

MEDICAL PHYSICS DEVELOPMENT IN MALAYSIA

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Abstract — Medical physics is a relatively young profession in Malaysia, but we have seen encouraging development in the past 20 years. There are currently 349 medical physicists in Malaysia, making a ratio of 1 medical physicist for every 100,000 people. This ratio ranked the second among the South East Asia countries. 41% of the medical physicists are working in the regulatory/licencing bodies and academic/research institution, followed by 36% in radiation oncology, 15% in diagnostic radiology and 8% in nuclear medicine. In 2016, the Malaysian parliament gazetted the Allied Health Profession Act (ACT 774) that governs that all practising allied health professionals including medical physicists must obtain a practising certificate and compulsory Continuous Professional Development (CPD) of 30 points per year. Malaysia has two affiliate National Member Organizations (NMOs) of AFOMP, namely Medical Physics Division (MPD) under the umbrella of Institute of Physics Malaysia (IFM) and Malaysia Association of Medical Physics (MAMP). Malaysia currently offers two postgraduate medical physics programme at two public universities. The Master of Medical Physics programme at the University of Malaya is accredited by the Institute of Physics and Engineering in Medicine (IPEM) since 2002. There is currently no medical physics residency programme in Malaysia. However, the country adapts the International Atomic Energy Agency (IAEA) RAS6038 Clinical Training programme in three sub-disciplines (i.e. ROMP, DRMP and NMMP).

Keywords — medical physics, Malaysia, IFM, MAMP

I. INTRODUCTION

Malaysia has a population of 32.7 million, with a total area of 329,847 km² [1]. The country currently has 71,041 medical doctors working in both public and private sectors, making a ratio of one doctor for every 454 people [2]. Malaysian has an average life expectancy at birth of 77.3 years for females and 72.2 years for male [3].

As of 1st January 2020, the total number of medical physicists in the country is 349 [4]. Hence the ratio of medical physicists is 1:100,000 people. This ratio ranked the second among the South East Asia countries [5]. 36% of the medical physicists in the country are working in the sub-discipline of radiation oncology, 15% in diagnostic radiology, 8% in nuclear medicine, and the remaining 41% are serving in either the regulatory bodies, licensing companies, or academic/research institutions. The number of

medical physicists in Malaysia, according to different sub-disciplines is given in Table 1 [5].

Table 1 Distribution of medical physicists according to sub-disciplines in Malaysia (as of 1 January 2020)

Sub-Discipline	Total
Radiotherapy	126
Nuclear Medicine	53
Radiology	28
Other Sub-Discipline	142
Total	349

II. INFRASTRUCTURE

As of 31st December 2018, Malaysia has 135 public hospitals, nine special medical institutions and 210 private hospitals [6]. On top of that, there are more than 228 medical clinics and 487 dental clinics that are registered for the use of X-ray equipment. The number of radiological facilities/equipment in the country is given in Table 2 [5].

Table 2 Number of radiological facilities/equipment in Malaysia (as of 1 January 2020)

Facilities/Equipment	Number
Radiation Oncology	
EBRT (including LINAC, IMRT, IGRT, Cyberknife, Gamma Knife)	67
Brachytherapy systems	19
Nuclear Medicine	
Gamma Camera (including SPECT Camera)	23
SPECT/CT scanners	13
PET/CT scanners	21
Medical Cyclotron	3
Diagnostic Radiology	
CT scanners	3,427
Fluoroscopy and angiography systems	711
Mammography	279
General X-ray systems	3,629
Dental X-ray Equipment	257
MRI systems	104

Abbreviations:

EBRT: External beam radiotherapy

LINAC: Linear accelerator

IMRT: Intensity-modulated radiotherapy

IGRT: Image-guided radiotherapy

SPECT: Single photon emission computed tomography

CT: Computed tomography
 PET: Positron emission tomography
 MRI: Magnetic resonance imaging

III. REGULATION OF MEDICAL PHYSICS

In 2016, the Malaysian parliament gazetted the Allied Health Professions Act (Act 774) [7]. This Act governs medical physicist, along with 22 other allied health professions. All the practising professionals must obtain a practising certificate and compulsory Continuous Professional Development (CPD) of 30 points per year. The Act is effective from 1st July 2020 onwards [7].

IV. PROFESSIONAL ORGANIZATIONS

Malaysia currently has two medical physics professional organizations, namely Medical Physics Division (MPD) under the umbrella of Institute of Physics Malaysia (IFM) [8] and Malaysia Association of Medical Physics (MAMP) [9]. MPD, IFM are the National Member Organization (NMO) of the Asia-Oceania Federation of Organizations for Medical Physics (AFOMP) and the International Organization for Medical Physics (IOMP); while MAMP is the affiliate member of AFOMP. Table 3 lists the current executive committee members of both organizations. Both MDP, IFM and MAMP have actively involved in organizing professional activities related to medical physics such as regional conferences, workshops and seminars. The organizations are also responsible for the annual celebration of the International Day of Medical Physics (IDMP) and International Medical Physics Week (IMPW). On the 7th of November 2017, IFM organized a global webcast in conjunction with the 150th birthday of Marie Sklodowska-Curie [10]. MAMP also organized bi-annual national scientific meetings on medical physics known as “International Seminar on Medical Physics” that typically attracts 100-200 participants from the region. Some examples of the important scientific events organized by the organizations from 2015-2020 are shown in Table 4.

Table 3 Executive committee members of the NMOs

Name of NMO	MPD, IFM	MAMP
Chair:	Prof. Dr. Kwan Hoong Ng	Dr. Hafiz Mohd Zin
Vice Chair:	Dr. Noriah Jamal	Dr. Rafidah Zainon
Secretary:	Dr. Jeannie Wong	Dr. Noramaliza Mohd Noor
Assistant Secretary:	Dr. Hafiz Mohd Zin	Dr. Rozilawati Ahmad
Treasurer:	Dr. Chai Hong Yeong	Dr. Husaini Salleh
Assistant Treasurer:	Dr. Ngie Min Ung	-

Table 4 Some examples of important scientific events organized by the Malaysian NMOs from 2015 – 2020

Date	Scientific Events	Theme	No. of Delegates
11 - 14 Nov 2015	AAPM/IOMP/ISEP Imaging Physics Workshop	Building Foundations for Sound Clinical Practice	214
10 Dec 2015	Workshop on Digital Radiography	To review the basic principles, image quality and artifacts, as well as some routine quality control (QC) tests in digital radiography	40-50
5-6 Aug 2016	Interventional Radiology: Safety, Optimization, Dosimetry and Quality Control	To provide the latest updates on radiological safety, optimization, dosimetry and quality assurance related aspects in the field of interventional radiology	64
27-28 Aug 2016	10 th International Seminar on Medical Physics (ISMP)	Fostering Medical Physics Research and Clinical Practice for Better Healthcare	200
6 Dec 2017	Workshop on Radiation Dosimetry II - Solid-State and OSL Dosimetry: Physics & Applications	To provide a basic understanding of physics of semiconductor and optically stimulated luminescence dosimetry.	38
11 – 14 Nov 2018	18 th Asia-Oceania Congress of Medical Physics (AOCMP) & 16 th South-East Asia Congress of Medical Physics (SEACOMP)	A Sustainable Future For Medical Physics	529
4 Jul 2019	Updates in Radiobiology	-	50
7-8 Nov 2019	11 th International Seminar on Medical Physics (ISMP)	Medical Physics: Together We Make an Impact	112

V. EDUCATION AND TRAINING

Malaysia currently offers two postgraduate programmes of medical physics (Master’s and doctorate degrees). One is offered by the University of Malaya (UM) in Kuala Lumpur (started in 1999), and the other is offered by the University of Science Malaysia (USM) in the northern region of the peninsular of Malaysia (started in 1995) [11]. The

universities have produced more than 400 medical physicists for the country and the region since 1996.

The Master of Medical Physics programme offered by UM is accredited by the Institute of Physics and Engineering in Medicine (IPEM) of the United Kingdom since 2002, is the only university outside of the British Isles to receive such recognition [7,11,12]. UM is also recognized as a regional education and training centre for postgraduate medical physics by the International Atomic Energy Agency (IAEA). Since 2012, the IAEA has been sponsoring fellows from less developed countries to undergo the Master's programme and clinical training at UM. To date, the programme has successfully trained four IAEA fellows from Cambodia and Vietnam, with two more candidates in the pipeline. Three of them are currently medical physics leaders and educators in their respective countries and one currently pursuing a doctorate at UM.

There is currently no medical physics residency programme in Malaysia. Most of the clinical medical physicists were trained on-the-job after obtaining their postgraduate degrees. However, under the IAEA RAS6038 programme, Malaysia has completed clinical medical physics training for six Radiation Oncology Medical Physicists (ROMPs) and two Diagnostic Radiology Medical Physicists (DRMPs). The latest cohort of the ROMP, DRMP and Nuclear Medicine Medical Physicists (NMMP) clinical training kick-started in 2018 and expected to complete in 2021 [5].

VI. AWARDS AND RECOGNITIONS

Malaysia has been actively involved in the development of medical physics profession in the Asia-Oceania region through strong collaborations with numerous international organizations, such as the IAEA, IOMP, AAPM, IPEM, AFOMP, SEAFOMP and ACOMP. In 2018-2021, Malaysia is leading a non-agreement project under the IAEA Technical Cooperation project (RAS6088) on "Strengthening Education and Clinical Training Programmes for Medical Physicists in the Asia Pacific region". This project provides budget to support capacity building and training for medical physicists in the region. Under the project, 12 workshops in the field of radiotherapy, diagnostic radiology and nuclear medicine physics have been planned [5].

On individual level, a number of medical physicists from Malaysia have been awarded for their significant contributions in the development of medical physics at the international level. These include Prof. Dr. Kwan Hoong Ng for the prestigious Marie Skłodowska-Curie Award 2018 as well as the Top 50 Medical Physicists who have made an outstanding contribution to the advancement of medical physics over the last 50 years by the IOMP in 2013; Assoc. Prof. Dr. Chai Hong Yeong, Dr. Hafiz Mohd Zin and Assoc. Prof. Dr. Jeannie Wong Hsiu Ding for the Young Leader Awards by SEAFOMP for the year of 2017, 2018 and 2019, respectively; Dr Noriah Jamal and Prof. Dr. Wan Kamil for

the Top 21 Outstanding Medical Physicists from the AFOMP region in 2020; and etc.

VII. CONCLUSION

Medical physics profession has seen steady development over the past 20 years in Malaysia. The demand for medical physicists in both quantity and quality increased by year in line with the rapid development in healthcare services. Malaysia is listed in the Top 10 Medical Tourism Destinations in the World by Patients Beyond Borders [13] due to its strategic location, technology orientated, friendly environment, proficient English speaking healthcare professionals, excellent public and private healthcare services at very affordable price. Malaysia's strength lies in having accredited postgraduate medical physics programmes, structured clinical trainings supported by the IAEA, professional certification under the allied health professional act, as well as active and leading roles of the medical physics associations. The continuing challenges faced by the medical physics community in the country, however, is outward migration of experienced medical physicists and sustainable research funding.

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