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Short communications and technical notes

## Setting up a new radiation therapy centre in Malawi: Opportunities and challenges

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### ARTICLE INFO

#### Keyword:

Setting up a new radiation therapy

### ABSTRACT

Radiotherapy (RT) is one of the three pillars of cancer treatment (with surgery and systemic therapies) and has proven to be a cost-effective modality for curative and palliative treatment. In low and middle-income countries, access to RT treatment is limited posing many challenges to patients and caregivers. Many patients living in low and middle-income countries (LMICs) such as Malawi spend enormous sums of money to be treated abroad, through Government schemes, or, more commonly, go without treatment. This paper reviews the progress of the Malawi Government in establishing the first dedicated cancer treatment center with RT facilities at Kamuzu Central Hospital in Lilongwe. Malawi is expected to have a fully functional dedicated RT centre towards the end of 2024 equipped with one cobalt machine, two linear accelerators (LINAC), and a high dose rate (HDR) Brachytherapy unit. More cancer patients will have access to RT services locally, resulting in the Government saving on the foreign currency required to treat patients out of the country. While there has been great progress towards establishment of services in Malawi, careful and strategic planning is needed for the sustainability of required resources to avoid long-term disruption of treatments.

### Introduction

Cancer is a leading cause of death worldwide, accounting for nearly 10 million deaths in 2020, or nearly one in six deaths [1]. In Malawi, it was estimated that in 2020 a total of 17,936 new cancer cases of 6723 men and 11,213 women, were reported [2]. The leading causes of morbidity and mortality of patients with cancer are due to inadequate equipment, infrastructure, and human resources [3].

Malawi had an estimated population of twenty-one million people in 2022. An estimated 84 % of the population lives in rural areas as compared to 16 % in urban areas [2]. High quality health services delivery, including cancer treatment, is focused in urban areas with the majority of patients having limited or no access to quality health

services. Patients requiring RT are being referred to countries such as India, Tanzania, Kenya, Zambia, and the Republic of South Africa. In 2012 it was reported to have cost the Malawian Government up to one million United States dollars annually to send approximately 40 patients to other countries to receive RT [2]. Therefore, the need to establish the first dedicated cancer treatment center with RT facilities at Kamuzu Central Hospital in Lilongwe, the capital city of Malawi, was identified.

### Plan for RT centre

The Malawi Government approved a National Plan for the provision of cancer treatment in the country in 2012 [4]. The RT project was designed to have two phases with the first phase planned for 2013 to

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<https://doi.org/10.1016/j.tipsro.2024.100264>

Received 16 March 2024; Received in revised form 6 July 2024; Accepted 29 July 2024

Available online 5 August 2024

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2015 [4]. During this phase, The Government implemented the infrastructure development and sent qualified Malawian healthcare professionals abroad for skill development. Phase two was planned for January 2016 to 2019. During this phase, The Government continued with further human resource skill development and identified specialist training for these practitioners. Many of these trained practitioners have returned to the country after successful training. The infrastructure development during this phase consisted of the construction of two bunkers for linear accelerators (LINACS), rooms for diagnostic imaging, and hospital wards to accommodate oncology patients at Kamuzu Central Hospital in Lilongwe.

### Human resource training for RT centre

In setting up a RT program, The International Atomic Energy Agency (IAEA) recommends that countries develop a training plan for the RT staff which should be completed before the installation of the equipment [5]. In 2012, the Malawian Government approved a plan for the development of comprehensive cancer treatment services that included the establishment of a RT service [2]. With the support from IAEA and World Health Organisation (WHO), a plan was developed to support activities such as training and equipment procurement. The initial plan was to have a fully functioning RT department by 2019. This included human resource development where a cohort of healthcare professionals was identified by the Malawian Government to undergo training in the specialist fields required for RT services [4]. These individuals received training in many countries outside of Malawi such as, Kenya, South Africa, Tanzania, Ghana, Zambia and Zimbabwe. The specialists included radiation oncologists, medical physicists, radiation therapists, and oncology nurses.

Currently, the Malawi government has recruited and employed five radiation oncologists, two medical physicists, ten radiation therapists, and three oncology nurses to the new RT centre at Kamuzu Central Hospital in Lilongwe. This radiation oncology team is responsible for the commissioning of the new RT service. The other professionals who received specialist training are currently deployed throughout the health services in Malawi and will be recruited once the service has been established. The number of RT professionals may increase in the future, as capacity building efforts are still underway.

### Infrastructure for RT center

Malawi became a member of the IAEA in 2006. The IAEA has been assisting in the development of the RT centre at the Kamuzu Central Hospital with the services expected to commence in the last quarter of 2024. The IAEA provides clear guidelines for planning national RT programs. Setting up a RT program is complex and involves many sub-processes related to equipment, infrastructure, staff, and training [5]. Once completed, the radiotherapy centre is expected to have Computerized Tomography (CT) Simulator, Treatment Planning System (TPS), one tele cobalt, two LINACS, and a single High Dose rate (HDR) brachytherapy machine. It is argued that LINAC units are recommended over Cobalt-60 teletherapy units due to more skin sparing effect, ability to generate higher energy photons and less penumbra effect [6]. The benefits of cobalt in resource-limited settings include its relatively long half-life of 5.3 years, its resilience to power outages, and its lower maintenance costs compared to LINAC.

### The current status of the RT centre in Malawi

Malawi is one of the first wave of countries that have benefited from the in the IAEA's Rays of Hope (ROH) initiative that was launched in 2022. The ROH's intent is to close the gap in access to RT, especially in low-income countries. This partnership has resulted in the mobilisation of financial resources towards building, equipping and sustaining the necessary infrastructure for cancer care and to train specialists, health

workers and technicians.

Since November 2022, there has been tremendous progress in the construction of the LINAC bunkers. The radiotherapy equipment vendor, offered a discount for the LINACS and has been supporting the infrastructure development by offering expert advice on bunker construction, ensuring that this aligns with international standards and will offer training to staff once machines are installed. The Government has shown commitment to providing resources and checking the progress on the construction site. The bunker construction is expected to be completed in the second quarter of 2024.

Through the partnership with the IAEA, one linear accelerator, one HDR brachytherapy unit and a CT for simulation have been procured. A cobalt machine has also been donated by the Government of India and is expected to be delivered in the last quarter of 2024. Equipment for nuclear medicine including a SPECT CT have been procured with funds from the IAEA Rays of Hope initiative.

Refresher courses, and additional trainings have been commenced for radiation oncologists, radiation therapists, medical physicists, and oncology nurses in countries such as Kenya, Tanzania, Uganda, India and Ghana in preparation for the opening of radiation therapy services.

### Opportunities arising from establishing RT center in Malawi

RT is a key component in the management of cancer with almost half of all patients with cancer requiring radiotherapy as a part of their treatment [5]. The availability of radiotherapy services in Malawi will enable patients to receive timely treatments thus reducing the waiting time and improve the outcomes. This will also help with emotional and spiritual wellbeing of the patient as they are treated in a familiar environment. Patients from nearby communities will be treated on an outpatient basis whereas those from afar will be accommodated at the hospital whilst allowing visits from their friends and relatives. These supportive family networks are crucial as they assist patients in coping with a variety of psychological and emotional challenges, reducing anxiety and depression, and providing company to counteract loneliness during treatment [6]. The availability of services within the country will also reduce financial toxicity on the families.

Adherence to the treatment is also expected to improve since patients will be counselled on the procedure and the expected side effects in a local language that they can easily comprehend. Cultural norms will be brought into context as this influences psychological and behavioural acceptance /response toward treatment.

Cancer patients will be able to seek spiritual support from the religion they belong, it is believed that having spiritual support throughout the cancer journey help the patient feel less alone and more hopeful [7].

Furthermore, the Government will save on the foreign currency required to treat patients out of the country and may support neighbouring countries such as Mozambique, which do not have established radiotherapy services. The introduction of RT will help to improve the services in order to achieve the Malawi 2063 vision of quality, affordable, and accessible health for all [8]. This is in line with WHO Sustainable Development Goal 3 (SDG3) related to reducing premature mortality from non-communicable diseases through prevention and treatment.

### Challenges faced during setting up of the RT center in Malawi

The initial plan was to have a fully functioning RT department by 2019 however the project is five years behind schedule [4]. This is delay is attributed to various factors such as budget-associated constraints, international outsourcing of the technical expertise to construct the radiotherapy bunkers, and the recent COVID-19 pandemic. The majority of the radiation oncology team who completed the specialized RT course three to four years before the installation of the equipment have not been practising as per their training and this has an impact on the proficiency of their practical skills as this is integral for RT. This has led to

the need for refresher courses for these professionals. The refresher courses consist of up to 12 months of hands-on/practical training for the radiation oncology disciplines at other institutions in regions that offer similar treatments. The IAEA, through its Technical Cooperation projects, has facilitated these refresher courses through short-term fellowships. These fellowships enable professionals to train at institutions in countries such as South Africa, Ghana, Kenya, and Tanzania. Additionally, through IAEA initiatives such as AFRONET, the radiation oncology professionals are able to participate in regional educational activities such as virtual tumor boards, contouring workshops and dedicated radiation therapists workshops [9].

## Conclusion

There has been tremendous progress in setting up a new RT centre in Malawi over the past two years. It is expected that many patients with cancer will benefit from the establishment of these service. Careful and strategic planning is needed for the sustainability of this RT center. Collaborations with various stakeholders in cancer care such as the IAEA and WHO can further strengthen the country's cancer control programs and enhance sustainability efforts for the established services.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence

the work reported in this paper.

## References

- [1] Kostecky B, Trimble EL, Bhatia K. Learning lessons from cancer centers in low- and middle-income countries. *Infect Agent Cancer* 2013;8(1):44. <https://doi.org/10.1186/1750-9378-8-44>. PMID: 24228782; PMCID: PMC3882881.
- [2] Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin* 2021;71(3):209–49. <https://doi.org/10.3322/caac.21660>. Epub 2021 Feb 4 PMID: 33538338.
- [3] Government of the Republic of Malawi. National Cancer Control Strategic Plan 2019–2029. Malawi: Ministry of Health; 2019. 117 p. NCCSP I.
- [4] Government of the Republic of Malawi. Establishment of a new National Cancer Centre in Lilongwe – Malawi Bankable document. Malawi: Ministry of Health; 2013. p. 7.
- [5] International Atomic Energy Agency: Setting up a Radiotherapy Programme. 1400 Vienna: Austria; 2008. 243 p. [https://www-pub.iaea.org/MTCD/Publications/PDF/pub1296\\_web.pdf](https://www-pub.iaea.org/MTCD/Publications/PDF/pub1296_web.pdf).
- [6] Chua GP, Pang GSY, Yee ACP, Neo PSH, Zhou S, Lim C, et al. Supporting the patients with advanced cancer and their family caregivers: what are their palliative care needs? *BMC Cancer* 2020;20(1):768. <https://doi.org/10.1186/s12885-020-07239-9>. PMID: 32799834; PMCID: PMC7429720.
- [7] Lee YH. Spiritual care for cancer patients. *Asia Pac J Oncol Nurs* 2019;6(2):101–3. [https://doi.org/10.4103/apjon.apjon\\_65\\_18](https://doi.org/10.4103/apjon.apjon_65_18). PMID: 30931352; PMCID: PMC6371666.
- [8] National Planning Commission. Malawi's vision 2063: an inclusively wealthy and self-reliant nation Malawi; 2020. p. 1–92. <https://npc.mw/wp-content/uploads/2021/02/MW2063-VISION-FINAL.pdf>.
- [9] Rosenblatt E, Prasad RR, Hopkins K, Polo A, Ndlovu N, Zaghoul M, et al. Africa radiation oncology network (AFRONET): an IAEA telemedicine pilot project. *J Int Soc Telemed eHealth* 2018;6(6):1–7.