

Education and Training of Medical Physicists in Europe.

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Abstract

Introduction: Medical Physicist, as a professional who works in a hospital environment, is a member of a wide clinical team which is responsible for the correct diagnosis and the therapeutic methods applied using radiation. The role of a Medical Physicist is multifold and consists of the estimation of the dose received by patients and personnel, the quality control of radiological equipment, the studies for shielding requirements and the training of several health professionals (doctors, medical physicists, radiologists, technicians, nurses). All the above are prerequisites in order to receive the professional license to act as Medical Physicist.

Aim-Research Inquires: The aim of European Union (EU) via European Federation of Medical Physics (EFOMP) is to apply a common policy among the EU countries in the area of Education and Training in Medical Physics within the context of the current developments in the European Higher Education Area arising from "The Bologna Declaration". A short-term perspective is the free movement of professionals within EU, via the assurance of knowledge and skills uniformity. A necessary preliminary stage is the collection, classification and further process of relevant information at the European level.

Methods-Techniques: To achieve the above in an efficient way EFOMP prepared a questionnaire and sent it to the National Organisation for Medical Physics of each country member of EFOMP (NMO). 23 out of 34 country members responded. The main parts (3 in total) of this questionnaire and some typical questions were:

Part A: Medical Physics Education

- Which degree is required? Is this a university degree? How many years of studies does it represent?
- Is there a nationally approved education programme and, if yes, then by whom?
- Where do the education and training take place (University, Hospital, or both of them)? Are these centers accredited and who gives the accreditation?

Part B: Qualified / Specialist Medical Physicist

- Is there a license or diploma required to work as Medical Physicist? Is it officially provided (i.e. government)?

Part C: Register of Medical Physicists

- Is there a Register of Medical Physicists in the country? If yes, how is someone registered?
- Is there a renewal mechanism in the Register? If yes, is it based on a Continuing Professional Development system (CPD)?

Results (Summarised):

- In all countries that responded in this questionnaire, the basic educational requirement to enter Medical Physics is a university degree (basic titles: BSc 30%, MSc 57%).
- There are 3 different approaches concerning post-graduate education and training (university studies only 23%, hospital only 18% and combining university and hospital 59%).
- In 61% of all countries it is mandatory to hold a diploma or license to work as a Medical Physicist.
- 65% of all countries have an organised Register for Medical Physicists.
- A formal CPD programme is in operation in 52% of the countries.

Conclusions: The processing of the above results leads the EFOMP to propose some general guidelines. It is strongly recommended that holding a university Masters degree (MSc) and having 2 years' training in a hospital environment are the necessary requirements to take the license to act as a Medical Physicist. EFOMP strongly encourages NMO's to organise a formal CPD programme and to include a CPD-based renewal mechanism for the Register of Medical Physicists.

Keywords: medical physics, training, education, guidelines.

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1. Introduction

The Medical Physicist as a professional who works in a hospital environment is a part of a wide clinical team which is responsible for the correct diagnosis and the application of therapeutic methods using radiation. (EFOMP [5], Eudaldo et al [7]). The role of a Medical Physicist is multifold and consists of the estimation of dose for patients and personnel, the quality control of radiological equipment, the studies for shielding requirements and the training of several health professionals (doctors, medical physicists, radiologists, technicians, nurses). All the above are prerequisites in order to receive the professional license to act as Medical Physicist. Part of the duties-responsibilities of a Medical Physicist and their classification depending on the area of competence that they work are shown in Tab.1 (EFOMP [5]).

2. Aims–Research inquires

The aim of European Union (EU) via European Federation of Medical Physics (EFOMP) is the existence of a common policy between the EU countries in the area of Education and Training in Medical Physics, within the context of the current developments in the European Higher Education Area arising from “The Bologna Declaration” (Bologna Declaration [1]) and the Directive 2005/36/EC of the EU on the recognition of professional qualifications (Directive [3]). The short-term objectives of the Bologna Declaration are shown in Tab.2. A short-term perspective of Directive 2005/36/EC is the free movement of professionals within EU via the assurance of knowledge and skills uniformity (Schlegel [10]). A necessary initial stage is the collection, classification and further process of relevant information at European level.

Table 1.
Typical responsibilities of Medical Physicist

AREA OF COMPETENCE	TYPICAL RESPONSIBILITIES
Radiotherapy	Treatment Planning
	Clinical Dosimetry
	Quality control of equipment and procedures
	Radiation protection of personnel
	Hazard Reports and Quality Assurance- Control Checks
Nuclear Medicine	Estimation of patient’s dose.
	Quality control of equipment and procedures
	Management of radioactive wastes
	Radiation protection of personnel
	Radiation protection of the environment
	Hazard Reports and Quality Assurance- Control Checks
Diagnostic Radiology	Optimization of imaging methods
	Quality control of equipment and procedures
	Estimation of patient’s dose
	Optimization of imaging methods
	Estimation of fetus’ dose in case of pregnancy

Note: In addition and independently of the area of competence the Medical Physicist is responsible for the training of health professionals on Radiation Protection issues and also to make research in several topics of Medical Physics.

Table 2.
Short-term objectives of the Bologna Declaration

A/A	OBJECTIVES
1	Easy recognition and comparison of degrees
2	Educational system based on 2 cycles (undergraduate- and graduate)
3	Educational credits’ system (such as ECTS)
4	Promotion of geographic mobility
5	Promotion of geographic co-operation on Quality Assurance issues
6	Promotion of the European dimensions in Higher Education area

Bologna Declaration (19-6-1999). At the present phase and after the Bergen’s Conference (19 and 20-5-2005) 45 European countries are involved.

3. Methods-Techniques

To collect necessary information in an efficient way, a questionnaire was prepared by EFOMP and sent to the National Organisations for Medical Physics of each country member of EFOMP (NMO) for completion. 23 out of 34 country members responded. The main parts (3 in total) of this questionnaire and some typical questions are shown in Tab.3 (Christofides [2], Eudaldo and Olsen [8], Eudaldo [9]).

Table 3.
Typical Questions asked to the National Organizations of Medical Physics

PART	QUESTIONS
Medical Physics’ Education	Which degree is required? Is this a university degree? How many years of studies does it require?
	Is there a nationally approved education programme and, if yes, then by whom?
	Where do the education and training take place (University, Hospital, or both of them)? Are these centers accredited and who gives the accreditation?
Qualified / Specialist Medical Physicist	Which is the total duration of the Education programme and how is the time education-training distributed?
	Is there a license or diploma required to work as Medical Physicist? Is it officially provided (i.e. government)? Are there alternative ways for someone to be eligible to work as a Medical Physicist (except having the license)?
Register of Medical Physicists	Is the “diploma” or “license” equivalent to Qualified Medical Physicist (QMP) or to Specialist Medical Physicist (SMP)?
	Is there a Register of Medical Physicists in the country? If yes, how is someone registered?
	Is the Register entrance voluntary or compulsory based?
	Are there any procedures for Registry entrance of applicants from a foreign country, registered on a foreign approved Register?
	Is there a renewal mechanism in the Register? If yes, is it based on a Continuing Professional Development system (CPD)?

4. Results

Summarized:

- In all countries that responded, the basic educational requirement to enter Medical Physics is a university degree (basic titles: BSc 30%, MSc 57%).
- The duration of the basic university education ranges from 2 to 5 years.
- There are 3 different approaches concerning post-graduate education and training (university studies only 23%, hospital only 18% and combining university and hospital 59%).
- The total duration of the programme for education and training in Medical Physics ranges from 4.5 to 9 years.
- In 61% of all countries it is mandatory to hold a diploma or license to work as a Medical Physicist.
- Diploma or license to work as a Medical Physicist allows one to work in all areas of competence (Radiotherapy, Nuclear Medicine, Diagnostic Radiology, Radiation Protection) in 65% of the countries, whereas in 13% the area of competence that a Medical Physicist is allowed to work depends on the areas selected during the Education and Training programme.
- 65% of all countries have an organized Register for Medical Physicists.
- A renewal mechanism exists in 73% of the Registers.
- A formal CPD programme is in operation in 52% of the countries.
- CPD is used as a renewal mechanism in the Register in 100% of the cases.

5. Conclusions-Discussion

EFOMP recognises 2 levels of training for a Medical Physicist working in a hospital environment: the qualified medical physicist (QMP) and the specialised medical physicist (SMP). The QMP has the required training level to work independently and the minimum qualifications required for enrolment in an approved National Register of Medical Physicists by EFOMP. The QMP reaches the level of SMP by gaining substantial clinical experience and participating in the processes of education and training based on an EFOMP's approved National CPD programme.

CPD is an organised reach of knowledge, experiences and skills that required to a Medical Physicist to work at a high quality level during his professional life. EFOMP encourages all Medical Physicists, who have completed the basic education and training, to follow a CPD programme, so that they can maintain or increase their knowledge and skills level after getting the diploma or license to act as Medical Physicists (EFOMP [4], EFOMP [6]).

CPD is considered essential for the employee as well as the employer and generally for the profession trying to ensure the high quality services, as a measure promoting healthy competition or in a court. The advantages for the employee consist of higher professional satisfaction, higher motivation during the work and perspectives for future professional promotion. With the energetic participation into the CPD programme, the employer achieves up-to-date scientific and technologically trained professionals. This will help the natural and successful insertion of new medical practices in the future. Under the processes of CPD, the profession reputation is improved and general recognition is achieved in the benefit of patient and general public, in the case that there is assurance of the conditions for good medical practices (EFOMP [4]).

The implementation of CPD demands the existence of available resources like time, high scientific knowledge and skills level of trainers as well as economic resources (EFOMP [4]). These resources must be offered by those who gain from this process (employee, employer, general public and the corresponding scientific union). Both the employee and the employer contribute money and time so the employee can participate to CPD programmes. The scientific union is responsible for the organisation of such seminars, congresses and other relevant scientific meetings and for the development and management of a formal CPD programme. General public contributes with providing the necessary material and technical infrastructure, as well as the high level trainers.

The processing of the above results leads the EFOMP to the formulation of some general guidelines (Eudaldo and Olsen [8]). Therefore, it is recommended to hold a postgraduate title (MSc) and to have 2 years' training experience in a hospital environment, as essential requirements to achieve the licence or the diploma to work as Medical Physicist. The National Organisations of Medical Physics are strongly encouraged to make a formal CDP programme and have a renewal mechanism in the Register of Medical Physicists and a promotion from QMP to SMP, both based on CDP programme.

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