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Research Article

"Establishing a Multi-disciplinary Adult Oncology Unit at Muhimbili National Hospital: Lessons Learned, Challenges, and Opportunities Amidst Tanzania's Growing Cancer Burden"

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The escalating cancer burden, particularly in low- and middle-income countries such as Tanzania, necessitates innovative strategies. One strategy is to increase access to cancer services through the establishment of treatment in existing referral hospitals that offer multidisciplinary care, as was the case in the opening of the adult oncology unit at Muhimbili National Hospital (MNH) in Tanzania.

A comprehensive facility assessment served as the foundation for this expansion, encompassing assessments of the spatial requirements of human resources, equipment, and drug availability. Aiming to ensure optimal resource allocation and effective implementation by capitalizing on existing systems. The main objective of opening the MNH adult oncology unit was to increase coverage and accessibility to comprehensive cancer care services. This initiative has substantially improved patient outcomes, with reduced wait times for oncology care initiation, facilitating seamless care coordination that capitalizes on multidisciplinary treatment planning.

The unit has provided benefits to MNH by fostering collaborative efforts, serving as a revenue generation point, and expanding care that aligns with institutional goals. Nonetheless, challenges persist, including space constraints and an inadequate number of trained human resources for oncology care.

The successful establishment of the MNH's adult oncology unit exemplifies the significance of stakeholder engagement, adaptability, and collaboration. A comprehensive approach that emphasizes workforce development, community awareness, and infrastructure enhancement offers promise in confronting Tanzania's mounting cancer burden.

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Introduction

The incidence of cancer is increasing globally, with most countries facing an increasing burden of cancer cases^[1]. This upward trend is particularly evident in low- and middle-income countries such as Tanzania, where the prevalence of infectious and non-communicable diseases already poses significant challenges^{[2][3]}. In Tanzania, a diverse range of cancers is observed, with some associated with poverty, such as infection-related cancers, while others are linked to affluent lifestyles characterized by behaviors such as tobacco use, alcohol consumption, poor diet, and sedentary habits^{[4][5]}.

There is a substantial disparity in comprehensive cancer care services worldwide, attributed to socioeconomic, racial, and geopolitical factors^[6]. In the sub-Saharan African setting, obstacles to addressing the growing cancer burden include limited resources that hinder access to diagnostic and therapeutic services, inadequate oncology-trained healthcare professionals, and limited training facilities. Although efforts have been made to establish cancer care services in some sub-Saharan African countries, these services often have limited scope and fail to effectively address the significant cancer burden in the region^{[6][7]}.

In Tanzania, a significant proportion of individuals afflicted by cancer face considerable challenges in accessing healthcare facilities equipped with adequate diagnostic and therapeutic interventions^[8].

As Tanzania has a growing population, both in size and age, there has been a significant increase in the incidence of cancer within the country. It is currently stipulated that the country has an average annual rate of increase of 4%. More alarmingly, cancer is quickly becoming a prominent cause of mortality in Tanzania, ranking fifth among adult males and second among adult females. Globocan statistics reported approximately 40,464 new cancer diagnoses in Tanzania in 2020, with models projecting a further increase to over fifty thousand new cases by 2025. Cervical cancer was the most prevalent cancer, constituting a quarter (25%) of all cases, followed by breast cancer (10%), and prostate cancer (9%). This rapidly increasing cancer burden exerts substantial pressure on the already overburdened healthcare infrastructure. We also acknowledge the increased public awareness campaigns, availability of expertise,

and facilities providing screening, and diagnostic services might play a role in the noted increase in the burden of cancer in Tanzania.

The provision of comprehensive oncological care in Tanzania faces substantial challenges common in LMIC, including resource constraints and infrastructural inadequacies. The centralized delivery model at the Ocean Road Cancer Institute (ORCI), primarily oriented toward the administration of chemotherapeutic and radiotherapeutic modalities, imposes substantial demands on the institute and broader governmental healthcare system.

Another key concern is the advanced stages of the disease at the time of diagnosis. Presentation in advanced stages poses significant challenges to achieving comprehensive remission and favorable therapeutic outcomes for these individuals^{[9][10]}.

To improve healthcare outcomes and address the escalating oncological burden, there is a critical need to expand the purview of cancer care services to other tertiary and referral hospitals within the country^[11].

The overarching aim of the establishment of an adult oncology unit at the Muhimbili National Hospital (MNH) was multi-faceted. The main objective was to increase coverage and accessibility to comprehensive cancer care services, to address the growing cancer incidence in Tanzania. The MNH serves as a national referral hospital and serves a significant portion of the population in Tanzania, particularly those in need of specialized and comprehensive medical care. The hospital has two campuses: MNH-Upanga and MNH-Mloganzila. The multidisciplinary nature of the hospital enables comprehensive treatment planning in oncology care through inter-departmental consultations. Multidisciplinary team discussions have become central to the decision-making process, resulting in an improved quality of care and therapeutic outcomes.

The implementation was designed to provide a comprehensive range of services spanning the entire oncological care continuum, from screening, diagnosis, and targeted surgical and chemotherapeutic interventions at the MNH-Upanga campus, which has served as the national pediatric oncology care center since 2011.

Implementation of the adult oncology unit

Facility Assessment

Prior to the opening of the adult oncology unit at MNH-Upanga in 2016, a comprehensive evaluation of the facility was conducted to ensure smooth workflow and functioning of the unit. This evaluation aimed to appraise various aspects of the hospital's infrastructure and resources to effectively accommodate the new oncology unit.

One crucial aspect of facility assessment is the evaluation of available human resources. This involved identifying healthcare professionals with expertise in oncology, who could be deployed to the unit. The assessment considered the number of oncologists, nurses, and other staff members required to adequately cater to the needs of patients with cancer. Acknowledging the availability of skilled healthcare professionals is essential to ensure delivery of high-quality care within the unit.

Additionally, facility assessment focused on identifying suitable locations within the MNH that could be dedicated as key components of the adult oncology unit. This included determining the appropriate spaces for chemotherapy administration wards, admission wards for cancer patients, and outpatient clinics for follow-up appointments and consultations. The assessment considered multiple factors, including accessibility, space requirements, and proximity to other oncological care support departments and services.

Another critical consideration is the availability of equipment for preparation and administration of chemotherapy. This assessment was aimed at determining the necessary equipment and ensuring its availability within the unit. This includes evaluating the capacity for compounding, storage, and safe administration of chemotherapy. Adequate equipment is crucial for safe and efficient delivery of chemotherapy treatments to patients.

Furthermore, facility assessments have addressed the availability of cytotoxic chemotherapeutic drugs. It seeks to guarantee a consistent supply of these essential medications to meet the treatment requirements of patients with cancer. The assessment involved assessing existing drug procurement processes and storage facilities, and establishing a reliable system for monitoring and replenishing drug stocks. Ensuring the availability of cytotoxic chemotherapeutics is

imperative to prevent interruptions in patient treatment and maintain the continuum of care.

Facility assessment also involved estimating the patient population that the unit could accommodate safely. This assessment considered factors such as existing patient load, capacity constraints, and resources available within the unit. The goal of this estimation was to ensure that the unit could provide high-quality care, while effectively handling the influx of patients seeking treatment.

Collaboration among stakeholders is paramount throughout the facility evaluation process. This included engagement with hospital administrators, medical professionals, and support staff from different departments and representatives of patients with cancer. By involving all relevant parties, the evaluation aimed to ensure a comprehensive understanding of the hospital's capacity and address any potential challenges or gaps in resources.

Facility evaluation at the MNH is a complex and thorough process that plays a pivotal role in the successful establishment of adult oncology units. It allows for careful planning, resource allocation, and infrastructure development to meet the needs of patients with cancer. Through this comprehensive evaluation, the MNH ensured that the unit could operate smoothly and provide uninterrupted care to cancer patients.

Following facility evaluation and acquisition of necessary approvals, the MNH made significant progress in establishing and operating an adult oncology unit. The Internal Medicine Department was designed to house the unit. The hospital administration officially announced the unit's launch, communicating the changes to hospital staff, all departments, and stakeholders. Communication was aimed at facilitating patient transfers from other departments to the oncology unit, thus ensuring seamless care transitions.

To uphold the highest standards of care, the MNH administration emphasized strict adherence to international guidelines, specifically evidence-based treatment protocols. In addition to the international guidelines, a local national guideline was implemented involving the coordination of oncologists across Tanzania. This initiative aimed to standardize the quality of care and optimize the utilization of chemotherapy already available in the country. By following these established guidelines, the MNH aims to deliver standardized, effective, and evidence-based treatments, ultimately improving treatment outcomes and patient safety.

The implementation process requires close collaboration among various departments, including pathology, surgery, gynecology, ear, nose, and throat (ENT), and oncology. Collaborative efforts and inter-departmental consultations, including tumor board discussions and decisions, have become integral to the decision-making process. This approach not only reduced the referral burden to ORCI but also fostered a multidisciplinary approach to cancer care, maximizing resources and expertise across specialties.

Challenges and setbacks in opening the oncology unit at MNH

Initially, the adult oncology unit faced significant staffing and infrastructure challenges, and operated with limited resources when delivering comprehensive cancer care. Chemotherapy was administered in a small room, which could accommodate only four patients per day, leading to delays and restricted access to treatment. However, the MNH recognized the urgent need for expanded services and embarked on a collaborative initiative between internal medicine and the surgical department to find a dedicated ward.

This collaborative effort resulted in the conversion of ward 10 to a dedicated space for chemotherapy administration, significantly boosting the capacity of the unit to serve up to 55 patients daily. This transformation not only expanded the physical infrastructure but also fostered cross-departmental collaboration, enabling a comprehensive multidisciplinary approach to cancer care. This expansion coincided with an increase in the number of patients with various types of cancers, as depicted in Figure 1.

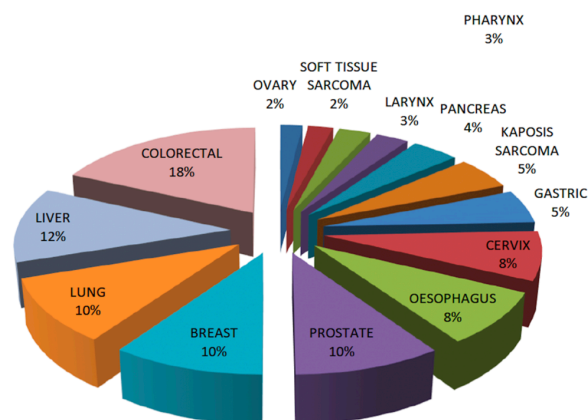


Figure 1. Cancer incidence 2019 to 2021 as per Muhimbili National Hospital cancer registry.

This solution-based approach exemplifies the MNH's dedication to meeting the growing demand for cancer care, reducing waiting times, and ensuring timely access to vital treatment.

Over time, the adult oncology unit at the MNH has made significant progress in strengthening its human resources to meet the increasing demands for cancer care. Initially, staffed with only three nurses, one clinical oncologist, and two medical oncologists, the unit expanded its workforce.

Currently, the unit has six clinical oncologists with expertise in both radiation and medical oncology and two medical oncologists, offering specialized expertise in diagnosing and treating various types of cancer. This increase in staff has enabled units to deliver more personalized and comprehensive care to the growing patient population. The team conduct outpatient clinics from Monday to Saturday, alternating between a group of four specialists in clinics and four tending inpatients.

The hospital also recognized the necessity for the expansion of oncology services at the MNH Mloganzila campus. The campus offers both inpatient and outpatient services and currently has two dedicated clinical oncologists offering chemotherapy and plans to open a radiotherapy center.

Acknowledging the importance of continuous professional development, the MNH has implemented ongoing training programs for oncology staff. These programs cover various areas of expertise, including wound care, chemotherapy administration, basic clinical research, and advanced procedures such as bone marrow transplantation. The training initiatives aimed to enhance the skills and knowledge of the oncology

team, ensuring that they remain up-to-date with the latest advancements in cancer care. By regularly updating their expertise, the MNH staff can provide patients with state-of-the-art treatment and deliver the highest standard of care.

Furthermore, by employing the trainer approach, the unit successfully expanded its nursing staff to include 11 dedicated oncology nurses and five attendants.

This hands-on model emphasizes practical learning and knowledge sharing Figure 2.

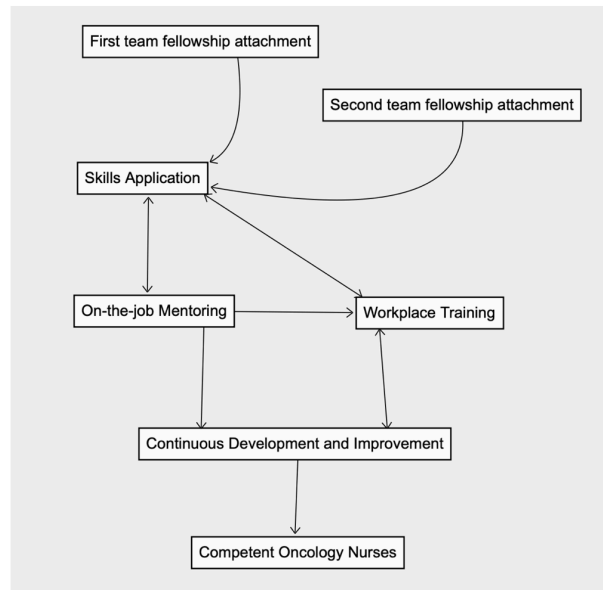


Figure 2. Hands-on model for training oncology nursing staff at Muhimbili National Hospital.

The processes involved:

1. Initial phase

1. First team Fellowship Attachment: The process began with the selection of two nurses in the pediatric oncology unit. They were sponsored by a fellowship in adult oncology care with partner institutions in India. This specialized training allowed them to acquire the skills and knowledge required for adult oncology care.
2. Skills Application: Upon completing their fellowship, the nurses joined the adult oncology unit. They began to work closely with oncologists, including in chemotherapy. Additionally, one attendant from the pediatric oncology unit joined and contributed to the team's efforts.

3. Second Team's Fellowship Attachment: Following the successful integration of the first two trained nurses, a second team of two nurses was selected. These nurses sponsored a fellowship with a partner institution in Turkey, where they underwent specialized training in oncology care with a focus on bone marrow transplantation.
4. On-the-job Mentoring: The four trained nurses continue to collaborate with our partner training institutions, with trainers traveling abroad to the MNH to facilitate and mentor them on-site. This direct mentorship within the MNH environment has played a pivotal role in enhancing the expertise of oncology nurses and equipping them to effectively train and mentor their colleagues in the MNH. This collaborative approach significantly reduces the need to send staff abroad to train and streamline the local development of specialized skills.

2. Second phase

1. Workplace Training: The next phase involved trained nurses, now experts in adult oncology care, providing training to new nurses assigned to the oncology unit. This hands-on training took place directly in the workplace and covered a range of the theoretical and practical aspects of oncology care.
2. Continuous Development and Improvement: The trainer model promotes continuous development and improvement within a nursing team. Ongoing collaboration with partner institutions and the mentorship provided by experienced nurses contributed to the overall growth of the team.

This approach not only ensures that all nurses in the unit are well-trained and prepared for their roles but also fosters a culture of knowledge exchange and continuous improvement. Consequently, the unit is better equipped to provide high-quality care and to achieve operational excellence. Additionally, the training enabled them to provide compassionate and tailored support to cancer patients throughout their treatment journey. Their inclusion is pivotal for providing comprehensive care and addressing the diverse physical and emotional needs of the patients.

Moreover, while the model has already yielded a commendable expansion of the unit's capabilities, Muhimbili University of Health and Allied Sciences (MUHAS) has taken a visionary step toward ensuring

the sustainability and future of oncology nursing. The university initiated an oncology nursing master's course poised to cultivate a cohort of highly skilled oncology nurses equipped to uphold the unit's standards of excellence and compassionate care. This visionary stride exemplifies a commitment to the continuous enrichment of the field and provision of support for cancer patients.

In addition to the medical and nursing staff, the oncology unit includes two dedicated registrars and two interns who rotate within. These medical professionals play an integral role in providing specialized care and supporting the oncology team in delivering comprehensive treatment to patients. Their presence enhances the unit's capacity to handle the increasing workload and ensures the continuity of care.

To optimize medication management, the MNH sponsored one pharmacist for a fellowship in India. Currently, the unit has two full-time pharmacists and a rotating pharmacy. Pharmacists play a vital role in ensuring the safe and effective administration of chemotherapeutic drugs and other medications prescribed to patients. They collaborated closely with the oncology team to ensure accurate medication dosing, minimize potential drug interactions, and provide valuable pharmaceutical guidance. Pharmacy interns contribute to the unit's smooth functioning by assisting in medication dispensing, inventory management, and patient education.

The combined efforts of an expanded oncology team, ongoing training programs, and collaborative partnerships have empowered MNH to deliver personalized and comprehensive cancer care. This dedication to continuous improvement and capacity building demonstrates the MNH's commitment to providing the best possible outcomes for individuals battling cancer in Tanzania.

Benefits to Patients

The establishment of an adult oncology unit in the MNH has brought about numerous benefits for patients, enhancing their overall cancer care experience. Some of these benefits include the following.

1. Expansion of specialized cancer treatment center:
The establishment of a specialized treatment center dedicated to serving adult oncology patients has provided an additional and complementary option for individuals seeking care. This specialized center serves as a

supplementary resource, ensuring that more patients have access to timely and high-quality treatment.

2. Improved quality of care:

With the implementation of the adult oncology unit, the quality of care for cancer patients has significantly improved. The unit operates with a dedicated multidisciplinary team of oncologists, nurses, and other healthcare professionals who specialize in diagnosing and treating various types of cancer. Their expertise and focused attention contribute to better treatment outcomes and overall patient satisfaction.

3. Reduced waiting times:

The availability of an additional oncology unit has helped to reduce the waiting time for cancer treatment. By expanding the capacity to accommodate more patients, the unit ensures that individuals receive timely access to critical treatments such as chemotherapy, reducing delays, and minimizing the impact of cancer progression.

4. Seamless cancer care continuum:

The adult oncology unit at the MNH facilitates a seamless continuum of cancer care. From initial screening to diagnosis and treatment, individuals can navigate through these stages within a single center. This integrated approach streamlined the patient's journey, ensuring efficient coordination and continuity of care.

5. Multidisciplinary treatment planning:

The presence of an adult oncology unit has enabled multidisciplinary team discussions for treatment planning. Collaboration among various departments, including pathology, surgical oncology, and medical oncology, allows for comprehensive evaluation and personalized treatment plans tailored to each patient's specific needs. This multidisciplinary approach enhances the treatment outcomes and patient well-being.

6. Easy monitoring and record-keeping:

The adult oncology unit maintains complete medical records within the system, making it easier to monitor patient progress and overall survival. Access to comprehensive patient data allows health care professionals to track treatment responses, adjust interventions when needed, and make informed decisions regarding ongoing care.

Benefits to the Institution

The establishment of an adult oncology unit at the MNH has brought several advantages to the institution.

These benefits include:

1. Collaboration with other centers:

The establishment of an adult oncology unit has fostered collaboration with other centers involved in oncology treatment, sponsored fellowships, and bone marrow transplant programs. This collaboration not only benefits oncology patients, but also extends to individuals requiring hematology services. The exchange of expertise, resources, and research among these centers enhances the overall quality of care provided and strengthens the institution's reputation as a leading healthcare facility in the country.

2. Revenue generation:

The establishment of an adult oncology unit served as a source of revenue for the institution. By catering to both public and private patients, the unit generates income that can be reinvested to improve the infrastructure, acquire advanced technologies, and expand services. Financial stability strengthens an institution's ability to provide high-quality care and meet the growing demand for cancer treatment.

3. Alignment with institutional and government objectives:

The implementation of the adult oncology unit aligns with hospitals and the country's objectives and mission of providing multidisciplinary and specialized care to all in Tanzania. By expanding services to include comprehensive cancer care, the MNH and Ministry of Health demonstrated their commitment to addressing the pressing healthcare needs of the population and fulfilling the role of the MNH as a national referral hospital that leads to healthcare provision.

Limitations, Areas for Opportunity, and Future Plans

The establishment of an adult oncology unit at the MNH has provided numerous benefits to patients and institutions. However, this study also revealed several limitations and areas for potential improvement and growth, as outlined below.

1. Space limitations and infrastructure expansion:

The lack of space for further expansion, such as the construction of bunkers for radiotherapy, is a limitation. To address this, plans were made to open bunkers on Mloganzila campus.

Space limitations and infrastructure expansion posed a challenge, given the constraints on further

development, but the planned opening of bunkers at the Mloganzila compound offers a clear opportunity to enhance infrastructure and expand the capacity for advanced cancer treatments.

2. Medication availability and procurement procedures:

Building upon the existing framework of pediatric oncology care and established drug and supplies procedures in Tanzania, we initiated a monthly collaborative meeting between the pharmacy and the oncology unit. The unit conducted a comprehensive analysis projecting the bulk of drugs required by patients, estimating the number of medications needed for complete chemotherapy courses. These projections informed our procurement plans, which are now organized on a quarterly basis. This strategic platform fosters in-depth discussions on current drug demands, enabling us to refine our procurement processes by adjusting projected unit demand and responding promptly to emerging needs.

3. Staff shortage and workforce development:

The unit has gradually expanded its workforce by training nurses and doctors, and hiring medical specialists. This highlights the need for continuous workforce development and recruitment efforts to meet the growing demand for oncology services in both MNH Upanga and Mloganzila.

4. Private chemotherapy administration wards:

The increasing demand for private chemotherapy administration wards is a notable limitation; however, there are plans to establish these private wards on the Mloganzila campus.

5. Cancer stigma and community awareness

Cancer stigma within the community remains a challenge that affects treatment-seeking behavior. However, the presence of an adult oncology unit at the MNH-Upanga has begun to alleviate some of the fear and stigma associated with cancer. This emphasizes the importance of ongoing community awareness programs and initiatives to combat cancer stigma and to promote early detection and treatment.

6. Research Challenges and Opportunities:

One noteworthy challenge facing the unit is the absence of a dedicated research team, which limits its ability to engage in comprehensive research initiatives including clinical trials. Establishing an in-house research team is a strategic priority for the unit as it presents a significant opportunity to enhance research capabilities, explore novel treatments, and improve patient outcomes.

Leveraging partnerships between local and international research partners will certainly enrich research efforts and potentially contribute to breakthroughs in cancer treatments.

7. Strengthening the Cancer Registry:

Currently, the cancer registry relies on data from the histology department. To enhance its effectiveness, there is a clear need to expand the registry to incorporate more comprehensive data including treatment outcomes and a cancer survivor database. This initiative will not only aid in monitoring patient progress and the effectiveness of treatments but will also provide valuable data for future research and improve long-term care for cancer survivors. Developing such a comprehensive registry system is an opportunity to further enhance the quality of care and support offered to patients with cancer in the MNH.

Discussion and Conclusion

The successful establishment of an adult oncology unit at MNH-Upanga in Tanzania exemplifies the criticality of active stakeholder involvement, adaptability, and a commitment to providing comprehensive cancer care. The journey to develop this unit involved several key steps, each of which contributed to the overall success of the project. The initial robust facility evaluation set the foundation for the unit's infrastructure and resources, ensuring that it would be well-equipped to provide high-quality cancer care. Subsequently, the expansion of staff and infrastructure, in conjunction with a commitment to flexibility, exemplified the dedication and adaptability essential throughout the implementation process. Collaboration among different departments, adherence to international standards of care, and the integration of multidisciplinary approaches were pivotal in delivering personalized and comprehensive cancer care to a larger patient population^[12].

These efforts underscore the interconnected nature of cancer care initiatives, emphasizing shared principles that transcend geographical boundaries. Examples include Italy's emphasis on integrating cardiovascular and oncological care in Southern Italy resonates with the collaborative approach of the MNH's Adult Oncology Unit in Tanzania, highlighting the global importance of multidisciplinary strategies^[13]. The growth of integrated onco-palliative care in the United States aligns with the patient-centered focus of the Tanzanian unit, showcasing common threads in

addressing holistic patient needs^[14]. The significance of international collaboration, mirroring the collaborative efforts seen in Tanzania can be accentuated not only in LMIC but also in conflict-affected regions^[15].

The unit's commitment to flexibility and responsiveness has allowed it to quickly adapt to emerging challenges and opportunities, ensuring that cancer care services remain relevant and effective within Tanzania. By learning from this experience and continuing to adapt to the evolving needs of cancer care, MNH-Upanga can serve as a beacon of hope and support for cancer patients in Tanzania and beyond.

Our narrative has provided a baseline of existing services, as we aim to establish a research agenda, evaluation, and monitoring of the unit's impact will include both qualitative and quantitative approaches. We acknowledge the usage of patients' testimonials or case studies will offer a more humanized view of the oncology unit's influence. Additionally, exploring the long-term outcomes and quality of life for cancer survivors through longitudinal studies could provide valuable insights into the lasting impact of the unit. It is also imperative to scrutinize whether the increased availability of expertise and facilities offering screening and diagnostic services has indeed contributed effectively to the early-stage diagnosis of cancer, thereby potentially influencing the overall cancer burden in Tanzania.

In conclusion, the successful implementation of the adult oncology unit at MNH-Upanga highlights the importance of collaboration, adaptability, and a commitment to providing comprehensive cancer care. By embracing a multidisciplinary approach and adapting to the changing needs of cancer care, the unit serves as a model for successful oncology unit implementation capitalizing on existing infrastructures, and systems in a limited resources setting.

Statements and Declarations

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Declarations

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