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Capacity building for oncology programmes in sub-Saharan Africa: the Rwanda experience

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Despite an estimated 456 000 deaths caused by cancer in sub-Saharan Africa in 2012 and a cancer burden that is predicted to double by 2030, the region accounts for only 0·3% of worldwide medical expenditure for cancer. Challenges to cancer care in sub-Saharan Africa include a shortage of clinicians and training programmes, weak healthcare infrastructure, and inadequate supplies. Since 2011, Rwanda has developed a national cancer programme by designing comprehensive, integrated frameworks of care, building local human resource capacity through partnerships, and delivering equitable, rights-based care. In the 2 years since the inauguration of Rwanda's first cancer centre, more than 2500 patients have been enrolled, including patients from every district in Rwanda. Based on Rwanda's national cancer programme development, we suggest principles that could guide other nations in the development of similar cancer programmes.

Cancer in sub-Saharan Africa

Sub-Saharan Africa accounts for 12% of the world's population, but has 24% of the global burden of disease. The region also has the world's highest mortality rates for both communicable and non-communicable diseases.^{1–3} The region's health indicators are entwined with its socioeconomic realities; in 2010, about 48% of inhabitants lived on US \$1·25 or less per day.⁴ This poverty is accompanied by barriers to the most basic health care, and even greater barriers to specialised services, including cancer care. One important challenge to delivery of health care is a worldwide shortage of 4·3 million health professionals; sub-Saharan Africa is served by only 3% of the global health workforce.^{2,5} On average, sub-Saharan Africa has 25 physicians per 100 000 people, with as few as one physician per 100 000 people in Tanzania—the lowest in the world.¹ Improved salary, educational opportunities, and living conditions draw many African physicians and nurses to work abroad.⁶ With increased globalisation, this so-called brain drain threatens the collapse of already inadequate health systems, especially in parts of Africa with chronic political instability.⁷ The number of doctors in Zimbabwe decreased from 18·8 per 100 000 people in 1970 to six per 100 000 people in 2010. In Sudan, 24% of doctors who graduated between 2000 and 2008 were practicing medicine in the US in 2011.⁸ Despite these challenges, increased resources have been devoted towards health care in Africa over the past 20 years, with progress towards several of the Millennium Development Goals.⁹

645 000 new cases of cancer and 456 000 deaths caused by cancer were estimated to have occurred in sub-Saharan Africa in 2012. These numbers are expected to nearly double by 2030.^{10,11} Despite the disease burden, only 0·3% of the world's medical expenditure for cancer reaches this region.¹² Malignancies, when they are diagnosed, are often identified at advanced stages.¹³

Similar to arguments against the global expansion of HIV treatment in the 1990s, suggestions have been made that cancer care in low-income countries is not feasible, sustainable, or ethical in the face of competing priorities and restricted resources, and that prevention and palliative care are the only options to meet the growing cancer burden in low-income countries.^{14,15} However, action to address cancer and other non-communicable diseases includes several efforts by WHO, which in 2013 created the 25×25 target, calling for a 25% reduction in deaths from non-communicable diseases by 2025.^{16,17} Reductions in the prices of some cytotoxic medicines, steps towards increased production of generic versions, and new investments in vaccination against human papillomavirus (HPV) and hepatitis B virus hold promise for combating cancer globally.¹⁸

Although currently unattainable in the poorest countries, the world's gold standard for cancer care delivery remains the model of cancer care provided by specialised physicians using highly specialised technologies and expensive patented medications.¹⁹ Compared with high-income countries, sub-Saharan Africa has a pronounced shortage of oncologists and facilities dedicated to cancer care. A 2010 assessment of non-communicable disease programmes by WHO reported that just 14 of the 46 responding sub-Saharan African countries had operational plans to address cancer. The same year, the International Association of Cancer Registries reported that only 13 African countries had national cancer registries, although some hospital-based registries existed.²⁰ Complete data for the number of oncologists in Africa are not available. In 2011, Kenya was reported to have one oncologist for every seven million people, with services concentrated in Nairobi, the capital.²¹ In 2008, Tanzania had one medical oncologist, no paediatric oncologists, four radiation oncologists, and seven pathologists.²² Most African countries also have a

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lack of surgeons with the training in procedures needed for cancer treatment.^{23,24}

Some relatively developed African countries, such as South Africa and Ghana, have several cancer centres, while other African nations have none.²⁵ Among existing facilities, many do not have the technologies and resources needed for comprehensive cancer care. In 2010, the average number of radiotherapy units was 0·1 per million people in sub-Saharan Africa, meeting an estimated 18% of the need.^{1,22} Most were in urban referral hospitals, and several countries did not have a single radiotherapy machine.²⁶ CT scanners for cancer diagnostics and staging are also scarce; in 2010, 0·4 machines existed per million people in sub-Saharan Africa.¹ Few cancer programmes have developed adequate pathology services to meet the needs of the population they serve.²⁷ Some African cancer programmes collaborate with pathologists from high-income nations via telepathology—where microscope images are uploaded electronically for remote diagnosis by pathologists—to address these gaps.^{28,29}

Chemotherapeutics and other medications are another major need. More drugs are needed to treat common cancers compared with HIV or tuberculosis. WHO have produced an essential medicines list for antineoplastic drugs, but few national formularies in Africa have made these medications widely accessible.²¹ Some partnerships make patented drugs more affordable, such as the Glivec International Patient Assistance Program.³⁰ However, the unmet needs remain substantial, and evidence from the worldwide AIDS response shows that drug donation programmes and concessional tiered pricing agreements for individual drugs are insufficient to meet the burden of disease.³¹

Prevention, screening, and early detection are all important components of national cancer programmes. Healthy diet, tobacco avoidance, and physical activity will need more attention as African economies grow.³² Some efforts in Africa have focused on prevention of infection-associated malignancies, including access to vaccines against HPV and hepatitis B virus, control of HIV to avoid advanced-stage AIDS, and early detection for cervical cancer, notably visual inspection and treatment with acetic acid (VIA). In 2009, out of 20 African countries with cervical cancer screening programmes, only six programmes were government funded.³³

Since fewer than 50% of cancer cases in Africa are cured at present, improved palliative care is urgently needed, concurrent with the up-scaling of treatment programmes.³⁴ Most people in sub-Saharan Africa cannot access morphine, despite its low cost and ease of administration. Reasons for this unavailability include restrictive national opioid policies and regulations, social constructions of pain in the face of chronic scarcity, absence of clinician training, and health system weaknesses.^{35,36} More than 94% of global morphine consumption occurs in high-income countries.³⁷ 1·1 million people are estimated to die

in pain in Africa per year, while the region consumes enough opioids to treat just 85 000 people.³⁷ However, the past decade has seen increasing pain relief efforts for cancer patients in Africa.³⁶

Major barriers to equitable access to cancer care persist. Few African countries have national health insurance programmes, and few additional mechanisms exist to overcome barriers such as transportation costs, food, and caregiving, all of which are important factors for patients and families living with chronic diseases.³⁴ Although the continent has much progress to make, several African countries without substantial cancer infrastructure have made progress in the development of frameworks for cancer care. We aim to describe the experience of Rwanda in the development of a national cancer programme, with suggestions for principles that could guide other nations in the development of cancer programmes.

Rwanda

Background

The 1994 genocide in Rwanda resulted in the deaths of one million people and the devastation of the country's health infrastructure and clinical capacity.³⁸ Over the past two decades, however, life expectancy at birth has nearly doubled, from less than 30 years in 1992, to 63 years in 2012, and Rwanda's health system has undergone major improvements.³⁹ This rebound has been attributed to a decentralised health system that prioritises equitable access to all levels of care, evidence-based policy making, and participation at all levels of governance and civil society.⁴⁰ Investment of vertical funding—eg, funding for HIV/AIDS—into broader health system strengthening efforts has enabled substantial scale-up of human resource and infrastructural capacity.^{38–41} An equitable rollout of communication technology has further helped clinical advances: broadband internet is available at district hospitals, and both an online health information system and a national AIDS informatics system enable monitoring and evaluation.^{38,40,42} Additional drivers of progress include the broad implementation of community-based health insurance and performance-based financing.⁴⁰ Among the signatories of the 2001 Abuja Declaration on HIV/AIDS, Tuberculosis and Other Related Infectious Diseases, Rwanda was one of the first countries in Africa to exceed the target of allocating 15% of its annual budget towards health, in 2009.⁴³ By 2011, health spending represented 24% of total government expenditure.⁴⁴ Although foreign assistance has been crucial to Rwanda's rapid progress, the proportion of government financing has increased from 39% to 59% between 2000 and 2011.⁴³ Rwanda is on track to achieve all of the health-related Millennium Development Goals, and is moving toward a broader health agenda, including cancer care.^{38,45}

In 2011, Rwanda had 625 physicians and 8273 nurses for nearly 11 million people, or 0·84 clinicians per 10 000 population. This is about a third of the minimum

WHO-recommended health care worker density of 2·3 per 10 000 population.⁴⁰ Until 2012, most physicians were not specialists and only 10% of nurses had a degree.⁴¹ Access to specialists was largely restricted to referral hospitals in Kigali, the capital city, and Butare in southern Rwanda. Rwanda's health sector promoted task-shifting, a practice whereby clinical tasks are transferred to nurses and community health workers, aiming to bridge the gap in adequately trained health professionals as specialised care programmes were improved. In 2012, Rwanda launched its Human Resources for Health Program, a 7-year partnership with a consortium of 25 US medical, nursing, public health, and dental schools. The programme aims to train Rwandan health professionals through mentorship, sustained collaboration, and supporting new medical residency and specialty nursing certificate programmes. US institutions send specialist and subspecialist physicians to partner with Rwandan doctors in direct academic and clinical teaching for periods of up to 1 year.⁴¹ This twinning model aims to develop capacity in Rwandan specialist clinicians and educators to assume all teaching and care delivery after 7 years, with plans to train more than 500 physicians by 2018 (figure).⁴¹ The programme also seeks to strengthen incentives to work in the public sector and rural districts, and to better equip hospitals to improve the clinical teaching environment. Clinicians are compensated based on their levels of training and experience.

Cancer in Rwanda

Decreased mortality from infectious diseases and increased life expectancy at birth have changed the proportions of morbidity and mortality attributable to cancer in Rwanda, similar to much of sub-Saharan Africa. According to the International Agency for Research in Cancer, about 8263 new cancer cases will occur per year in Rwanda, although the true incidence is unknown.⁴⁶ The Rwanda National Cancer Registry reported 3420 cancer cases at referral hospitals between 2007 and 2011, with cervical, liver, breast, and prostate cancers as the leading diagnoses (unpublished data). However, attempts to quantify the burden of cancer in Rwanda have underscored the need for improved documentation. Without strong systems for cancer diagnosis and treatment, many patients with cancer have died without receiving pathological diagnoses.

Before 2011, little cancer care was provided in Rwanda. Some pathology-based cancer diagnoses were made at national referral hospitals, where some chemotherapy was provided without oncologists. In 2006, some paediatric patients began to receive chemotherapy at a rural district hospital whereby US-based oncologists guided local providers via email and telephone—a distance twinning approach. Using this approach in combination with support to address socioeconomic barriers, high retention and good outcomes were

achieved in a small cohort of children.⁴⁷ Most cancer care in Rwanda was constrained by scarcity of laboratory reagents and drugs, high costs to patients, absence of radiotherapy, and few oncology-trained personnel. Rwanda was classified by WHO as a country with some improvement in palliative care between 2006 and 2011: palliative care was delivered at some district hospitals without a strong systematic framework, improved financing mechanisms were needed, and morphine was scarcely available.^{42,48}

Cancer care infrastructure

These limitations warranted a systematic national approach, which Rwanda's Ministry of Health began in 2011. In July 2012, the Butaro Cancer Center of Excellence (BCCOE) was opened as the region's first rural cancer centre and Rwanda's first facility to deliver comprehensive cancer services. Although peripherally located at Butaro District Hospital near the Ugandan border, this hospital was chosen because of its new and state-of-the-art infrastructure, which provides a favourable environment for cancer treatment, and because of a unique partnership between the Ministry of Health, a non-government organisation, and academic institutions committed to supporting the programme and building local clinicians' capacity.⁴⁹

The range of services offered at the BCCOE includes pathology-based diagnosis, basic imaging, chemotherapy, surgery, and palliative care. Socioeconomic support includes transport vouchers, food packages for outpatients, inpatient meals, and community health workers to accompany patients who need them. Patients are transferred to other referral hospitals for complex surgery, and a small number of patients prioritised by the Ministry of Health are sent for radiotherapy internationally. Because of their prohibitive prices, chemotherapy, radiotherapy, and pathological testing are subsidised by the government, Partners In Health, and Dana-Farber/Brigham and

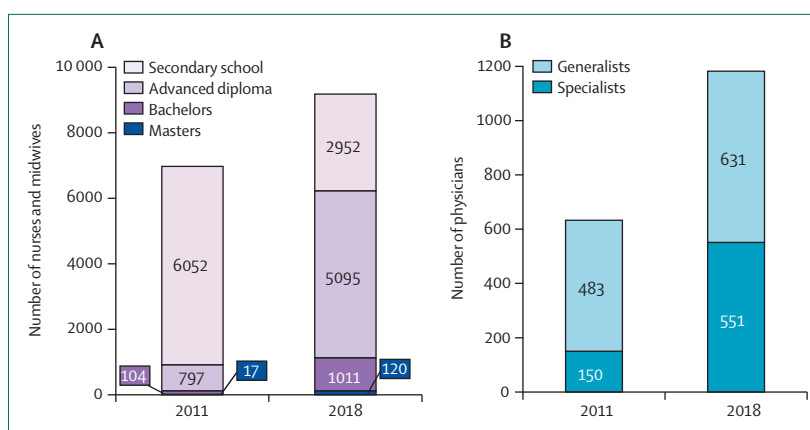


Figure: Training targets for Rwanda's Human Resources for Health Program from 2011 to 2018

Projected skill level of nurses and midwives (A) and physicians (B) in Rwanda's health workforce 2011–18. Data from Binagwaho and colleagues.⁴¹

Women's Cancer Center in Boston (MA, USA). Patients are charged for other services according to national health insurance rates. The cancer centre is accessible by foot or through public transportation; patients referred from inpatient services at other hospitals are transferred via ambulance as per national protocol.

Care is delivered at the BCCOE through a structure of task-shifting and institutional twinning, despite the absence of permanent pathologists or oncologists onsite: laboratory technicians process biopsies, general doctors prescribe chemotherapy and manage patient care, and nurses prepare and give chemotherapy. US-based oncologists at Dana-Farber/Brigham and Women's Cancer Center provide clinical mentorship through daily email exchanges and weekly conference calls to guide case management. Pathologists and oncologists provide periodic site-based training and mentorship. These partners also provide procurement support, and participate in the technical working group that supports the Ministry of Health to develop clinical protocols and training curricula.

In the 2 years since it opened, more than 2500 patients have been received at the BCCOE, including patients from every district in Rwanda. More than 70% of patients come from other districts, indicating that the BCCOE is a national resource for patients with cancer. Breast cancer has been diagnosed for more than 550 patients, well above the average of 75 breast cancer diagnoses annually reported to the national cancer registry during 2007–11 (unpublished). Patient numbers have led to the addition of beds to the originally 24 bed cancer ward, which now has an average of more than 40 patients daily; additional patients receive outpatient care. The number of new patients continues to increase monthly, indicating ongoing unmet needs.

Blood samples, bone marrow aspirates, and tissue samples are processed at the BCCOE. Slides are stained and sent to the US for pathological diagnosis, unless visiting pathologists are present for on-site diagnosis. Although slides are sent to the US for immunohistochemistry staining at present, plans exist to transfer such work to the BCCOE by 2015. Retrospective and prospective studies have been done to validate a telepathology system, and data analysis is in process. The BCCOE histopathology laboratory received more than 2000 pathology specimens in its first 2 years and 37% were sent from other Rwandan hospitals.⁵⁰

Although several factors have allowed the immediate implementation of a cancer programme at the BCCOE, the Ministry of Health also took steps to build cancer care infrastructure at national referral hospitals. Three national referral hospitals are being provided with the training and capacity to deliver chemotherapy, specialised surgery, and pathology services. These referral hospitals have one clinical oncologist and three pathologists between them. The Human Resources for Health Program enables periodic visits by oncology and

pathology specialists at Kigali's main referral hospital. Through a grant with the US Centers for Disease Control and Prevention, the pathology laboratory capacity at one referral hospital in Kigali has been expanded, and plans are underway to initiate BCR-ABL testing for chronic myeloid leukaemia.

Building human resource capacity

A key component of Rwanda's cancer strategy is decentralisation of care by definition of roles for each level of health facilities: physicians at referral hospitals manage patients for chemotherapy; general practitioners at district hospitals do the initial diagnostic work-up, including biopsies and basic imaging; nurses at health centres provide palliative care; and community health workers support families through tasks such as providing home wound care and teaching women to do breast self-examination.

Formal educational programmes in cancer diagnosis, treatment, and palliative care are being developed to enable task shifting for clinicians. These programmes include diplomas in oncology for general practitioners, postgraduate physician residency training in pathology, and Master's degrees in oncology and palliative care for specialist nurses. A postgraduate physician residency programme exists for pathology, and a physician fellowship programme will begin in 2015, with plans to train nine Rwandan oncologists by 2018. The Human Resources for Health Program includes positions for oncology faculty each year, and oncology subspecialists on rotation as mentors. Although a few physicians are sent by Rwanda's Ministry of Health for oncology fellowship training in other African and European countries, all future oncology fellowship training for physicians will happen in Rwanda.

While formal programmes are being launched to train Rwandan clinicians to provide the full range of cancer diagnosis and treatment services, Rwanda has adopted an interim strategy of preparing practising clinicians through short practical training sessions, with support from several academic partners. Over the past 3 years, these sessions have included a series of baseline cancer training sessions for a broad group of clinicians across Rwanda, and chemotherapy safe-handling training for doctors, nurses, and pharmacists at referral hospitals that already provide some cancer care. Doctors and nurses at district hospitals were trained in cervical cancer diagnosis and treatment with VIA, cryotherapy, the loop electrosurgical excision procedure, and colposcopy. So far, more than 100 doctors and 130 nurses from district and referral hospitals have been trained in the basics of cancer care. Palliative care training has been provided for at least one doctor, pharmacist, nutritionist, nurse, and mental health specialist from each of Rwanda's 45 hospitals. Three national cancer registrars have been trained through academic partnerships and the African Cancer Registry Network.

Policy developments

The Rwandan Government is cofinancing the national cancer prevention and care programmes with its partners, and leads the establishment of guidelines and capacity-building plans. Rwanda's Ministry of Health created a national coordinating body to oversee cancer policy development, as part of its non-communicable disease strategy framework. In 2011, a Non-Communicable Disease Desk was established in the Ministry of Health, and, in 2012, a Non-Communicable Disease Division was created in the Ministry of Health's implementation group. A technical working group, consisting of clinicians, civil society representatives, non-government organisations, and international partners, was created to guide the development of the national cancer plan, strategies, and protocols. By consensus of the national coordinating body, components of the WHO National Cancer Control Plan framework, and the experiences of partners from South Africa, the US, and Europe, were incorporated into Rwanda's cancer programme.

Through an iterative consultative process between the technical working group, policy makers, and partners, the Rwandan Government endorsed its first national cancer protocols in 2012. These protocols provided guiding principles on cancer diagnosis and treatment, and prioritised which malignancies would be initially treated at the BCCOE, based on their prevalence and the availability of safe and effective treatment. For adults, these included breast, colorectal, gastric, and cervical cancers, in addition to lymphomas, multiple myeloma, chronic myeloid leukaemia, and Kaposi's sarcoma. For children, nephroblastoma, Hodgkin's lymphoma, non-Hodgkin lymphomas, acute lymphoblastic leukaemia, Burkitt's lymphoma, osteosarcoma, and retinoblastoma were prioritised.⁵¹

Rwanda's approach embraced both treatment and prevention, notably with cervical cancer. Through new partnerships, multisectoral collaborations, health professional outreach at schools, and the engagement of the country's 45 000 community health workers, in 2011 and 2012, respectively, Rwanda vaccinated 93·2% and 96·6% of girls in targeted age groups against HPV.^{52,53} Radio, television, and community-based education on cervical cancer were brought to all 15 000 Rwandan villages.⁵³ After the launch of its National Cervical Cancer Prevention Programme in 2011, Rwanda established the Rwanda Task Force on Cancer Care and Control, a local branch of the Global Task Force on Cancer Care and Control.⁵⁴ In response to WHO's 25×25 initiative, Rwanda proposed a more ambitious target of 80×40×20: to reduce premature mortality from non-communicable diseases and injuries by 80% in people younger than 40 years by 2020, through integrated health system strengthening.^{16,38}

Rwanda's Medical Procurement and Distribution Division drafted a list of chemotherapy and supportive care medications to be added to Rwanda's essential

medicines list, with plans to procure these medications through the national pharmacy system. Rwanda provides imatinib for chronic myeloid leukaemia through the Glivec International Patient Assistance Program. At present, the BCCOE relies on partnerships with foundations and academic cancer centres in the US for the free provision of medications to patients, and financing plans are under development for cancer care at other hospitals. The Ministry of Health created a National Policy on Palliative Care, with more options for palliation, and substantially increased access to morphine.⁵⁴

Rwanda's next steps

Financing of a fully functioning cancer care system in Rwanda is challenging. Several options for financing of cancer care are under review by the Ministry of Health and its partners. Responses to some urgent human resource constraints are already underway through innovative partnerships, including the Human Resources for Health Program, yet many gaps remain.⁴¹ Additional mechanisms to adequately compensate clinicians in rural areas would improve workforce retention, since high staff turnover undermines training efforts. The Ministry of Health must identify long-term strategies to procure medications and make them accessible to patients. Addressing of socioeconomic barriers and other causes of delayed presentation at health facilities is crucial, as reported in initial studies on breast cancer care in Rwanda.⁵⁵ Since the distance to the few hospitals providing cancer care is too far for most Rwandans, the Government of Rwanda plans to establish cancer treatment centres in each of Rwanda's five provinces.

Establishment of baseline data on the burden of different types of cancer is essential. By leveraging its existing data systems for HIV to define cancer outcome targets, the Ministry of Health is planning to collect data, distribute and maintain cancer registries, and to continue ongoing monitoring and evaluation.⁴⁰

As Rwanda aims to expand cancer care, several opportunities are presented. Although radiotherapy is not yet available, Rwanda was approved as a member of the International Agency for Atomic Energy in 2012, a prerequisite for the creation of an internal radiotherapy programme. Much work remains to develop appropriate infrastructure for delivery of radiotherapy, and the partnership with the Dana-Farber/Brigham and Women's Cancer Center aims to advance this agenda. Rwanda plans to bring specialised procedures, such as loop electrosurgical excision for cervical cancer, to additional health facilities. Availability of services must be coupled with both clinicians and the public being aware of the services, and a strengthened referral system. Rwanda's contributions to global advocacy efforts to increase access to essential cytotoxic and adjuvant medicines will be a necessity, and must include championing of uninterrupted access to palliative care drugs and services.^{16,56,57}

Principles for cancer programme development

Overview

The WHO guidelines for National Cancer Control Programs provide a comprehensive framework for policymakers in the development of national cancer programmes. Rwanda's approach to cancer programming uses the core components of this framework, including creation of a national cancer control programme, prevention, early diagnosis, screening, curative therapy, pain relief, and palliative care. Rwanda's early steps and the challenges the government has faced in the launch of a national cancer programme might be useful for other countries when they strengthen their basic cancer care capacity. The specifics of each country's plans must be tailored to local needs. However, we suggest some common guiding principles (panel).

Comprehensive, integrated frameworks of care

Comprehensive frameworks that combine prevention, treatment, and palliation, with monitoring and evaluation systems embedded in each component are needed for successful cancer programmes in sub-Saharan Africa. Although stepwise scale-up might be needed, all aspects of cancer care must eventually be addressed. Rwanda achieved nearly universal coverage of the HPV vaccine while implementing a national

cancer treatment programme during the same 2 year period. Rather than following a strictly stepwise approach, Rwanda aimed to provide both palliation and treatment, even in the programme's early phases, by seeking strategic partnerships to provide an interim approach to treatment.

A so-called diagonal approach to integrate cancer care into primary care and prevention platforms, rather than an exclusively disease-focused approach, can reinforce health systems as a whole.⁵⁸⁻⁶⁰ This approach also responds to concerns that cancer care will draw scarce resources away from the treatment of infectious diseases. HIV programme implementation has provided examples of funding allocated to specific diseases being invested in overall health system improvements, and has shown the essential role of community health workers in case-finding, long-term management, and retention in chronic disease care.^{61,62}

Strong systems for monitoring and assessment, alongside health information system infrastructure and well-articulated research agendas, should be embedded in the framework of cancer programmes. This embedding allows documentation of the earliest steps of programme implementation, and provides the basis for ongoing evidence-based decision making. Since cancer treatment has specific complexities and encompasses a wide range of individual diagnoses, meticulous outcome monitoring is needed as part of an ongoing, iterative process in settings where monitoring has not previously been achieved.

Cancer care is always urgent for patients who are suffering, and a human rights approach demands that delivery not be delayed until sophisticated systems of care exist. Evidence-based priority setting with stepwise implementation allows long-term goal-setting, while also addressing short-term patient needs. Similar to Rwanda, governments might need to start with treatment of high-burden diseases for which patients can be successfully treated within the country through mobilisation of innovative partnerships. Human resource strategies should also be prioritised according to current capacity and long-term goals. National programmes might depend on outside assistance in the early stages of implementation, while local human resources and financial capacity are developed for future care delivery.

Potential exists for a synergistic effect from the combination of the many partners involved in worldwide cancer care. Ministries of health should lead the development of national cancer care and control frameworks, to guide the roles of non-government organisations, donors, and academic institutions. Global advocacy is still needed beyond the role of individual governments. Broader initiatives should include advocacy to make cancer treatment financially accessible, including lowering the prices of chemotherapy medications to make them accessible in low-income countries.⁶³

Panel: Lessons learned from implementation of a national cancer programme in Rwanda

- As has been the case with HIV/AIDS, equitable scaling up of cancer services across sub-Saharan Africa will need the integration of prevention, treatment, and palliation efforts.
- Partnerships led by the Ministry of Health, in collaboration with academic institutions and non-government organisations, might help to rapidly implement cancer care programmes in low-income countries.
- Such efforts should prioritise building of capacity for local health professionals at the point of care, which is often in rural areas. These efforts should include training of new oncologists, task shifting of cancer treatment to general doctors and nurses with oncology training, and empowerment of community health workers with knowledge and resources to support patients at the village level.
- Strengthening of cancer care delivery needs to be linked to research, evaluation, and policy making at the outset, to ensure programmes can adapt to new findings and opportunities.
- Training programmes should address the fundamental drivers of the so-called brain drain by investing in infrastructure and equipment, and offering practical continuing professional development opportunities to clinicians, in addition to compensation corresponding to training and expertise.

Prioritisation of human resource capacity building through partnerships

Even in the best circumstances, decades will pass before the number of local oncologists is sufficient to treat the region's patients with cancer according to the gold-standard of cancer care provision. Withholding effective care now would be unethical, so alternative models of care need to be developed through innovative mechanisms. Rwanda and other countries have shown that the absence of oncologists within a country need not preclude the delivery of cancer care.

Human resource development is a pressing need for all health-care workers, from subspecialist physicians to community health workers. Twinning is one of several approaches for capacity-building.^{64,65} The institutional twinning model delivered by the St Jude Children's Research Hospital has been particularly successful in middle-income countries, but only some aspects can be applied in the lowest-resource settings at present. Task shifting is another approach that has proven useful to address clinical human resource shortages in countries across Africa, although its best application with respect to cancer care has not yet been established.⁶⁵ In Rwanda, components of both models have been used, allowing partners to fill specific needs, while they are guided by the government's comprehensive vision. In this framework, partnering oncologists and other clinicians work directly with Rwandan counterparts who are often of different training levels, and provide twinning within a task-shifted programme structure.

As national economies and health systems of low-income countries develop, the aim will be to achieve full in-country capacity for cancer programmes. Rwanda has laid out its vision to achieve this independence from outside assistance, and has structured the role of partners around the building of local capacity. Interventions such as Rwanda's Human Resources for Health Program can provide necessary external programme support in the short term, while ultimately leading to improved national health-care capacity, thus combating brain drain. Short-term and long-term efforts towards building of human resource capacity should be mutually reinforcing. When coordinated well, interim support from partners can stimulate longer-term capacity building, rather than act as a substitute for it.⁶⁶

Rights-based, equity-driven approach

An equity-driven approach is essential to the foundation of a national cancer programme. In countries where most of the population faces prohibitive barriers to basic health care, access to specialised and centralised cancer services is even further beyond reach. Equity can be achieved by building programmes informed by knowledge of the barriers faced by the poorest section of the population, and by design of strategies to address those barriers. Even when services are free of charge, transportation costs and time away from provision of household needs

Search strategy and selection criteria

References for this Review were identified through searches of PubMed with the search terms "cancer", "sub-Saharan Africa", "Rwanda", "oncology", "human resource", and "capacity building," from Jan 1, 2002, to Aug 31, 2014, in various combinations. Articles were also identified through searches of the authors' own files. Only papers published in English were reviewed. The final reference list was generated on the basis of originality and relevance to the broad scope of this Review.

can lead to care delays and loss to follow-up. Good clinical outcomes for chronic diseases can only be guaranteed when these barriers are addressed.

With cancer responsible for an increasing proportion of the burden of disease in sub-Saharan Africa, cancer care should be included in plans for universal access to affordable, quality health care. A key step to realisation of a rights-based approach is the inclusion of the full range of cancer services in national health insurance programmes. Strong referral networks are needed: care delivery and trained clinicians need to be brought to rural settings where many of the patients who need them the most live. Equitable population-level access can be achieved through decentralisation of cancer services and provision of an appropriate package of care at each level of the health system.

Conclusion

With the successful implementation of treatment programmes for HIV, multidrug-resistant tuberculosis, and other diseases once thought untreatable in the world's poorest countries, international advocacy groups and funders have increasingly applied resources towards the complex treatment of cancer and other non-communicable diseases. Creation of high-quality, comprehensive cancer care and treatment frameworks that are accessible to people across the African continent will take many years of concerted effort and new frameworks of care will be needed. The unprecedented level of worldwide connectivity in 2015 might enable high-income countries to share their resources with low-income countries. This sharing could create substantial progress in care delivery that brings about novel challenges and the potential for new frameworks of care delivery. Leveraging of resources available through partnerships, aiming for equitable access to high-quality comprehensive care, and documentation and learning from successes and failures will all be needed to achieve comprehensive cancer care worldwide.

Contributors

SS did the literature search, assisted with the organisation of the manuscript, interpreted and collected the data, helped to design the figure and panel, and wrote and edited the manuscript. AB and NMT assisted with the organisation of the manuscript, interpreted and collected the data, and wrote and edited the manuscript. CMW and CTN interpreted and collected the data, helped to design the figure and panel, and wrote and

edited the manuscript. MAM interpreted and collected the data, and wrote and edited the manuscript. FN, SN, LK, and PEF helped with the writing and editing of the manuscript. AJL did the literature search, interpreted and collected the data, and wrote and edited the manuscript. LL and LS assisted with the organisation of the manuscript and wrote and edited the manuscript. PD and TM helped to edit the manuscript. JBB helped to write the manuscript.

Declaration of interests

We declare no competing interests.

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