

MEDICAL PHYSICS PROFESSIONAL DEVELOPMENT AND TRAINING IN ZAMBIA

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Abstract— This paper highlights the roles of Medical Physicists in Zambia, as well as the opportunities for professional development and training in Medical Physics. Currently, the highest of priority for Medical Physicists in Zambia, is to fight Cancer. For this reason, all Medical Physicists are currently trained or will be trained in Radiotherapy Physics. However, there is room for growth and diversification of roles. Zambia's many medical imaging centres need the attention of Diagnostic Radiology Physicists and Nuclear Medicine Physicists. Plans are already in place to train and employ more Medical Physicists to meet the need to provide safe and optimal radiotherapy and medical imaging services countrywide.

Keywords— Zambia, medical physics, training, education, radiotherapy, medical imaging, diagnostic radiology, nuclear medicine

I. INTRODUCTION

Zambia is a land-locked country found in the south-central region of Africa. The capital city is Lusaka. It has a population of approximately sixteen (16) million people. The official language is English and there are seventy-two (72) ethnic groups in the country. Zambia has a nominal Gross Domestic Product (GDP) of approximately twenty-point-six-billion United States Dollars (US\$ 20.6 billion) or twenty-point-six-trillion Zambian Kwacha (ZMK 20.6 trillion) (Zambia 2016).

Currently, there are only five (5) Medical Physicists working in Zambia and they are all stationed at the Cancer Diseases Hospital (CDH) in Lusaka, Zambia. Three (3) of these are clinically qualified while two (2) are in clinical training. Their main area of work is in Radiotherapy (RT) but they also play the roles in Diagnostic Radiology (DR) and Nuclear Medicine (NM) both at CDH and at other medical imaging centres in the country (see Fig 1). There is no National Medical Physics Society that represents these physicists but they do have representation under the Radiological Society of Zambia.

Recently, the Government of Zambia approved the Cancer Diseases Hospital Phase III Project for the expansion of Radiotherapy services to all the remaining nine (9) provinces in Zambia, which will introduce more jobs in healthcare, including Medical Physics jobs (Government of Zambia 2014). According to the Cancer Diseases Hospital Strategic Plan 2014-2016, Zambia has the highest cancer incidence and mortality rates, at thirty-eight-point-six percent (38.6%), in the African region. For this reason, the Government of Zambia has chosen to prioritize the Sustainable Development Goal No. 3 (SDG

3), to reduce the number of deaths due to non-communicable diseases (NCDs), such as cancer, by one third (1/3) by 2030 (Government of Zambia 2006) (Government of Zambia 2016) (United Nations 2015). Once SDG No. 3 has been achieved, the priorities of Zambia concerning Medical Physicists may be much more welcoming toward more diverse roles other than Radiotherapy Physics.

There is room for Medical Physicists in Zambia to diversify into DR and NM Physics. Plans are already in place to introduce more clinical imaging equipment and to upgrade the current existing imaging centres. These advances in healthcare will create more opportunities for the roles of DR and NM Physicists to be realized in the years to come, especially post-2030. There are currently about ninety (90) public medical imaging centres in Zambia (see Fig. 1 below) equipped with one hundred and forty-six (146) x-ray machines, eighty-four (84) ultrasound, nine (9) Computed Tomography (CT), one (1) Magnetic Resonance Imaging (MRI) machine and one (1) Single Photon Emission Computed Tomography (SPECT) machine. One of these centres functions as both a radiotherapy centre and a medical imaging centre. This is the Cancer Diseases Hospital (CDH). Other than imaging equipment this hospital has one (1) Linear Accelerator (Linac), two (2) Cobalt Teletherapy machines and one (1) Simulator for to provide radiotherapy services. (Sindaza 2016) (Government of Zambia 2011)

II. EDUCATIONAL OPPORTUNITIES AND PROFESSIONAL DEVELOPMENT

Note that Zambia's Professional Development and Education Programme for Medical Physicists is still under development. There is no established and approved documentation or programme currently in place. Despite this, efforts are being made to fill this gap. The Physics Department of the University of Zambia offers a new optional *Introduction to Medical Physics* module under its Bachelor of Science in Natural Sciences programme – for Physics major students only. This module was piloted in 2016 with students in their fourth (4th) year (The University of Zambia 2013). To obtain a qualification in Medical Physics at either Bachelor's or Master's level, one would have to be enrolled at a University outside Zambia, that offers these programmes.

Clinical training in Medical Physics is provided at the CDH under the supervision of clinically certified Medical Physicists. This kind of training opportunity can

be made available to those who hold a Master of Science in Medical Physics or a similar field, through either a clinical attachment or as a member of staff. On a clinical attachment, the trainee is not remunerated nor do they have to pay for the training. They will have the opportunity to shadow the clinically certified

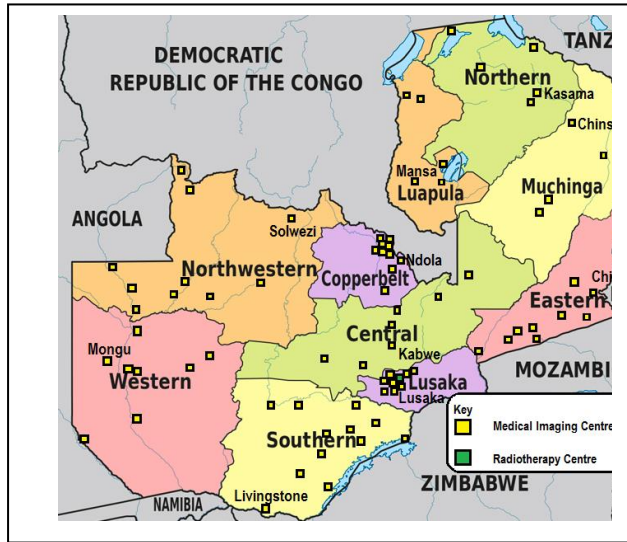


Fig. 1 Map of Zambia displaying the distribution of medical imaging centres and radiotherapy centres in Zambia. Derived from an inventory database from the Ministry of Health (Sindaza 2016).

Physicists for as long as agreed upon by the hospital’s management and supervising Physicist. As a member of staff, one is to be assessed and registered under the Health Professions Council of Zambia (HPCZ) and thereafter, training will occur on the job (HPCZ 2016). This clinical training includes activities in Radiotherapy, DR, and NM. It may also include Biomedical Engineering, with assistance from the University Teaching Hospital (UTH), upon request.

Further professional development or Continuous Professional Development (CPD) opportunities in Medical Physics are hosted both locally and internationally. Recently, the Radiation Protection Authority (RPA) and the Radiological Society of Zambia hosted an event to facilitate the training of Radiation Protection Officers (RPOs) from around the country, in Lusaka, Zambia (Radiation Protection Authority 2016). Internationally, professional development events and resources are provided by the Federation of African Medical Physics Organisations (FAMPO), the Abdus Salam International Centre for Theoretical Physics (ICTP), the International Atomic Energy Agency (IAEA), etc. (FAMPO 2010) (IAEA 2016) (ICTP 2016). One example is the annual “College on Medical Physics: Enhancing the Role of Physicists in Clinical Medical Imaging...” held at the ICTP (ICTP 2016). So far, three (3) Medical Physicist from Zambia have attended this event.

III. CONCLUSION

Plans for Medical Physicists in Zambia are still under development. Discussions are being held to secure educational, employment and professional development opportunities in Medical Physics. On the educational front, strides are being made to introduce and maintain Medical Physics programmes at tertiary level. For example, at the University of Zambia; if the pilot year for the Introduction to Medical Physics module at Bachelor’s level proves to be successful, this may mean that the module continues. More students will be made aware of the opportunities in Medical Physics and an increased awareness about this career option among youth will increase Zambia’s potential for human resource building in this field. Also under discussion are plans for the introduction of a Medical Physics programme at Master’s level. The outcomes of these discussions are yet to be shared with the public.

Other than this, Zambia is a part of an inter-governmental agreement that assists African member states to establish cooperation in nuclear science and technology called the Africa Regional Cooperative Agreement for Research (AFRA). Among the themes covered by this agreement include Radiation Safety, Education, and Human Health. This agreement supports, among other activities, the expansion of Zambia’s Radiotherapy and Nuclear Medicine services through training of healthcare staff. (AFRA 2016)

The newly approved CDH Project (Phase III) Proposal outlines a plan to extend the reach of Radiotherapy services to all the other nine (9) provinces in Zambia. This will be done by establishing Radiotherapy centres in the designated locations and hiring of staff members, including Medical Physicists, to provide cancer care services (Government of Zambia 2014). As such, the focus of Medical Physicists in Zambia will be on cancer treatment using Radiotherapy and soon using Nuclear Medicine. This implores for the need for NM Physicists to help provide these services.

In Fig. 1 above is a map displaying the locations of ninety (90) public medical imaging centres. As mentioned earlier, there are only five (5) Medical Physicists working in Zambia, that means there is approximately one (1) Medical Physicist for every eighteen (18) public imaging centres. There are approximately two hundred and forty-five (245) imaging and radiotherapy devices in these centres. This implores for more Medical Physicists and specifically DR Physicists to ensure the safe and optimal provision of clinical imaging services. It has been estimated that a minimum of two (2) clinically qualified Medical Physicists are required per Radiotherapy department; one (1) per Diagnostic Radiology department and one (1) per Nuclear Medicine department (Vassileva 2017). This means that, ideally, ninety-three (93) Medical Physicists are required right now (for the ninety (90) diagnostic radiology departments, one (1) radiotherapy department and one (1) nuclear medicine department) and at least

eighteen (18) more will be required for the nine (9) new radiotherapy facilities to be built.

In conclusion, although Medical Physicists in Zambia are focussed on providing cancer treatment and ultimately contributing to achieving SDG No. 3, there is room for growth. This growth is in terms of human resource capacity and the diversification of the role of Medical Physicists to meet the needs in the provision of safe and optimal clinical imaging and radiotherapy services, countrywide.

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