THE EUROPEAN FEDERATION OF ORGANISATIONS for MEDICAL PHYSICS

POLICY STATEMENT No. 9

Radiation Protection of the Patient in Europe: The Training of the Medical Physics Expert in Radiation Physics or Radiation Technology

Preamble

Medical exposure continues to constitute the major source of exposure to artificial sources of ionising radiation and their use has enabled great progress to be made in many aspects of medicine. These practices need to be carried out in optimised radiation protection conditions as recommended by the International Commission on Radiological Protection, recognising the development of scientific knowledge in the field of radiation protection applied to medical exposure. The Council of the European Union has therefore found it necessary to repeal the Directive 84/466/Euratom and has adopted Directive 97/43/Euratom of 30 June 1997 on health protection of individuals against the dangers of ionising radiation in relation to medical exposures[1)]. Member States of the European Union shall bring into force the laws and regulations to comply with this Directive before 13 May 2000.

Introduction

National Member Organisations affiliated to EFOMP note the definition of the Medical Physics Expert and the involvement of the expert in radiotherapeutic, diagnostic nuclear medicine and other radiological practices in the new Directive.

EFOMP has in the last two decades sought to harmonise and promote the best practice of medical physics in Europe and has in this respect issued a series of Policy Statements. Reference should be made to the Policy Statement of 1988: “Radiation Protection of the Patient in Europe. Training of the Medical Physicist as a Qualified Expert in Radiophysics”[2)] which was the EFOMP response to the Directive 84/466/Euratom. In 1991 EFOMP issued the first Policy Statement on the numbers of qualified physicists needed in a Medical Physics Department, this Document was revised in 1997[3)]. In the 1993 Policy Statement the advantages, organisation and management of Departments of Medical Physics are described[4)].

The EFOMP strategy is directed towards recognition of the European Medical Physicist and for this purpose the Federation’s approach has been to encourage registration schemes (on a voluntary basis) where no regulated scheme (as imposed by law) exists. EFOMP recognised that the most appropriate way to achieve harmonisation of standards across the whole of Europe was to express the duties and competencies expected of the Qualified Expert in Radiophysics set out in the 1984 Directive, in very practical terms. A framework of five levels of competency that covers the whole career structure of the medical physicist was developed[5)]. A system for recognised Continuing

Professional Development is recommended by EFOMP and has been described in a recent Policy Statement[6)].

Definition of the Medical Physics Expert

EFOMP wishes to emphasise that the term Medical Physics Expert only applies to suitably experienced medical physicists, working in hospitals or recognised analogous institutions, where knowledge and training in radiation physics permits them to advise or act on all aspects of radiation protection of the patient. As a consequence, medical radiation physicists have a professional role which cannot be confused with any part of the work of a radiologist, radiographer, service engineer or other professional. Neither can the work of a Medical Physics Expert be undertaken by other professional groups without further training.

Furthermore, the definition spells out some areas in which the medical physicist should be involved - advice on patient dosimetry, development of complex techniques, optimisation, quality assurance and quality control. The national organisations must now ensure that medical physicists do get involved in all these areas.

The Role of the Medical Physics Expert

The Medical Physics Expert has to be involved in practices in all medical departments using ionising radiation on patients i.e. radiotherapy, nuclear medicine and diagnostic radiology.

The involvement of the Medical Physics Expert has already been described in the 1988 Policy Statement 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 unnecessary 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.

EFOMP stresses the need for clarification of the following details in the 1997 Directive on involvement of the Medical Physics Expert:

In radiotherapy: *the Medical Physics Expert shall be closely involved. -*
EFOMP interprets this statement to mean that a daily relationship exists between the Expert and the patient environment, in particular the radiation oncologists, and the Expert must have an in depth working knowledge of both the techniques used in the radiotherapy department and the way they are put into practice for individual patients.

In nuclear medicine: *the Medical Physics Expert shall be available.* -
EFOMP interprets this statement that the Expert shall have sufficient involvement to be

able to act as well as to advise. In practice this means that the Expert must know the equipment and the procedures in the nuclear medicine department in such detail that a daily relationship is most appropriate.

In diagnostic radiology: *the Medical Physics Expert shall be involved as appropriate.* - EFOMP has for many years highlighted the need for medical physics services in diagnostic radiology. Such services should be mandatory in all university hospitals and other specialised hospitals, where advanced techniques are used with possibilities of high doses to patients. The service should be made available for the radiological community in the region of such a university or specialised hospital. It is noted that under the heading of special practices involving high doses to the patient, both diagnostic and therapeutic procedures in this category, the involvement of the Medical Physics Expert should be as for radiotherapy - i.e. close involvement.

Competency Level to be assigned to the Medical Physics Expert: The term 'Medical Physics Expert' introduced by the new Directive has not been used before in an EFOMP Policy Statement. However, the duties of the Medical Physics Expert in the various fields of radiological practice specified in the new Directive suggest that, in the terminology of the Principles of Education and Training recommended by EFOMP, the competency with advanced practical experience is appropriate for the Medical Physics Expert. However, due to local circumstances, i.e. degree of specialisation of the hospital or lack of adequately trained medical physicists, it might be justified to lower this standard temporarily to the competency obtained after completion of directed education and practical training in medical physics and qualified to work indepently , but not lower whatever the local situation.

Principles of Education and Training

Education and Training Scheme: Medical Physics Experts are specifically included as a professional group in the Directive for which Member States shall ensure there is adequate theoretical and practical training for the purpose of radiological practices, as well as relevant competence in radiation protection. The Medical Physics Expert should first have a basic education in physical sciences, engineering or equivalent that provides an adequate scientific basis in radiation physics to the level of a diploma or masters degree and the subsequent education and training should follow the EFOMP Guidelines and the current policies on required competencies.

The basic education must therefore be followed by structured training including further theoretical courses and 2 - 3 years practical training in one or more of the sub-specialities to become a qualified medical physicist. This training should include the legal aspects of the application of radiation in medicine and the responsibilities of the Competent Authority in radiation protection. Practical experience should involve working in a clinical environment under the professional supervision of a qualified medical physicist who is a Medical Physics Expert. The qualified medical physicist should obtain formal recognition from the National Competent Authorities and be enrolled in a national registration scheme[7)].

The medical physicst needs subsequent experience and specialist training after formal recognition as a qualified medical physicist to be approved as Medical Physics Expert. This experience should be gained within the first period of a formalised Continuing Professional Development (CPD) system. The role of the Expert has already been stated in this document in general terms and there will be differences in emphasis, when this is applied to the three specific areas of radiotherapy, nuclear medicine and diagnostic radiology.

The Curricula of both Basic Courses and Special Courses dedicated to the fields of application were given in the 1988 Policy Statement and have been up-dated in this Document (Appendix 1). These curricula should be recognised by the Competent Authorities and will ensure comparability of standards in the three specialities in Europe.

The appropriate diploma, certificate or formal qualification must be duly recognised by the National Competent Authorities.

***Continuing Professional Development*:** It is stated in the Directive that Member States shall ensure that continuing education and training after qualification is provided. EFOMP strongly recommends the National Member Organisations to establish a system for Continuing Professional Development to ensure increasing competence and expertise after recognition and registration. The system should be established in agreement with the national health authorities and in accordance with EFOMP Policy Statement: Continuing Professional Development for the Medical Physicist[6)].

Summary of EFOMP recommendations:

In order to reach harmonisation throughout Europe when implementing EC-Directive 97/43/Euratom into national legislation, with regard to the definition and role of the Medical Physics Expert (MPE) EFOMP recommends the following guidelines:

1. The MPE at the minimum must have been recognised as a qualified medical physicist and preferably some further experience.
2. Education and Training Scheme in Medical Physics aiming at the level of a MPE has to follow the EFOMP guidelines[2)].
3. A system for a recognised Continuing Professional Development is recommended[6)].
4. According to the duties defined by the new Directive, the MPE has to be involved in radiological pratices in all university and specialised hospitals using ionising radiation on patients i.e. radiotherapy, nuclear medicine and diagnostic radiology.
5. Involvement of the MPE in radiological practices as demanded in Article 6(3) is recommended by EFOMP in the following way:

    5.1 *EC Directive*:
    In radiotherapy the MPE shall be closely involved:
    EFOMP:
    Daily relationship between MPE and patient environment is mandatory. Deep involvement in dosimetry, QA and elaboration of techniques used in the radiotherapy department.

    5.2 *EC Directive*:
    In nuclear medicine the MPE shall be available:
    EFOMP:
    MPE shall be able to make a meaningful intervention. Daily relationship between MPE and patient environment is most appropriate.

5.3 *EC-Directive*:

In diagnostic radiology the MPE shall be involved as appropriate.

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Depending on the spectrum of techniques used there must be access to medical physics service, for instance local or regional netwoks could be established to provide practicioners and smaller hospital with up to date medical physics service. When special practices are used as defined in Article 9, a daily relationship of the MPE and the patient environment shall be standard.

Appendix 1,

Curriculum of Courses in Radiation Protection for the Medical Physics 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 for risk assessment and risk management
- 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 Medical Physics Expert

Special Courses:

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

Radiotherapy

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 - clinical 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. Management in the event 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.

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. Formal quality assurance systems and procedures relating to the procurement, use and disposal of radioactive substances.
12. Practical radiation protection measures: - transport and storage of radioactive substances, handling of radioactive waste and planning of its disposal.
13. Radiation protection of the patient in diagnosis and therapy.
14. Radiation protection of the staff in diagnosis and therapy.
15. Radiation protection of the public; ie other patients in the hosptial, relatives and others after discharge
16. Radiation protection of the environment.
17. Design, construction and adaptation of premises for work with unsealed radionuclides.
18. Management in the event of accidents or incidents and risk assessments.
19. Special legal requirements and guidelines.
20. Technical Rules..

Diagnostic Radiology

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 assurance.
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. Management in the event of accidents or incidents.
10. Special legal requirements and guidelines.
11. Technical rules.

References

1. Official Journal of the European Communities No L180, 9.7.1997, p. 22
2. EFOMP Policy Statement (1988).
3. Physica Medica 13, 187 - 194 (1997).
4. Physica Medica 11, 126 - 128 (1995).
5. Physica Medica 13, Supplement 1, 400-404 (1997)
6. Physica Medica 14, 81 - 83 (1998).
7. Physica Medica 11, 157 - 159 (1995).