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Medical physics practice and training in Ghana

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ABSTRACT

Medical physics has been an indispensable and strategic stakeholder in the delivery of radiological services to the healthcare system of Ghana. The practice has immensely supported radiation oncology and medical imaging facilities over the years, while the locally established training programme continues to produce human resource to feed these facilities. The training programme has grown to receive students from other African countries in addition to local students. Ghana has been recognised by the International Atomic Energy Agency as Regional Designated Centre for Academic Training of Medical Physicists in Africa. The Ghana Society for Medical Physics collaborates with the School of Nuclear and Allied Sciences of the University of Ghana to ensure that training offered to medical physicists meet international standards, making them clinically qualified. The Society has also worked together with other bodies for the passage of the Health Profession's Regulatory Bodies Act, giving legal backing to the practice of medical physics and other allied health professions in Ghana. The country has participated in a number of International Atomic Energy Agency's projects on medical physics and has benefited from its training courses, fellowships and workshops, as well as those of other agencies such as International Organization for Medical Physics. This has placed Ghana's medical physicists in good position to practice competently and improve healthcare.

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1. Introduction

Medical physics activities in Ghana began in the 1970s when physicists were recruited and sponsored by the Government of Ghana and International Atomic Energy Agency (IAEA) to be trained in medical physics in developed countries. Population of Ghana then was about 8 million [1]. Ghana is situated along the Gulf of Guinea in the western part of Africa and is bounded by the countries Côte d'Ivoire, Burkina Faso and Togo. The country presently has a population of approximately 25 million [1] and has about forty fully trained medical physicists. Ghana has Accra

as its capital city and also the most populous of all the cities in the country, with Kumasi as the second most populous city. Until the year 2004, Ghana's medical physicists were all trained outside the country, mostly in Europe. The trained personnel offered services mainly to Ghana's Radiotherapy and Nuclear Medicine programmes. Through an initiative of Ghana Atomic Energy Commission (GAEC), the Government of Ghana with support from IAEA established two state-owned radiotherapy centres and one nuclear medicine centre. These centres were established in Accra and Kumasi in 1998 and 2004, respectively. A third radiotherapy centre, which is privately owned, has also been established and operating in Accra. Diagnostic radiology also has seen tremendous growth in Ghana with the introduction of imaging systems such as computed tomography, computed radiography, digital radiography, magnetic resonance imaging, mammography and fluoroscopy.

In the quest to ensure sustainability to Ghana's radiotherapy, nuclear medicine and diagnostic radiology programmes, training programmes were developed to locally train personnel who would feed into the nation's radiological health centres. A two-year Mas-

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ters degree programme (M.Phil) in Medical Physics was introduced by the University of Ghana (UG) in 2004. The programme was then run under the School of Allied Health Science (SAHS) of the University. Through a restructuring process in 2007, the Medical Physics programme was migrated and placed under the School of Nuclear and Allied Sciences (SNAS) of the same academic institution. The SNAS was established in 2006 by collaboration between GAEC and UG with key support from the IAEA, to promote post-graduate university education and training for preservation and enhancement of nuclear knowledge in Ghana and Africa [2,3]. To make the Medical Physics academic programme complete, Doctor of Philosophy (PhD) was introduced in 2008.

Over the years, the Medical Physics programme has grown from initially admitting local students to admitting foreign students from across Africa [4]. The Medical Physics Department at SNAS has become a hub of medical physics training in the sub-region, attracting a number of foreigners from the African countries. Presently, the department is the only one in Africa to be accredited by the IAEA as Regional Designated Centre for Academic Education in Medical Physics in Africa. This has contributed to recognition of the SNAS across Africa and has resulted in IAEA and governments of some African countries sponsoring students from across Africa to be trained in the programme.

2. Practices and infrastructure

The practice of Medical Physics in Ghana is impinged on international set guidelines and recommendations [5]. Clinical medical physicists are predominantly employed in radiation oncology facilities in the country and their responsibilities include performance of quality control and quality assurance checks, dosimetry, equipment specification, radiation safety and protection, treatment planning and commissioning of equipment. A good number of medical physicists are also involved in research at the Radiological and Medical Sciences Research Institute of the GAEC. Through collaboration between GAEC and some of the health facilities, selected medical physicists are seconded to offer clinical services in the nuclear medicine and radiotherapy facilities. This arrangement contributes to the overall improvement in healthcare delivery since the positives of research outcomes are applied in clinical practice. In academia, senior medical physicists actively engage in the education and training of students not only in medical physics but in other programmes such as radiology, radiography, oncology, nuclear science, health physics, radiation protection and biomedical engineering.

Infrastructure available for radiotherapy and medical imaging programmes in Ghana include:

- National Centre for Radiotherapy and Nuclear Medicine, Korle-Bu Teaching Hospital, Accra.
- Oncology Directorate, Komfo Anokye Teaching Hospital, Kumasi.
- Sweden-Ghana Medical Centre, Accra.
- 37 Military Hospital, Accra.

Several other diagnostic radiology centres, most of which are privately-owned, also contribute to the nation's medical imaging programme. Equipment available in the medical facilities are presented in Table 1.

3. Education and training

3.1. Admission requirement

The minimum qualification to pursue Medical Physics Masters degree in Ghana (at the SNAS) is BSc degree with second class

Table 1
Distribution of installed equipment (as at December 2015) [4].

Radiologic Procedure	Equipment	Number
Radiotherapy	Co-60 teletherapy unit	2
	Linear accelerator	1
	LDR Cs-137 brachytherapy unit	4
	MultiSource HDR brachytherapy unit (with Co-60 source)	1
	LDR I-125 prostate brachy system	1
Diagnostic radiology	Computed tomography	28
	Mammography	17
	Fluoroscopy	18
	General radiography	322
	Dental X-ray	56
Nuclear medicine	SPECT system	1
	Laminar flow hood	1
	Dose calibrator and well counter	5
	Survey metre	4

lower division in physics or related fields from approved universities. Prospective candidates for the PhD programme require a 2-year Masters degree in Medical Physics or other related disciplines to be considered for admission [6].

3.2. Academic and clinical training

The two-year Masters programme in Medical Physics comprises two semesters of didactic academic work in the first year and clinical training with research in the second year. Academic courses offered in the first year include: Anatomy and Physiology; Radiation Physics; Radiobiology and Radiation Protection; Electronics and Signal Analysis; Dosimetry for Photon and Electron Beams; Research Methodology and Scientific Communications; Professional and Medical Ethics; Ultrasonics and Instrumentation; Nuclear Magnetic Resonance Spectroscopy and Imaging; X-rays and Diagnostic Radiology; nuclear medicine; Radiotherapy; Applications of Computers in Medicine; and Nuclear Law and Legislation [6]. In order to ensure sustained credibility and international standards to the medical physics training in Ghana, IAEA's harmonised Regional Syllabus for academic and clinical training of medical physicists in Africa has been adapted, and is being used for the training [7,8]. Additionally, IAEA's publications on Education and Training of medical physicists such as the Technical Course Series (TCS 37, TCS 47, TCS 50, TCS 56) [9–12] are also used. The publications provide guidelines for academic and clinical training of medical physicists specialising in radiation oncology, diagnostic radiology and nuclear medicine. The two-year training is followed by a one year clinical internship for local graduates, a requirement by the medical physics professional association and the allied health regulatory body [13]. This arrangement ensures that clinically qualified medical physicists receive minimum of two years clinical training.

The PhD Medical Physics programme has since the 2013/2014 academic year been restructured to last a four year duration, comprising of one year didactic academic work and three years of research study [2]. Hitherto, the PhD programme was run for a period of three years and had no didactic academic component. A number of PhD candidates benefit from IAEA's PhD Sandwich Programme, which ensures that candidates from less resourced countries and registered with local universities receive support to undertake their research studies in well resourced institutions, mostly in developed countries. Results from the studies are subsequently submitted to the local universities for the award of degrees.

Clinical training and research studies of the students in the Masters programme are undertaken through collaboration

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