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**Further Education and Vocational Training
of Medical Physicists**

Recommendation by the German Commission on Radiological Protection

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1997

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Empfehlung der Strahlenschutzkommission

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In the event of any doubts about the meaning, the German original as published shall prevail.

Contents

1	Present Situation.....	4
2	Concept of Further Education.....	5
3	Recommendations	5
4	Literature.....	7

1 Present Situation

In Germany, it is laid down in the Radiation Protection Ordinance (Strahlenschutzverordnung, StrlSchV) that the handling of unsealed radioactive substances for examinations and treatments, the handling of sealed radioactive substances for examinations and treatments as well as the operation of irradiation facilities with radioactive sources and the operation of facilities for the generation of ionizing radiation require licensing. One of the prerequisites for licensing is that sufficient personnel with appropriate expertise is available. According to para. 19 subpara. 2 StrlSchV, a second radiation protection officer, e. g. an especially trained physicist, must be appointed in addition to the radiation protection supervisor or radiation protection officer, when accelerators are used. Also when applying radioactive substances or ionizing radiation in medicine or dentistry (para. 42 StrlSchV), the responsible authority may give order that, for instance, a physicist is appointed as additional radiation protection officer. According to the guideline 97/43/EURATOM of 30 June 1997 on health protection of persons against the dangers of ionizing radiation in the case of medical exposure, an expert in medical physics shall be consulted for close collaboration in all radiation-therapeutical applications. An expert in medical physics must be available in the event of therapeutical nuclear-medical applications of radiation and applications in nuclear-medical diagnostics,. In the event of other radiological applications, if necessary, an expert in medical physics should be consulted, to give advice with regard to optimization issues, including patients' dosimetry and quality assurance with quality control, and, if need be, also to give advice with regard to radiation protection questions in the case of medical exposures.

The scope of tasks of a medical physicist comprises measures for quality assurance, for the optimization of the patients' exposure and for radiation protection of patients and personnel.

Physicists are also employed in the fields of medical application of nuclear magnetic resonance, hyperthermia and ultrasound. In all fields, in particular in the case of dosimetry of non-ionizing radiation, dose planning and dose calculation including clinical dosimetry of ionizing radiation as well as the development and application of complex procedures, specialist knowledge is the prerequisite for responsible work.

Frequently, in particular in the case of therapy with accelerators and gamma-irradiation installations and the irradiation with sealed radioactive substances, this requires of the physicist direct working at the patient, both when determining the irradiation parameters and also in simulation and first focussing. Similar workings at the patient are frequently given within the framework of dose determination in X-ray diagnostics. It is likewise demanded in the recommendations of the International Commission on Radiological Protection (ICRP publication no. 62), that a medical physicist should be available who is able to perform the necessary dose measurements and calculations.

Also according to the X-Ray Ordinance (Röntgenverordnung, RöV), medical physicists may be appointed within the framework of quality assurance to perform quality control measures and determine the patients' dose.

There is no legally binding regulation for the whole area of the Federal Republic of Germany concerning the acquisition and acceptance of the specialist knowledge required of physicists for doing this, which is not conveyed during the regular studies of physics. At present, solutions covering the needs only exist in the Federal State of Berlin due to the protection of the job title "medical physicist" which is bound to a completed further education.

Also the guideline 97/43/EURATOM states that taking care of the training of the qualified personnel employed in the field of medical irradiation application is a task of the member countries. Furthermore, it is laid down in this guideline that the member countries shall also approve of, in addition to the training, the corresponding diplomas, certificates or other proofs of qualification issued by the competent authorities. According to European right, this acceptance shall be valid within the member countries. Due to the described initial situation, regulation is urgently required for the Federal Republic of Germany.

2 Concept of Further Education

In view of the risks for the patients linked with a non-expert application of ionizing radiation, the International Atomic Energy Agency (IAEA) in co-operation with the World Health Organization (WHO), elaborated already in 1972 a concept of further education in medical physics, which has been taken over with regard to radiation protection by the International Commission on Radiological Protection (ICRP) and the competent scientific expert societies which have joined together in Europe in the European Federation of Organisations for Medical Physics (EFOMP) as further education concept. According to the recommendations of the WHO, this concept comprises

- initial prerequisites
- practical experience
- general and special courses in medical physics with proof of success.

The German Association for Medical Physics (Deutsche Gesellschaft für Medizinische Physik e.V., DGMP) has worked a further educational concept which corresponds to the ideas elaborated by the EFOMP in correspondence to the WHO and which is in accord with the Berlin law concerning the acceptance of the job title "Medical Physicist". The completed further education is presently certified by the Association after the factual prerequisites have been checked.

3 Recommendations

In the interest of the necessity of quality assurance in radiation protection as well as with regard to the guideline 97/43/EURATOM and the recommendation of the Commission on Radiological Protection on the "State-Approved Further Education in Medical Physics" of 1990, **the Commission on Radiological Protection recommends the standardization of further education and vocational training as well as the state approval of further education of medical physicists.** With this, a significant step would be taken with regard to quality assurance and risk minimization in this complex field of application of ionizing radiation and radioactive substances as well as non-ionizing radiation.

The basis of a state-approved further education in medical physics should be the IAEA/WHO concept. The further education must be determined with regard to their contents and the final examination. With this it is guaranteed that extent and specialist orientation of both the practical work as well as the theoretical further education correspond to the state-of-the-art of science and technology and, in addition to this, are also valid on the European scale. Correspondingly, the SSK recommends:

a) Initial Prerequisites

The initial prerequisite for the further education in medical physics should be studies with a diploma in physics or a physically-technically oriented engineering science completed at a scientific university in the area within which the German Constitution is operative or a corresponding adequate qualification of the EC member countries.

b) Extent of Further Education

The further education should comprise an occupation of at least three years in medical physics and the proof of

I. basic knowledge in the following areas (obligatory):

- anatomy, physiology
- biophysics, biochemistry, molecular biology
- biomathematics, informatics
- medical technology
- organizational and legal principles in health service

II. comprehensive knowledge and practical experience in another field of medical physics

III. knowledge of the fundamental and general principles in at least two other fields of medical physics (optional).

Further educational courses comprising at least 360 hours are considered as serving the acquisition of knowledge according to I, II and III.

c) Specialist Knowledge

Further education in the subject area of "Medical Radiation Physics" should comprise the acquisition and proof of the basic knowledge defined in I. as well as of comprehensive knowledge and practical experience and/or of knowledge in

- physics in radiation therapy
- physics in nuclear medicine
- physics in diagnostic radiology.

This includes knowledge in radiation protection to the factual and temporal extent as is required for the acquisition of expertise according to the RöV and the StrlSchV.

d) Vocational Training

Vocational training should take place in regular intervals in a provable way after approval has been granted.

4 Literature

Rat der Europäischen Union:

Richtlinie 97/43/Euratom des Rates vom 30.6.1997 über den Gesundheitsschutz von Personen gegen die Gefahren ionisierender Strahlung bei medizinischer Exposition und zur Aufhebung der Richtlinie 84/466/Euratom. Amtsblatt der Europäischen Gemeinschaften L 180/26 vom 9.7.1997

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Radiological Protection in Biomedical Research. ICRP Publication 62.

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30. Juni 1989 (BGBl. I S. 1321, 1926), zuletzt geändert durch Verordnung vom

18. August 1997 (BGBl. I S. 2113)

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