The European Federation of Organisations for Medical Physics

Policy Statement Nr. 3

Radiation Protection of the Patient in Europe: The training of the Medical Physicist as a Qualified Expert in Radiophysics

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1 Preamble

The man-made contribution to the radiation exposure of human beings in the European Community Member States is primarily due to the use of ionising radiations and radioactive substances in medicine. The Council of the European Community has published a directive laying down basic measures for the radiation protection of persons undergoing medical examinations or treatment. This EEC Directive 84/466/Euratom, of 3 September 1984, contains the following statements:

Article 2, paragraph 1. *Without prejudice to Directives 75/362/EEC and 75/363/EEC, as amended by Directive 82/76/EEC, and Directives 78/686/EEC and 78/687/EEC, Member States shall take all appropriate measures to ensure that any ionising radiation used in medical procedures is effected under the responsibility of doctors or dental practitioners or other practitioners who are entitled to perform such medical procedures in accordance with the national legislation and who, during their training, have acquired competence in radiation protection and received adequate training appropriate to the techniques used in medical and dental diagnostic radiology, in radiotherapy or in nuclear medicine.*
Article 5. *A Qualified Expert in radiophysics shall be available to sophisticated departments of radiotherapy and nuclear medicine.*

2 Introduction

National organisations affiliated to EFOMP note the reference to a Qualified Expert in radiophysics. It is further noted that this Qualified Expert shall be available to sophisticated departments of radiotherapy and nuclear medicine. The principal qualifications, experience and qualities required of the Qualified Expert are easily stated:-

i) an adequate theoretical knowledge of the properties of ionising radiation

ii) a thorough knowledge of the hazards they present

iii) a knowledge of how to minimise these hazards

However, the role and training of this Expert in a patient oriented environment needs to be clarified.

Dr. Eriskat, Head of the Division for Health Protection and Public Health (Euratom), has pointed out that the phrase "available to" should not be interpreted as "permanently present" in the department concerned (XIV ICMBE and Vll ICMP, Espoo, Finland, 1985) but it should clearly imply a very familiar knowledge of the patient environment. The

Qualified Expert must be deeply involved in the elaboration of techniques used for examinations or treatment. This can be achieved only if a daily relationship exists between the Expert and the patient environment, in particular the medical staff.

3 Definition of a Qualified Expert in Radiophysics.

In this document the Qualified Expert in Radiophysics has been defined as 'an experienced Medical Physicist working in a hospital, or in a recognised analogous institution, whose knowledge and training in radiation physics are required in services where the quality of the diagnostic image or the precision of treatment is important and the doses delivered to the patients undergoing these medical examinations or treatments must be strictly controlled'.

4 The Role of the Qualified Expert in Radiophysics.

The Role of the Qualified Expert in Radiophysics is as follows:

- to carry out the physical measurements related to evaluation of the dose delivered to the patient and to take responsibility for dosimetry.
- to improve any conditions that will lead to a reduction in patient dose
- to lay down tests in the field of quality assurance of the equipment.
- to assure the surveillance of the installations with regard to radiological protection.
- to choose equipment required to perform radiation protection measurements and to give advice on medical equipment.
- to take part in the training of medical practitioners and other staff in relevant aspects of radiation protection.
- to provide skills and responsibilities that complement those of medical practitioners as mentioned in Article 2 paragraph 1 of the same Directive.

These arrangements should apply to all medical departments using ionising radiation on patients, i.e. diagnostic radiology. nuclear medicine and radiotherapy.

5 Principles of Training

To undertake the role of the Qualified Expert as described earlier in this paper and in accordance with the EFOMP Policy Statement on Education and Training, EFOMP proposes that the following requirements for education and training of a Qualified Expert must be fulfilled:

5.1 The formal part of the training

The Qualified Expert should firstly have an education in physical sciences that provides an adequate scientific basis in radiation physics to the level of a masters degree or its equivalent. This level may be attained in different ways depending on the educational situation in a country, e.g. a PhD in radiation physics or a batchelors degree in physical sciences followed by vocational training in medical radiation physics or similar post graduate specialists' training.

The formal part ot this training should include the legal aspects ot the application of radiation in medicine and the responsibilities of the authority in radiation protection.

5.1.1 Curriculum of Courses in Radiation Protection for the Qualified Expert

Basic course. *(It is assumed that participants will already have sufficient skills and knowledge in fundamental radiation physics)*

- fundamentals of radiation biology, including effects of low doses of interest in radiation protection.
- fundamentals and basic principles of radiation protection with respect to patients, occupationally exposed radiation workers and the public in general.

- natural and artificial exposure in man.
- physical and legislative measures to be taken in case of accidental and/or incidental exposure in man.
- legislative status and duties of the Qualified Expert.

5.1.2 Curriculum of Courses in Radiation Protection for the Qualified Expert

Special Courses

There should be special courses dedicated to the fields of application, e.g.

Radiation Therapy

1. Physical principles and technical features of irradiation facilities - X-ray therapy equipment, gamma irradiation units, circular and linear accelerators, therapeutic neutron facilities, sealed radioactive substances.
2. Control of irradiation facilities and provision and maintenance of safety features.
3. Control of radioactive sources, leakage tests, record keeping and stock control.
4. Biological fundamentals of radiation therapy.
5. Clinical dosimetry, methods of dose evaluation.
6. Radiation treatment planning - medical and physical aspects.
7. Quality assurance procedures.
8. Radiation protection of staff and the assessment of hazards etc.
9. Radiation protection of the environment.
10. Instructions in case of accidents or incidents.
11. Planning of new or modified buildings, equipment, installations and processes which have radiation safety implications.
12. Special legal requirements, guidelines, official proceedings and inspections.
13. Technical Rules.

Radiodiagnosis

1. Physical principles and technical features of diagnostic radiology facilities.
2. Control of diagnostic radiology facilities including specification of protection measures and conduct of room and equipment surveys.
3. Imaging techniques and their effect on the radiation exposure of the patient.
4. Optimisation of exposure and alternative diagnostic methods.
5. Quality control.
6. Measurement and calculation of doses to patients, including those following irradiation of an undisclosed pregnancy.
7. Selection of calibration, monitoring and test equipment.
8. Radiation protection of staff.
9. lnstruction in the event of accidents or incidents.
10. Special legal requirements and guidelines.
11. Technical rules.

Nuclear Medicine

1. Physical characteristics of radionuclides.
2. Production of radionuclides: - reactor, accelerator, radionuclide generators.
3. Production of radioactive pharmaceuticals and pharmaceuticals labelled with radioactive substances in accordance with good radiation protection standards.
4. Purity of radioactive pharmaceuticals- purity of radionuclides, radiochemical purity, chemical purity, pharmaceutical purity.
5. Biokinetics of radioactive substances:- incorporation, distribution, excretion.
6. Radioactivity.

7. Dose calculations. Calculations of the patient dose likely to arise from administration of radioactive materials for diagnostic procedures.
8. Optimisation of exposure and alternative diagnostic methods.
9. Measuring methods and devices.
10. Control of radioactive sources, record keeping and stock control.
11. Practical radiation protection measures: - transport and storage of radioactive substances, handling of radioactive waste and planning of its disposal.
12. Radiation protection of the patient in diagnosis and therapy.
13. Radiation protection of the staff in diagnosis and therapy.
14. Radiation protection of the environment,
15. Design, construction and adaptation of premises for work with unsealed radionuclides.
16. Instructions in case of accidents or incidents.
17. Special legal requirements and guidelines.
18. Technical Rules.

5.2 Practical Experience.

The Qualified Expert should, secondly, have a period of in-service training comprising two years experience in medical radiation physics. In these two years he/she should acquire adequate practical experience in dosimetry and in those areas where expertise is to be provided (the use of radioactive materials; the operation of systems for the generation of ionising radiation; irradiation units containing radioactive sources). The two years of practical experience should involve working in a clinical environment under the professional supervision of a qualified medical physicist who is an expert in radiophysics. This professional supervision cannot be found among other medical, paramedicaI or technical specialties. The nature of the work during this period shall include standardisation and calibration of medical radiophysical equipment and control of the accuracy and safety of radiophysical methods used in routine clinical applications in close co-operation with medical doctors and paramedical personnel. A certified record of this period of practical experience should be maintained.

6 Assessment.

Appropriate arrangements should be made for assessment and certification of Qualified Experts either by the competent national authorities or by the national professional organisation for medical physics.

The certificate awarded on successful completion of the designated training should be formally recognised by the competent national authority as indicating a Qualified Expert in radiophysics.

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