COSTS ASSOCIATED WITH THE MANAGEMENT OF WILMS TUMOR AT MUHIMBILI NATIONAL HOSPITAL AND OCEAN ROAD CANCER INSTITUTE IN TANZANIA, A NARROW SOCIETAL PERSPECTIVE.

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Master of Science in Health Economics and Policy of
Muhimbili University of Health and Allied Sciences
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Muhimbili University of Health and Allied Sciences

School of Public Health and Social Sciences

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By

Amosi Absalom Kilipamwambu

A proposal submitted in (partial) fulfillment of the requirements for the Degree of Master of Science in Health Economics and Policy of Muhimbili University of Health and Allied Sciences

October, 2024

CERTIFICATION

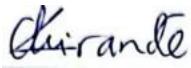
The undersigned certify that they have read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation titled "**Cost associated with the management of wilms tumor at Muhimbili National Hospital and Ocean Road Cancer Institute in Tanzania, a narrow societal perspective** in (partial) fulfilment of the requirements for the degree of Master of Science in Health Economics and Policy of Muhimbili University of Health and Allied Sciences.



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30.10.2024



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30.10.2024

Date

DECLARATION AND COPYRIGHT

I, **Amosi Absalom Kilipamwambu**, declare that this dissertation is my original work and that it has not been presented and will not be presented to any other university for a similar or any other degree award.

Signature…… Date……

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ACKNOWLEDGMENT

First and foremost, I thank and praise God for His endless blessings, good health, and the capability to reach where I am today. I have invested significant effort in conducting this research, yet it would not have been possible without the kind support and help of my family. They have been my inspiration for exploring and fostering curiosity in cancer research, both in paediatrics and adults. This motivation stems from the loss of my niece to bilateral thalamic masses, which were diagnosed late. Through this research, I aim to contribute potential gains to others.

I owe a special debt of gratitude to my university supervisors, Dr. Frida Ngalesoni and Dr. Lulu Chirande, for their unwavering support, guidance, and encouragement throughout this research endeavour. The completion of this dissertation would not have been possible without their remarkable contributions.

My deepest gratitude goes to my late father, Absalom Kilipamwambu, who passed away this year due to cancer complications. I also extend my thanks to my mother, Enesia Nyasi, and the entire family for their prayers during my entire study period.

Lastly, I would like to express my appreciation to the faculty, workmates, classmates, and friends at my university who were always willing to assist and offered their invaluable technical guidance and relentless support throughout my studies.

DEDICATION

*This work is dedicated to my beloved father, **Absalom Rajab Kilipamwambu**, whose unwavering support and love have been my guiding light. His memory continues to inspire me every day.*

I also dedicate this research to the brave children battling cancer in the wards. Your strength and courage in the face of adversity are a source of inspiration for us all.

ABSTRACT

Background: Non-communicable diseases (NCDs) are a major global health concern, particularly impacting Low- and Middle-Income Countries (LMICs). Childhood cancer, notably Wilms tumour (WT), presents significant challenges in LMICs like Tanzania due to disparities in healthcare access and resources. However, in Tanzania, managing WT is hindered by a lack of understanding of its financial implications. This study aims to address this gap by analysing the costs of WT management in major specialized hospitals in Tanzania to facilitate better resource allocation and cost-effective strategies.

Objective: To determine Costs associated with the management of Wilms Tumor at Muhimbili National Hospital (MNH) and Ocean Road Cancer Institute (ORCI) in Tanzania.

Methods: We utilized a cross-sectional costing study for Wilms tumor (WT) management, employing micro-costing with top-down and bottom-up approaches. A 'narrow' societal perspective approach, for the financial year 2021/22 was used to identify, quantify, and value resources used for WT Care after verification at the costing unit, with exit interviews with 52 caregivers, Data analysis was done through Excel and SPSS version 20 for both provider and patient perspective.

Results. The study found that the annual unit cost for managing early WT was three times lower than that for advanced WT. The annual unit costs for the early and advanced WT were 2,901,660.25 Tsh (1,104.58 USD) and 8,744,835.85 Tsh (3,328.92 USD), respectively, from the provider perspective. The oncology costing center contributed about 60% of the annual unit cost for both early and advanced disease, for patients, the cost of managing advanced WT was almost twice that of early WT. Productivity loss and treatment costs were significantly influenced by disease status.

Conclusion and Recommendations. Advanced stage Wilms tumor underscores economic burden to provider and patient, as well as sustainability issues. To prevent this, cost-effective solutions must be improved.

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ABBREVIATION

DALYs Disability-Adjusted Life Years

MNH Muhimbili National hospital

MUHAS Muhimbili University of health and allied sciences

ORCI Ocean Road cancer Institute

WT Wilms Tumor

DEFINITION OF TERMS

Economic costs (opportunity costs) reflect the full value of all resources utilized in producing a good or service (1).

Financial costs reflect financial outlays for goods and services needed to carry out a public health or medical intervention (in the context of global health), and as such are like expenditures (2).

Narrow societal perspective refers to an approach that focuses on the costs and benefits of a healthcare intervention from the viewpoint of specific societal groups or sectors, rather than the society as a whole.

Recurrent costs are the value of resources/inputs with useful lives of less than one year. This includes supplies and personnel (2).

Time horizon refers to the length of time-of-service provision or intervention implementation that the costs are being considered (1).

Unit cost refers to the average cost of an intervention, service or output (2).

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Non-communicable diseases (NCDs) are the leading cause of deaths and disability globally accounting for 74% of all deaths (Of these, nearly 77% of deaths and 86% of pre-mature mortality occur in Low and Middle-Income Countries (LMICs) (4). Number of deaths from Sub-Saharan African countries are three to five times higher compared to High-Income Countries (HIC)(5). This shift from the usual narrative of communicable disease predominance in LMICs strains the healthcare system (5,6). Overall, cancers are the second-leading cause of death (next to cardiovascular diseases), accounting for 16% of the global death toll (7). In 2021, an estimated 20 million people were diagnosed with cancer, and 10 million died from it (5,7).

Childhood cancer is a significant global health concern, with nearly 400,000 new cases reported annually (8). Despite its relatively low proportion (0.5–4.8%) of overall cancer incidence, it stands as the leading cause of death from NCDs among children with significant Disability-Adjusted Life Years (DALYs) lost(8). Tragically, approximately 328,000 children lose their lives to cancer each year (8). Notably, 90% of this burden is borne by LMICs. Timely diagnosis and effective treatment significantly influence outcomes, with a stark contrast in survival rates between HICs and LMICs, where the five-year survival rate ranges from over 80% to 25%, respectively (9). The disparity in resources and healthcare access plays a crucial role in determining a child's outcome. To narrow global disparities, the World Health Organization has initiated efforts to address six prevalent and curable childhood cancers, collectively accounting for 50%–60% of such cases in LMICs (9,10). These cancers include Acute Lymphoblastic Leukemia (ALL), Hodgkin’s lymphoma, Burkitt’s lymphoma, Wilms tumor, retinoblastoma, and low-grade glioma (10), to improve the survival rate by 60% by 2030.

Worldwide, Wilms tumor or nephroblastoma is the fourth most common childhood cancer and kidney cancer in children (11). Most Wilms tumor children live in LMICs, where survival rates are below 50%, compared to over 90% in HIC (12). Late presentation,

advanced disease, inadequate nutrition, treatment abandonment, and facility restrictions like inability to access care patients through treatment-related repercussions contribute to this(13,14)

The delivery of childhood cancer services in LMICs with attention to Tanzania, follows a tiered healthcare system, characterized by varying levels of capacity and excellence (15). Specialized hospitals, though limited in number, serve as centers for diagnosis and treatment. These facilities are interconnected with zonal and regional hospitals, referred to as satellite sites, ensuring the continuum of care, including chemotherapy, early detection, and referral capabilities. This network is complemented by robust Primary Healthcare Facilities, which play a crucial role in effective early detection and referral.

Focusing on the management of Wilms Tumor (WT) in Tanzania, Primary Healthcare is instrumental in early detection and referral processes. Patients are initially identified at this level and referred for further evaluation to a regional hospital. Subsequently, patients may be referred to a zonal or National hospital equipped with a specialized Pediatric Oncology Unit. At these specialized centers, a comprehensive approach is undertaken. The disease is stratified as either Localized or advanced WT, prompting the initiation of pre-operative chemotherapy. This study addressed the gap by analyzing the costs associated with WT management at major specialized hospitals from a narrow societal perspective. The secondary outcome identified potential areas for cost reduction and resource optimization, contributing to evidence-based strategies for improving the financial sustainability of WT management and enhancing overall care for affected pediatric patients. The results will potentially be used for resource optimization and strategic planning by the Ministry of Health

1.2 Problem statement

Wilms tumor (WT) ranks as the fourth most prevalent childhood cancer globally (11), third in Africa, and is the most prevalent and frequently diagnosed pediatric renal malignancy in Tanzania(16). It poses a significant healthcare challenge to the Ministry of Health (MoH) in Tanzania due to its complex management, including diagnostic, therapeutic, and supportive interventions, each incurring distinct costs and indirect costs to patients (13, 17,18).While the challenges of managing Wilms tumor in Tanzania are recognized, there exists a noticeable gap in understanding the comprehensive financial implications associated with its treatment and care. Specifically, there is a lack of detailed cost analysis hindering the MoH's ability to optimize resource allocation, develop cost-effective strategies, and enhance overall healthcare delivery.

This study aims to address the gap by conducting a comprehensive analysis of the costs associated with managing Wilms tumor at Muhimbili National Hospital and Ocean Road Cancer Institute. By exploring both direct and indirect costs related to diagnosis, surgery, chemotherapy, supportive care, radiation therapy, follow-up, and patient expenses, the research intends to provide valuable insights into the financial implications faced by the healthcare system and the patients themselves.

Through a detailed examination of cost drivers, the study seeks to identify potential areas for cost reduction, resource optimization, and improved healthcare efficiency ultimately improving the overall quality of care provided to pediatric patients and mitigating catastrophic healthcare spending for households associated with managing this condition (13,19).

1.3 Conceptual framework

Upon reviewing various literature, the author observed that two types of independent factors influence the cost of Wilms tumor management: direct and indirect costs. Direct costs encompass both capital and recurrent expenses, whereas indirect costs involve productivity loss. The primary objective of this study is to determine the cost of Wilms tumor management in Tanzania, considering the narrow societal perspective whereby include patient cost to services and provider cost to the management of WT.

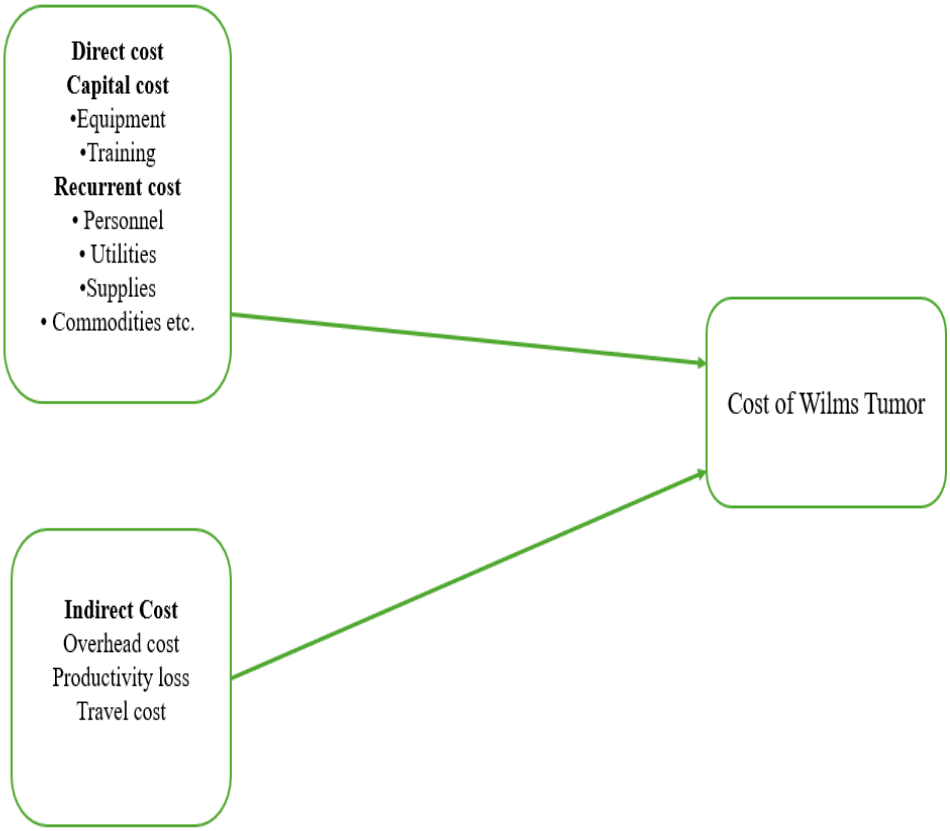


Figure 1: Conceptual framework of costing of Wilms Tumor under societal perspective.

1.4 Rationale

Health reforms that occurred in LMICs since the 1990s from free services to user fee have influenced the establishment of the Ministry of Health in Tanzania to institutionalize how health services are produced and financed through the National Essential Health Care Interventions Package (NEHCIP-Tz) which indicates minimum services at primary /and secondary care levels. According to the last NEHCIP-Tz - developed in 2013 - non-communicable diseases (NCDs) particularly common cancers added due to high management costs to providers and households (20), To achieve universal health coverage (UHC), all six blocks of the health system need to function optimally. Regarding Financing WT management in Tanzania and other LMICs, it is predominantly financed through donor funding or institutional twinning arrangements (21). These arrangements provide diagnostic equipment, chemotherapy, and technical expertise. However, this reliance on external funding jeopardizes the sustainability of childhood cancer care overall. It affects both the predictability of financing and the flexibility of resource allocation to priority services, childhood cancers like Wilms Tumor (WT) in Tanzania have significant financial implications, as the most frequently diagnosed childhood cancer, and these implications often go unnoticed. With international targets of increasing the survival rate of WT to 60% by 2030 in LMICs, understanding financial implications and detailed cost drivers will help inform planning and effective strategies to utilize resources for Childhood cancer management (10). These cost results could be used as an advocacy tool in the development of National cancer control strategies and National essential health care interventions package (NEHCIP-Tz). More studies will be required through which these cost estimates could be made to use including cost-effective intervention for childhood cancer to increase life expectancy and other health outcome indicators and their associated budget impact analyses.

1.5 Research questions

1.5.1 Main Questions

What is the cost to manage Wilms Tumor at Muhimbili National Hospital and Ocean Road Cancer Institute in Tanzania?

1.5.2 Specific Questions

1. What is the unit cost of managing an early Wilms tumor?
2. What is the unit cost of managing an Advanced Wilms tumor?
3. What is the cost to the patient receiving Wilms tumor management?

1.6 Broad objective

To determine Costs associated with the management of Wilms Tumor at Muhimbili National Hospital and Ocean Road Cancer Institute in Tanzania via a narrow societal perspective.

1.6.1 Specific objectives

a) To determine the unit cost of managing early Wilms tumor.
b) To determine the unit cost of managing Advanced Wilms tumor.
c) To identify the cost to a patient receiving Wilms tumor management

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Management of Wilms tumor in Tanzania

In this chapter, we will review the literature on three distinct themes related to the costing perspectives of Wilms tumor management: (a) the unit cost of managing an early Wilms tumor, (b) the unit cost of managing an advanced Wilms tumor, and (c) the cost to the patient receiving Wilms tumor management. The management of Wilms tumor adheres to an internationally recognized protocol widely employed in Low- and Middle-Income Countries (LMICs), known as the 2001 International Society of Pediatric Oncology (SIOP) Wilms protocol (14), Following imaging evaluation by abdominal ultrasound, Magnetic Resonance Imaging (MRI) or Computed Tomography (CT) of the abdomen is performed to determine the origin and local extent of the primary tumor. This stage involves the identification of hepatic metastasis and lesions in the contralateral kidney. Subsequently, CT chest and chest X-ray are conducted to assess metastasis. The cases are then categorized as either Early-Stage Disease or Advanced Stage Disease, and both groups undergo chemotherapy as a neoadjuvant. After a specific period, based on stage reassessment is done through imaging, and surgery is performed with subsequent re-staging. For those with early-stage disease, routine follow-up, and surveillance imaging are scheduled to monitor for recurrence or relapse. Meanwhile, individuals with advanced-stage disease undergo a CT chest to make decisions regarding pulmonary radiation therapy (22), Following this, they are scheduled for routine follow-up for surveillance or relapse.

2.2 Unit cost for Early Wilms Tumor management

Following the treatment protocol after diagnosis, which involves clinically staging the disease, patients undergo four to six weeks of preoperative chemotherapy with vincristine and actinomycin D for early-stage disease (stages I and II). This group constitutes 68% of cases globally(23). However, in Tanzania, this group represents less than 15% of the entire population treated at the Pediatric Oncology Center (17). Consequently, most patients are present with advanced-stage disease, necessitating additional chemotherapy and radiotherapy treatments, resulting in additional costs. The cost of managing an early-stage Wilms tumor is limited due to the methodology employed. Nevertheless, available evidence

from Rwanda indicates a cost of 1,831.2 USD, while in South Africa, it is reported as 1,093.40 USD (24,25).

2.3 Unit cost for advanced Wilms Tumor management

The management of advanced Wilms tumor (WT) after diagnosis is significantly longer compared to early WT management. It spans nine to twelve weeks, incorporating an additional chemotherapy agent (Doxorubicin), following the previous regimen. Selected cases may also require radiation therapy after surgery staging. Globally, this group is found to be relatively small, especially in high-income countries(23). However, in Tanzania, epidemiological studies reveal that more than 80% of patients present to the Pediatric Oncology Unit with advanced-stage disease. Few studies on WT cost have been conducted based on established protocols, and they vary in methodology. Evidence indicates that the management cost for advanced WT is more than five times higher than that for early WT. For instance, in South Africa, the cost is reported as USD 1,093.40 for early WT management compared to USD 5,674.97 for advanced WT management(24). This will allow the ministry to understand the size of the financial benefit encountered by this group so that can properly allocate the resources for early intervention through the early detection of childhood cancers.

2.4 Cost to a patient receiving Wilms tumor management.

In Tanzania, the cost of cancer care poses a significant financial burden of cancer treatment, especially for low-income and less-educated individuals. A study by Makene et al. (2022)(13) reveals a median delay of nearly one year in diagnosing cancer, strongly influenced by socio-economic factors such as low education, income, and non-professional occupations. Delays lead to extensive movements within the health system, causing out-of-pocket payments that disproportionately affect low-income patients. Higher-income individuals with health insurance experience quicker diagnoses at lower costs. Despite Tanzania's policy of free public sector cancer treatment, literature highlights slower and more expensive diagnoses for socioeconomically disadvantaged patients. It emphasizes the socially unjust impact of delays on costs and suggests interventions to expedite and equalize cancer diagnosis, contributing to more equitable Universal Health Coverage (UHC). Up-to-date author knowledge of childhood cancer in Tanzania, no known studies have reported the cost encountered by patients during care for childhood cancers, this will shed a light on this field.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study design

This research employs a cross-sectional costing study for Wilms tumor management, employing micro-costing with both top-down and bottom-up approaches (26,27). The study focuses on identified patient pathways at Muhimbili National Hospital and the Radiotherapy Unit at Ocean Road Cancer Institute during the financial year 2021/22. Exit interviews were conducted with caregivers to gather information on the costs incurred during clinic visits and other services. The comprehensive approach aimed to understand direct and indirect costs, resource allocation intricacies, and subjective experiences related to Wilms tumor management, contributed valuable insights for improved resource allocation and patient care strategies.

3.2 Study Setting and Population

In Tanzania, childhood cancer care is provided through the Pediatric Oncology Unit, with support from satellite centers for follow-up and continuity of care. Muhimbili National Hospital (MNH) is one of the largest centers offering care to patients with Wilms tumor (WT), with an average of approximately five patients diagnosed and managed monthly. This study includes all patients referred to MNH for Wilms tumor management between June 2021 and July 2022. Patient and provider costing elements were involved in interviews with caregivers and healthcare providers respectively, as well as the collection of secondary data on resources utilized in various costing centers during patient care was conducted

3.3 Sample Size, Selection, and Perspective

This study employed a purposive sampling strategy and adopted a narrow societal perspective. We administered exit interviews to parents of patients with Wilms tumor, A sample size of the study (n) was calculated using a finite population formula proposed by Yamane's formula to maintain a 95% confidence interval.

$$n = N / \{1 + N (e)^{2}\}$$

Whereby:

n - Minimum required sample size

N = Population size (From data in the Hospital electronic system and hard copy files which was reported to be 60 between 2021/22)

e=Margin of error 5%

Therefore; 60 / {1+ 60(0.05) ²}

n= 52

The maximum sample size for objective three was 52 parents from both the early and advanced tumor categories at Muhimbili National Hospital.

3.4 Data collection methods

We adopted a 'narrow' societal perspective, incorporating both healthcare provider and patient costs (27). For Caregiver perspective we adopted Ngalesoni et al 2015 costing tool and modified for our study (1). For the provider perspective section of the study, we adopted the WHO cancer control and prevention tool for cervical cancer costing(28), modified and used it as a guide for costing(29). An ingredients approach to costing was employed to identify and measure all providers' resource use (30). The method helped with the identification, quantification, and valuation of all the resources consumed to provide a specific service(31).

3.4.1 Identification of resources

Detailed interviews were done with key professionals at health facilities and the International Society of Pediatric Oncology (SIOP) Wilms protocol (14) was used to create standard service routes for patients receiving WT care, as shown in Figure 3 below. Several costing centers, such as the emergency department and the pediatric oncology unit, as shown in Figure 2, were identified from the literature and were validated through interviews with key staff at the costing center. In addition, order books, inventory records, issue vouchers, and delivery notes were checked to ensure that all equipment and supplies were utilized. Heads of units and hospital accounts were consulted to determine administrative resources and expenditures. When necessary, actual counting of equipment and supplies will be done. Health Management and Information Systems (HMIS), such as Jeeva system™ and other relevant hospital records, were utilized to collect data on the number of patients and visits, laboratory tests performed, imaging performed, and medications given during the costing period.

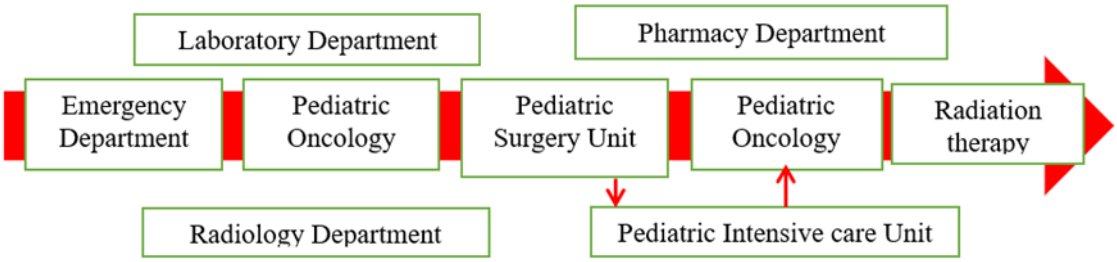


Figure 2: Patient pathway for Wilms Tumor management.

3.4.1 (a) Description of costing center activities

The emergency department (EMD) is the starting point for all referral and emergency services, where the care journey begins. Stable cases are moved to the oncology ward for further management. The pharmacy, radiology, and laboratory units play a crucial role in providing necessary support with medicines, consumables, diagnostics, and interventions. After an appropriate diagnosis, a patient completes chemotherapy at the oncology ward, then a patient is scheduled for surgery, and they are transferred from the oncology ward to the operating theater. After surgery, the patient is moved to the intensive care unit (ICU) or high dependency unit (HDU) to ensure their stability. Following that, the oncology team re-evaluates the patient's condition and suggests additional radiation therapy treatment for eligible individuals.

3.4.2. Quantification of resources

Costs was categorized into direct and indirect, with direct costs further divided into capital and recurrent costs. Capital costs included expenses related to items with a lifespan exceeding one year, while recurrent costs included those associated with items used up within a year (31). Recurring costs was divided into different categories: personnel (salaries), commodities, Rental space, contracted services, supplies (stationery, media, and so on), and utilities. Indirect costs, such as overhead expenditures, travel expenses, and productivity loss, were evaluated.

The finance and accounting departments was consulted to collect salary scales and utility bills for the identified staff. The procurement department determined the costs of materials

and supplies. Capital costs were divided into two categories: Training, and equipment. Buildings was tape-measured to determine the amount of space utilized for Wilms tumor (WT) management services. The building's area size was utilized to assess the space's value. All equipment and furnishings in each cost center were recognized and counted, with most receipts confirming the original purchase price. Otherwise, replacement prices was used to determine their value. Finally, charges incurred by the hospital will be classified as financial costs, while those borne by donors as economic costs.

3.4.3. Valuation of resources

According to the economic (opportunity) costs method (1), all resources were valued at their best alternative usage. In economics, opportunity costs represent the potential benefits that are forgone when a resource (such as time, money, or materials) is used for one purpose instead of another. The Tanzania Medical Stores Department (MSD) pricing catalog was used to determine medical supply and equipment costs (Medical Stores Department and Tanzania 2021/22). Tanzania Government Procurement Services Agency tender pricing was used for non-medical products. National Housing Corporation (NHC) rates determined building rent. For items without prices in the data sources above, the market price was utilized. For 2021/2022, all expenditures were estimated in Tanzanian shillings (TSh) and translated to US$ using a mean exchange rate of 2440 TSh/US$ (Bank of Tanzania 2022a),

A systematic questionnaire was used to collect patient costs from 52 parents/guardians at facility patients at exit interviews (see Supplementary Appendix S1). These were adults over 18 caring for WT patients diagnosed at least six months before the interview. After determining patients' alternative time usage, market prices for agriculture and animal goods and Tanzanian minimum salaries was utilized to assess lost productive working hours during WT management. Finally, a non-parametric test was done to examine the relationship between disease status and cost categories.

3.5 Data analysis

The cost analysis by providers was conducted using Excel. Health facility departments were categorized into direct, intermediate, supporting, and administration service centers, regardless of their level of patient interaction or the services they provide. Resource consumption was transitioned into financial (GVT) and economic (Donor) costs, which were either capital or recurrent. Capital expenditures encompass training, building space costs and equipment that have a lifespan of over a year, while recurrent costs consist of salaries and consumables. We deflated cost based on GDP Deflator for 2021/22 respectively, then The Bank of Tanzania's average interest rate for 2021/22 is 3% was used to annuitize capital expenses(2).

We calculated and assigned all financial and economic costs to the specific intervention after an interview with the costing center in charge of resources used by staff at each service center. After that, shared and overhead costs were assigned to service centers using a three-stage step-down costing technique (32), Furthermore, overhead service center costs were distributed among supporting, intermediate, and direct service centers based on a patient volume approach that accurately represents resource utilization. Expenses from the indirect service centers were distributed in the same manner until all costs were assigned to the direct service centers. Based on the service center, allocation keys were determined by the total health facility visits, and WT total visits at the respective costing center. Finally, the unit cost per patient and visit was calculated by dividing the direct service centers' total cost by the number of WT management seen and visited. Sensitivity analysis assuming a 20% input price shift will manage uncertainty (27) . Due to drug price variability, scenario analysis examined provider unit cost variations when additional valuation sources are used.

Patient cost data was entered using an online data collection tool (ODK) and then sent to Excel for analysis into SPSS. We conduct analytical and descriptive analyses using SPSS Version 20. Utilizing mean, standard deviation, Median, and Independent-samples Mann-Whitney U Test, since costing data are positively skewed, it’s important to run a non-parametric test to test its significance.

3.6 Ethical issues.

The study was submitted for review to the Ethical Committee of Muhimbili University of Health and Allied Sciences, and clearance no.DA.282/298/01.C/2224 was requested from the MUHAS Research Ethics Committee. We obtained permission to conduct the study from the hospitals where the costing unit is located. In addition, permission was requested from the department and unit heads where patients with Wilms tumor are treated to conduct the study in the chosen costing unit. Consent was obtained from all study respondents (Caregiver/guardian) who are above 18 years of age as necessary. Confidentiality, anonymity, and privacy of personal information were strictly maintained.

CHAPTER FOUR

4.0 RESULTS

4.1 Introduction

This chapter provides the findings of this study on the Cost of Wilms tumor management at Muhimbili National Hospital and Ocean Road Cancer Institute in Tanzania

4.2 **The Unit cost (In Tsh) for management of Wilms Tumor Costing Centers**

The table 1 displays the capital and recurrent costs for both the early and advanced disease stages of Wilms Tumor (WT). Capital costs include building space, training, and equipment. Equipment is categorized into cancer-related and non-cancer-related, with cancer-related equipment being mostly donor-funded. The Oncology Costing Centre reported approximately 1,914,770 Tanzanian shillings used for early-stage Wilms Tumor, compared to the government's contribution of only four hundred thousand shillings for the same disease status.

For commodities, about 60 million shillings were from donors compared to approximately 30 million Tanzanian shillings from other sources. In the surgical costing center, the annual unit cost for surgery in the early stage was 403,255 Tsh (154 USD), whereas for the advanced stage, it was about 1.4 million Tanzanian shillings (547 USD). This higher cost is largely influenced by recurrent costs for personnel, which amounted to approximately 17 million shillings for advanced-stage disease.

Radiation therapy treatment accounted for about 15% of the annual unit cost for advanced-stage Wilms Tumor management, with a capital investment of about 21,356,265 shillings for radiation therapy for these cases.

Table 1 The Annual Cost (in Tsh) for Wilms Tumor Management costing centers for the financial year 2021/22

COST CATEGORIES	Funder	EMD WT Services		Oncology WT Services		Surgery WT Services		Diagnostics Services		RTT Services
CAPITAL COST		Early	Advanced	Early	Advanced	Early	Advanced	Early	Advanced	Advanced
Training	Donor			9,266	8,384					
	GVT	3,902	3,530							94,013
Cancer Equipment	Donor			1,979,741	1,791,194					
	GVT			426,032	385,458					21,356,265
Non-Cancer Equipment	Donor	184,316	166,762							
	GVT			5,098,189	16,144,266	576,120	1,824,378	1,256,451	1,806,692	
Building space	Donor									
	GVT	299,955	271,388	5,318,712	7,339,527	5,297	16,775	349,053	608,398	1,888,383
TOTAL CAPITAL COST		488,173	441,680	12,831,940	25,668,829	581,417	1,841,153	1,605,504	2,415,089	23,338,661
RECURRENT COST										
Personnel	Donor			9,415,430	8,518,722			136,634	914,400	
	GVT	827,690	748,862	23,757,391	56,971,984	5,473,788	17,333,661	4,822,643	6,456,709	14,441,637
Supplies	Donor			892,829	807,798					
	GVT	17,106		21,138	66,937	1,822	5,769	381,286	349,981	1,499
Commodities	Donor		15,476	14,333,423	60,287,985					
	GVT	367,082	332,121	10,639,933	33,504,451	3,610,612	11,433,603	9,073,278	8,365,334	4,764,199
Utilities	Donor									
	GVT	61,854	55,963	8,528,252	9,072,054	636,089	2,014,281	1,285,968	1,266,923	4,006,183
TOTAL RECURRENT COST		1,273,731	1,152,423	67,588,396	169,229,931	9,722,310	30,787,314	15,699,809	17,353,347	23,213,518

Total costing center	1,761,904	1,594,103	80,420,336	194,898,760	10,303,727	32,628,467	17,305,313	19,768,436	46,552,179
Cases seen	42	38	42	38	27	24	42	38	38
Annual unit cost 2022	37,562	41,950	1,914,770	5,128,915	381,620	1,359,519	412,031	520,222	1,225,057
Annual unit cost 2024*	39,691	44,328	2,023324	5419,688	403,255	1,436,595	435,391	54,715	1,294,510
Cost in USD 2024***	15	17	770	2,063	154	547	166	209	493
% Contribution to annual cost	1%	1%	70%	62%	14%	16%	15%	6%	15%
		Annual Unit Total Cost		Early-stage Wilms Tumor Management				2,901,660	1,105USD
		Annual Unit Total Cost		Advanced Wilms tumor management				8,744,836	3,329USD[1]

*Cost after inflation **Bank of Tanzania Exchange rate at 2626.93Tsh/USD in July 2024, GVT-Government of Tanzania, EMD-Emergency medicine department, RTT-Radiation Therapy Treatment.

[1] **Calculating the Unit cost of managing Early WT entails Total Capital and Recurrent cost then divided by the volume of cases seen per year.**

4.3 The plot displays the annual unit cost of WT Management for different cost centers, with a 20% sensitivity variation.

The base cost represents the cost without adjustment, while the other costs show variations with a 20% increase or decrease. The Oncology unit is highly sensitive to these variations, meaning that a small change in this category significantly impacts the overall cost. Therefore, careful financial planning and oversight are crucial for the Oncology unit. In contrast, the Emergency Department (EMD) and Diagnostics units exhibit smaller variations, indicating less sensitivity and a lower impact on the overall cost.

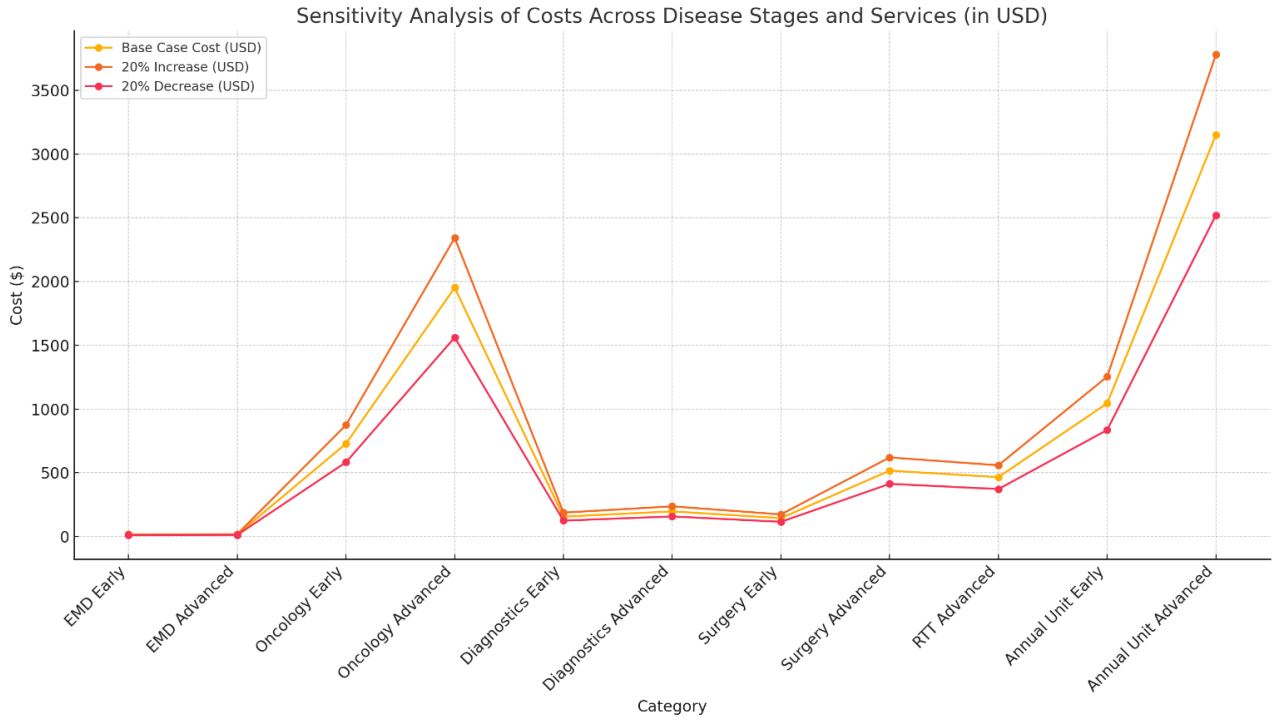


Figure 3: The Plot line graph showing the sensitivity analysis of the costing centre on the disease status of Wilms tumor and its variations at 20%

4.4 The demographic characteristics of Caregivers/parents of Wilms Tumor receiving care at the Muhimbili National Hospital Oncology Clinic

The study conducted exit interviews with 52 Caregivers who were receiving care at the pediatric oncology clinic at Muhimbili National Hospital. The majority of the caregivers were women, with about 30% working in the informal sector and some being housewives. Additionally, more than 70% of the caregivers had no insurance coverage

Table 1: The demographic characteristics of Caregivers/parents of Wilms Tumor receiving care at the Muhimbili National Hospital Oncology Clinic

Demographic Characteristics	Frequency	Mean±SD	Percentage
Patient Age (Years)	52	4±2	
Guardian/Caregiver Age (Years)	52	32±5	
Duration in treatment for Wilms Tumor (Months)	52	7±4	
Sex of Caregiver			
Male	1		1.9%
Female	51		98.1%
Total	**52**		**100%**
Caregiver Education level			
No education	2		3.8%
Some primary education	2		3.8%
Completed primary education	21		40.4%
Some secondary education	3		5.8%
Completed secondary education	14		26.9%
Above secondary education	10		19.2%
Total	**52**		**100%**
The main Economic activity for the past 12 Months			
Self-employed (without employees)	18		34.6%
Farming or livestock-keeping	5		9.6%
Fishing	2		3.8%

Paid Employee (Private)	7	13.5%
Self-employed (with employees)	5	9.6%
Not working (available for work)	2	2.8%
Paid Employee (Government)	1	1.9%
Homemaker/Housewife/ House chores	12	23.1%
Total	**52**	**100%**
Residence		
Town or City (urban)	41	78.8%
Countryside (rural)	11	21.2%
Total	**52**	**100%**
Disease Status		
Early Wilms Tumor	30	57.7%
Advanced Wilms Tumor	22	42.3%
Total	**52**	**100%**
Insurance Status		
Insured	11	21.2
Non-Insured	41	78.8
Total	**52**	**100%**

4.5 Annual Unit cost (in Tsh) from the patient's perspective during Wilms Tumor management service at Muhimbili National Hospital

The costs for transportation and meals for patients receiving care are skewed towards the higher end, with approximately 50% of these expenses falling at 95,750 Tsh and 69,000 Tsh respectively. Meanwhile, the cost for lodging stays the same, averaging at 346,667 Tsh.

The total indirect costs are significantly impacted by productivity loss, with an average unit cost of 1,047,075 Tsh (SD 629,086 Tsh). The annual unit cost for a patient with early-stage disease can vary between 1,547,702 Tsh and 2,321,553 Tsh, as demonstrated by a one-way sensitivity analysis with a 20% variation.

Table 2: Annual Unit cost (in Tsh) from the patient's perspective during Wilms Tumor management service at Muhimbili National Hospital

	Direct Cost	**Mean±SD¶**	**N**	**Median**	**IQL (50%)**
Transportation	4,515,200	-	42	52,000	95,750
Cost of Meal	4,245,000	-	51	55,000	69,000
Cost of Lodging	9,360,000	346,667±3,536	27	350,000	285,000
Cost of Treatment*	60,735,676	1,167,994±534,985	52	-	
Total Direct	**78,855,876**	**19,713,969±23,771,184**	**-**	**6,937,600**	**43,579,207**
	Indirect Cost	**Mean±SD**		**Median**	**IQL (50%)**
Insurance premium	3,750,000	340,909±19,285	11		
Productivity loss (Parent)	54,447,872	1,047,075±629,086	52		
Tutoring Cost	150,484	10,032 ±6,332	15		
Total Indirect Cost	58,348,356	19,449,452±24,791,211	52	3,750,000.	54,297,388.
Grand Total	**137,204,233**				
Annual unit cost (52) per patient	**2,638,543 (987USD)**		52		
		Sensitivity analysis (USD)			
Annual unit cost per patient		**Base cost**	**Min 20%**		**Max 20%**
	Early WT	**1,934,627(737)**	**1,547,702(589)**		**2,321,553(884)**
	Advanced WT	**3,230,604(1230)**	**2,584,483(984)**		**3,876,725(1,476)[2]**

NB: *Cost of Treatment includes **Admission fee, Registration fee, Surgery, laboratory investigations, imaging studies, and medications**, **IQL (50%)-**Interquartile range at 50% representing the range within which the central 50% of the costs lie, **SD**-Standard Deviation, **N**-number of observations, **1USD**=2673.77 Exchange rate of Bank of Tanzania July 11, 2024.

[2] Calculating the Unit cost of managing Early WT entails Total Capital and Recurrent cost then divided by the volume of cases seen per year.

4.6 Relationship between disease status and cost categories

The study reveals that productivity loss for parents, treatment costs, meal costs, and lodging costs are significantly influenced by the disease status of the child. However, transportation costs do not show a significant variation across different disease status

Table 3: Tables showing non-parametric test Mann-Whitney U test for cost categories relationship with Disease status

S/N	Null Hypothesis	Test	Sig	Decision
1	The distribution of productivity loss(parent) is the same across categories of disease status	Independent-samples Mann-Whitney U Test	0.018	**Reject Null Hypothesis**
2	The distribution of cost to Transportation is the same across categories of disease status	Independent-samples Mann-Whitney U Test	0.358	Retain the Null hypothesis
3	The distribution of cost to treatment is the same across categories of disease status	Independent-samples Mann-Whitney U Test	0.000	**Reject Null Hypothesis**
4	The distribution of cost for Meal is the same across categories of disease status	Independent-samples Mann-Whitney U Test	0.002	**Reject Null Hypothesis**
5	The distribution of cost for Lodging is the same across categories of disease status	Independent-samples Mann-Whitney U Test	0.025	**Reject Null Hypothesis**

Asymbiotic significances are displayed. The significance level is 0.05

CHAPTER FIVE

5.0 DISCUSSION

Wilms tumor is among the fourth diagnosed childhood cancer Globally, and yet the third and first most prevalent cancer to the pediatric population in Africa and Tanzania respectively based on WHO through the International Agency for Research on Cancer(33). Considering this burden of disease to our country a study to understand the cost associated with Wilms tumor management at Muhimbili National Hospital and Ocean Road Cancer Institute in Tanzania through a narrow societal perspective was done for the financial year of 2021/22. The study findings show that in the stated financial year, both institutions saw about 80 by 38 cases of Wilms tumors for Muhimbili National Hospital and Ocean Road Cancer Institute respectively.

The unit cost for managing early Wilms tumor cases from this study was found to be 1104.58 USD, and the advanced case was found to be 3,328.91USD in Tanzania, which is almost three times from early Wilms tumors, meanwhile, a study done in Rwanda showed an advanced case of Wilms total annual cost was 2093USD bearing no Radiation therapy treatment done (34). However, was lowest compared to high-income countries (35). Another study done in Australia in 2018 also reported annual mean cost for managing Wilms tumor was 426 USD (SD 679) which is even lower than our study and Rwanda. These findings present an opportunity to African countries to invest in childhood cancer to save children's lives but also to improve the nation's human capital to avert the conditions and burden to caregivers.

Funding for the oncology costing center, most recurrent costs like personnel and commodities have a mix of funding for commodities about 60 million Tsh are funded by donors for advanced-stage disease half of that is government-funded, this implies Effective budget planning and resource allocation are crucial, with a need for policies that ensure sustainable funding. Enhanced government support, especially for advanced-stage Wilms tumors, may be necessary to mitigate financial impacts and maintain quality patient care.

The study investigated the funding methods for cost centers, with a particular emphasis on the oncology costing center, which is responsible for the majority of operational costs. The oncology unit endures approximately 60% of the annual unit cost for both early and advanced stages. This illuminates the sustainability and financial supervision of healthcare

programs in African countries. It is noted that oncology services in African countries frequently operate through twinning arrangements, which entail the exchange of knowledge and technology transfer to achieve optimal outcomes. Nevertheless, these initiatives are substantially reliant on charitable foundations, which provide approximately 44% of global funding.(36).

Most cost categories from our study for commodities at the Oncology costing centre for advanced diasese about 60,287,985 Tsh was from Donor compared to 33,504,451 Tsh from government support, the same for commodity like chemotherapy is donor dependency, which is not a new story to African setting on its availability and accessibility, previously study on anti-cancer was noted to be 50% compared to the 80% standard set by WHO, this was higher compared to Rwanda which was 45%(37), with the majority of medicines being imported from India pharmaceutical which leaves the question of sustainability(38), this provides a light on addressing the financial burden on early access to care. This information can be crucial for healthcare planners and policymakers to understand where resources and support may be needed the most

From a provider perspective, our study showed that about 21% of patients had insurance, However National Health Insurance Fund's 2019 estimate of about 9% has insurance coverage, meanwhile having insurance does not guarantee coverage of all cancer care costs. Most patients in our study had early-stage Wilms' tumors, providing an opportunity for early treatment. At our site, chemotherapy is provided for free. However, patients still face direct costs such as payments for surgery, imaging, and hospital admission, which significantly contribute to the total cost of treatment. Another study reported that the cost of chemotherapy for patients, including government workers, is unfavorable, and public pharmacies have relatively low availability of these medications (39),

The cost categories for patients with Wilms' tumor varied significantly depending on disease status. Productivity loss accounted for the highest cost in the indirect cost category, while treatment costs were the most significant in the direct cost category for advanced-stage disease compared to early-stage disease. Transportation costs were not significant, with a median cost of 20.9USD, like the 21 USD reported in a study conducted in Kenya (40).

This study provides evidence for steps in Cancer Early Diagnosis and interventions, highlighting the cost elements encountered by providers and patients. Engaging stakeholders to develop strategies and cost-saving measures through early intervention can prevent the

financial burden of advanced-stage disease. Even off-patent chemotherapy drugs impose a heavy financial burden on patients, insurance companies, and governments (40).

Several strengths and limitations to this study, First, provider and patient perspectives are considered from a narrow social perspective. This approach provides a complete picture of financial distribution and potential cost shifting between societal divisions. Second, the study uses the micro-costing approach to costing, which uses precise primary data on real resource use, making it more useful than reference costing. However, the study has drawbacks. Purposefully selected facilities limit the generalizability of the results, avoiding broad inferences about costing structures across health service delivery tiers. secondly, it failed to consider the expenses linked to disease comorbidities. It is important to note that patients with Wilms' tumor may have other underlying health conditions that necessitate additional treatments and resources. These factors were not considered in the cost analysis. These limitations underscore the importance of conducting more thorough data collection and analysis in future studies to ensure precise and dependable cost assessments.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Managing advanced WT is more expensive, with three times the cost compared to Early WT. Advanced-stage Wilms' tumor (WT) necessitates more resources for treatment, leading to higher overall expenses. This may involve more intensive and prolonged chemotherapy, additional diagnostic tests, and potentially more complex surgical procedures. The cost of managing advanced WT is significantly higher compared to early-stage WT, due to the increased intensity and duration of treatment needed.

The sustainability of cancer treatment programs is challenged by the reliance on donor funding for chemotherapy medications. Donor support can sometimes be unpredictable and may not always be a dependable source of funding in the long run. The reliance on this could potentially result in disruptions to the availability and accessibility of treatment, which could ultimately impact patient outcomes and the continuity of care.

Lack of sufficient investment in training and capacity building for early detection and management, The training and capacity building of healthcare professionals to effectively detect and manage Wilms' tumor at an early stage is not receiving enough investment. Recognizing symptoms early and taking prompt action can greatly increase the chances of survival and help minimize medical expenses. The lack of proper training among healthcare providers can result in the oversight of early signs of the disease. This can lead to delays in diagnosis and treatment, ultimately resulting in increased costs and suboptimal outcomes.

The patient cost finding is primarily determined by factors such as productivity loss and the cost of treatments, rather than transportation expenses. The financial impact on patients with Wilms' tumor is primarily caused by the loss of productivity resulting from the inability to work or attend school, as well as the direct expenses associated with treatment, including hospital stays, medications, and procedures. Transportation expenses are negligible in contrast. Productivity loss can have a significant economic impact on families, particularly in low- and middle-income countries where social safety nets may be limited.

6.2 Recommendations

1. Enhancing Early Detection Programs to Ministry of health: Support nationwide screening programs and public health campaigns to raise awareness of Wilms' tumor symptoms and emphasize the significance of early detection. It is important to prioritize routine pediatric check-ups that include screenings for Wilms' tumor, particularly in high-risk populations.

2. Ensure Long-Term Financial Support for Chemotherapy to Ministry of Heath: Create a funding model that is diverse and reduces reliance on donors by incorporating government funding, private sector partnerships, and international collaborations. Implementing a national drug procurement system is crucial to guarantee a consistent and cost-effective supply of chemotherapy drugs. This can be achieved by exploring options such as pooled procurement mechanisms or collaborating with generic drug manufacturers.

3. Investing in training and capacity-building initiatives by Provider. It is crucial to allocate resources towards providing comprehensive training for healthcare professionals in the early detection and management of Wilms' tumor. This includes specialized training for both pediatric oncologists and general practitioners. By equipping these professionals with the necessary knowledge and skills, we can enhance their ability to identify and effectively treat this condition. Create and implement continuing education programs and workshops to ensure healthcare providers stay informed about the most recent advancements and best practices in cancer care.

4. Efficiently Managing and Optimizing Caregiver Productivity Loss and Treatment Costs by Provider,

Create support programs for caregivers to reduce productivity loss. These programs can include offering flexible working arrangements, financial assistance, and mental health support. Our focus is to optimize treatment costs by engaging in negotiations for lower prices on chemotherapy drugs, streamlining treatment protocols, and eliminating unnecessary medical expenses. Controlling total healthcare costs relies heavily on effectively managing these facto

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APPENDICES

Appendix I

1. Patient Questionnaire

Study of the Costs of WT Management at the Out-Patient Clinics

Utafiti wa Gharama za Usimamizi wa WT katika Kliniki za Wagonjwa wa Nje

Facility name Jina la Kituo	Facility Code: Msimbo wa kituo
Facility Location Eneo la kituo	
Facility level Kiwango cha kituo	
Date (mm/dd/yyyy) Tarehe (mm/dd/yy)	_____/ _____/ _____. Start time: Mda wa kuanza

Basic Information/Demographic Taarifa za Msingi/Demografia			
NO.	QUESTIONS AND FILTERS	RESPONSES	SKIPS
1	Enter respondent's gender: Ingiza jinsia ya anayejibu:	Male.....0 Female.....1 Mwanaume…0 Mwanamke……..1	
2	What is your age? Una umri gani?	☐☐☐ Years old/ Umri wa miaka	
3	What is your highest level of education?	No education…….....0 Hakuna elimu……..0 Some primary education……1 Angalau elimu ya msingi……..1	

Basic Information/Demographic Taarifa za Msingi/Demografia			
NO.	QUESTIONS AND FILTERS	RESPONSES	SKIPS
	Kiwango chako cha juu cha elimu ni kipi?	Completed primary education……...2 Nilimaliza elimu ya msingi……2 Some secondary education……...3 Angalau elimu ya sekondari.....3 Completed secondary education……...4 Nilimaliza elimu ya sekondari.....4 Above secondary education……..5 Juu ya elimu ya sekondari.....5	
4	During the last 12 months, what was your main activity? Katika miezi 12 iliyopita, shughuli yako kuu ilikuwa ipi?	Farming or livestock keeping 0 Kilimo au ufugaji…….0 Fishing 1 Uvuvi……1 Paid Employee (Government) 2 Mfanyakazi anayelipwa (Serikali)……2 Paid Employee (Private) 3 Mfanyakazi anayelipwa (Binafsi)….3 Self-employed (with employees) 4 Kujiajiri (pamoja na wafanyikazi)…4 Self-employed (without employees) 5 Kujiajiri (bila wafanyikazi)……5 Not working (available for work) 6 Sifanyi kazi (napatikana kwa kazi)…6 Not working (not available for work) 7 Sifanyi kazi(Sipatikani kwa kazi)..7 Homemaker/Housewife/ House chores 8 Mama wa Nyumbani…….8 Student 9	

Basic Information/Demographic Taarifa za Msingi/Demografia			
NO.	QUESTIONS AND FILTERS	RESPONSES	SKIPS
		Mwanafunzi……..9 Unable to work (old/retired/sick)....10 Siwezi kufanya kazi(nimestaafu,/naumwa/mzee)..10 Other (describe) Nyinginezo(Fafanua) _____	
5	Is your household in a town or city, or is it in the countryside? Je, kaya yako iko katika mji au jiji, au iko mashambani?	Town or City (urban).....0 Mji au Jiji (mjini)……..0 Countryside (rural).....1 Mashambani (vijijini)…….1	
6	How long have you been receiving regular WT treatment at the clinic? Umekuwa ukipokea matibabu ya kawaida ya WT kwenye kliniki kwa muda gani?	☐☐ Months/M☐☐ Years /Miaka	
7	How old is your child?	Years …….. Months…… Miaka…….Miezi……..	

Basic Information/Demographic Taarifa za Msingi/Demografia			
NO.	QUESTIONS AND FILTERS	RESPONSES	SKIPS
	Mtoto wako ana umri gani?		
8	Does the child enroll in school? Je, mtoto kaandikishwa shuleni?	Yes No Ndio Hapana	
9	Which class/grade is she/he? (supposed to be) Yeye ni darasa/daraja gani? (Alilopaswa kuwa)	Class Darasa	
10	How long since last time she/he attended school? Je, ni muda gani tangu mara ya mwisho alienda shule?	Years Months Miaka Miezi	

Time and Travel Costs Muda na Gharama za Kusafiri			
NO.	QUESTIONS AND FILTERS	RESPONSES	SKIPS
11	How do you normally get to the clinic? (mark all that apply) Je, huwa unafikaje kliniki? (weka alama kwa yote yanayotumika)	No/Hapana Yes/Ndio Walk 0 1 Kutembea 0 1 Bicycle 0 1 Baisikeli 0 1 Bus or other public transport 0 1 Basi au usafiri mwingine wa umma 0 1 Private car or motorbike 0 1 Gari la kibinafsi au pikipiki 0 1 Other (describe) Nyingine (eleza) _____	
12	How much does one-way clinic transportation cost for you and your companions? Je, usafiri wa kwenda kliniki ya njia moja unagharimu kiasi gani kwako na sahaba wako?	☐☐☐☐☐☐ Shillings	
13	How much do you spend on meals for yourself and your companions when attending clinic? Je, unatumia kiasi gani kwa ajili ya chakula kwa ajili yako	☐☐☐☐☐☐ Shillings	

	na wenzako unapohudhuria kliniki?		
14	Do you visit the clinic and go home the same day? How much does overnight lodging near the clinic cost? [only record accommodation required for attending clinic] Je, unatembelea kliniki na kwenda nyumbani siku hiyo hiyo? Je, nyumba ya kulala wageni karibu na kliniki inagharimu kiasi gani? [rekodi ya malazi pekee inahitajika kwa kuhudhuria kliniki]	Return home on same day.....0 Rudi nyumbani siku hiyo hiyo……..0 Stay overnight.....1 Kaa usiku kucha…….1 ☐☐☐☐☐☐ If 1 → Shillings Kama 1 Shilingi	
15	How many clinics visits you made in the past six months? Je, umefanya ziara ngapi za kliniki katika miezi sita iliyopita?	Routine app ☐☐ ☐☐ Hrs. Mins Emergency app ☐☐ Hrs ☐☐ Mins	
16	How long does it normally take you to get to the clinic (one way)? Je, kwa kawaida huchukua muda gani kufika kliniki (njia moja)?	☐☐ Hours ☐☐ Mins	

17	How long do you usually wait at the clinic before your appointment? Je, huwa unasubiri muda gani kwenye kliniki kabla ya miadi yako?	Routine app Hrs. ☐☐ Mins ☐☐ Emergency app Hrs. ☐☐ Mins ☐☐	
18	Your appointment usually lasts how long? [include medical appointment, counseling session, pharmacy visit, if applicable]? Miadi yako kwa kawaida huchukua muda gani? [ni pamoja na miadi ya matibabu, kikao cha ushauri, kutembelea duka la dawa, ikiwa inafaa]?	Routine app Hrs. ☐☐ Mins ☐☐ Emergency app Hrs. ☐☐ Mins ☐☐	

Interviewer's Name and Comments:

"Thank you for taking part in this study."

	Any suggestions about the cost of WT Management Mapendekezo yoyote kuhusu gharama ya Usimamizi wa WT

End Time:	

Costs of Clinic Treatment

Gharama za Matibabu ya Kliniki

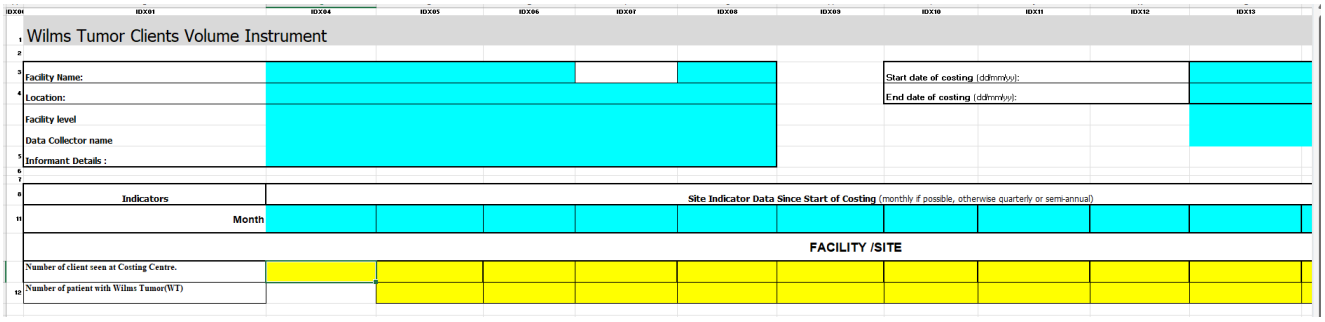
NO.	QUESTIONS AND FILTERS	RESPONSES	SKIPS
19	Have you paid for any of the following WT management services at this clinic (including in-kind payments)? Je, umelipia huduma zozote zifuatazo za usimamizi wa WT katika kliniki hii (pamoja na malipo ya ndani)?	No Yes Initial registration app 0 1 Usajili wa Mwanzo……0 1 Routine app 0 1 Usajili wa kawaida ……0 1 Emergency app 0 1 Usajili wa dharula……0 1 Blood tests 0 1 Vipimo vya damu……0 1 X-rays 0 1 Picha ya miozi kifua…….0 1 USS……0 1	
20	[Any 'Yes' to Q15] How much and how often did you pay for each service in the past six months? [Ikiwa 'Ndio' Kwa Q15] Je, ulilipa kiasi gani na mara ngapi kwa kila huduma katika kipindi cha miezi sita iliyopita?	Initial registration app/Mwanzo ☐☐☐☐☐☐ hs, ☐☐ Times Routine app/Kawaida ☐☐☐☐☐☐ Shs, ☐☐ Emergency app/Dharula ☐☐☐☐☐☐ Shs, ☐☐ mes Blood tests/Vipimo vya damu ☐☐☐☐☐☐ Shs, ☐☐ mes X-rays/ECHO ☐☐☐☐☐☐ Shs, ☐☐ Times	

21	Were there any WT treatments you paid for at this clinic? [If YES], please describe these services, how much you paid for each, and how often you paid in the past 6 months. Je, kulikuwa na matibabu yoyote ya WT uliyolipia katika kliniki hii? [Ikiwa NDIYO], tafadhali eleza huduma hizi, ni kiasi gani ulilipa kwa kila moja, na mara ngapi ulilipa katika miezi 6 iliyopita.	No.....0 Hapana……0 Yes.....1 Ndio……1 Other 1:_____ ☐☐☐☐☐☐ Shs, ☐☐ Times Other 2:_____ ☐☐☐☐☐☐ Shs, ☐☐ Times	
22	Have you ever paid for or been prescribed medications or other health supplies for WT management at this clinic? [If YES], How much have you spent on these drugs or health supplies in the past six months? Je, umewahi kulipia au kuandikiwa dawa au vifaa vingine vya afya kwa ajili ya usimamizi wa WT katika kliniki hii? [Kama NDIYO], Je, umetumia kiasi gani kununua dawa hizi au vifaa vya afya katika miezi sita iliyopita?	No.....0 Yes.....1 If 1 Drug payment at the facility…….0 Malipo ya dawa kwenye kituo hicho.0 Prescription given……...1 Dawa imetolewa…….1 If 0☐☐☐☐☐☐ Shs ☐☐ Times If 1☐☐☐☐☐☐ Sh☐☐ Times	

23	Have you made informal payment to this facility's staff for treatment? [If yes], how much have you paid in the last 6 months? Je, umefanya malipo yasiyo rasmi kwa wafanyakazi wa kituo hiki kwa matibabu? [Kama ndiyo], umelipa kiasi gani katika miezi 6 iliyopita?	No.....0 Hapana…….0 Yes.....1 Ndio…….1 If 1 → ☐☐☐☐☐☐ Shillings	
24	Have you paid any other fees or lost any money to get WT treatment at this clinic or elsewhere? Childcare, missed wages, self-care, etc. [If yes], please describe the costs, how much you paid, and how often you had to pay in the last 6 months. Je, umelipa ada nyingine yoyote au umepoteza pesa yoyote ili kupata matibabu ya WT kwenye kliniki hii au kwingineko? Malezi ya watoto, mishahara iliyokosa, kujitunza n.k. [Ikiwa ndio], tafadhali eleza gharama, kiasi ulicholipa, na mara ngapi ulilazimika kulipa katika miezi 6 iliyopita.	No.....0 Hapana…….0 Yes.....1 Ndio…….1 Other 1:_____ ☐☐☐☐☐☐ Shillings ☐☐ Times Other 2:_____ ☐☐☐☐☐☐ Shillings ☐☐ Times	

Appendix II

Patient Volume Tool



Wilms Tumor Clients Volume Instrument												
Facility Name:								Start date of costing (ddmmyy):				
Location:								End date of costing (ddmmyy):				
Facility level												
Data Collector name												
Informant Details :												
Indicators	Site Indicator Data Since Start of Costing (monthly if possible, otherwise quarterly or semi-annual)											
Month												
	FACILITY /SITE											
Number of client seen at Costing Centre.												
Number of patient with Wilms Tumor(WT)												

Costing tool

General Information	
Facility CODE	
Costing Unit	
Data Collector's Name	
Date (mm/dd/yy)	

Informant Details	
Informant Name	Informant Contact Details

Evaluation Periods and References		
Start Date of Costing	June 2021	
End Date of Costing	July 2022	
Total Months of Costing	12	
GDP Deflator 2021	127	
GDP Deflator 2022	130.5	
Discount Rate	3%	
Exchange rate USD to TZS		

General Information

Facility Costing centre	
Facility Location	
Data Collector's Name	
Date (mm/dd/yy)	

Informant Details

Informant Name	Informant Contact Details

Costing year	2021/22
GDP Deflator (2021)	127
GDP Deflator (2022)	130.5

Personnels

Time Period Information			Descriptive information		Cost data								Distribution of Costs				
(2021/22)	Date (mm/dd/yy) (overwrite as appropriate)		Personel type	Position description	Financial information								Total costs	GDP Deflator Fraction	Total cost after Deflation	% of time allocated to WT services	Total costs for WT services
	Start	End			Currency (USD, TSHS)	Loaded monthly salary	Payer	Number of months received salary for this intervention	Monthly Allowances	Payer	Number of months received allowance for this intervention	No. in position					
													0	0.97	0		0
													0	0.97	0		0
													0	0.97	0		0
													0	0.97	0		0
													0	0.97	0		0
													0	0.97	0		0
													0	0.97	0		0
													0	0.97	0		0

Utilities

Time Period Information			Basic Descriptive Information								Distribution of Costs	
ne Period(2021/22)	Date (mm/dd/yy) (overwrite as appropriate)		Item Description	Payer	No. Units	Unit Cost	No. Months	Total Costs for Period	GDP Deflator fraction	Total cost after Deflation	%to WT services	Total costs for WT services
Code	Start	End			A	B	C	A x B x C				
								0.00	0.97	0.00		0
								0.00	0.97	0.00		0
								0.00	0.97	0.00		0
								0.00	0.97	0.00		0
								0.00	0.97	0.00		0

Commodities

Time Period Information			Descriptive information				Cost data							Distribution of Costs
Time Period(2021/22)	Date (mm/dd/yy) (overwrite as appropriate)		Item	Description of item	Payer	Date of purchase	Item cost			Total	GDP Deflator fraction	Total cost after Deflation	% allocated to WT services	Total costs for WT services
Code	Start	End					Unit cost	Unit/ item/ pack	No. of units per item/ unit					
										0	0.97	0		0
										0	0.97	0		0
										0	0.97	0		0
										0	0.97	0		0
										0	0.97	0		0

Equipment

Descriptive information				Cost data										Distribution of Costs
Item	Description of item	Payer	Date of purchase	Currency (USD, TSHS)	Item cost			Total	Useful life years	Annutization factor	Annual Cost	GDP Deflator fraction	Total cost after Deflation	% use to WT services	Total costs for WT services
					Unit cost	Unit/ item/ pack	No. of units								
								0	0	0.1	0	0.97	0		0
								0	0	0.1	0	0.97	0		0
								0	0	0.1	0	0.97	0		0
								0	0	0.1	0	0.97	0		0
								0	0	0.1	0	0.97	0		0
								0	0	0.1	0	0.97	0		0
								0	0	0.1	0	0.97	0		0

Supplies

Time Period Information			Descriptive information								Distribution of Costs	
ne Period(2021/22)	Date (mm/dd/yy) (overwrite as appropriate)		Item	Payer	Description of item	Item cost			Total	GDP Deflator fraction	Total cost after deflation	% of time allocated to WT services	Total costs for WT services
Code	Start	End				Unit cost	Unit/ item/ pack	No. of units					
									0	0.97	0		0
									0	0.97	0		0
									0	0.97	0		0
									0	0.97	0		0
									0	0.97	0		0
									0	0.97	0		0

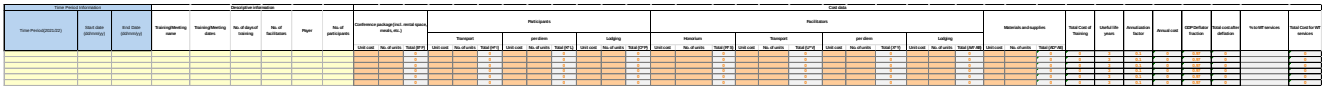
Contracted Services

Time Period Information			Basic Descriptive Information								
Time Period(2021/22)	Date (mm/dd/yy) (overwrite as appropriate)		Payer	Item Description	No. Units	Unit Cost	Total Costs	GDP Deflator fraction	Total cost after deflation	% to WT services	Total costs for WT services
Code	Start	End									
							0	0.97	0		0
							0	0.97	0		0
							0	0.97	0		0
							0	0.97	0		0
							0	0.97	0		0
							0	0.97	0		0

Building and Maintenance

Time Period Information			Descriptive information										
Time Period(2021/22)	Start date (dd/mm/yy)	End Date (dd/mm/yy)	Payer	Basic description of buildings / rooms (Select from down drop)	Units for floor space (m^2 or ft^2)	Floor Space Area	Currency	Unit Cost for Floor Space	No. of months	Total Costs	GDP Deflator fraction	Total cost after deflation	Percent to WT services	Total costs for WT services
										0	0.97	0		0
										0	0.97	0		0
										0	0.97	0		0
										0	0.97	0		0
										0	0.97	0		0

Training



Appendix IIIA: Consent form

Muhimbili university of Health and allied sciences

School of Public Health and Social Sciences

Cost associated with Wilms Tumor management at Muhimbili National Hospital in Tanzania

Introduction

My name is Amosi Kilipamwambu, and I am now studying advanced studies at MUHAS, Muhimbili University of Health and Allied Sciences. I am doing a research project to determine the expenses incurred by a patient undergoing Wilms tumor treatment. The objective is to research and determine the cost associated with managing Wilms tumor at Muhimbili National Hospital in Tanzania**.**

Procedures: You, as a stakeholder in this study, will be asked to provide information on the expenses related to managing Wilms tumor at a Tertiary Hospital in Dar es Salaam. The interview is expected to last under 60 minutes.

Participation risk: There are no expected hazards from becoming involved in this study. You will not gain any distinctive benefits as a participant. As a stakeholder, you will benefit from policymakers' actions to shape policy development, cost reduction, resource allocation, and program implementation by offering evidence-based suggestions on the economic feasibility and sustainability of managing Wilms tumor in Tanzania.

Confidentiality is maintained during interviews to ensure the privacy of information. Because your name is not necessary, no one can recognize you based on the information provided.

Compensation: We value your involvement in this study, but, no compensation will be provided for your time or any inconvenience.

Voluntary Participation: You can discontinue this study at any time without facing any consequences as it is voluntary.

Whom to contact for more questions or queries: You have the autonomy to discontinue participation in this study at any point as it is voluntary. To inquire or express issues regarding this project, contact Dr. Amosi Kilipamwambu, the primary investigator, at +255 757 966 169. You can contact the Chairman of the MUHAS Institutional Review Board at Muhimbili University of Health and Allied Sciences in Dar es Salaam, Tanzania, if you have any questions regarding your participation rights in this study. The contact information is as follows: P.O. Box 65001, United Nations Road, Dar es Salaam, Tanzania,Phone: +255 22 2152489.

Participant: I acknowledge all the given requirements and have agreed to take part in this study.

Name of the participant: _____

Signature: _____

Date: _____

Signature of the interviewer: _____

Date: _____

Appendix IIIB: Fomu ya Idhini

Chuo cha Afya na Sayansi Shirikishi Muhimbili

Gharama zinazohusiana na Matibabu ya ugojwa wa Wilms Tumor katika Hospitali ya Taifa ya Muhimbili nchini Tanzania

Utangulizi

Naitwa Amosi Kilipamwambu, na sasa ninasoma masomo ya juu katika Chuo Kikuu cha Afya na Sayansi Shirikishi Muhimbili, (MUHAS). Ninafanya mradi wa utafiti ili kubaini gharama ambazo mgonjwa anayepata matibabu ya uvimbe wa figo(Wilms tumor). Madhumuni ni kutafiti na kubaini gharama zinazohusiana na kudhibiti uvimbe wa Wilms katika Hospitali ya Taifa ya Muhimbili nchini Tanzania.

Taratibu: Wewe, kama mdau katika utafiti huu, utaombwa kutoa taarifa kuhusu gharama zinazohusiana na kudhibiti uvimbe wa figo(Wilms tumor) katika Hospitali ya Juu jijini Dar es Salaam. Mahojiano hayo yanatarajiwa kudumu chini ya dakika 60

Athari inayohusishwa na kushiriki: Hakuna hatari zinazotarajiwa kutokana na kuhusika katika utafiti huu. Hutapata manufaa yoyote tofauti kama mshiriki. Kama mdau, utafaidika na hatua za watunga sera kuchagiza maendeleo ya sera, kupunguza gharama, ugawaji wa rasilimali, na utekelezaji wa programu kwa kutoa mapendekezo ya msingi ya ushahidi juu ya uwezekano wa kiuchumi na uendelevu wa kudhibiti uvimbe wa Wilms nchini Tanzania.

Usiri: Siri hudumishwa wakati wa mahojiano ili kuhakikisha faragha ya habari. Kwa sababu jina lako si la lazima, hakuna mtu anayeweza kukutambua kulingana na taarifa iliyotolewa.

Fidia: Tunathamini ushiriki wako katika utafiti huu, lakini, hakuna fidia itakayotolewa kwa muda wako au usumbufu wowote.

Ushiriki wa Hiari: Unaweza kusitisha utafiti huu wakati wowote bila kukabili matokeo yoyote kwa kuwa ni ya hiari**.**

Nani wa kuwasiliana naye kwa maswali au maelezo zaidi:

Kuuliza au kueleza masuala yanayohusu mradi huu, wasiliana na **Dk.Amosi Kilipamwambu**, Mtafiti Mkuu, kwa namba +255 757 966 169. Unaweza kuwasiliana na Mwenyekiti wa Bodi ya Mapitio ya Taasisi ya MUHAS katika Chuo Kikuu cha Afya na Sayansi Shirikishi Muhimbili, Dar es Salaam. Tanzania, kama una maswali yoyote kuhusu haki zako za ushiriki katika utafiti huu. Maelezo ya mawasiliano ni kama ifuatavyo:P.O. Box 65001, United Nations Road, Dar es Salaam, Tanzania SLP 9653, Dar es Salaam, Simu: +255 22 2152489.

Mshiriki: Ninakubali mahitaji yote yaliyotolewa na nimekubali kushiriki katika utafiti huu.

Jina la Mshiriki: _____

Sahihi: _____

Tarehe: _____

Sahihi ya Mhoji _____

Tarehe: _____

Appendix VI: Ethical clearance letter

UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR – RESEARCH, PUBLICATIONS AND INNOVATIONS

Ref. No.DA.282/298/01.C/2224 Date: 08/05/2024

MUHAS-REC-05-2024-2224
AMOSI ABSALOM KILIPAMWAMBU
SHOOL OF PUBLIC HEALTH AND SOCIAL SCIENCES
MUHAS

RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED: COST ASSOCIATED WITH THE MANAGEMENT OF WILMS TUMOR AT MUHIMBILI NATIONAL HOSPITAL, TANZANIA

Reference is made to the above heading,

I am pleased to inform you that the Chairperson has on behalf of the University Senate, approved ethical clearance of the above-mentioned study, on recommendations of the Senate Research and Publications Committee meeting accordance with MUHAS research policy and Tanzania regulations governing human and animal subjects research.

APPROVAL DATE: 08/05/2024
EXPIRATION DATE OF APPROVAL: 08/05/2025

STUDY DESCRIPTION:
Purpose:
The purpose of this cross-sectional costing study, employing micro-costing, is to determine the cost associated with the management of Wilms tumor at Muhimbili National Hospital, Tanzania.

The approved protocol and procedures for this study is attached and stamped with this letter, and can be found in the link provided: https://irb.muhas.ac.tz/storage/Certificates/Certificate%20-%2015537.pdf and in the MUHAS archives.

The PI is required to:

1. Submit bi-annual progress reports and final report upon completion of the study.
2. Report to the IRB any unanticipated problem involving risks to subjects or others including adverse events where applicable.
3. Apply for renewal of approval of ethical clearance one (1) month prior its expiration if the study is not completed at the end of this ethical approval. You may not continue with any research activity beyond the expiration date without the approval of the IRB. Failure to receive approval for continuation before the expiration date will result in automatic termination of the approval for this study on the expiration date.
4. Obtain IRB amendment (s) approval for any changes to any aspect of this study before they can be implemented.
5. Data security is ultimately the responsibility of the investigator.
6. Apply for and obtain Data Transfer Agreement (DTA) from NIMR if data will be transferred to a foreign country.
7. Apply for and obtain Material Transfer Agreement (MTA) from NIMR, if research materials (samples) will be shipped to a foreign country.
8. Apply for and obtain permission to publish the results from National Institute for Medical Research. The application should be before submitting to a publisher and not concurrently through the email publications@nimr.or.tz.
9. Any researcher, who contravenes or fail to comply with these conditions, shall be guilty of an offence and shall be liable on conviction to a fine as per NIMR Act No. 23 of 1979, PART III section 10 (2)
10. The PI is required to ensure that the findings of the study are disseminated to relevant stake holders.
11. PI is required to be versed with necessary laws and regulatory policies that govern research in Tanzania. Some guidance is available on our website https://drp.muhas.ac.tz/.

Dr. Nahya Salim Masoud,
Chairperson, MUHAS Research and Ethics Committee

Muhimbili University of Health and Allied Sciences
DIRECTOR
Research, Publications & Innovations

Appendix V: Introduction letter

UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

OFFICE OF THE DIRECTOR – POSTGRADUATE STUDIES

In reply quote;
Ref. No. HD/MUH/T.539/2022

13th May, 2024

The Executive Director,
Muhimbili National Hospital,
P.O. Box 65000,
DAR ES SALAAM.

RE: INTRODUCTION LETTER OF AMOSI ABSALOM KILIPAMWAMBU

We would like to inform you that the carrier of this letter is Amosi Absalom Kilipamwambu with registration number HD/MUH/T.539/2022 a student at Muhimbili University of Health and Allied Science (MUHAS), Pursuing MSc. Health Economics and Policy.

As part of his studies,he will be doing an elective research titled: **"Cost Associated With The Management Of Wilms Tumor At Muhimbili National Hospital, Tanzania".** he is being supervised by from Dr.Lulu Chirande MUHAS and Dr Christopher Chambo from MNH.

The Ethical Clearance for doing the said research has been given by the University.

Kindly request your assistance and cooperation to our student.

Yours Sincerely,

Ms.Victoria Mwanilwa
For: DIRECTOR, POSTGRADUATE STUDIES

cc: Amosi Absalom Kilipamwambu

9 United Nations Road; Upanga West; P.O. Box 65001, Dar Es Salaam: Tel. G/Line: +255-22-2150302/6; Ext. 1015; Direct Line:+255-22-2151378;Telefax:+255-22-2150465;E-mail:dpgs@muhas.ac.tz;Web:https://www.muhas.ac.tz

UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

OFFICE OF THE DIRECTOR – POSTGRADUATE STUDIES

In reply quote;
Ref. No. HD/MUH/T.539/2022

13th May, 2024

The Executive Director,
Ocean Road Cancer Institute,
P.O.BOX 3592,
DAR ES SALAAM.

RE: INTRODUCTION LETTER OF AMOSI ABSALOM KILIPAMWAMBU

We would like to inform you that the carrier of this letter is Amosi Absalom Kilipamwambu with registration number HD/MUH/T.539/2022 a student at Muhimbili University of Health and Allied Science (MUHAS), Pursuing MSc. Health Economics and Policy.

As part of his studies,he will be doing an elective research titled: **"Cost Associated With The Management Of Wilms Tumor At Muhimbili National Hospital, Tanzania".** he is being supervised by from Dr.Frida Ngalesoni MUHAS and Dr Rashid Mruma from ORCI.

The Ethical Clearance for doing the said research has been given by the University.

Kindly request your assistance and cooperation to our student.

Yours Sincerely,

Ms. Victoria Mwanilwa
For: DIRECTOR, POSTGRADUATE STUDIES

cc: Amosi Absalom Kilipamwambu

9 United Nations Road; Upanga West; P.O. Box 65001, Dar Es Salaam: Tel. G/Line: +255-22-2150302/6; Ext. 1015; Direct Line:+255-22-2151378;Telefax:+255-22-2150465;E-mail:dpgs@muhas.ac.tz;Web:https://www.muhas.ac.tz

Appendix VI: Permission to collect data

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF HEALTH

MUHIMBILI NATIONAL HOSPITAL

In reply please quote:

Ref. No.: MNH/CRTCU/Perm/2024/217 Date: 31st May, 2024

Head of Department,

- Central Pathology Laboratory
- Revenue
- Procurement
- Medical Records
- Paediatrics and Child Health
- Emergency Medicine
- Radiology
- Engineering
- Environmental

Muhimbili National Hospital

RE: PERMISSION TO COLLECT DATA AT MNH

Name of Student	Dr. Amosi Absalom Kilipamwambu
Title	"Cost Associated with the Management of Wilms Tumor at Muhimbili National Hospital"
Institution	Muhimbili University of Health and Allied Sciences
Supervisors	Dr. Lulu Chirande (MUHAS) Dr. Frida Ngalesoni
Co – supervisor	Dr. Rashid Mruma (ORCI) Christopher Chambo (MNH)
Period	31st May 2024 to 13th August, 2024

Approval has been granted to the above principal investigators to collect data at MNH. Dissemination of study findings at MNH shall be overseen by **Dr. Christopher Chambo** (MNH) supervisor.

Received
01/07/2024

Upanga West, Kalenga Street, Plot No. 10480/3, P.O. BOX 65000, Dar es Salaam, Tanzania.
Telephone: +255-22-2151367-9, Telephone: +255-22-2151351-2
Email: info@mnh.or.tz, Website: www.mnh.or.tz

Kindly ensure the named principal investigator abide to the ethical principles and other conditions of the research approval.

Sincerely,

Dr. Charles K. Pallangyo

For: Head of Clinical Research, Training and Consultancy Unit

C.c DMS, DCSS, DSS

C.c Dr.Christopher Chambo

c.c Dr. Amosi Absalom Kilipamwambu

UNITED REPUBLIC OF TANZANIA

MINISTRY OF HEALTH

OCEAN ROAD CANCER INSTITUTE

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On Reply Please Quote:

Ref: 10/VOL.XXI/228B

Date: 20th May, 2024

INSTITUTIONAL ACADEMICS, RESEARCH, PUBLICATIONS AND ETHICS COMMITTEE

Amosi Absalom Kilipamwambu
Reg no: HD/MUH/T.539/20222
MSC Health Economics and Policy
MUHAS

Re: Approval to collect data for the study "Cost associated with the management of wilms tumor at Muhimbili National Hospital, Tanzania."

Reference is made to the above heading, this is to let you know that the Institute Academics, Research, Publications and Ethics Committee has granted you permission to conduct this study. For a period of one year ending; May 2025.

Upon successful completion of the study, you are obliged to submit a copy of the final document of this research project to the IARPEC.

Yours Sincerely,

Dr. Mamsau Ngoma
Academic Unit, ORCI.

Ocean Road Cancer Institute; Junction of Luthuli / Baraka Obama Roads; P.O. Box 3592; Dar Es Salaam -Tanzania;
Tel: +255-22-2127597; Fax: +255-22-2118704; Email: info@orci.or.tz; Website: www.orci.or.tz