The European Federation of Organisations for Medical Physics
Policy Statement Nr. 2

The Roles, Responsibilities and Status of the Clinical Medical Physicist

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Introduction

The European Federation of Organisations for Medical Physics (EFOMP) was founded during the second conference of representatives from European organisations for Medical Physics, in London in May 1980. The current membership includes eighteen national organisations which together represent about 2500 physicists and engineers in the field of Medical Physics.

The aims and purposes of the Federation include the task of 'making recommendations on the appropriate general responsibilities, organisational relationships and roles of workers in the field of medical physics'. At the inaugural meeting Dr. P.-E. Åsard presented a report on replies to a questionnaire on professional matters such as grading structures, organisation and salaries. A working group was elected to work towards a policy statement on these matters. It consisted of Dr. P.-E. Åsard (Sweden), Dr. H. Aget (France), Professor M. M. Black (United Kingdom), Dr. M. Tautz (G.D.R.) and Mr. A. Piron (Belgium). Dr. Åsard was the chairman. This working group subsequently became the Federation's Committee on Professional Matters. The outline of this Policy Statement was produced and debated at a meeting of the EFOMP Council in Brussels in June 1981. It was further discussed at an EFOMP symposium at the Vlth International Congress on Medical Physics and at an EFOMP Council meeting, both in Hamburg in September 1982. The document was then reviewed by the member organisations and comments were incorporated leading to its adoption as an EFOMP Policy Statement, at the Council meeting in Bordeaux on 3rd September, 1983.

1. Medical Physics - Past, Present and Future

It is generally agreed that the important effects of scientific thought on medicine first occurred during the seventeenth century. From that time and during the three following centuries the association of physics and medicine and the development of physics applied to medicine advanced. During this phase it was possible for an educated person to have sufficient knowledge of both physics and medicine to make important and fundamental contributions in both fields.

From around 1900, after the discovery of X-rays and radioactivity, atomic and nuclear physics developed. It was clear that no person could as a rule have sufficient knowledge in both fields. Thus some physicists in the 1920s began to appear in medical work mainly to solve problems involved in medical applications of ionizing radiations. These problems lay particularly in radiotherapy and radiation protection including radiation biology. Later on, in the 1940s, the use of radionuclides was introduced for both diagnostic purposes and for therapy and increasingly physicists were employed by hospitals as hospital physicists. These physicists contributed to the improvement of radiotherapeutic equipment, technique and dosimetry and the use of radionuclides in medical care and research. With the introduction of the ^{60}Co-therapy machine, accelerators, and more advanced nuclear medicine techniques, the number of hospital physicists increased in some countries very rapidly during the 1950s, the 1960s and the 1970s.

During this development of medical physics the working fields of the medical physicists increased. They cover today, in almost all countries, the whole field of radiology and also non-ionizing radiation such as ultrasound, ultraviolet,

radiofrequency and laser radiation. In many countries they also cover extensive areas in computer science and electronics that have been introduced at an increasing rate into medical care by physicists, mathematicians, electronic engineers and computer specialists working in hospitals. In some countries the working field includes applications of electrical measurements, physics of gases, and mechanics.

In the past the physicists' contribution to the initial progress of some applications of physics in medical science was made from outside direct clinical involvement. During the last 20 years however the situation has developed where physicists are main collaborators with the clinicians in almost all fields of medicine, although perhaps especially in the radiological field. Medical electronics and clinical or bioengineering have commonly developed from the activities of physicists. In some countries these are today regarded as part of the medical physics service, and in other countries as separate from it, although closely related. In the future, physics will be of even more importance both in clinical medicine and in medical science. Medicine can be expected to become more scientific and quantitative. Scientific data will be of more significance in the diagnosis and treatment of diseases. Medical physics will play an increasingly important part in this development. High standards in medical physics services must be maintained and sufficient resources directed towards this.

In this policy statement examples are frequently taken from the long established speciality of radiation physics. However, the importance ot the more recently developed fields of ultrasonics, medical electronics, clinical engineering etc. should not be underestimated.

2. Definition of the Medical Physicist

The preamble to the Constitution of EFOMP states that 'In most European countries there are National Organisations in which the principal defined category of members are persons ... qualified with a University degree or equivalent in physics, mathematics, computing sciences, physical chemistry, mechanical, electrical or electronic engineering, etc., and... working in alliance with medical staff in hospitals, universities or research institutes'. These individuals are medical physicists. In addition to their university degree or equivalent they will have training in the concepts and techniques of applying physics in medicine and they will also have practical training in the field.

Two categories of medical physicists can be identified according to their employment situation and working fields. One category consists of medical physicists working as teachers and scientists in universities, as researchers in industrial laboratories and so on. For these physicists the employment itself defines their role, responsibilities and status. The Committee has no intention of including this category in these recommendations. These recommendations are intended to be applied only in the situation where these physicists are also involved in clinical work or research work involving patients.

The second category to which these recommendations are intended to apply concerns medical physicists working in a clinical environment either employed in hospitals or as a consultant to hospitals. These physicists have or might have an influence on the diagnosis and/or treatment and safety of patients, or their decisions might have consequences for the performance of diagnostic, treatment and safety procedures in hospital care. The name of this category of medical physicists varies from country to country. For example "medical physicist", "clinical physicist", "hospital physicist" are used to categorize these physicists.

The Committee has used the words clinical medical physicist in the following to stress that these recommendations do not, except for the distinction above, include medical physicists not working in a clinical environment. They also do not include a category of medical doctors who in some countries get training in medical physics in the faculty of medicine.

3. Professional Aspects of Education and Training

Education and training of medical physicists is of great importance when defining roles, responsibilities and status. The evolution of medical physics in each country depends to a large extent on the existence and standard of education. In general it can be said that medical physics is most advanced in countries where there exists a more formal organisation for education and training of medical physicists. It is therefore of importance that chairs of medical physics and/or in

medical radiation physics at universities should be established in every country. These chairs should have dual responsibilities in the faculty of science and the faculty of medicine.

The education of medical physicists can be divided into three stages. The first step is to bring the physicist up to a basic standard during an initial period of training at the university in physics, mathematics and other relevant topics in natural science. The second step is to introduce medical physics in the education and the third step is in-service training in hospitals. After finishing this the physicist can be recognised as a medical physicist. It should also be possible to reach a senior level by further education, training and experience, and to get a higher academic degree, i.e. Ph.D. or equivalent in medical physics. The Committee will not in these recommendations go into details about education and training but will only give a view of the levels.

First stage: An entrant to medical physics training should have at least a Bachelors degree in physics or equivalent.

Second stage: Education in medical physics should follow as a formal course of lectures, seminars, tutorial work and practical work. A minimum of 1-2 years is required. It should be possible from the beginning at this stage to concentrate on, for instance, medical radiation physics but the courses should in such cases also include other aspects of physics applied to medicine. The second stage can run simultaneously with the third stage.

Third stage: In-service training should be done under the supervision of a medical physicist at senior level. It is an advantage if during in-service training the physicist gets opportunities to do individual work on projects. The length of the in-service training period should be 2 years or longer.

It is most important that in every country not only formal courses in medical physics are arranged but also that possibilities are created to help those physicists who want to make a career in clinical medical physics to get opportunities to do in-service training in an efficient and economical way in hospitals. It should be possible for the medical physicist to attend additional courses which give opportunities for obtaining deeper understanding and knowledge in special branches of medical physics. This is necessary as even in the field of medical radiation physics a high degree of specialisation among medical physicists in different types of applications of radiation physics to medicine has occurred. A further training to the senior level should be arranged and the universities or some of them should have the capacity to arrange training leading to a Ph.D. or equivalent in medical physics. However, it should be recognised that academic training of this nature cannot take the place of in-service training which, ideally, should be organised through properly constituted national training schemes.

4. Responsibilities of the Clinical Medical Physicist

In countries where the clinical medical physics service is well developed it plays an essential part in medical care and health services. The main responsibility of the clinical medical physicist is to provide a high standard of service in the hospital. Two functions can be distinguished. One function is the professional one fulfilled by the medical physicist through his competence in the field of clinical medical physics, a competence not as a rule found among any other medical, paramedical or technical specialities. Thus the clinical medical physicist must be responsible within this area of competence for the standardisation and calibration of medical physical equipment and for the accuracy and safety of physical methods used in routine clinical applications in close co-operation with medical doctors and other personnel. He has also a responsibility in research and in the development of new techniques and physical methods and equipment. Further he has a responsibility for providing education and training in applied physics for doctors, nurses, medical technical assistants, etc., and student physicists and technical staff.

The other function is a managerial one exercised at a senior level where the clinical medical physicist is an administrator for the clinical medical physics service. He will also have a responsibility for the financial control of the medical physics service and responsibilities in the general organisation and financial control of the hospital and/or the region. He will be answerable to the highest level of central administration.

The clinical medical physicist is a member of a team of personnel responsible for diagnosis and treatment of patients. The clinical medical physicist will have an influence on the diagnosis, treatment and safety procedures for the patient and thus his decisions will have consequences for the patient. As his decisions are based on his competence, a

competence not found elsewhere, he should be fully responsible for his work.

EFOMP recommends that the responsibility of the clinical medical physicist should be recognised by the national health authorities in every country. EFOMP feels that state recognition of clinical medical physicists, perhaps by a structure comparable to that used for medical doctors, might be appropriate in establishing a base for competence and responsibility.

5. Status and Organisation of the Clinical Medical Physics Service

The status of clinical medical physicists and the clinical medical physics service varies largely throughout Europe: This depends on several factors but in general it is related to the existence and standard of the education and training in medical physics and to the standard of service provided. In some countries this standard is high and the ultimate goal in other countries must be to reach the same level. In general and especially for these latter countries it is of vital importance that the profession of clinical medical physics has a recognised high status, that good working conditions and facilities are provided and that the organisation of the medical physics service is attractive for skilled physicists. A good career structure for medical physicists is of importance.

The organisation for the clinical medical service also varies widely. In countries where the clinical medical physics service is of the highest standard the service is organised with independent departments of clinical medical physics. That means that the head of the department is a clinical medical physicist at senior level responsible for the clinical medical physics service within a hospital or within a region. Clinical involvement will be broad and flexible with a strong supporting organisation. It is of importance that the clinical medical physics service is not directed only to a few particular hospitals, for example, university hospitals. Other hospitals in a region should also achieve the same standard of service, which means that the departments of clinical medical physics should serve a whole region or a part of a region.

6. The Need for Clinical Medical Physics Service

The need for clinical medical physics service in each country depends primarily on the standard and scope of medical care. Generally speaking it can be said that in the radiological field (X-ray diagnostics, radiotherapy, nuclear medicine and radiation protection) there is an obvious need for a clinical medical physics service. This has been proven by the development in countries where the service has a long tradition. It is also obvious that the introduction of a medical physics service in general depends a great deal on the appreciation by the medical profession of the ways in which physicists may assist in solving problems of medical diagnosis and treatment.

Figures of the number of physicists per million inhabitants in different European countries show a wide variation. Figures can be used in comparisons between countries only if they have about the same standard of medical care. Countries which do not have this standard but strive to reach it should in their planning take into account the medical physics service needed to obtain this standard. The number of physicists needed in diagnostic radiology, radiotherapy, nuclear medicine and radiation protection is correlated to the number of institutions and the number of, for instance, radiotherapy units. As a rule countries at an early stage of development of medical physics are in fact developing medical radiation physics first as this is still the largest single part of the medical physics service. EFOMP considers this strategy suitable and that it will form a basis for further development of physics service in other applications of physics in medical care. The number of clinical medical physicists and supporting staff must be adequate to meet the high standards of service required. In making such provision, health authorities are best guided by the recommendations of the national organizations which is affiliated to EFOMP.

The European Federation of Organisations for Medical Physics (EFOMP) was formed in 1980 and has affiliated organisations in Austria, Belgium, Bulgaria, Denmark, Federal Republic of Germany, Finland, France, German Democratic Republic, Holland, Israel, Italy, Norway, Spain, Sweden, Switzerland, Turkey, United Kingdom, and Yugoslavia.
