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Global Health and Cancer

Views from Multidisciplinary Oncology Clinicians on Strengthening Cancer Care Delivery Systems in Tanzania

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Abstract

Background. In response to the increasing burden of cancer in Tanzania, the Ministry of Health, Community Development, Gender, Elderly and Children launched National Cancer Treatment Guidelines (TNCTG) in February 2020. The guidelines aimed to improve and standardize oncology care in the country. At Ocean Road Cancer Institute (ORCI), we developed a theory-informed implementation strategy to promote guideline-concordant care. As part of the situation analysis for implementation strategy development, we conducted focus group discussions to evaluate clinical systems and contextual factors that influence guideline-based practice prior to the launch of the TNCTG.

Materials and Methods. In June 2019, three focus group discussions were conducted with a total of 21 oncology clinicians at ORCI, stratified by profession. A discussion guide was used to stimulate dialogue about facilitators and barriers to delivery of guideline-concordant care. Discussions were audio recorded, transcribed, translated, and analyzed using thematic framework analysis.

Results. Participants identified factors both within the inner context of ORCI clinical systems and outside of ORCI. Themes within the clinical systems included capacity and infrastructure, information technology, communication, efficiency, and quality of services provided. Contextual factors external to ORCI included interinstitutional coordination, oncology capacity in peripheral hospitals, public awareness and beliefs, and financial barriers. Participants provided pragmatic suggestions for strengthening cancer care delivery in Tanzania.

Conclusion. Our results highlight several barriers and facilitators within and outside of the clinical systems at ORCI that may affect uptake of the TNCTG. Our findings were used to inform a broader guideline implementation strategy, in an effort to improve uptake of the TNCTGs at ORCI.

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Implications for Practice: This study provides an assessment of cancer care delivery systems in a low resource setting from the unique perspectives of local multidisciplinary oncology clinicians. Situational analysis of contextual factors that are likely to influence guideline implementation outcomes is the first step of developing an implementation strategy for cancer treatment guidelines. Many of the barriers identified in this study represent actionable targets that will inform the next phases of our implementation strategy for guideline-concordant cancer care in Tanzania and comparable settings.

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Introduction

Low- and middle-income countries (LMICs) face a disproportionate burden of global cancer deaths [1]. Substantial disparities in cancer survival rates are closely correlated with country income for many cancers [2]. Outcome gaps are attributable to inequalities in access to early detection and standard cancer treatment, translating into millions of avoidable cancer-related deaths in LMICs each year. There is an urgent need to strengthen cancer care delivery systems in LMICs.

Effective implementation of evidence-based clinical practices is a critical component of efforts to strengthen care delivery systems and improve cancer survival rates. In recent years, several international organizations have developed resource-stratified cancer treatment guidelines for use in LMICs [3–6]. In harmony with these international efforts, Tanzania's Ministry of Health, Community, Development, Gender, Elderly, and Children (MoHCDGEC) published new Tanzanian National Cancer Treatment Guidelines (TNCTG) in 2020. TNCTG development was coordinated by the national cancer referral hospital, Ocean Road Cancer Institute (ORCI). Technical working groups composed of multisector stakeholders drafted the guidelines, referencing existing institutional and international guidelines and tailoring for the context and available resources in Tanzania [7]. Input was solicited from external collaborators, and the working groups convened iteratively to finalize the guidelines.

The burden of cancer in Tanzania is significant, with approximately 40,464 new cases and more than 26,945 deaths per year [8]. The need for improved cancer care delivery in Tanzania is substantiated by available data from the national cancer referral hospital, ORCI, which demonstrate treatment quality indicators and patient outcomes below international standards despite the availability of multiple treatment modalities, including chemotherapy and radiotherapy [9–11]. The TNCTG launch presented an impetus to galvanize efforts toward improving the quality of care delivery at ORCI. To achieve this objective, we developed an implementation strategy to promote guideline-based practice and strengthen clinical systems at ORCI [12].

The first step of developing an implementation strategy for cancer treatment guidelines is to conduct a situational analysis to assess cancer care delivery systems and to identify barriers and facilitators for guideline-based practice [13]. Qualitative data collection from key informants is a critical component of situational analysis. We conducted a qualitative study in June 2019 aiming to (a) evaluate clinical systems for cancer care and contextual factors that influence guideline-based practice at ORCI from the perspective of multidisciplinary oncology clinicians and (b) collect specific suggestions for solutions that could directly inform a multifaceted guideline implementation strategy.

Materials and Methods

Setting

Located in Dar es Salaam, ORCI is the largest national cancer referral center for adult oncology patients in Tanzania. ORCI's mission is to provide equitable, accessible, affordable, and high-quality early detection and cancer care services to the public [14]. ORCI provides care to approximately 4,675 new patients with cancer per year. The inpatient oncology unit has 270 beds, and between 200 and 250 outpatients are seen per day. The vast majority (~90%) of patients have advanced disease at time of referral. Available evaluations include laboratory services, x-ray, ultrasound, computed tomography (CT), bone scan, and fine needle aspiration biopsies with cytology. Treatment services include radiotherapy, chemotherapy, nuclear medicine, HIV care and treatment, and palliative care. Other services such as histopathology, magnetic resonance imaging, and surgical care are provided at the national referral hospital, Muhimbili National Hospital (MNH), or at private hospitals. Although insurance coverage in Tanzania is low, the national government and philanthropic partners sponsor diagnostic evaluations and radiotherapy at ORCI and subsidize chemotherapy costs for patients. Cancer services offered at other sites in Tanzania are subject to fee-for-service payment models.

Study Design and Participants

A qualitative study of oncology clinicians' evaluation of ORCI care delivery systems was conducted in June 2019 as part of a needs assessment for the development of a TNCTG implementation strategy [12]. Focus group discussions were selected to facilitate interactive exchange of experiences and opinions and to generate new considerations and ideas. A discussion guide was designed to generate dialogue about systems-level barriers and facilitators to high-quality guideline-concordant treatment at ORCI and suggestions for improvement. Questions explored major domains of the care delivery system. The guide was available in English and Swahili and pretested by the study team.

Because the planned guideline implementation strategy would target clinician behavior change (i.e., adoption of guideline-based practice), it was considered particularly important to understand clinicians' views on the contextual factors relevant to this behavior as well as systems-level improvements they believed would promote guideline-concordant care. The focus groups constituted an opportunity to learn from oncology clinicians' perspectives on day-to-day care delivery operations and provide a platform for their insights and recommendations. Purposive sampling was used to recruit clinical oncologists, nuclear medicine specialists, radiologists, final-year oncology residents, radiotherapists, and oncology nurses to participate [15]. Focus groups were stratified by profession to maximize participants' comfort and open expression and were facilitated by two trained moderators, an experienced oncology nurse (M.S.) and an academic leader at Muhimbili University of Health and Allied Sciences (MUHAS) with expertise in qualitative research (E.T.).

This study was approved by the institutional review boards at MUHAS and UCSF, as well as by the Tanzanian National Health Research Ethics Committee and the ORCI Academic and Research Unit.

Data Collection and Analysis

In June 2019, a total of 21 oncology clinicians participated in three separate focus group discussions at ORCI. The first group included "specialists" consisting of five clinical oncologists, a radiologist, and a nuclear medicine specialist ($n = 7$). The second group included four senior oncology residents and two radiotherapists ($n = 6$). The third group included oncology nurses ($n = 8$). A majority (67%) of participants were female. The average years of practice at ORCI were 6.1 years among specialists, 3 years among residents, 7.5 years among radiotherapists, and 10.6 years among nurses.

The mean duration of the focus group discussions was 89 minutes (range, 72–109 minutes). The discussions were audio recorded, transcribed verbatim, and translated from Swahili to English by a professional translator. Transcripts were deidentified to protect confidentiality. Textual data were independently coded and analyzed by three members of our multidisciplinary research team using the framework method of thematic analysis [16]. The coding system and analytic framework were based on both a priori concepts taken from the discussion guide and key themes that emerged during an initial open coding process. We used an overarching framework of inner context versus outer context to categorize themes [17]. Findings and interpretations were iteratively compared among researchers. To validate the analysis, findings were presented and discussed with study participants and collaborators at ORCI [18].

Results

Participants identified targets for strengthening cancer care delivery systems in both the inner context of clinical systems within ORCI and the outer context of factors external to ORCI. Within each context, barriers and facilitators of high-quality guideline-concordant cancer care were discussed (Tables 1, 2) and strategies for improvement were recommended (Table 3). These categories were generally fluid; discussion of barriers and facilitators frequently led directly to suggested solutions, and recommended improvements revealed barriers and facilitators. Contextual factors and recommendations were categorized into emergent themes.

Inner Context: Clinical Systems within ORCI

Participants evaluated several aspects of clinical systems for cancer care delivery at ORCI, describing both recent improvements and ongoing challenges and suggesting solutions. These aspects were grouped according to five themes: (a) capacity and infrastructure, (b) information technology, (c) communication, (d) efficiency of services provided, and (e) quality of services provided.

Capacity and Infrastructure

In recent years, linear accelerator radiation machines and CT simulation became available at ORCI, on-site fine needle aspiration and cytology services were expanded, and chemotherapy availability in the public supply chain became more consistent. Although participants applauded these improvements, they also highlighted several limitations that pose ongoing challenges. All groups emphasized the particular barriers posed by the lack of on-site surgery, blood bank, radiology, pathology, and medical specialties to manage comorbidities and complications. The need to refer patients to other institutions for these services, where patients are obliged to cover out-of-pocket costs, results in significant treatment disruption and delays. All groups strongly advocated for bringing these services to ORCI, "ensuring that all the services are available under one roof." (registered nurse [RNs]; 82) Some participants reported that plans are underway to build an operating theater and blood bank at ORCI. More aspirational resource availability, such as autologous stem cell transplant or intensive care, was occasionally raised.

Information Technology

All groups articulated that advances in information technology have yielded both improvements and challenges, with a particular emphasis on the recent introduction of an electronic medical record (EMR). Participants described benefits of the EMR, such as instant access to patient information and the ability for clinicians in different locations to access a patient file simultaneously. However, they also noted its shortcomings, ranging from lack of integration with laboratory and imaging results to suboptimal documentation by physicians. They expressed frustration with technological barriers, including inadequate server space for record and imaging archives, too few computers, and poor internet connectivity. Because of these barriers, paper charts are still being used concomitantly, requiring clinicians to access both systems for complete data and creating duplicate work and inefficiencies. Despite these challenges, there was wide support for transitioning completely to an EMR. As one nurse stated, "We must agree that we need to move forward, not backward." (RNs; 145) Participants offered practical suggestions such as contracting with a second internet service provider and providing tablets for nurses to access EMR data.

Communication

All groups highlighted the importance of good communication among members of the care team to facilitate patient care. Many participants referenced the culture of interdisciplinary teamwork that already exists at ORCI as an attribute. They identified existing weekly conferences as an opportunity for oncology clinicians to discuss complicated cases, suggesting that adding radiology review could enhance the discussions among different specialists. Participants also identified opportunities for further improvements in communication across departments, such as between the radiotherapy unit and clinics that prescribe concurrent chemotherapy, or between the screening and medical directorates.

Efficiency of Service Provided

Participants noted that several clinical systems at ORCI have become more efficient in recent years. The turnaround time for laboratory results, time to chemotherapy initiation, and waiting times for radiotherapy have all decreased. Reorganization of patients and clinicians into disease-based firms

Table 1. Inner context: barriers and facilitators to cancer care delivery within ORCI

Theme	Barriers	Facilitators
Capacity and infrastructure	Overburdened system due to demand outpacing supply leading to treatment delays Lack of on-site surgery, blood bank, full-service radiology and pathology, and other medical specialty consultation services at ORCI Inadequate space on cancer wards and lack of housing for patients undergoing outpatient treatment	Installation of linear accelerator radiation machines and CT simulation On-site fine needle aspiration and cytology services Improved consistency of chemotherapy availability in public supply chain Expansion of trained oncology workforce
Information technology	Lack of integration between laboratory, imaging, and EMR software systems Inadequate server space for record and imaging archival Inadequate computers and internet connectivity Persistent need to access both paper charts and EMR for clinical care	Instant access to patient information afforded by EMR Simultaneous access to patient records for clinicians in different physical locations afforded by EMR
Communication	Communication gap between different departments Patient belief systems leading to nonadherence	Culture of interdisciplinary teamwork Weekly case conferences for complex cases High-quality patient counseling
Efficiency	Long patient waiting times for clinic appointments Suboptimal triage among patients who are waiting to be seen by physicians Delays due to intermediate steps for routine laboratory and imaging evaluations	Reductions in turnaround time for laboratory results Improvements in time to chemotherapy and radiotherapy initiation Reorganization of patients and clinicians into disease-based firms
Quality	Nonstandardized clinical management across clinicians Outpatient clinic system that prioritizes quantity of patients seen over quality of care provided	Standardized clinical guidelines

Abbreviations: CT, computed tomography; EMR, electronic medical record; ORCI, Ocean Road Cancer Institute.

has resulted in workflow improvements. However, participants also identified remaining inefficiencies and challenges to be addressed in the future. For example, all three groups suggested modifying the appointment system to reduce wait times for patients and optimize triage in the setting of high patient volumes. They also advocated for shortening the timeline from a clinic visit to eventual treatment by condensing the intermediate steps (e.g., laboratory and imaging evaluations and results review). Inpatient nurses advocated for grouping patients in shared wards by disease-based firm so that patients with similar nursing care needs and the same clinician team are geographically together, to promote patient comfort and maximize the efficiency of nursing care and ward rounds. Many commented that inefficiencies patients experience at ORCI are minor compared with the delays that many patients experience prior to arrival at ORCI.

Quality of Service Provided

While valuing efficiency, participants also suggested strategies for promoting quality. Oncologists and residents discussed the need to standardize treatment practices at ORCI, highlighting hypothetical examples in which the proper treatment protocol is unknown or varies from provider to provider, and called specifically for clinical guidelines. Oncologists expressed concern that the current outpatient system, which requires clinicians to continue seeing patients each day until all in the queue are seen, prioritizes quantity over quality. They attributed clinician burnout to this workflow, citing high patient volumes and a high ratio of patients to clinicians as contributing factors. They suggested reforms that would allocate a finite number of patients to each specialist each day, allowing time for other responsibilities such as seeing high acuity cases in the inpatient wards. The need for oncology subspecialty training was also mentioned. For example, a nurse explained "We just work based on experience. If you are a new nurse at Ocean Road, you will learn from experienced nurses." (RNs; 293)

Outer Context: Factors External to ORCI

Participants discussed several contextual factors external to ORCI that also influence cancer care delivery, which were categorized into four themes: (a) interinstitutional coordination; (b) oncology capacity in peripheral hospitals; (c) public awareness and beliefs; and (d) financial barriers.

Interinstitutional Coordination of Care

A dominant theme reported in all groups was the need to improve communication and coordination of patient care between clinicians at ORCI and referring clinicians at other nearby centers, as many patients undergo cancer surgeries at MNH and other hospitals throughout the country prior to referral to ORCI for radiotherapy or systemic therapy. Participants explained that patients often arrive to ORCI with incomplete clinical information in referral documents, missing key elements such as preoperative clinical TNM stage, operative reports, and complete pathology details. The residents proposed the development of a comprehensive referral form for oncology patients that could be shared by institutions, although indicated that previous efforts to create such a form were not successfully implemented. The oncologists similarly pointed out that efforts have previously

Table 2. Outer context: barriers and facilitators to cancer care delivery outside ORCI

Theme	Barriers	Facilitators
Interinstitutional coordination	Incomplete clinical information from referring institutions (e.g., preoperative clinical staging, operative reports, tumor board discussion) Current function of tumor boards as administrative referral process	Comprehensive referral form for oncology patients Opportunity for clinical decision-making at weekly multidisciplinary tumor boards
Oncology capacity in peripheral hospitals	Delayed diagnosis due to lack of knowledge among primary care providers Mismanagement of patients with cancer in peripheral health care facilities	Education of providers in peripheral health care facilities
Public awareness and beliefs	Delayed presentation due to lack of public awareness about signs and symptoms of cancer Negative perceptions and beliefs about cancer treatment in local communities Preferences for alternative medicine	Outreach programs to raise awareness about cancer, screening, and treatment availability High-quality patient counseling to encourage trust and dispel myths
Financial barriers	Out-of-pocket costs of services outside of ORCI (e.g., surgery, pathology, imaging) Out-of-pocket costs of chemotherapy at ORCI Need to process exemptions if patients are unable to pay out-of-pocket costs	Community cost-sharing schemes and health insurance programs

Abbreviation: ORCI, Ocean Road Cancer Institute.

been made to improve communication between institutions but have not yielded noticeable improvements.

Participants reported that currently, patients who are referred from MNH to ORCI for treatment are presented at weekly tumor board conferences held at MNH for all cancer types. All groups identified tumor boards as an opportunity for coordinating interinstitutional multidisciplinary management of patients with cancer. However, physicians indicated that tumor boards often serves as an administrative formality for the purpose of transferring patients rather than a forum for clinical discussion and decision-making. One resident physician suggested that, "Before any treatment, we should start with a discussion to check if the patient needs neoadjuvant chemotherapy before surgery" (resident doctor (RES); 126). They advocated for several improvements to tumor boards: to organize disease-specific tumor boards, rather than combining all patients into one weekly meeting; to focus on complex cases, rather than patients with advanced disease who are not candidates for treatment; to improve documentation of tumor board discussions and decisions for subsequent patient care; and to collect data for registry and improvement purposes. Finally, participants recommended that a mechanism should be developed to review cases from other referring hospitals at tumor boards to establish management plans collectively recommended by multidisciplinary specialists and to serve as an education platform for health care providers at all centers in Tanzania that provide cancer care.

Oncology Capacity in Peripheral Hospitals

All groups cited mismanagement of patients with cancer in primary health care facilities as an important barrier to timely cancer diagnosis. Participants provided examples of a patient with cervical cancer being treated with "high and lengthy doses of antibiotics" for pelvic inflammatory disease, a patient with lung cancer being empirically treated for tuberculosis for months, and a patient who was ultimately diagnosed with advanced esophageal cancer being treated for peptic ulcers for years. They advocated for education of clinicians in primary health centers, district hospitals, and regional hospitals about the importance of early detection of cancer and prompt referral to institutions equipped for cancer care. They also advocated for capacity building at zonal referral hospitals in Tanzania to decentralize cancer treatment services, reduce the travel burden for patients, and decongest the national referral hospitals, thereby reducing treatment delays and abandonment.

Public Awareness and Beliefs

All groups reported that negative perceptions and beliefs about cancer treatment prevail in local communities, contributing to treatment delays or abandonment. They cited patient preferences for alternative medicine, commonly held beliefs that "radiation kills," (RNs; 163) and misgivings that ensue after an initial experience of treatment toxicity or failure of a first-line regimen as barriers to treatment adherence. However, they emphasized that high-quality counseling can dispel negative beliefs and lead to patients accepting standard oncologic therapies. Participants also advocated for raising public awareness about cancer and the importance of early presentation to the hospital when new symptoms develop, especially in rural areas. They noted that public education about cancer treatment is needed to dispel myths related to chemotherapy and radiation therapy. The oncologists described an outreach program that was conducted to train general doctors in district hospitals and health centers in cancer screening and early detection and to raise public awareness about screening availability for breast, cervical, and prostate cancer and skin cancer for people with albinism. They advocated for the importance of these outreach programs and cancer screening and early detection services at other sites.

Table 3. Recommended improvements to cancer care delivery within and outside ORCI from the perspective of oncology providers

Inner Context Within ORCI
Establish on-site blood bank, surgery, radiology, pathology, medical specialties
Increase internet connectivity, server capacity, and computer availability for EMR
Improve quality of clinical documentation; explain overall treatment plan, rationales for decisions
Expand case-based discussions (internal tumor boards) at ORCI
Modify patient appointment and triage system in outpatient clinic
Condense timeline from initial visit to evaluations to treatment initiation
Group patients with similar diseases and nursing care needs in the same ward
Construct a hostel for patients who need shelter but do not require inpatient medical care
Outer Context External to ORCI
Implement a comprehensive form for referrals of oncology patients from other institutions
Enhance effectiveness of multidisciplinary tumor boards: convert from administrative to clinical discussion; organize disease-specific tumor boards; serve as an education platform; collect tumor board data for registry and quality improvement purposes
Establish cancer support groups in the community to provide a platform for survivors to share experiences and dispel myths Educate clinicians in peripheral hospitals about early detection and prompt referral
Raise public awareness about cancer and the importance of early diagnosis
Expand health insurance coverage and payment exemption programs; consider instituting cost-sharing models at ORCI Build oncology capacity at all regional hospitals to decentralize cancer care
Introduce formal training in additional oncology specialties such as surgical oncology, gynecological oncology, psycho-oncology, oncology nursing, and oncology nutrition

Abbreviations: EMR, electronic medical record; ORCI, Ocean Road Cancer Institute.

Financial Barriers

Health insurance coverage is low in Tanzania. Although most cancer care at ORCI is provided free of charge, patients are required to purchase chemotherapy drugs. Patients are also required to pay for procedures and imaging that are not available at ORCI. If patients cannot afford to pay, they may request exemptions, which can cause significant delays. Physicians reported that these realities often affect clinical decision-making and can result in deviations from guideline-concordant care. For example, they may choose a substandard treatment option that is more affordable or determine treatment response using subjective assessments because a patient is unable to afford imaging. Participants advocated for patient enrollment in health services payment schemes such as district-level community cost-sharing programs or health insurance offered by government and private institutions.

Participants also commented on the unintended consequences of the government's well-intentioned policy to provide heavily subsidized chemotherapy and free radiotherapy for all cancer patients at ORCI. As the only center in the country that provides free radiotherapy, ORCI is overcrowded with patients coming from all regions of Tanzania, including patients who reside closer to other cancer treatment facilities. Because diagnostic procedures and surgeries are fee-for-service, many patients experience delays while trying to pay for these services, and by the time they make it to ORCI their disease is advanced, rendering guidelines for life-saving care irrelevant. For these reasons, some participants advocated for revised cost-sharing scales at ORCI, in addition to broader coverage by health insurance plans.

All groups also discussed transportation to and from ORCI and the need for food and shelter among many patients who come from distant locations as barriers. As a result, patients are often admitted to ORCI for weeks or months during their treatment, even if they have no inpatient medical needs. Participants advocated for building a hostel for these patients so that the wards are reserved for patients with critical medical needs, and one participant reported plans for acquiring a nearby building to use as a hostel are underway.

Discussion

Prior to the implementation of cancer treatment guidelines, situational analyses should be conducted to assess the contextual factors that are likely to influence guideline implementation outcomes [13]. Qualitative data collection from key informants is a critical component of situational analysis. This study provides an assessment of cancer care delivery systems in Tanzania from the unique perspectives of multidisciplinary oncology clinicians in the country's national referral center for cancer treatment. Barriers and facilitators of high-quality cancer care were identified in both the inner context of clinical systems within ORCI and the outer context of external factors, and several pragmatic solutions to strengthen cancer care delivery in Tanzania were recommended by participants.

Situational analysis is a baseline assessment of services across the cancer care continuum as well as the broader structural, sociocultural, personal, and financial contexts within which they operate [13]. In Tanzania, previous and ongoing research contributes to a greater understanding of several important aspects of the context for cancer care in the country. For example, the Breast Health Global Initiative in partnership with MoHCDGEC performed an assessment of breast health care capacity in Tanzania and relevant strengths and weaknesses of the health care system [19]. The "Time to A.C.T." study assessed barriers and facilitators of optimal breast cancer control in Mwanza, Tanzania through surveys and in-depth interviews with stakeholders [20, 21]. Additional studies have assessed barriers and facilitators of cervical cancer screening and treatment completion in Tanzania [22, 23].

To date, these assessments of cancer care systems in Tanzania have largely focused on the earlier stages of the cancer care continuum for particular high prevalence diseases (e.g., prevention, early detection, and diagnosis). This approach is appropriate from a public health perspective

and, accordingly, dominates cancer research across LMICs. Outer context themes that emerged in our study, including oncology capacity in peripheral hospitals, public awareness and beliefs, and financial barriers, corroborate key findings from this body of research. For example, other studies have attributed delays in cervical cancer care for patients in rural areas of Tanzania to the centralization of diagnostic and treatment capacity [23, 24]. Studies have demonstrated that low levels of breast cancer knowledge and fears of treatment are barriers to care seeking [21, 25]. A large cross-sectional survey conducted in Dar es Salaam found that negative perceptions of radiotherapy are highly prevalent [26]. These authors similarly advocate for community education and awareness campaigns.

By contrast, our study also examined the contextual factors within the ''treatment'' stage of the cancer care continuum that influence oncology care delivery in Tanzania. Given the focus of TNCTG on providing evidence-based guidelines for multimodality treatment for all cancer types, assessment of the barriers and facilitators to the provision of high-quality care delivery at the country's leading cancer center is both timely and highly relevant. Our participants provided a frontline perspective on contextual factors related to capacity and infrastructure, information technology, communication, systems efficiency, and quality of care of ORCI, as well as interinstitutional coordination of oncology care, offering recommendations for each domain. This perspective supported our hypothesis that successful guideline implementation will require addressing a variety of both internal and external factors. A qualitative study of staff perspectives at the newly established cancer center at Kilimanjaro Christian Medical Centre in Moshi, Tanzania revealed some common challenges, such as resource and infrastructure limitations, medication shortages, understaffing relative to high volumes of patients, and the need for oncology nursing training [27]. Challenges in technology have also been reported in other studies in sub-Saharan African countries [28].

In implementation science, evaluation (or ''determinant'') frameworks and theories are used to organize the barriers and facilitators identified in a situational analysis as the first step in designing an implementation strategy [13, 20]. In a subsequent project, our team used the Capability, Opportunity, Motivation, (COM-B) and Behavior/Behavior Change Wheel framework to classify the barriers collected in all components of our needs assessment, including this study, and to develop a guideline implementation strategy that would optimally target these barriers. This process is described in detail elsewhere [12]. Most of the barriers identified in this study fell under the COM-B domains of *physical capability* (e.g., lack of updated context-specific clinical practice guidelines to date), *physical opportunity* (e.g., inefficiencies in clinical systems impede timely completion of standard treatment), and *social opportunity* (e.g., inadequate communication and coordination among multidisciplinary team members).

Despite the numerous challenges discussed by study participants, the overarching narrative was one of progress: past, present, and planned. As in many countries in sub-Saharan Africa, major advances in cancer care delivery and system strengthening in Tanzania have been achieved in the last decade. At ORCI, two new linear accelerator radiotherapy machines and a CT simulator have been installed, the public formulary has expanded to include targeted therapies on the World Health Organization Essential Medicines List, the drug supply chain has become increasingly reliable, and the postgraduate clinical oncology training program has produced a growing workforce for clinical care delivery. Recent initiatives at ORCI, such as the introduction of an EMR and organization of patients and clinicians into disease-specific firms, have improved the quality of care.

With improvements in cancer treatment availability in recent years, attention has shifted to the importance of evidence-based care in LMICs and to adapting guidelines for parsimonious utilization of local resources. Although international efforts to provide resource-stratified guidelines have been highly publicized, research to evaluate context-appropriate strategies for dissemination and implementation of these guidelines is nascent. Establishing processes for successful implementation of evidence-based cancer care guidelines in resource-constrained settings is a high priority for the years to come. Many of the barriers identified in this study represent actionable targets that will inform the next phases of our implementation strategy for guideline-concordant cancer care in Tanzania and comparable settings. Our ongoing partnership will focus on behavior change interventions, structural modifications to clinical care systems, and engagement with stakeholders and leaders who have the ability to affect myriad external factors.

This study should be interpreted in light of its limitations. As a qualitative study exploring the views of purposively sampled ORCI clinicians, the findings are not representative of all ORCI stakeholders. Additionally, the perspectives of surgical specialists and others at affiliated institutions, and those of referring health care providers at peripheral hospitals, were not included. Although qualitative studies of particular contexts are limited in generalizability, their strength lies in a deeper understanding of complex systems and interacting factors. It is likely that the barriers, facilitators, and solutions identified in this study, and our methodological approach, may be applicable to other similar LMIC settings.

Conclusion

Our results highlight several barriers and facilitators within and outside of ORCI clinical systems that may affect uptake of TNCTG. The findings from the focus groups were used to inform the next phases of our implementation strategy for guideline-concordant cancer care in Tanzania and comparable settings prior to the launch of TNCTG in February 2020.

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Disclosures

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