

# MEDICAL PHYSICS EDUCATION AND TRAINING IN GHANA

F. Hasford<sup>1</sup>, S. Inkoom<sup>1</sup>, A.K. Kyere<sup>1</sup>, C. Schandorf<sup>1</sup>, J.H. Amuasi<sup>1</sup>

<sup>1</sup> Medical Physics Department, School of Nuclear and Allied Sciences, University of Ghana, Accra, Ghana

**Abstract** — Medical physics education and training programme in Ghana involves a two-year masters degree and one-year clinical internship. The programme has grown over the years and produced medical physicists from several African countries. Owing to high standards of the training programme, Ghana has been recognized by the African Regional Cooperative Agreement of the International Atomic Energy Agency as Regional Designated Centre for Medical Physics Training within the African Region. Relevant stakeholders in Ghana jointly contribute to ensure that the education and training programme sees constant improvement. Several collaborative projects are also pursued with international institutions, making the programme meet international standards. This has contributed to placing Ghana’s medical physics programme on the World map.

**Keywords** — medical physics, radiotherapy, diagnostic radiology, nuclear medicine.

## I. INTRODUCTION

Medical physics is a major stakeholder in radiation medicine delivery in Ghana and the practice has supported radiation oncology and medical imaging services over the years. Medical physics education and training in Ghana dates back to 2004, when the Masters programme was introduced by the University of Ghana [1]. This was in response to the need of adequately trained medical physicist in the health delivery system of the country and in the Africa sub-region.

The academic programme is hosted by the School of Nuclear and Allied Science (SNAS) of the University of Ghana. Clinical training is undertaken in three main medical centres in Ghana, namely Korle-Bu Teaching Hospital, Komfo Anokye Teaching Hospital and SGMC Cancer Centre [1]. Through collaborative projects with the International Atomic Energy Agency (IAEA) and other stakeholder institutions, a strong training programme has been built and producing medical physicists who feed into healthcare, research and academic institutions [2, 3].

The medical physics programme has grown and currently admits foreign trainees from across Africa, in addition to Ghanaian nationals.

## II. EDUCATION AND TRAINING

Ghana’s medical physics education and training programme is structured in line with the academic and clinical training syllabi produced by the African Regional

Cooperative Agreement (AFRA) of the IAEA [5, 6]. The syllabi were produced for Africa as means of harmonizing and achieve equivalence in the levels of training in the region. The medical physics education and training programme in Ghana (Figure 1) is comprised of two-year Masters (MPhil) programme and one-year clinical internship.

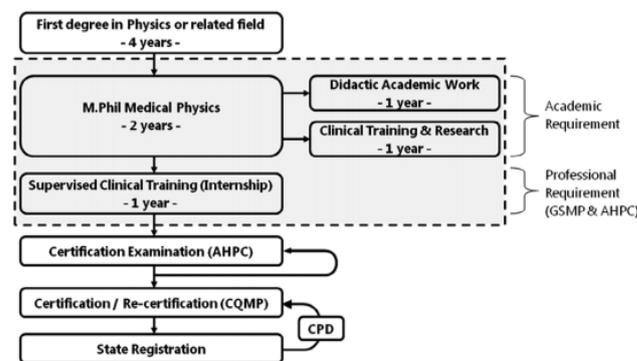


Fig. 1: Training structure for medical physics in Ghana [1]

The MPhil programme 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 Methods; Professional and Medical Ethics; Ultrasonics and Instrumentation; Magnetic Resonance Spectroscopy and Imaging; X-rays and Diagnostic Radiology; Nuclear Medicine; Radiotherapy; Applications of Computers in Medicine [4, 6]. The medical physics academic programme has since its inception produced 91 graduates, 26% of whom are foreigners.

As a requirement by the medical physics professional association and the allied health regulatory body, the two-year academic programme is followed by one year clinical internship for local graduates. This arrangement ensures that clinically qualified medical physicists receive minimum of two years clinical training. A four-year PhD programme in medical physics is also run with academic and clinical training components.

The three hospitals that are primarily used for the clinical training of medical physicists are:

- Korle-Bu Teaching Hospital, Accra.
- Komfo Anokye Teaching Hospital, Kumasi.
- SGMC Cancer Centre, Accra.

A few other diagnostic radiology centres, most of which are privately-owned, are also used for student practical demonstrations.

### III. INFRASTRUCTURE

Ghana has three radiotherapy centres, one nuclear medicine unit and a host of diagnostic radiology centres scattered around the country. Equipment available in the facilities for radiation therapy and medical imaging are presented in Table 1.

Table 1 Medical equipments for radiation therapy and medical imaging

Equipment	Total
Co-60 External Beam Radiotherapy	2
Linear Accelerator	3
HDR Brachytherapy	2
LDR Brachytherapy	2
CT Simulator	2
C-Arm Fluoroscopy	2
Radiotherapy Simulator	2
Radionuclide Dose Calibrator	3
SPECT	1
MRI scanner	16
Diagnostic CT scanner	55
Mammography	32
Conventional X-ray (fixed)	350
Conventional X-ray (mobile)	148
Dental X-ray	71
Interventional	24

### IV. HUMAN RESOURCE

The practice of medical physics in Ghana is impinged on international set guidelines and recommendations [7]. In view of this, stakeholders such as the allied health regulatory body (Allied Health Professions Council) and the national medical physics body (Ghana Society for Medical Physics) have put in place systems to check medical physics practices in the country. Table 2 provides a snapshot of medical physics workforce in Ghana.

Table 2 Distribution of medical physicists in Ghana

Medical Physicists	Total
Radiotherapy	32
Nuclear Medicine	6
Diagnostic Radiology	20
Total	58

Clinical medical physicists are predominantly employed in radiation oncology facilities in the country and their responsibilities include performance of treatment planning, quality control, dosimetry, radiation safety, equipment specification and commissioning. Those specializing in nuclear medicine and diagnostic radiology are mostly employed as research scientists at Ghana Atomic Energy Commission (GAEC) and additionally offer periodic clinical services to the hospitals through special arrangements

between the institutions. In academia, senior medical physicists actively engage in the education and training of students not only in the field of medical physics but in other fields such as radiology, radiography, oncology, health physics, radiation protection and biomedical physics.

### V. REGULATION OF MEDICAL PHYSICS

The National Accreditation Board (NAB) of Ghana and the National Council for Tertiary Education (NCTE) accredits the academic component of the Medical Physics programme at the University. Assessment of academic programmes by these regulatory bodies are carried out periodically (between 2 – 3 years) using the services of international experts and consultants to ensure neutrality. Recommendations from the NAB and NCTE are precisely applied to ensure that international standards are upheld.

The Ghana Society for Medical Physics (GSMP) promotes the application of physics in medicine and collaborates with stakeholder institutions to raise the standards of practice [8]. The GSMP draws its inspiration from the International Organization for Medical Physics (IOMP) and it ensures that the roles and responsibilities of medical physicists are clearly adhered to [9]. The Society affiliates to IOMP and the Federation of African Medical Physics Organizations (FAMPO).

Clinical practice of medical physicists is regulated by the Allied Health Professions Council (AHPC) of Ghana through the Health Professions Regulatory Bodies Act (Act 857 of 2013) [10]. Act 857 gives medical physics and other disciplines the recognition as health professions in Ghana. This is in conformity with the classification of medical physics as a health profession by the International Labour Organization (ILO) in 2011 [11]. Among other things, AHPC regulates internships of trainees by placing them in hospitals to undergo one-year supervised clinical training in the fields of radiotherapy and/or medical imaging. Interns are required to undergo licensure examination before being certification to practice clinically [10].

### VI. COLLABORATION & PARTNERSHIPS

Ghana has collaborated and partnered with a number of institutions locally and internationally in the promotion of medical physics education and training as well as professional practice. Some international partners include International Atomic Energy Agency (IAEA), International Organization for Medical Physics (IOMP), Federation of African Medical Physics (FAMPO), International Centre for Theoretical Physics (ICTP), Argonne National Laboratory (ANL), Norwegian University of Science and Technology (NTNU), National University of Science and Technology (NUST) in Zimbabwe, World Health Organization (WHO) and the University College London (UCL).

## VII. CONCLUSION

Medical physics education and training in Ghana has been hugely successful since its introduction. The programme has been a channel through which several medical physicists in Africa have been trained. It is envisaged that the programme will grow further to solidify the gains so far made.

## ACKNOWLEDGMENT

The authors acknowledge the contribution of all institutions and individuals involved in the education and training of medical physics in Ghana.

## REFERENCES

33. J.H. Amuasi, A.K. Kyere, C. Schandorf, J.J. Fletcher, M. Boadu, E.K. Addison, F. Hasford, E.K. Sosu, T.A. Sackey, S.N.A. Tagoe, S. Inkoom, Y. Serfor-Armah. Medical Physics Practice and Training in Ghana. *Physica Medica* 32 (2016) 826–830.
34. Kyere AWK, Serfor-Armah Y, Amuasi JH, Sosu EK, Hasford F. Ten years of medical physics training in Ghana: successes, challenges and the way forward. *Med Phys Int* 2014;2(2):418–9.
35. Amuasi JH, Schandorf C, Nani EK, Boadu M, Inkoom S. Medical physics in Ghana. In: Tabakov S, Sprawls P, Krisanachinda A, Lewis C, editors. *Medical physics and engineering education and training part 1*. Trieste: Abdus Salam International Centre for Theoretical Physics; 2011. p. 205–7.
36. International Atomic Energy Agency. *Regional postgraduate medical physics syllabus for academic programmes*. Vienna: IAEA; 2013.
37. International Atomic Energy Agency. *Regional clinical training for radiotherapy medical physics syllabus*. Vienna: IAEA; 2013.
38. University of Ghana. *Handbook for graduate studies, vol. 3. School of Graduate Studies*; 2011.
39. International Organization for Medical Physics. *Policy statement no. 1 – the medical physicist: role and responsibilities*. York: IOMP; 2010.
40. Ghana Society for Medical Physics. *Constitution*. Accra: GSMP; 2011.
41. International Organization for Medical Physics. *Policy statement no. 1 – the medical physicist: role and responsibilities*. York: IOMP; 2010.
42. Ministry of Health. *Health Professions Regulatory Bodies Act (Act 857)*. Accra: MOH (Ghana); 2013.
43. International Labour Organization. *International standard classification of occupations (ISCO-08)*. Geneva: ILO; 2011.

### Contacts of the corresponding author:

Author: Francis Hasford  
 Institute: Medical Physics Department, School of Nuclear and Allied Sciences, University of Ghana  
 Street: Atomic Street  
 City: Accra  
 Country: Ghana  
 Email: fhasford@ug.edu.gh