



Implementation of the Adult Oncology Unit at Muhimbili National Hospital (MNH)

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Abstract

The escalating cancer burden, particularly in low- and middle-income countries such as Tanzania, necessitates innovative strategies. One such strategy is increasing 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 to address the burgeoning cancer crisis. A comprehensive facility assessment served as the foundation for this transformation, ensuring optimal resource allocation and effective implementation.

The rising cancer burden in Tanzania is dominated by cervical, breast, and prostate cancers. However, reported figures might underestimate the issue due to the lack of a centralized national cancer registry and limited access to diagnostic and treatment facilities throughout the country. The MNH oncology unit's creation aimed to decentralize care from the Ocean Road Cancer Institute (ORCI); as the cancer burden increased over the years, the center was getting strained by demand.

The MNH facility assessment encompassed assessments of spatial requirements for human resources, equipment,

and drug availability. This unit adopts a multidisciplinary approach, enabling personalized treatment plans and collaborative decision-making, aimed at expanding capacity and promoting inter-departmental cooperation. A "train-the-trainer" model empowered nursing staff in chemotherapy administration, and pharmacist involvement ensured accurate medication management.

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 opening of the oncology unit has given benefits to MNH through fostering multidisciplinary collaboration, an increase in revenue generation, and the expansion of care that aligns with institutional goals. Nonetheless, challenges, including space constraints and an inadequate number of trained human resources for oncology care, persist.

The successful establishment of MNH's adult oncology unit exemplifies stakeholder engagement, adaptability, and the significance of collaboration. A comprehensive approach, emphasizing 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 on the rise globally, with most countries facing an increasing burden of cancer cases^[1]. This upward trend is particularly evident in low- and middle-income countries like Tanzania, where the prevalence of infectious and non-communicable diseases already pose significant challenges^{[2][3]}. In Tanzania, a diverse range of cancers are observed, with some associated with poverty, such as infection-related cancers, while others are linked to affluent lifestyles characterized by behaviors like 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 Africa setting, obstacles in 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 fall short in effectively addressing the significant cancer burden in the region^{[6][7]}.

In Tanzania, as in many other countries that lack a national cancer registry and also have limited resources, it is necessary to point out the limitations in the accuracy of reported figures, as the numbers most likely are an

underrepresentation of the actual figures. It is stipulated that a significant proportion (80-90%) of individuals afflicted by cancer face considerable challenges in accessing healthcare facilities equipped with adequate diagnostic and therapeutic interventions. Consequently, a significant proportion of patients resort to alternative care, including seeking remedies from traditional healers, or remain undiagnosed, leading to unfavorable prognoses.

As Tanzania faces a growing population both in size and age, there has been a significant increase in cancer incidences reported within the country. Currently, it is stipulated that the country has an average annual increase rate 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. In 2020, Globocan statistics reported that approximately 40,464 new cancer diagnoses were documented in Tanzania, with models projecting a further increase to over fifty thousand new cases by 2025. The most prevalent cancer reported at the center is cancer of the cervix, constituting a quarter (25%) of all cases, followed by breast cancer at 10% and prostate cancer at 9%. This rapidly increasing cancer burden exerts substantial pressure upon an already overburdened healthcare infrastructure.

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 ORCI, primarily oriented toward the administration of chemotherapeutic and radiotherapeutic modalities, imposes substantial demands upon the institute itself and the broader governmental healthcare system.

Another key concern is the prevailing advanced stage at the time of diagnosis. A considerable percentage (75-80%) of patients seeking oncological interventions already manifest advanced stages of their malignancies upon presentation to specialized centers like ORCI. The presentation in advanced stages poses significant challenges in achieving comprehensive remission and favorable therapeutic outcomes for these individuals.

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

To address these challenges, the establishment of an adult oncology unit at Muhimbili National Hospital (MNH) was mandated. MNH serves as the national referral hospital with two campuses, namely MNH-Upanga and MNH-Mloganzila. Through the integration of several specialties within MNH, the center facilitates the seamless coordination of care for cancer patients, eliminating the necessity for multiple referrals across separate healthcare institutions.

The multidisciplinary nature of the adult oncology unit at MNH enables comprehensive treatment planning through inter-departmental consultations. Collaborative efforts among departments, including pathology, surgical oncology, and medical oncology, ensure personalized treatment plans tailored to meet the specific needs of each patient. Multidisciplinary team discussions have become central to the decision-making process, resulting in improved quality of care and therapeutic outcomes.

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

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 the smooth workflow and functioning of the unit once it was opened. This evaluation aimed to appraise various aspects of the hospital's infrastructure and resources in order to effectively accommodate the new oncology unit.

One crucial aspect of the facility assessment was the evaluation of available human resources. This involved identifying healthcare professionals with expertise in oncology care 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 cancer patients. Acknowledging the availability of skilled healthcare professionals is essential to ensure the delivery of high-quality care within the unit.

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

Another critical consideration was the availability of equipment for chemotherapy preparation and administration. The assessment aimed to determine the necessary equipment and ensure its availability within the unit. This included evaluating the capacity for chemotherapy compounding, storage, and safe administration. Having adequate equipment is crucial for the safe and efficient delivery of chemotherapy treatments to patients.

Furthermore, the facility assessment addressed the availability of cytotoxic chemotherapy drugs. It sought to guarantee a consistent supply of these essential medications to meet the treatment requirements of cancer patients. 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.

The facility assessment also involved estimating the patient population that the unit could safely accommodate. This assessment considered factors such as the existing patient load, capacity constraints, and the 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.

Throughout the facility evaluation process, collaboration among various stakeholders was paramount. This included engagement with hospital administrators, medical professionals, and support staff from different departments, and cancer patient representatives. By involving all relevant parties, the evaluation aimed to ensure a comprehensive understanding

of the hospital's capacity and to address any potential challenges or gaps in resources.

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

Implementation

Following the facility evaluation and acquisition of necessary approvals, MNH made significant progress in establishing and operating the adult oncology unit. The internal medicine department was designated to house the unit. The hospital administration officially announced the unit's launching, communicating the changes to hospital staff, all departments, and stakeholders. The communication was aimed at facilitating patient transfers to the oncology unit from other departments and thus ensuring seamless care transitions.

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

The implementation process required close collaboration among various departments, including pathology, surgery, gynecology, ear, nose, and throat (ENT), and oncology. Collaborative efforts and inter-departmental consultations, including tumour board discussions and decisions, became integral to the decision-making process. This approach not only reduced the referral burden to the 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, operating with limited resources when delivering comprehensive cancer care. The administration of chemotherapy took place in a small room that could accommodate only four patients per day, leading to delays and restricting access to treatment. However, MNH recognized the urgent need for expanded services and embarked on a collaborative initiative between the internal medicine and surgical departments to find a dedicated ward.

This collaborative effort resulted in the conversion of Ward 10 into a dedicated space for chemotherapy administration, significantly boosting the unit's capacity 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 cancer patients, spanning various cancer types as depicted in Figure 1.

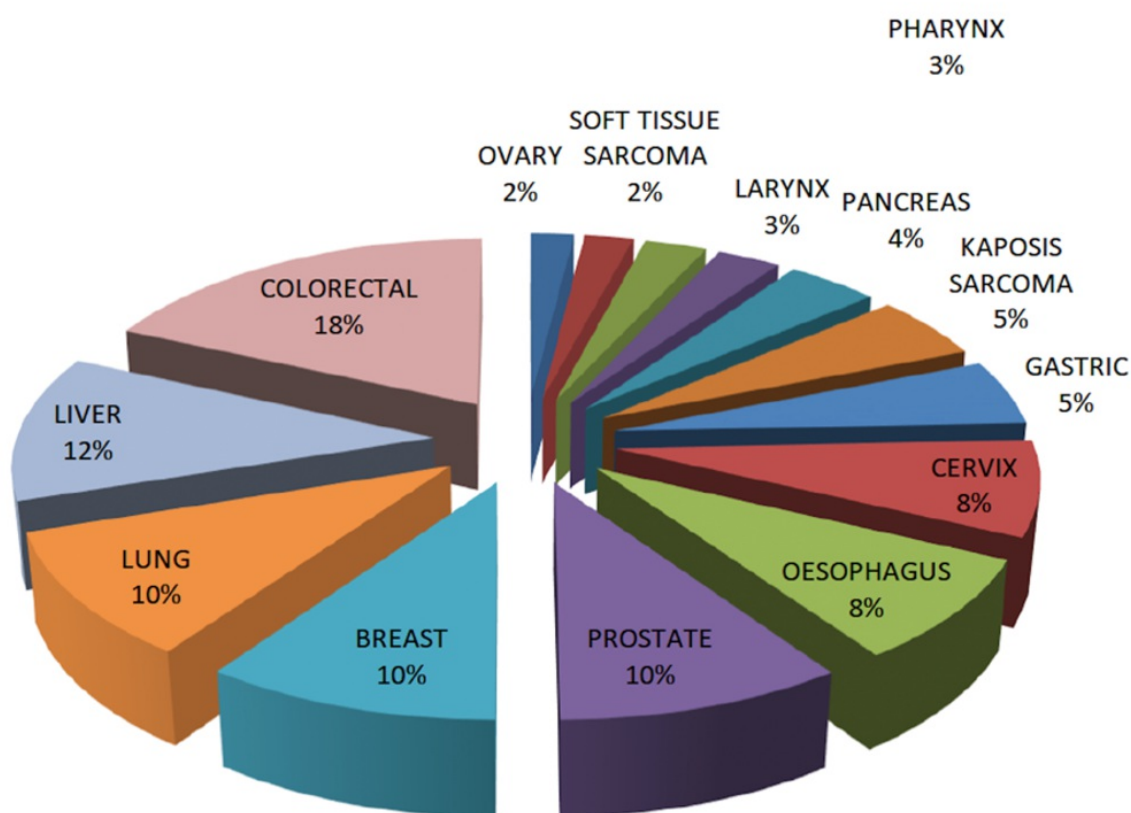


Figure 1. Cancer incidence 2019 to 2021 as per Muhimbili National Hospital cancer registry.

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

Over time, the adult oncology unit at MNH has made significant progress in strengthening its human resources to meet the increasing demands of cancer care. Initially staffed with only three nurses, one clinical oncologist, and two medical oncologists, the unit has since 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 the unit to deliver more personalized and comprehensive care to a growing patient population. The team conducts outpatient clinics from Monday to Saturday, alternating between a group of four specialists in the clinics and four tending to inpatients.

The hospital also recognized the necessity for expansion and has expanded Oncology services at the MNH Mloganzila campus. The campus offers both inpatient and outpatient services and currently has two dedicated clinical oncologists in place offering chemotherapy, with plans to open a radiotherapy centre.

Acknowledging the importance of continuous professional development, MNH has implemented ongoing training programs for the 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 aim to enhance the skills and knowledge of the oncology team, ensuring they remain up to date with the latest advancements in cancer care. By regularly updating their expertise, the staff at MNH can provide patients with state-of-the-art treatments and deliver the highest standard of care.

Furthermore, through employing the train-the-trainer approach, the unit successfully expanded its nursing staff to include 11 dedicated oncology nurses and 5 attendants.

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

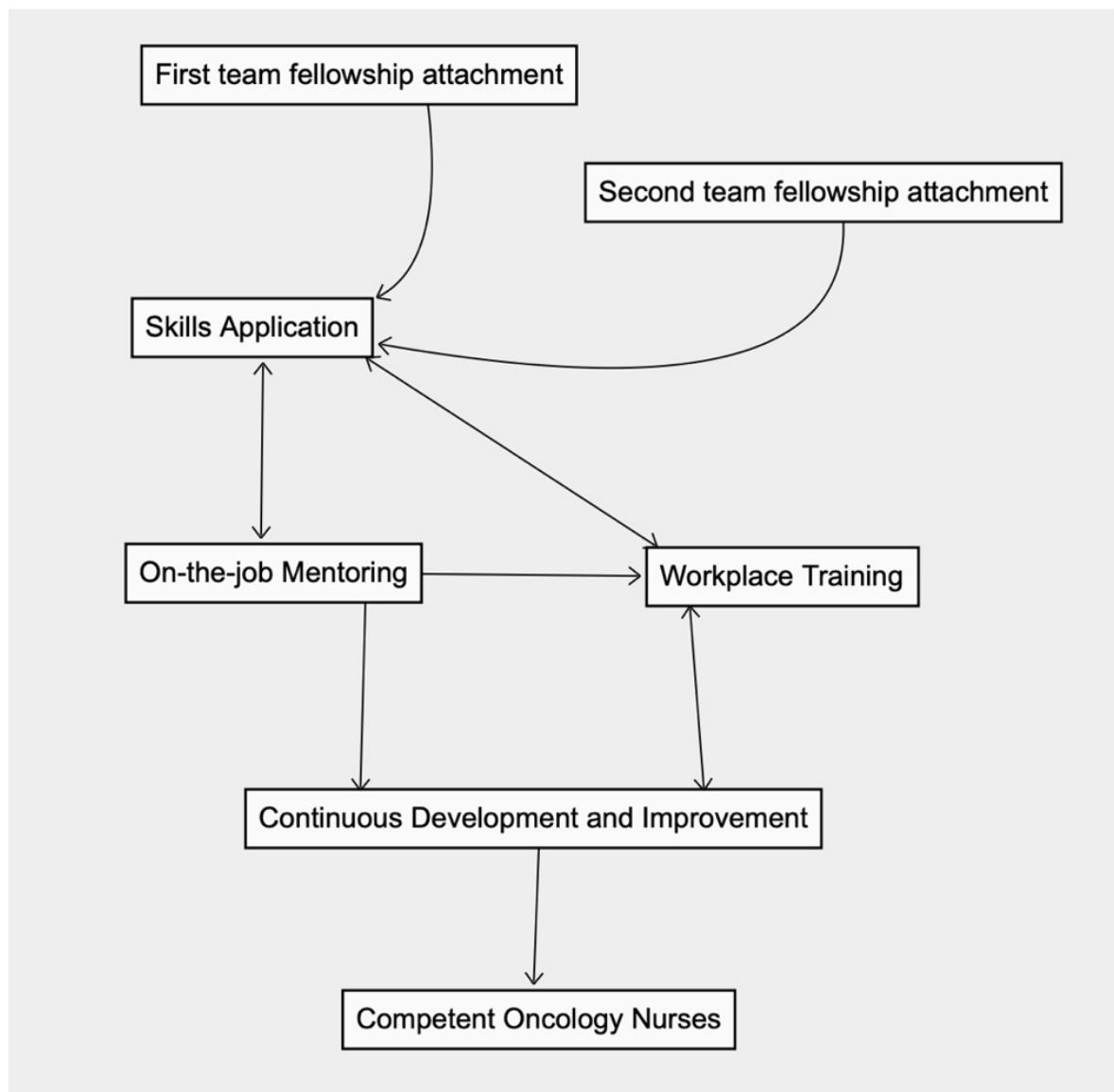


Figure 2. Hands-on model for training oncology nursing staff at Muhimbili National Hospital.

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 for a fellowship in adult oncology care with partner institutions in India. This specialized training allowed them to acquire the necessary skills and knowledge required for adult oncology care.
2. **Skills Application:** Upon completing their fellowship, the nurses joined the adult oncology unit. They began working closely with oncologists, including in administering chemotherapy treatments. Additionally, one attendant from the pediatric oncology unit also 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 were sponsored for 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 from abroad traveling to 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, equipping them to effectively train and mentor their colleagues at MNH. This collaborative approach significantly reduces the need to send staff abroad for training, streamlining the development of specialized skills locally.

2. Second phase

1. **Workplace Training:** The next phase involved the 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 theoretical and practical aspects of oncology care.
2. **Continuous Development and Improvement:** The train-the-trainer model has promoted continuous development and improvement within the nursing team. Ongoing collaboration with partner institutions and the mentorship provided by experienced nurses contribute to the overall growth of the team.

This approach ensures that all nurses in the unit are well-trained and prepared for their roles, and it also fosters a culture of knowledge exchange and continuous improvement. As a result, the unit is better equipped to provide high-quality care and achieve operational excellence. Additionally, the training has enabled them to provide compassionate and tailored support to cancer patients throughout their treatment journey. Their inclusion is pivotal in providing comprehensive care and addressing the diverse physical and emotional needs of 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 towards ensuring the sustainability and future of oncology nursing. The university has initiated an oncology nursing masters 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 the provision of support to cancer patients.

In addition to the medical and nursing staff, the oncology unit includes two dedicated registrars and two interns who rotate

within the unit. 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 continuity of care.

To optimize medication management, MNH sponsored one pharmacist for a fellowship in India. And currently, the unit has two full-time pharmacists and rotating pharmacy interns. The pharmacist plays a vital role in ensuring the safe and effective provision of chemotherapy drugs and other medications prescribed to the patients. They closely collaborate with the oncology team to ensure accurate medication dosing, minimize potential drug interactions, and provide valuable pharmaceutical guidance. The pharmacy interns contribute to the unit's smooth functioning by assisting with 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 MNH's commitment to providing the best possible outcomes for individuals battling cancer in Tanzania.

Benefits to Patients

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

1. Expansion of a 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 reduce waiting times 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 MNH facilitates a seamless cancer care continuum for patients. From initial screening to diagnosis and treatment, individuals can navigate through these stages within one center. This integrated approach streamlines the patient journey, ensuring efficient coordination and continuity of care.

5. Multidisciplinary treatment planning:

The presence of the adult oncology unit enables multidisciplinary team discussions for treatment planning. Collaborations among various departments, including pathology, surgical oncology, and medical oncology, allow for comprehensive evaluation and personalized treatment plans tailored to each patient's specific needs. This multidisciplinary approach enhances 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 healthcare professionals to track treatment response, adjust interventions when needed, and make informed decisions regarding ongoing care.

Benefits to the Institution

The establishment of the adult oncology unit at MNH has brought several advantages to the institution itself. These benefits include:

1. Collaboration with other centers:

The establishment of the adult oncology unit has fostered collaboration with other centers involved in oncology treatment, for sponsored fellowships, and in 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. Expansion of research and publications:

The adult oncology unit has contributed to the expansion of institutional research and publications in the field of cancer. Through ongoing research endeavors, the unit generates evidence-based data that can be utilized to improve cancer policies, protocols, and treatment approaches. This research output not only enhances the institution's academic standing but also contributes to advancements in cancer care nationally and internationally.

3. Revenue generation:

The establishment of the adult oncology unit has 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 in improving infrastructure, acquiring advanced technologies, and expanding services. This financial stability strengthens the institution's ability to provide high-quality care and meet the growing demands of cancer treatment.

4. Alignment with institutional and government objectives:

The implementation of the adult oncology unit aligns with the hospital's 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 the Ministry of Health demonstrate 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 in healthcare provision.

Limitations and Areas for Opportunity

The establishment of the adult oncology unit at MNH brought numerous benefits to patients and the institution. However, it has 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, posed a limitation. To address this, plans were made to open bunkers at the Mloganzila campus.

Space limitations and infrastructure expansion posed a challenge, given constraints on further development, but the planned opening of bunkers at the Mloganzila compound offers a clear opportunity to enhance infrastructure and expand capacity for advanced cancer treatments.

2. Medication availability and procurement procedures:

Medication availability, particularly for chemotherapy drugs, presented difficulties in ensuring a consistent supply. MNH implemented procurement procedures to address this issue and meet patient needs. This presents an opportunity to further optimize the medication procurement process and ensure uninterrupted access to essential cancer medications.

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 both at MNH Upanga and Mloganzila.

4. Private chemotherapy administration wards:

The increasing demand for private chemotherapy administration wards is a notable limitation, but there are plans to establish these private wards at the Mloganzila campus. Cancer stigma and community awareness:

Cancer stigma within the community remains a challenge, affecting treatment-seeking behavior. However, the presence of the adult oncology unit at 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 promote early detection and treatment.

5. Research Challenges and Opportunities:

One noteworthy challenge facing the unit is the absence of a dedicated research team, limiting the 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 with local and international research partners will certainly enrich research efforts and potentially contribute to breakthroughs in cancer treatment.

6. 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 also provide valuable data for future research and improving 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 cancer patients at MNH.

Conclusion

The successful implementation of an oncology unit relies on the active involvement of all stakeholders and a commitment to adaptability and openness to change. The journey of establishing the adult oncology unit at MNH-Upanga demonstrates the importance of these factors in achieving improved cancer care outcomes for patients in Tanzania.

From the initial robust facility evaluation to the expansion of staff and infrastructure, MNH exemplified dedication and flexibility throughout the implementation process. The collaboration among different departments, the adherence to international standards of care, and the integration of multidisciplinary approaches allowed for the delivery of personalized and comprehensive cancer care to a larger patient population.

The establishment of the adult oncology unit not only addressed the increasing demand for cancer services, but also provided alternative specialized treatment options, alleviating the burden on ORCI and improving the overall quality of care. The unit's commitment to ongoing training programs, collaboration with other centers, and the generation of evidence-based data further enhanced its capabilities and contributed to the advancement of cancer policies and protocols.

While limitations and challenges were encountered along the way, MNH-Upanga embraced these as opportunities for growth and improvement. The team's dedication, responsiveness, and commitment to continuous improvement have set a strong foundation for the future of cancer care in Tanzania.

Moving forward, sustaining the momentum and building upon the achievements of the adult oncology unit will require continued collaboration, ongoing training, and capacity building, conducting community engagement to address cancer stigma. Also, establishing a dedicated in-house research team to drive cancer-related research initiatives and clinical trials.

By maintaining a culture of flexibility, responsiveness, and a willingness to adapt to emerging needs, MNH-Upanga can ensure that its oncology services continue to evolve and meet the changing demands of cancer care, and these efforts will enable the institution to contribute to the advancement of cancer treatment and care while expanding its academic and research footprint.

The successful implementation of the adult oncology unit at MNH-Upanga stands as a testament to the commitment and collective effort of all stakeholders involved. Through their dedication, Tanzania has made significant strides in improving cancer care services and providing hope and support to individuals and families affected by this devastating disease.

Statements and Declarations

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