

# TEN YEARS OF MEDICAL PHYSICS EDUCATION AND CONTINUING PROFESSIONAL TRAINING IN JAMAICA

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**Abstract—** Caribbean countries and Jamaica face several challenges in the use of radiation medicine. Most provide diagnostic services, but few offer radiotherapy treatments. Training opportunities are limited, and primarily delivered by overseas institutions. The Medical Physics education and professional training in Jamaica was implemented in three phases. The first step introduced the Bachelor of Science (BSc) degree in Medical Physics, and the second phase implemented the postgraduate education with MS and PhD programmes in Medical Physics. The third phase of the medical physics programme comprised of postgraduate diploma and certificate courses, as well as of short professional courses on radiation safety and protection. The PhD programme provides opportunities for professional development at higher levels, solving research problems in the fields of radiotherapy and nuclear medicine. Currently Jamaica is the leading country in the IAEA regional project “Strengthening Human Capacities of Caribbean Countries in Radiation Medicine” which aims to improve radiation medicine services in the Caribbean, as well as to identify centres of excellence in diagnostic radiology, nuclear medicine and radiotherapy for clinical training in the region.

**Keywords—** Jamaica, medical physics, training, education, medical imaging, diagnostic radiology, nuclear medicine, radiotherapy, UWI, UHWI, IAEA, ICTP.

## I. INTRODUCTION

Jamaica is the third largest Caribbean island and the largest English-speaking one. The population has increased on average by 3% over the past years and currently is estimated to 2.9 million, with a median age of 26 years. The island is divided into three counties – Cornwall, Middlesex and Surrey – which are subdivided into 14 parishes.

National health services are administrated by four Regional Health Authorities (RHA) - South East, Southern, North East and Western RHA, shown in Figure 1. The Regional Health Authorities have direct management responsibility for the delivery of public

health services within its geographically defined area. Services are provided through a network of 24 hospitals, including 6 specialist institutions and 316 health centres.

Caribbean countries, including Jamaica, face several challenges in the use of radiation medicine. Most provide diagnostic services, but few offer radiotherapy treatments. Training opportunities are limited, and primarily delivered by overseas institutions.



Fig.1. Map of Jamaica showing the parishes and health regions.

The Medical Physics education and professional training programme in Jamaica was introduced in 2009 with a Bachelor of Science (BSc) degree in Medical Physics, and it was implemented in three phases. After the first step, bringing medical physics to undergraduate university standards, a postgraduate MSc and PhD programmes in Medical Physics were introduced in 2011. To-date, over 140 students have graduated with BSc degrees in Medical Physics and 38 with Master’s and PhD degrees. Among graduates are students from Jamaica, Trinidad and Tobago, St. Lucia, Dominica, Bahamas and Nigeria.

The increased use of ionization radiation for diagnostic and therapeutic purposes, as well as the high radiation doses delivered by interventional procedures, have raised serious safety and health concerns for both patients and medical staff. The public health providers in Jamaica conducted over 450,000 diagnostic imaging studies in 2017, with an average increase of 30% [1]. The third phase of the medical physics programme included postgraduate diploma and certificate courses, as well as delivery of short professional courses on radiation safety and protection. Courses are delivered by local and overseas experts of the International Atomic Energy Agency.

## II. MEDICAL PHYSICS AND RELATED EDUCATIONAL RESOURCES IN RADIATION MEDICINE

Jamaican Medical Physics education and professional training programme is under continuous development to respond to emerging needs of the country on radiation medicine. The IAEA has recently published a guidance document on development of national strategies for education and training in radiation, transport and safety [2]. Following these guidelines, a Joint Interfaculty Steering Committee was established in 2018 at the University of the West Indies to coordinate the continuing professional and clinical training in radiation medicine with participation from the Faculties of Medicine and Science & Technology, Ministry of Health, University Hospital of the West Indies and International Centre for Environmental and Nuclear Sciences. The committee developed a new BSc degree programme in Biomedical Radiation Science to support the biomedical research and radiation protection needs of the country.

The curriculum of the postgraduate Masters' programme in Medical Physics (Fig.2 and Fig.3) was developed using the AAPM guidelines "Academic Program Recommendations for Graduate Degrees in Medical Physics" [3], which will enable students to achieve professional accreditation by relevant national/international institutions.

The programme is delivered as evening and weekend classes and offers the flexibility of attending part- or full-time according of the work schedule of students. The MSc course has a modular structure consisting of core (Level I), professional (Level II) and speciality & practical (Level III) courses. Level I courses include Basic Radiation Physics, Medical Electronics, Anatomy, Physics of the Human Body, Radiation Biology, Biostatistics and Informatics. The Level II courses focused on specialization areas of the Qualified Medical Physicists and includes Diagnostic Imaging, Nuclear Medicine, Radiotherapy, as well as Nonionizing Radiation Imaging (MRI and US) and Environmental & Industrial Radiation Health Physics. Level III includes six months research project in Medical Physics and graduate seminar presentations. The research topics include quality control in diagnostic imaging, customised phantom development, image processing, radiation safety in medical and dental X-ray facilities. Ethics approval is obtained through the UWI Ethics Committee based in the Faculty of Medical Sciences.

The Postgraduate Diploma option (PgDip) requires completion of Level I and Level II courses and is suitable for personnel working in the health care sectors and seeking to obtain additional certification in diagnostic imaging or radiation safety and protection services. Individual courses of the programme are also delivered to "specially admitted students" as postgraduate certificate course (PgCert) in ionising/nonionizing imaging

modalities, radiotherapy or environmental and industrial radiation health studies.

Other educational resources in radiation medicine in Jamaica include the following:

\*Bachelor of Science in Diagnostic Imaging (Radiography) delivered by the School of Medical Radiation Technology, Faculty of Medical Sciences, University of the West Indies, Mona.

\*\*Doctor of Medicine (DM) in Radiology, offered by Faculty of Medical Sciences, University of the West Indies, aiming to train medical professionals in the speciality of general diagnostic radiology.

## III. OUTCOMES

Cancer care delivery in the public health system has been advanced with establishment of two new National Cancer Treatment Centres at Cornwall Regional Hospital in Montego Bay, and in St Joseph's Hospital in Kingston. The centres are equipped with state-of-the-art Linear Accelerators (LINAC) supplied by Varian Medical Systems. Medical physicist employed in both centres are graduates from Jamaican Medical Physics MS programme.

Jamaica's effort to fight cancer and chronic diseases has received a major boost with the re-establishment of a Nuclear Medicine Centre at the University Hospital of the West Indies (UHWI) (4). It is expected that the facility will be fully operational in mid-2019. The IAEA has contributed with delivery of equipment and technical expertise, as well as with the fellowship training of a medical physicist, a nuclear pharmacist, a nuclear medical physicist and a nuclear technologist.

The PhD programme in Medical Physics provides further opportunities for professional development at higher levels. Five medical physics staff members are currently enrolled in the PhD programme, carrying out research in the fields of radiotherapy and nuclear medicine. One staff member is currently completing the ICTP's Master of Advanced Studies in Medical Physics (MMP) programme, specializing in clinical radiation oncology. Research findings of MSc and PhD students were published in local and international peer-reviewed journals, as referenced [5-9].

The International Atomic Energy Agency (IAEA) started a four-year project to help Caribbean countries improve radiation medicine services in the region. Jamaica is the leading country in the IAEA regional project "Strengthening Human Capacities of Caribbean Countries in Radiation Medicine" with participation of Antigua and Barbuda, Bahamas, Barbados, Belize, Guyana, Haiti, Jamaica, Saint Vincent and the Grenadines, and Trinidad and Tobago, and experts from Cuba, Saint Lucia and Surinam. The aim of the project is to strengthen radiation medicine in the region, is to improve professional skills through training, with the

objective of ensuring safe and effective diagnosis and treatment of patients.

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Fig.2 First graduates of MSc Medical Physics and Physics staff, University of the West Indies, Kingston, Jamaica, 2013



Fig.3 MSc students at LINAC Cancer Centre in Kingston, Jamaica, 2018

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