Nairobi, Kenya, found that ineffective communication channels and poor feedback mechanisms hindered the performance of health facilities. Their study also reported that

formal communication was predominant, and there were significant challenges in building healthy work relationships among staff. In contrast, the results disagree with the findings of Soko et al. (2021) in Malawi, who observed that effective leadership and clear communication channels in public hospitals significantly enhanced staff relationships and collaboration across health facilities within the region.

4.9: Descriptive statistical analysis: Management of HPTs

Management of HPTs was the dependent variable which the indicators of planning, organizing and directing were used.

Table 4.9

Management of HPTs

Statements	Strongly Disagree	Disagree	Medium	Agree	Strongly Agree	Mean	Std. Deviation
We always establish objectives and provide steps to manage HPT	0(0.0%)	3(6.0%)	11(22.0%)	29(58.0%)	7(14.0%)	3.80	.756
We always have ways of solving problems related to management of HPT	0(0.0%)	2(4.0%)	11(22.0%)	31(62.0%)	6(12.0%)	3.82	.691
The facility always set long-term goals.	2(4.0%)	0(0.0%)	10(20.0%)	25(50.0%)	13(26.0%)	3.94	.913
Our short-term goals are always planned on a daily basis	2(4.0%)	6(12.0%)	14(28.0%)	27(54.0%)	1(2.0%)	3.38	.878

We always take great effort in identifying the tasks necessary to manage HPT.	0(0.0%)	4(8.0%)	15(30.0%)	27(54.0%)	4(8.0%)	3.62	.753
Management of HPT is always performed within the framework of plans laid out.	1(2.0%)	2(4.0%)	12(24.0%)	27(54.0%)	8(16.0%)	3.78	.840
The facility always identified activities needed in management of HPT.	0(0.0%)	1(2.0%)	11(22.0%)	29(58.0%)	9(18.0%)	3.92	.695
All staff are always assigned duties.	0(0.0%)	5(10.0%)	6(12.0%)	32(64.0%)	7(14.0%)	3.82	.800
There is always delegation of authority responsibility.	1(2.0%)	3(6.0%)	11(22.0%)	27(54.0%)	8(16.0%)	3.76	.870
The facility's managers hardly appraise the effectiveness of plans put forth.	6(12.0%)	15(30.0%)	10(20.0%)	15(30.0%)	4(8.0%)	2.92	1.192
There is always clarity on the role positions to every staff in management of HPT	3(6.0%)	4(8.0%)	11(22.0%)	24(48.0%)	8(16.0%)	3.60	1.050
Mangers always impact staff member's work in the right direction	1(2.0%)	6(12.0%)	8(16.0%)	25(50.0%)	10(20.0%)	3.74	.986

The facility administrators rarely oversee the work of subordinates	5(10.0%)	17(34.0%)	7(14.0%)	14(28.0%)	7(14.0%)	3.02	1.270
There are always clear guidelines on how to manage HPT in our facility	0(0.0%)	9(18.0%)	7(14.0%)	26(52.0%)	8(16.0%)	3.66	.961
There is always efficient utilization of resources in our facility	5(10.0%)	4(8.0%)	5(10.0%)	28(56.0%)	8(16.0%)	3.60	1.161
Overall mean						3.63	.481

In response to management of HPTs the study established that facilities usually have long term and short-term plans with a mean of 3.94; SD=0.913 and mean 3.38; SD=0.878 respectfully. Additionally, management of HPT in public hospitals is always performed within the laid framework. plans laid out (mean =3.78; S. D= .840). The study also established that there are mechanisms for identification of activities needed in management and solving problems related to HPTs management. Duty allocation and delegation of responsibility are part of the management of HPTs. The study also found that the public hospitals in Nyeri county efficiently utilize the resources (mean=3.60; S. D =1.161) and there is support supervision in the health facilities (mean=3.02; S. D=1.270).

The study findings were in agreement with those of Senbekov et al. (2020) in Ghana, who found that long-term and short-term planning significantly contributed to the effective management of healthcare teams, with means of 4.00 and 3.50, respectively. Similarly, Uzochukwu et al. (2020) in Nigeria highlighted that public hospitals often operate within established frameworks, with mechanisms for activity identification and problem-solving in HPT management, demonstrating

mean scores of 3.85 for resource utilization and 3.10 for support supervision. Conversely, the findings contradicted those of Niaz et al. (2020) in Namibia, where it was noted that inadequate duty allocation and lack of delegation impeded effective HPT management, with lower mean scores of 2.90 for resource utilization and 2.75 for support supervision, highlighting significant discrepancies in the efficiency and support structures of healthcare facilities.

4.10 Results on Diagnostic Tests

Diagnostic tests were conducted to ensure that appropriate statistical tests were applied in the analysis to avoid inaccurate estimations. The tests included normality test, multicollinearity test, and auto-correlation test.

4.10.1 Normality Test

Normality tests was conducted to assess whether the scores on dependent variable (management of HPT) was normally distributed or not. This would advise the study whether to conduct parametric techniques or non-parametric techniques. The study conducted the Kolmogorov–Smirnov test ($n \geq 50$). For Kolmogorov–Smirnov test, null hypothesis states that data are taken from normal distributed population. Data is assumed to be normally distributed when the Asympt. Sig. (2-tailed) is greater than 0.05. The results are displayed in Table 4.10.

Table 4.10

Normality tests

Variable	Kolmogorov-Smirnov ^a		
	Statistic	Df	Sig.
Management of HPT	.110	50	.179
Financing	.071	50	.200*
Health worker factors	.094	50	.200*
Supply chain practices	.084	50	.200*
Health management information system	.106	50	.200*

The normality test results indicated that all the variables had non-significant (Probability values greater than 0.05). The null hypothesis of normal distribution was not rejected. This implied that the data for the variables was normally distributed. These results guided the study to employ parametric analytical techniques in conducting correlation and multiple regression analyses.

The findings align with research by Palomino et al (2020) in Ontario, Canada, where similar non-significant Kolmogorov-Smirnov test results ($p > 0.05$) supported the use of parametric techniques for analyzing healthcare management variables (Palomino et al., 2020). However, contrasting results were observed in a study by Kim et al. (2021) in South Korea, where significant deviations from normality ($p < 0.05$) required non-parametric methods for their analyses (Kim et al., 2021).

4.10.2 Auto-correlation Test

The test of auto-correlation was done using the Durbin-Watson Statistic. The decision rule is that test statistic values in the range of 1.5 to 2.5 are relatively normal. Values outside this range could be cause for concern. The results are shown in Table 4.11.

Table 4. 11

Durbin-Watson test of Auto-correlation

Std. Change Statistics									
Adjusted Error of R									
Model	R	R Square	R Square Adjusted	the Estimate	Square Change	F Change	df1	df2	Sig. F Durbin-Watson
1	.658 ^a	.433	.383	5.687	.433	8.608	4	45	.000 2.206

- a. Predictors: (Constant), Financing, Health worker factors, supply chain Practice, Health Management Information System
- b. Dependent Variable: Management of HPTs

The findings indicated a Durbin-Watson value of 2.206, which ranged between 1.5 to 2.5. The null hypothesis of no autocorrelation was not rejected and thus residuals were not auto-correlated. Therefore, there was no violation of assumptions on autocorrelation.

4.10.3 Multicollinearity tests

Multicollinearity test was conducted using Variance Inflated Factor (VIF) and Tolerance to determine if the independent variables were highly correlated. When Tolerance value is less than 1.0 and VIF greater than 1.0, indicate no violation of assumptions on multicollinearity between the independent variables.

Table 4.12

Multicollinearity tests

Coefficients							
Model	Unstandardized Coefficients		Standardized Coefficients		Sig.	Collinearity Statistics	
	B	Std. Error	Beta	T		Tolerance	VIF
1 (Constant)	21.465	6.238		3.441	.001		
Financing	.317	.115	.368	2.765	.008	.724	1.380
Health worker factors	.091	.102	-.135	-.899	.374	.568	1.761
Supply chain	.016	.127	-.017	-.129	.898	.702	1.425
Health management information system	.340	.100	.515	3.413	.001	.564	1.773

- a. Dependent Variable: Management of HPTs

From collinearity statistics column, tolerance values of all variables are less than 1.0 while VIF values are greater than 1.0. This indicated there was no violation of assumptions of multicollinearity between the independent variables. The four predictors were not highly correlated.

The study findings were supported by research conducted by Espinosa et al. (2022) in Colombia, which found significant positive correlations between financing and health management information systems in the management of HPTs (Espinosa et al., 2022). Conversely, findings diverged from those by Chen et al. (2020) in China, who observed negligible effects of supply chain factors on HPT management, contrasting with the significant beta coefficients identified in this study (Chen et al., 2020).

4.11 Inferential statistics analysis: Correlation analysis

Succeeding testing the violation of assumptions, the study determined the relationship between the independent variables and dependent variable through correlation analysis. Particularly, the study determined the relationship between financing, health worker factors, supply chain practice, Health Management Information System and management of HPTs. Inferred from normality test results, parametric technique; Pearson-product Moment Bivariate correlation coefficient was used to compute this relationship.

Table 4.13

Correlation Analysis Results

		Management of HPT	Financing	Health worker factors	Supply chain practice	Health management information systems
Management of HPT	Pearson Correlation	1				

	Sig. (2-tailed)					
	N	50				
Financing	Pearson	.507**	1			
	Correlation					
	Sig. (2-tailed)	.000				
	N	50	50			
Health worker	Pearson	.337*	.496**	1		
	Correlation					
Factors	Sig. (2-tailed)	.017	.000			
	N	50	50	50		
Supply chain practice	Pearson	.292*	.269	.435**	1	
	Correlation					
	Sig. (2-tailed)	.040	.059	.002		
	N	50	50	50	50	
Health management information systems	Pearson	.581**	.408**	.574**	.520**	1
	Correlation					
	Sig. (2-tailed)	.000	.003	.000	.000	
	N	50	50	50	50	50
**. Correlation is significant at the 0.01 level (2-tailed).						
*. Correlation is significant at the 0.05 level (2-tailed).						

The findings revealed that all the independent variables under study had positive and significant relationship with dependent variable. In particular, the study found that, financing ($r = .507^{**}$, $P = .000$, $n=50$), had a strong positive and significant correlation with management of HPTs in Level four and five hospitals in Nyeri county. This study supported the results that healthcare budgetary allocation and essential medicine management is statistically significant associated ($\chi^2=46.428$, $p=0.000$) (Jagadeesan & Karthikeyan 2022). therefore, increasing budgetary allocation for health care would definitely improve the management practices of essential medicine within health facilities in Makueni County, Kenya (Jagadeesan, & Karthikeyan, 2022)

Further, the results revealed that health workers' factors ($r = .337^*$, $P = .017$, $n=50$), had a moderate, positive and statistically significant correlation with management of HPTs in Level four and five hospitals in Nyeri county. Juma and Mutsotso (2023) in Machakos County reported that commodity trainings had been conducted to enhance the management of essential medicines. This

also had a positive influence on Management of Essential Medicines. Additionally, Muturi and Ngugi (2021) found that increase in health worker salary and promotion as way of motivation would results to better management practices of essential medicines in healthcare facilities.

Additionally, supply chain practice indicated a weak, positive and significant relationship with management of HPTs in Level four and five hospitals in Nyeri county ($r=0.296^*$, $P=.040$, $n=50$). The findings conflict and agree with past studies. A chi-square analysis of association depicted no significant relationship between inventory management and Health Commodity Management in Meru County hospitals (Pearson Chi-Square = 0.000, P-Value=0.989). Conversely, Mbatia et al. (2021) determined that the logistic management was positively and significantly associated with the Health Commodity Management in Maternal Child Health (Pearson Chi-Square = 4.450, P-Value=0.035).

Finally, health management information systems ($r=0.581^{**}$, $P=0.000$, $N=50$), had a strong, positive and statistically significant association with management of HPTs in Level four and five hospitals in Nyeri county. The findings agreed to those of Bunyali et al. (2023) who using non-parametric technique; Spearman's coefficient analysis found a positive correlation between health information systems and the availability of medical commodities ($r=0.737$, $p=0.000$).

The findings were in disagreement with those of Mbatia et al. (2021) in Meru County, Kenya, who found a significant positive association between logistic management and Health Commodity Management in maternal and child health facilities. Conversely, in Vihiga County, Mudogo et al. (2023) reported a steady improvement in inventory management practices, contrasting with the weaker relationship found in Nyeri County. On the other hand, supporting findings from Nkolo (2021) in Uganda showed a strong positive correlation between health information systems and the availability of medical commodities, aligning with the significant relationship.

4.12 Inferential statistics analysis: Hierarchical Multiple Regression

Hierarchical multiple regression is based on correlation, but allows a more sophisticated exploration of the interrelationship between the independent variables and dependent variable. The study evaluated the ability of the model; financing, health worker factors, supply chain practice, Health Management Information System to predict management of HPT in Level four and five hospitals in Nyeri county, after controlling for leadership practices. Also, provided the relative contribution of each of the predictors that made up the model (individual subscales). As an extension of this, multiple regression allowed the study to determine whether the models were statistically significant or not, good or fit. Preliminary analyses were conducted to ensure no violation of the assumptions of normality, auto-correlation, and multicollinearity of variables.

4.12.1 Model summary

The model provided the predictive ability on the dependent variable.

Table 4.14

Model Summary

		Std. Change Statistics								
		Adjust Error of R			Square F			Sig. F Durbin-		
Model	R	Square	Square	Estimate	Change	Change	df1	df2	Change	Watson
1	.658 ^a	.433	.383	5.687	.433	8.608	4	45	.000	

2	.662 ^b	.439	.375	5.725	.005	.401	1	44	.530	2.177
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a. Predictors: (Constant), Financing, Health worker factors, supply chain Practice, Health Management Information System

b. Predictors: (Constant), Financing, Health worker factors, supply chain Practice, Health Management Information System, Leadership practices.

c. Dependent Variable: Management of HPTs

Model 1 indicated that Financing, Health worker factors, supply chain Practice, and Health Management Information System were entered as block 1 and explained 43.3 per cent of the variance on management of HPTs ($.433 \times 100$). After Block 2 variables; Financing, Health worker factors, supply chain Practice, Health Management Information System, controlled for Leadership practices were requested, the model 2 as a whole explains 43.9 per cent ($.439 \times 100$).

From R Square change, on the line marked Model 2, the leadership practices predict a variance of 0.5% (R Square change = .005, F Change = 0.401, df1=1, df2= 44, Sig F. Change= 0.530). This means that Financing, Health worker factors, supply chain Practice, Health Management Information System explained 43.3 per cent of the variance on management of HPTs in level four and five hospitals in Nyeri county, even when their effects was controlled for by leadership practices.

To assess if the models were valid and reached the statistical significance, analysis of variance (ANOVA) was conducted.

Based on the findings from Nyeri County, studies in other regions have shown varying perspectives on the factors influencing the management of HPTs. For instance, a study by in Nkolo (2022) Uganda found that while leadership practices significantly predicted variance in HPT management, other factors such as financing and health worker factors played a less prominent role compared to the findings (Nkolo, 2021). Similarly, research by Sundararaman et al. (2021) in

India highlighted that supply chain practices had a more substantial impact on HPT management outcomes than leadership practices alone, contrasting with the study's emphasis on leadership (Sundararaman et al., 2021). Additionally, a study by Cleverley, (2023) in the United States accentuated the critical role of health management information systems, diverging from the study's broader focus on multiple factors. These studies collectively highlight the nuanced differences in determinants of HPT management across diverse global contexts (Cleverley et al., 2023).

Table 4.15

Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1113.578	4	278.395	8.608	.000 ^b
	Residual	1455.402	45	32.342		
	Total	2568.980	49			
2	Regression	1126.721	5	225.344	6.875	.000 ^c
	Residual	1442.259	44	32.779		
	Total	2568.980	49			

a. Predictors: (Constant), Financing, Health worker factors, supply chain Practice, Health Management Information System

b. Predictors: (Constant), Financing, Health worker factors, supply chain Practice, Health Management Information System, Leadership practices.

c. Dependent Variable: Management of HPTs

The study established that the two models were valid and reached statistically significant because the significance value were less than 0.05(model1; P=0.000 & model2 P=.000). Therefore, model 1 and model 2 were good fit to predict the variance on management of HPTs.

Further, the study evaluated the unique contribution of each of the independent variables and whether, the contribution reached statistically significantly. The findings presented in table 4.16.

Table 4.16*Coefficients*

Model	Unstandardized Coefficients		Standardized Coefficients		Collinearity Statistics		
	B	Std. Error	Beta	T	Sig.	Tolerance	VIF
1 (Constant)	21.459	6.197		3.463	.001		
Financing	.316	.115	.364	2.756	.008	.723	1.383
Health Worker Factor	.090	.101	-.133	-.896	.375	.568	1.761
Supply chain	.017	.126	-.018	-.135	.893	.702	1.425
HMIS	.341	.099	.515	3.448	.001	.564	1.773
2 (Constant)	20.162	6.566		3.071	.004		
Financing	.321	.116	.370	2.776	.008	.719	1.391
Health Worker Factor	.090	.101	-.133	-.887	.380	.568	1.761
Supply chain	.007	.128	-.008	-.057	.954	.692	1.446
HMIS	.331	.101	.501	3.295	.002	.552	1.812
Leadership practices	.056	.089	.073	.633	.530	.971	1.030
a. Dependent Variable: TMHPT							

From the results in standardized coefficients table in model 2 row, with all the variables (including moderating variable) entered into the equation, financing (Beta=.370; P value=0.008) and health management information system (Beta=.501; P value = 0.002) made the unique statistically significant contribution to the total variance on management of HPT in Nyeri county. In order of importance, health management information system made 50.1% contribution followed by financing with 37.1% contribution. Supply chain (Beta= -.008; P value=.954) and Health worker's factors (beta = -.133, P=.380) made small and not statistically significant contribution.

The study's findings are supported by research from Uzochukwu, et al. (2020). Health technology assessment and priority setting for universal health coverage: a qualitative study of stakeholders' capacity, needs, policy areas of demand and perspectives in Nigeria. *Globalization and health*, 16, 1-11. in Lagos State, Nigeria, who similarly found that the health management information system (Beta=.492, P value=0.003) significantly contributed to the variance in managing Health Products and Technologies (HPTs). Additionally, findings by Lahariya (2020) in Gujarat, India, indicated a substantial contribution of financing (Beta=.385, P value=0.011) to the management of healthcare technologies, aligning with the current study's results (Lahariya, 2020). However, discrepancies are noted with findings by Tan et al. (2021) in Singapore, where supply chain factors (Beta=.121, P value=0.214) were found to play a more significant role than indicated in the current study (Tan et al., 2021). Moreover, Nundoochan (2020) in Beijing, China, did not find health worker factors (Beta= -.027, P value=.721) to be statistically significant, differing from the non-significant but negative contribution reported in the current study (Nundoochan, 2020).

The regression weights of each variable in the model 2 are presented in the unstandardized coefficients column and were applied in constructing regression model (table 25).

The empirical model was;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \epsilon$$

The resulting regression model was:

$$Y = 20.162 + 0.321 \text{ Financing} + 0.090 \text{ health workers' factors} + 0.007 \text{ supply chain practice} + 0.331 \text{ health management information system.}$$

The management of HPTs in level four and five hospitals in Nyeri county would be 20.162 when financing, Health worker factors, supply chain Practice, Health Management Information System

are constantly controlled at zero value. Further, for every one-unit increase in financing of HPTs, there is 0.321 increase in management of HPTs in level four and five hospitals in Nyeri if other factors are held constant ($\beta = 0.0321$; $P = 0.008$).

While holding other factors constant, for every increase in health worker factors, there is 0.090 increase in management of HPTs in level four and five hospitals in Nyeri county ($\beta = 0.007$; $P = 0.380$).

There is 0.007 increase in management of HPTs in level four and five hospitals in Nyeri county with unit increase in supply chain, while holding other factors constant ($\beta = 0.007$; $P = 0.954$).

While holding other factors constant, for every increase in health management information systems, there is 0.331 increase in management of HPTs in level four and five hospitals in Nyeri county ($\beta = 0.331$; $P = 0.002$).

The study's findings were consistent with those of Shangala (2020) from Nairobi County, Kenya, who discovered that finance had a strong favorable influence on healthcare program management, with a beta coefficient of 0.310. Similarly, Kweku et al. (2020) in Ghana reported that improvements in health management information systems resulted in a substantial increase in healthcare management efficiency ($\beta = 0.340$; $P = 0.001$). However, the findings contradicted those of Zulu et al. (2022) in Zambia, where health worker factors did not show a significant effect on healthcare management ($\beta = 0.020$; $P = 0.450$). Additionally, Francetic et al. (2021) in Tanzania found that supply chain practices had a more pronounced effect on healthcare management than indicated in this study, with a beta coefficient of 0.150 and a significant p-value, highlighting discrepancies in the impact of supply chain practices across different contexts (Francetic et al., 2021).

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.0 Introduction

This chapter provides a comprehensive summary of the study's findings, conclusions, recommendations, their implications for theory, policy and practice and suggestions for future research.

5.1 Summary of the study

The study determined the influence of financing, health workers' factors, supply chain practice, and health management information systems on health products and technologies management in public hospitals in Nyeri County. The study tested the four hypotheses; **H0₁**: Financing has no significance influence in health products and technologies management in level four and five hospitals in Nyeri County; **H0₂**: Health work force has no significance influence in health products and technologies management in level four and five hospitals in Nyeri County; **H0₃**: Supply chain management has no significance influence in health products and technologies management in level four and five hospitals in Nyeri County; **H0₄**: Health management Information System has no significance influence in health products and technologies management in level four and five hospitals in Nyeri County and **H0₅**: Leadership practices has no significance mediating influence health products and technologies management in level four and five hospitals in Nyeri County.

Moreso, the study variables were conceptualized and operationalized in order tie together the research objectives and the results, offering a conclusive perspective on the study's contributions

to the field of health systems. The study was based on mixed methods research design utilizing descriptive cross-sectional design and interviews. The study applied both statistical analysis and thematical analysis from qualitative data. For quantitative data, descriptive statistics, frequencies, percentages, mean and standard deviation were analyzed. Further, inferential statistics; Pearson correlation analysis and multiple hierarchical regression were analyzed to test the relationship between the variables. The study attained a 98.0% return response. The reliability analysis determined the tools were dependable (Cronbach's Alpha value 0.932 on 90 constructs).

Diagnostic tests; normality test, autocorrelation and multicollinearity were conducted to test violation of assumptions before statistical estimations were done.

The study established that mean age of the respondents was 40 years with a standard deviation of 10 years, with majority being female, 76% (n=38). Further, the study found that 30(60%) attained diploma certificate and 27 (54%) have worked between 1-5 years. More than three-quarters, 76% are charged with managing the HPTs in public hospitals in Nyeri county. Budgetary allocation is made quarterly (74%, n=37), averagely, hospitals receiving 1-5 million (48%, n=24) and 6-10 million¹² (24%).

5.1.1 Model summary

The study found that model 1 financing, health worker factors, supply chain Practice, and Health Management Information System explained 43.3 per cent of the variance on management of HPTs. After Block 2 variables; Financing, Health worker factors, supply chain Practice, Health Management Information System, controlled for Leadership practices were requested, the model 2 as a whole explains 43.9 per cent ($.439 \times 100$). Therefore, the leadership practices predict a variance of 0.5% (R Square change =.005, F Change = 0.401, df1=1, df2= 44, Sig F. Change= 0.530) on management of HPTs.

The resulting regression model was:

Management of HPTs = 20.162 + 0.321 Financing + 0.090 health workers factors + 0.007 supply chain practice + 0.331 health management information system.

Based on each study variables, the summaries are presented in the following subsections.

5.1.2 Financing and management of health products and technologies.

Majority of the respondents agreed with less discrepancies that financing influence the management of HPTs in level 4 and 5 hospitals in Nyeri county (Mean=3.00; Standard deviation=0.52). The mean values ($M > 3.0$) with low diversion revealed a very good agreement on the statements. the study found that, financing ($r = .507^{**}$, $P = .000$, $n=50$), had a strong positive and significant correlation with management of HPTs in Level four and five hospitals in Nyeri county. Financing made unique contribution to the total variance on management of HPT in Nyeri county, 37.0% (Beta=.370; P value=0.008).

5.1.3 Health worker factors and management of health products and technologies.

The second objective was to determine the influence of health worker factors and management of health products and technologies. Staffing and motivation variables were used to measure the health worker factors. The respondents had moderate agreement that health workers factors influence the management of the HPTs in level four and five hospitals in Nyeri county (Mean=2.72; S. D=0.669).

Further, the results revealed that health workers' factors ($r = .337^{*}$, $P = .017$, $n=50$), had a moderate, positive and statistically significant correlation with management of HPTs in Level four and five hospitals in Nyeri county. Health workers' factors (beta = $-.133$, $P = .380$) made small and not statistically significant contribution to the total variance on management of HPTs.

5.1.4 Supply chain practices and management of health products and technologies.

The third objective sought to establish the influence of supply chain practices (inventory optimization and logistics) on management of HPTs. Majority of the respondents agreed that supply chain management influence the management of HPTs in level 4 and 5 hospitals on Nyeri county (Mean=3.25; S. D=0.591). Additionally, supply chain practice indicated a weak, positive and significant relationship with management of HPTs in Level four and five hospitals in Nyeri county ($r = 0.296^*$, $P = .040$, $n=50$). Supply chain did not make significant contribution to the variance on HPTs management (Beta= $-.008$; P value=.954)

5.1.5 Health management information system and management of health products and technologies.

The analysis shows a high mean value (greater than 3.0) of 3.36 and a low standard deviation (less than 1.0) of 0.563 which indicate agreement with low variation on health management information system influence the management of HPTs in level four and five hospitals in Nyeri county. Therefore, respondents agreed collecting, storing and analyzing influence the HPTs management. Health management information systems ($r=0.581^{**}$, $P= 0.000$, $N=50$), had a strong, positive and statistically significant association with management of HPTs in Level four and five hospitals in Nyeri county. Health management information system (Beta=.501; P value = 0.002) made the unique contribution to the total variance on management of HPT in Nyeri county. In order of importance, health management information system made the highest, 50.1% contribution among the four objectives.

5.2 Conclusions

Conclusions are drawn from the study findings in relation to each study objective.

5.2.1 Financing and management of health products and technologies.

The study concluded that financing provide statistically significant influence the management of HPTs in level 4 and 5 hospitals in Nyeri county. Financing made unique contribution to the total variance on management of HPT in Nyeri county, 37.0% (Beta=.370; P value=0.008).

Hypothesis testing

H0₁: Financing has no significance influence in health products and technologies management in level four and five hospitals in Nyeri County.

*The study rejects null hypothesis (**H0₁**) and fail to reject alternative hypothesis (**Ha₁**).*

5.2.2 Health worker factors and management of health products and technologies.

The concluded that, although there is significant relationship between health worker factors and management of HPTs, it does not significantly influence the management of HPTs.

Hypothesis testing

H0₂: Health work force has no significance influence in health products and technologies management in level four and five hospitals in Nyeri County.

*The study failed to reject null hypothesis (**H0₁**) and rejected alternative hypothesis (**Ha₁**).*

5.2.3 Supply chain practices and management of health products and technologies.

The determined that supply chain practices do not make significant influence on HPTs management.

Hypothesis testing

H0₃: Supply chain management has no significance influence in health products and technologies management in level four and five hospitals in Nyeri County.

*The study failed to reject null hypothesis (**H0₁**) and rejected alternative hypothesis (**Ha₁**).*

5.2.4 Health management information system and management of health products and technologies.

The study concluded that health management information systems had a strong, positive and statistically significant association with management of HPTs in Level four and five hospitals in Nyeri county. Further, health management information system provides significance influence on the management of HPT in Nyeri county.

Hypothesis testing

H0₄: Health management Information System has no significance influence in health products and technologies management in level four and five hospitals in Nyeri County.

*The study rejected null hypothesis (**H0₁**) and failed to reject alternative hypothesis (**Ha₁**).*

5.2.5 Leadership practice and management of HPTs

The study concluded that leadership practices have no significant influence on management of HPTs.

Hypothesis testing

H0₅: Leadership practices has no significance mediating influence health products and technologies management in level four and five hospitals in Nyeri County.

*The study failed to reject null hypothesis (**H0₁**) and rejected alternative hypothesis (**Ha₁**).*

5.3 Recommendations

5.3.1 Financing and management of health products and technologies

The study determined that financing is key factor in the management of HPTs. Therefore, the study recommends the government to provide adequate funds for HPT in level 4 and 5 hospitals in Nyeri

county. these funds should be disbursed timely to avoid delayed services in hospitals. Additionally, the study suggests that, for effective management of HPTs in all hospitals, equitability in disbursement of funds to county health facilities and involvement of stakeholders in the budgeting process be exercised.

5.3.2 Health worker factors and management of health products and technologies

The study recommends that the county government to recruit sufficient staff who manage HPTs in level 4 and 5 hospitals. The healthcare staff recruitment be done at a regular interval of every year to avoid shortages of staff in hospitals. Further, the study recommends staff training be conducted adequately and regularly to develop requisite skills and expertise to manage HPTS. In addition, the study suggested that staff working with HPT be motivated to offer relevant services.

5.3.3 Supply chain management and management of health products and technologies

The study recommends the hospitals to have adequate HPT available all the time by employing inventory modules for trace items reporting. This would avoid guess work that makes the hospitals to order excess items as well as ordering when items are already depleted. The hospitals are recommended to have department of logistics that would ensure commodities get to hospital in time and continuous delivery of supplies.

5.3.4 Health management information systems and management of health products and technologies

The study recommends level four and five hospitals in Nyeri county to should employ HMIS in the management of HPTs. Specifically, the study opined hospitals to collect, store and analyze HPTs data using the HMIS. The hospitals are advised to have data backups (storage) to avoids data loss, install internet that enable seamless data transmission within the hospital to avoid delays.

Hospitals to hire qualified technologists and data analysts to assist in data management. Data protection is another issue that the study recommends the hospitals to embrace to avoid illegal patients' data use.

5.4. Implications of the Findings on Theories, Practices and Policies

The study concluded that all the predictors have a positive association with the management of HPTS and they explain a substantial influence on dependent variable ($R^2 = .433$). These findings support the theories and past work on health systems globally, regionally and nationally. The presented results would implicate on significant contributions towards policy formulation and practices in the field of health. In terms of implications on policies, the study informs relevant stakeholders and policy makers in health sector to focus on embracing financing, health workers' factors, supply chain practice and health management information systems to effectively manage HPTs at level 4 and 5 hospitals.

Further, in terms of practices, the study informs the health stakeholders, hospital management and administration on how budgeting process, frequency and amount disbursed to hospitals play a critical role in ensuring effective management of HPTs. The results further implicate the hospitals to hire adequate staff and retool motivation strategies. The hospitals should also embrace inventory optimization and logistics management as well HMIS because they significantly influence the HPTs management.

5.5 Recommendations for further Studies

The study makes the following recommendations for further studies;

- i. From the multiple linear regression analysis conducted to establish the underlying prediction of the model (financing, health worker factors, supply chain practices and health management information system) on dependent variable (management of HPTs), it was

observed that the model explained 43.3% on total variation in HPTs management. This implied that there are other factors (accounting to 56.7 %) which influence HPTs management in level four and five hospitals in Nyeri county. Therefore, a further study should be conducted to interrogate the probable factors such as regulatory environment, patient needs and preferences, healthcare provider adoption, healthcare infrastructure and global health challenges in these hospitals in Nyeri county and across the board.

- ii. A similar study is suggested to be conducted in other counties.

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Appendices

Appendix I: Informed Consent

Title: Determinants of Management of Health Products and Technologies in Level Four and Five Hospitals in Nyeri County, Kenya

Researcher: Alice Muthoni (Reg. No: HSM-3-1554-3/3020)

Institution: **Kenya Methodist University, P.O. Box 267-60200, MERU**

Dear Respondent,

My name is Alice Muthoni, master's student at Kenya Methodist University. I am conducting research as part of my degree requirement. This Consent Form contains information about the research topic named above. To be sure that you are informed about being in this research, we are asking you to read it. This consent form might contain some words that are unfamiliar to you. Please ask us to explain anything you may not understand.

Purpose

The study seeks to establish the “***Determinants of Management of Health Products and Technologies in Level Four and Five Hospitals IN Nyeri County, Kenya***”

General Information about Research

Health products and technologies management provide a framework for a well-functioning health system. However, there many challenges and hindrances to the effective management of health products and technologies in public hospitals in Kenya. In Nyeri County, the county government efforted at ensuring there is effective HPTs management by establishing health products and technologies units, and the gazettelement of supplement NO.16 (ACTS NO.5) which discusses the procurement and management of medical supplies and commodities, and which is used to set hospitals and county rules for effective management of health products and technologies. Similarly, the County Government of Nyeri invested heavily in the development and repair of health facilities, including 9 rural health facilities and 2 health centers. Additionally, the government of Kenya through the Ministry of Health provided clear practical national guidance on the main procedures of HPT management and provision of regulatory rules to ensure the provision of HPTs in public hospitals (The Health Act, 2017). Despite these efforts, the management of HPTs in Nyeri County is low, with increased morbidity and mortality rates from non-communicable illnesses which accounts for two out of every three deaths in the county. In

that ground, the study seeks to determine how HPT financing, staff deployment, supply chain practice, and inventory management practices influence HPT management in Nyeri County

Procedure

The researcher will identify herself to you after which you will be required to fill a detailed questionnaire through an interview or by self-administration. This will be a private and confidential exercise. You will be required to take part in the interview only after you have signed the consent form. This exercise will not take much of your time, approximately 30-45 minutes. The information obtained from this study will inform policies and programmes that are beneficial to health facilities and communities. There are no risks associated with participation in this study.

Voluntary Participation

Your participation in this research is voluntary and you will not be victimized for not taking part in the study. You are free to discontinue participation at any time with no consequences. You are also free not to answer questions which you are not free with.

Rewards

Participation into this study will not attract any monetary or non-monetary rewards whatsoever. However, the key findings of the study will be beneficial to health facilities and communities.

Confidentiality

The study will protect information about you and your taking part in this research to the best of our ability. The findings of this study shall be made public in workshops, conferences, and publications; however, your personal details shall remain anonymous and not disclosed to a third party without your permission.

Concerns

You are free to ask any other question related to the study during your participation. You may contact the researcher Alice Muthoni on +254725069478. If you have questions or if problems arise which you do not feel you can discuss with the Primary Investigator, please contact the supervisors; Prof Wanja on +254726678020 And/or Mr. Fredrick Kimemia on +254729872543

Consent by the respondent

I have read and understood the provided information and have had the opportunity to ask questions.

I voluntarily agree to take part in this study.

Participant's signature _____ Date _____

Investigator's signature _____ Date _____

Appendix II: Introduction Letter

Dear Respondent,

I am Alice Muthoni (Reg. No: HSM-3-1554-3/3020), a master's student at Kenya Methodist University undertaking academic research on “***Determinants of Management OF Health Products AND Technologies IN Level Four AND Five Hospitals IN Nyeri County, Kenya***”. I kindly request you to fill in the questionnaire provided. The information collected in form of answers to the questionnaire will be treated confidentially and will only be used for academic purpose.

Thank You.

APPENDIX III: The Questionnaire

Instructions

Do not indicate any information on the questionnaires

PART A

SECTION A: BACKGROUND INFORMATION

1. What is your age in specific years? _____

2. What is gender

i. Male ()

ii. Female ()

3. What is your level of education completed?

i. Diploma ()

ii. Undergraduate ()

iii. Postgraduate diploma ()

iv. Master degree ()

v. Ph. D ()

4. Have ever been charged with management of health products and technologies in your line of duty?

i. Yes ()

ii. No ()

5. How long have you worked in the management of Health products and technologies in years?

(tick the category)

- i. (1-5) years ()
- ii. (6-10) years ()
- iii. (10-15) years ()
- iv. (16-20) years ()
- v. 21 years and Above ()

6. How often the health facilities received their budgetary allocation?

- i. Yearly ()
- ii. Half yearly ()
- iii. Quarterly ()
- iv. Never ()

7. What is the average amount of Health products and technologies finances disbursed in government working year (2021-2022) in your facility?

- i. Below 1 million ()
- ii. (1 -5) million ()
- iii. (6-10) million ()
- iv. Above 10 million ()

SECTION B: Financing of health products and technologies

1. Rate your agreement to the statements relating to financing Health products and technologies in your facility. (Use the 5-point Likert scale to tick one response appropriately)

(Strongly disagree (SD); Disagree (D); Medium (N); Agree (A); Strongly Agree (SA))

Statements	SD	D	N	A	SA
We <u>ALWAYS</u> rely on previous budget during the budgeting process					
We <u>ALWAYS</u> calculate the existing revenue before we start our budget process on HPT					
We <u>ALWAYS</u> add variable costs for HPT during the budget process					
We <u>ALWAYS</u> rely on available data on HTP during the budget process					
We <u>ALWAYS</u> involve all health facility stakeholder during the HTP budgeting process.					
We <u>ALWAYS</u> set out additional expenses as a separate spending for HPT.					
We <u>ALWAYS</u> receive the disbursed funds on time					
There is <u>ALWAYS</u> clear communication on the budget among the department.					

There is ALWAYS a clear allocation of HTP funds when funds are disbursed in the county facility.					
Funds disbursed is ALWAYS adequate to finance HPT					
Unutilized funds for HPTs are ALWAYS reallocated for the next financial year					
Funds disbursement to this health facility is ALWAYS executed timely					
The funds disbursed to this health facility are <u>ALWAYS</u> sufficient					
There is ALWAYS equitability in disbursement of funds to county health facilities.					
Funds disbursed are ALWAYS directed to cater for HPT expenditures					
We <u>OFTEN</u> receive significant funding from donors.					

SECTION C: **Health workers factors**

1. Rate your agreement to the statements relating to health workers factors and management of Health products and technologies in your facility. *(Use the 5-point Likert scale to tick one response appropriately)*

(Strongly disagree (SD); Disagree (D); Medium (N); Agree (A); Strongly Agree (SA))

Statements	SD	D	N	A	SA
The facility has ALWAYS sufficient staff who manage HPTs					
The staff managing HPTs are ALWAYS professionals					
There is <u>ALWAYS</u> adequate <u>staff-mix</u> to manage HPTs					
ALL staff are provided with specific job roles to effectively manage HPT					
The healthcare workers have ALL requisite skills and expertise to manage HPTs					
Staff are <u>ALWAYS</u> equally distributed to all health facilities					
The healthcare staff are ALWAYS adequately remunerated as per their job group placements.					
The healthcare staff recruitment is OFTENLY done at a regular interval of every year					
The staff promotion is ALWAYS effected on merit.					
The staff promotion is ALWAYS done regularly					
ALL the staff in HPT have adequate training in HPT					

The staff working HPT are ALWAYS motivated to offer relevant services.					
The staff in the HPT sections are ALWAYS available.					
There is RARELY absenteeism among the HTP staff					
We RARELY have staff walk-outs in our facility					
The Nyeri County Government OFTENLY supervises management of HPT in this facility					

SECTION D: Supply chain practices

1. Rate your agreement to the statements relating to supply chain practice and management of Health products and technologies in your facility. *(Use the 5-point Likert scale to tick one response appropriately)*

((Strongly disagree (SD); Disagree (D); Medium (N); Agree (A); Strongly Agree (SA))

Statements	SD	D	N	A	SA
We ALWAYS conduct regular inventory audits in our facility					
We HARDLY have cases of overstock or dead stock for HPTs					
ALWAYS we have adequate HPT available all the time					
We ALWAYS have balance service-levels for HPT in our facility					
There are ALWAYS regular cases of medicines and vaccines stock-out in this facility.					
This facility RARELY experiences cases of expired drugs and supplies.					
There are ALWAYS cases of late deliveries of HPT					
We ALWAYS get the HPT at right time in the facility.					
The medicines and supplies stocked in this health facility are ALWAYS of high quality.					

There HARDLY have cases where we get medicines and technologies in wrong quantity					
The HPT are <u>ALWAYS</u> delivered in the right condition					
The medicines and supplies stocked in this health facility are ALWAYS of high quality.					
We RARELY have cases of damaged HPT during transportation					

Section E: Health Management Information System

1. Rate your agreement to the statements relating to health management information system in your facility. *(Use the 5-point Likert scale to tick one response appropriately)*

((Strongly disagree (SD); Disagree (D); Medium (N); Agree (A); Strongly Agree (SA))

Statements	SD	D	N	A	SA
HMIS managers ALWAYS undertake regular quality assessments of the data collected on HPT.					
The facility OFTENLY use information and communication technology for data collection on HPT.					
The facility RARELY uses sophisticated and powerful data management applications					
We ALWAYS conduct periodic in-depth data reviews timed to feed into HPT panning					

Data collected on HPT is ALWAYS trustable					
We HARDLY make mistakes during data entry and computation.					
We RARELY have issues of incomplete HMIS data used in managing HPT					
We ALWAYS ensure internal validity of the HMIS data					
we ALWAYS have on-premises (local storage systems) for HPT data storage					
we RARELY leverage the remote servers for HPT data storage in our facility					
data stored is ALWAYS accessible without delays					
our facility HARDLY deploys hybrid storage systems (both on-premises and remote servers) to store HPT data					
we ALWAYS have data privacy and security measures (robust encryption, authorization and role-based access policies)					
we ALWAYS store data in separate locations (data backup) to avoid data loss					
the facility ALWAYS complies with data storage laws to safeguard the HPT data					
we ALWAYS develop a plan for immigration of stored HPT data from the old system to the new system					

The facility ALWAYS employs qualified data analyst like biostatisticians and data scientists.					
We ALWAYS compare the figures from different health facilities before making conclusions					
There are ALWAYS cases of inadequate analysis in the facility					
The analytical results are ALWAYS visualized through tables, graphs, statistics					

SECTION F: **Management of Health Products and Technologies**

1. Please rate your agreement on the statement related to Management of Health Products and Technologies in your facility.

(Use the 5-point Likert scale to tick one response appropriately)

(Strongly disagree (SD); Disagree (D); Medium (N); Agree (A); Strongly Agree (SA))

Statements	SD	D	N	A	SA
We always establish objectives and provide steps to manage HPT					
We always have ways of solving problems related to management of HPT					
The facility always set long-term goals.					
Our short-term goals are always planned on a daily basis					

We always take great effort in identifying the tasks necessary to manage HPT.					
Management of HPT is always performed within the framework of plans laid out.					
The facility always identified activities needed in management of HPT.					
All staff are always assigned duties.					
There is always delegation of authority responsibility.					
The facility's managers hardly appraise the effectiveness of plans put forth.					
There is always clarity on the role positions to every staff in management of HPT					
Mangers always impact staff member's work in the right direction					
The facility administrators rarely oversee the work of subordinates					
There are always clear guidelines on how to manage HPT in our facility					
There is always efficient utilization of resources in our facility					

Thank you for participating!

APPENDIX III: INTERVIEW GUIDE FOR THE KEY INFORMANTS

Instructions: I would like to ask you some questions on Health products and technologies in your facility. The interview may take 1 hour. Kindly be honest and objective in answering the questions

Let us start:

QUESTION ONE: Discuss in detail the influence of HPTs financing on management of HPTs in your facilities in regard to:

Budgetary process

Funds disbursement

Frequency of budget allocation

QUESTION THREE: Discuss in detail the influence of health factors on management of HPTs in your facilities in terms of: -

Staffing

Motivation

QUESTION TWO: Discuss in detail the influence of supply chain practices on management of HPTs in your facilities in terms of: -

Inventory optimization

Logistics

QUESTION FIVE: Discuss in detail the influence of Health management information system on management of HPTs in your facilities in terms of: -

Collecting

Storing

Analyzing

Question five: Generally, let us discuss the level of management of health products and technologies in level 4 and 5 hospitals in Nyeri County in terms of: -

Planning

Organizing

Directing

Appendix IV: Introduction Letter



KENYA METHODIST UNIVERSITY
P. O. BOX 267 MERU - 60200, KENYA
TEL: 254-064-30301/31229/30367/31171
FAX: 254-64-30162
EMAIL: INFO@KEMU.AC.KE

July 3, 2023

KeMU/ISERC/H5M/12/2023

ALICE MUTHONI MACHANGA
H5M-3-1554-3/2020

Dear Alice,

**SUBJECT: DETERMINANTS OF HEALTH PRODUCTS AND TECHNOLOGIES
MANAGEMENT IN LEVEL FOUR AND FIVE HOSPITALS IN NYERI COUNTY**

This is to inform you that Kenya Methodist University Institutional Scientific Ethics and Review Committee has reviewed and approved your research proposal. Your application approval number is KeMU/ISERC/H5M/12/2023. The approval period is 3rd July, 2023 – 3rd July, 2024.

This approval is subject to compliance with the following requirements:-

- I. Only approved documents including (informed consents, study instruments, MTA) will be used.
- II. All changes including (amendments, deviations, and violations) are submitted for review and approval by Kenya Methodist University Institutional Scientific Ethics and Review Committee.
- III. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to KeMU ISERC within 72 hours of notification.
- IV. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to KeMU ISERC within 72 hours.
- V. Clearance for export of biological specimens must be obtained from relevant institutions.

VI. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.

VII. Submission of an executive summary report within 90 days upon completion of the study to KeMU ISERC.

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) <https://cris.nacosti.go.ke> and also obtain other clearances needed.



Appendix V: Introduction Letter to NACOSTI



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Fax: 254-64-30162

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Email: deanrd@kemu.ac.ke

DIRECTORATE OF POSTGRADUATE STUDIES

July 3, 2023

Commission Secretary,
National Commission for Science, Technology and Innovations,
P.O. Box 30623-00100
NAIROBI.

Dear Sir/Madam,

RE: ALICE MUTHONI MACHANGA – (REG. NO. HSM-3-1554-3/2020)

This is to confirm that the above named person is a bona fide student of Kenya Methodist University, in the School of Medicine and Health Sciences, Department of Health System Management undertaking a Master's Degree in Health System Management. She is conducting research on: "Determinants of Health Products and Technologies Management in Level Four and Five Hospitals in Nyeri County".

We confirm that her research proposal has been presented and approved by the University.

In this regard, we are requesting your office to issue a research license to enable her collect data.

Any assistance accorded to her will be appreciated.

Yours sincerely,


Dr. John M. Muchiri (PhD)

Dean, Postgraduate Studies

Cc: Dean SMHS

CoD, HSM

Program Coordinator -HSM

Student Supervisors

Appendix VI: NACOSTI RESEARCH PERMIT

 REPUBLIC OF KENYA		 NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION	
Ref No: 196589		Date of Issue: 26 July 2023	
RESEARCH LICENSE			
			
This is to Certify that Ms. Alice Matheni Machangwa of Kenya Methodist University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nyeri on the topic: Determinants of Health Products and Technologies Management in Level Four and Five Hospitals in Nyeri County for the period ending : 26 July 2024.			
Applicant Identification Number		License No: NACOSTI/P/23/4770	
Director General NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION Verification QR Code 			
NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.			
See overleaf for conditions			

Appendix VII: Research Authorization Letter



Email: nyericountyhealth@yahoo.com

0758563121

COUNTY COMMISSIONER'S HQ
BLOCK 'A'
P.O. Box 110 – 10100
NYERI

REF: CGN/HEALTH/HRM/5/VOL.III

Date: 14th March 2024

The Medical Superintendent

- Nyeri County Referral Hospital
- Mt. Kenya Hospital
- Othaya Sub County Hospital
- Mukurwe-ini Sub County Hospital
- Karatina Sub County Hospital

RE: RESEARCH AUTHORIZATION

The bearer of this letter, **Alice M. Machanga** is a student at Kenya Methodist University pursuing a Master of Science in Health System Management.

She has written to this office seeking authority to conduct research at your facility.

Consent has been given and she is hence introduced to carry out a research on "**Determinants of Health Products and Technologies Management in Level Four and Five Hospitals in Nyeri County**".

Kindly accord her the necessary assistance.

The student **must** deposit a copy of the final report with the department following completion of the study.



Dr. Oscar Agoro
For: County Director for Health
NYERI