

MEDICAL PHYSICS IN MALTA: PAST, PRESENT AND FUTURE

Carmel J. Caruana¹, Sam Agius², Jean M. Bickle², Nolan Vella², Chantelle Said², Nadine Napoli²,
Jessica Farrugia², Mark Bezzina², Eric Pace²

¹ Medical Physics, Faculty of Health Sciences, University of Malta, Msida, Malta

² Medical Physics, Mater Dei Hospital, Msida, Malta

Abstract— The Medical Physics profession is a very young profession in Malta. However, in the few years of its existence it has organized itself in a very effective manner. The profession is legally recognized, we have excellent Bachelor's and Master's degree programmes and now we are setting up our own training programme. Notwithstanding being a small association, we involve ourselves fully in EFOMP activities and we have contributed to the development of the profession in Europe.

Keywords— Medical Physics, Education and Training, Certification, Professional Recognition

INTRODUCTION: MEDICAL PHYSICS IN MALTA

The Medical Physics profession is a very young profession in Malta. Discussions to work towards the establishment and recognition of the profession started in 2007 through a collaboration of a single university academic at the University of Malta and the three clinical Medical Physicists at the time. At the time the profession was practically unknown, not legally recognized and clinical Medical Physicists were employed under the generic title of 'scientific officers'. A major breakthrough happened in 2012 when the Ministry of Health recognized the importance of Medical Physicists and through a grant of the European Social Fund and a strong collaboration between the Ministry of Health and the Medical Physics Department of the University of Malta, 14 trainee Medical Physicists were employed, read for a Master's in Medical Physics at the University of Malta and underwent two years supervised clinical training in the United Kingdom [1]. In 2014, the Maltese Government, through a legal notice, included Medical Physics as a regulated profession within the Council of Professions Complementary to Medicine. Medical Physics Experts in Malta are also legally recognized and certified by the national Commission for the Protection from Ionising and Non-ionising Radiation. As part of its national activities, the Malta Association of Medical Physics (MAMP, <https://mamp.org.mt/>) organizes meetings and seminars, some of which include members presenting the clinical challenges and successes achieved in our hospitals. MAMP has always encouraged members to get involved within the Association and EFOMP. Meetings are held in collaboration with other institutions, including the University of Malta, the national Commission for the Protection from Ionising and Non-ionising Radiation and

the Allied Health Care Services Directorate. MAMP also has a students' chapter. The number of clinically qualified Medical Physicists in Malta presently stands at 20.



Fig. 1 2020 Annual meeting of the Malta Association of Medical Physics

ROUTE FOR REGISTRATION

The standard route for certification as a clinical Medical Physicist is: (a) first degree in Physics or Engineering, (b) Master's in Medical Physics and (c) two years supervised clinical training.

EDUCATION IN MEDICAL PHYSICS: PAST, PRESENT, FUTURE

In the past the Master's in Medical Physics was a two-year full-time programme. The curriculum (shown in Table 1) was comprehensive and served the profession extremely well. Unfortunately, in the past few years this system has been found to be no longer attractive as students are insisting on a single year Master's degree programme, owing to their reluctance to forego two years of salary. The Medical Physics profession has had to face the contradictory situation when we needed to reduce the duration of the Master's programme at a time when the knowledge, skills and competences required to be an effective and safe Medical Physicist are increasing owing to the rapid expansion in medical device technology. In addition, we have been facing the dire situation of having low numbers of entrants to the Master's owing to the low number of undergraduate students in physics and engineering.

Table 1 Curriculum for the Master's in Medical Physics

Subject	ECTS Credits
Biophysics and Basic Biomedical Sciences for Medical Physicists	10
Clinical Medical Devices & Protection from Physical Agents	5
Research Methods and Statistics for the Physical and Health Sciences	5
Principles of Biomedical Signal Processing for Medical Physics	5
Principles of Biomedical Image Processing for Medical Physics	5
Professional, Ethical, Legislative and European Issues in Medical Physics	10
Service Quality Development, Health Technology Assessment and Innovation in Medical Physics	10
Clinical Medical Physics Practices and Procedures	10
Medical Physics in Diagnostic and Interventional Radiology (Major/Minor)	20 / 5*
Medical Physics in Nuclear Medicine (Major/Minor)	20 / 5*
Medical Physics in Radiation Oncology (Major/Minor)	20 / 5*
Dissertation	30

*Students were to choose one major area of specialization at 20ECTS and two minor areas at 5ECTS each.

After much thought we are pleased to report that we have found a solution. Our programme now involves an alternative route which involves a new undergraduate programme: a *B.Sc. (Hons) Physics, Medical Physics and Radiation Protection followed by a one-year MSc Medical Physics*. The new bachelor programme is an inter-faculty programme between the Physics department of the Faculty of Science and Medical Physics at the Faculty of Health Sciences. Students join physics, mathematics and statistics classes with the physics students of the Faculty of Science, and anatomy, physiology, pathology, ethics and health services management classes with the students of the Faculty of Health Sciences. These study units are then followed by study units in Medical Physics and Radiation Protection. Since our entrants to the bachelor's programme rarely have a background in biology, we offer an online free Summer School in which we provide a comprehensive overview of human biology. The programme also includes a total of 336 hours of clinical hospital experience. We are pleased to report that the bachelor undergraduate degree has been a huge success and we do not depend on entrants from physics or engineering any more (although of course these are still welcome). We now have enough students to easily provide all the future Medical Physics trainees the country would need. We are also hoping that some will go overseas for some years and bring much needed know-how back with them once they return. Further information on the new bachelor's programme can be found here: <https://www.um.edu.mt/courses/overview/UBSCHPMRFT-2021-2-O> whilst the full curriculum can be found here: <https://www.um.edu.mt/courses/programme/UBSCHPMRFT-2021-2-O>. This new pathway has enabled us to transfer a

chunk of the Master's in Medical Physics curriculum to the undergraduate course and is permitting us to include new future-oriented study units in the curriculum of the Master's proper (e.g., we have introduced a 10 ECTS credit in Machine Learning and Pattern Recognition).

CONTINUOUS PROFESSIONAL DEVELOPMENT TOWARD MEDIAL PHYSICS EXPERT STATUS

As part of the transposition of directive 2013/59/EURATOM into Maltese legislation, the recognition of an MPE in Malta has been defined to include an additional two years documented full time work experience following registration as a Medical Physicist and documented continuous professional development (CPD). The Association has taken the lead in supporting CPD through various activities, national and international.

INTERNATIONAL ACTIVITIES

Although a small organization by European standards, our members involve themselves as much as possible in EFOMP activities. We have a member on every EFOMP committee, our President Sam Agius is secretary of the Professional Matters committee and Carmel Caruana our EFOMP delegate was in the past Chairperson of the Education and Training Committee. Carmel is also well known for his initiatives in promoting leadership in Medical Physics both at the European and global level and his involvement in the European Guidelines on the MPE, the EUTEMPE project and Medical Physics education at the European level and at the global level with IMPCB are well known [2-7]. MAMP members are also involved in different working groups endorsed by EFOMP: Eric Pace is a member of the Working Group on "the involvement of MPEs in the life cycle of medical devices" and Sam Agius and Nadine Napoli are involved in the Special Interest Group for Radionuclide Internal Dosimetry.

We also organize international courses. Our EQF Level 7 EBAMP accredited course on Data Analysis with Python for Medical Physicists was designed to address a skills gap in the area of programming and formal understanding of principles of general purpose programming languages. The aim is to help Medical Physicists work with large datasets and to provide a foundation for the further expansion of the Medical Physicist's role in clinical applications of AI and machine learning. So far, we have held two successful courses with a combined attendance of more than 90 international participants. This course is also being taught as part of the new B.Sc. (Hons) Physics, Medical Physics and Radiation Protection as we believe that all future Medical Physicists need to have strong programming skills [8, 9].

FUTURE OPPORTUNITIES AND CHALLENGES

The great majority of Maltese clinical Medical Physicists have been trained in the UK. This has been good for the profession because we learned from some of the best Medical Physicists around. However, it is now time to set up our own training scheme. The Maltese authorities had insisted with the UK trainers that our training should follow the IAEA training schemes in all three specialty areas. We are now in the process of setting up our training scheme in Malta and we will be following the IAEA training scheme to be in line with international standards.

A major opportunity ahead is the expansion of our profession to other specialties, in particular that of the General Hospital Physicist (physiological measurement, lasers etc.) on the basis of the Dutch model.



Fig. 2 Poster of the international Python course for Medical Physicists

REFERENCES

1. Caruana CJ, Grech K. Cost-optimised medical physics education and training: an innovative scheme in Malta. *Medical Physics International Journal*. 2016;4(1):17.
2. Caruana CJ. 2020. Leadership and Challenges in Medical Physics. Institute of Physics Publishing - Institute of Physics and Engineering in Medicine.
3. Bosmans H, Bliznakova K, Padovani, R., Christofides, S., Van Peteghem N, Tsapaki V, Caruana CJ and Vassileva J. 2015. EUTEMPE-RX, an EC supported FP7 project for the training and education of medical physics experts in radiology. *Radiation Protection Dosimetry*, 165(1-4), pp. 518-522.
4. Caruana CJ, Vano E and Bosmans H. 2015. EUTEMPE-RX module MPE01: Developments in the profession and challenges for the medical physics expert (D&IR) in Europe - a first in international medical physics education and training. *Medical Physics International Journal*, 3(2), pp. 69.
5. Caruana CJ. 2014. Qualification and curriculum frameworks for the Medical Physics Expert in Europe - Inventory of learning outcomes for the Medical Physics Expert in Europe. *European Guidelines on the Medical Physics Expert (Radiation Protection Series 174)*. Luxembourg: Publications Office of the European Union, pp. Chapter 3 (pp 15-20) and Annex I (pp 1-59).
6. Caruana CJ. 2014. The role of the Medical Physics Expert. In: Guibelalde E, Christofides S, Caruana CJ, Evans S and Van Der Putten W, eds. *European Guidelines on the Medical Physics Expert (Radiation Protection Series 174)*. Publications Office of the European Union, Luxembourg: European Commission, pp. Chapter 2 (pp 11-14).
7. Caruana CJ, Christofides S. and Hartmann GH. 2014. European Federation of Organisations for Medical Physics (EFOMP) policy statement 12.1: Recommendations on medical physics education and training in Europe 2014. *Physica Medica : European Journal of Medical Physics*, 30(6), pp. 598.
8. Pace E, Vella N, Agius S, Falzon J, Bezzina M, Said C, Bickle J, Caruana CJ. An EBAMP accredited Python data analysis course for medical physicists, ECMP2020, Torino.
9. Pace E, Agius S. 2019. Data Analysis with Python for Medical Physicists. *EFOMP EMP News Winter 2019*. P27-28.

Contact information of the corresponding author:

Author: Carmel J. Caruana
 Institute: Medical Physics, Faculty of Health Sciences, University of Malta
 Street: -
 City: Msida
 Country: Malta
 Email: carmel.j.Caruana@um.edu.mt