The European Federation of Organisations for Medical Physics
Policy Statement Nr. 4

Criteria for the Number of Physicists in a Medical Physics Department

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PREAMBLE

Modern Health Care Services are provided with ever-increasing demands for competence, specialization and cost effectiveness. The Medical Physics Service as practised in hospitals faces the same demands. The Hospital Physicist has to make decisions with consequences for the patient and such decisions are based on a competence which only the discipline of Medical Physics covers. These facts have to be taken into account within the organisation and management of the Medical Physics Service.

INTRODUCTION

Medical Physics can be described as the scientific discipline which is concerned with the application of the concepts and methods of physics in medicine.

In the opinion of the European Federation of Organisations for Medical Physics (EFOMP) Medical Physics is a Health Care Profession and the Medical Physicist whose training and function are specifically directed towards Health Care is entitled to an official recognition as a specialist. High standards in Medical Physics Services are important and at a time of increasing demand sufficient resources must be directed towards an appropriate, safe and cost effective use of physical sciences in the Health Service for the benefit and safety of the patient.

MEDICAL PHYSICIST

The formal entry qualification to the profession of Medical Physics is academic with physical sciences as an essential component of the training. A formalised in-service training scheme must be completed succesfully before a physicist may proceed to a post in a hospital Medical Physics Department that is higher than the training grade. A certificate or diploma should be given to the candidate to recognize succesfull completion of training.

A qualified Medical Physicist is thereafter an individual who is competent to practice independently, one or more of the subfields of medical physics e.g. therapeutic radiological physics, diagnostic radiological physics, medical nuclear physics or one of the many branches of medical physics that does not involve the use of ionising radiation.

LEGAL REQUIREMENTS

EEC Directive 84/466/Euratom of 3 September 1984 contains the following statement in article 5. "A Qualified Expert in radiophysics shall be available to sophisticated departments of radiotherapy and nuclear medicine". Such departments would normally have one or more high energy therapy machines or gamma cameras respectively.

If a "sophisticated department" is taken to mean one in which complex radiological methods and procedures requiring special protection of the patient are undertaken, the concept should also be extended to many departments of diagnostic radiology.

EFOMP has already issued a policy statement entitled "Radiation Protection of the Patient in Europe: The training of the Medical Physicist as a Qualified Expert on Radiophysics". In it, a Qualified Expert in Radiophysics is described 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 patients undergoing these medical examinations of treatments must be strictly controlled".

MEDICAL PHYSICS DEPARTMENT

The Organization of Medical Physics Services in Health Care varies widely throughout Europe. The highest standards and most cost effective provision of services are usually obtained if the service is organized by an independent Department of Medical Physics. That means that the head of the department is an experienced Medical Physicists with responsibility for professional standards, provision of scientific services and for the department's budget. These responsibilities may be within a hospital or within a region. Small departments are likely to be relatively more expensive and less efficient, at the risk of the quality and availability of services to be reduced and the level of safety for patients may be compromised. Therefore it is recommended that small departments have collaboration with a larger department.

Medical Physics Departments generally serve a variety of medical specialities. In some countries the Medical Physics Service is still restricted mainly to the radiological field (radiotherapy, nuclear medicine, X-ray diagnostics and radiation protection), where the service has a long and recognised tradition. In other countries services are already provided to magnetic resonance and ultrasound imaging, physiological measurements, clinical applications of non-ionising radiations (lasers, ultraviolet light and microwaves), bioengineering, electronics, information technology, general data processing and computer technology. The role of medical physics in these areas is expected to increase in the future.

Because the Medical Physicist must have in depth understanding of techniques used for examinations or treatments there must be close daily relationship between the Medical Physicist and the patient environment especially the medical staff. The Medical Physics Department should therefore be close to relevant clinical areas.

GENERAL OBSERVATIONS ON STAFFING THE MEDICAL PHYSICS DEPARTMENT

Generally the number of Medical Physicists required in a Medical Physics Department depends upon:

(i) the range of applications of physics in medicine

(ii) the scale of organisational and management responsibilities (number of hospitals, population served)

(iii) the amount and complexity of equipment and procedures used in related clinical specialities

(iv) the number of patients examined and treated in the relevant modalities and the complexities of these examinations or treatments

(v) the load for formal teaching and training

(vi) the level of participation in research, development and clinical trials

(vii) the number of supporting staff (e.g. technical and radiographic).

The number of Medical Physicists per million inhabitants shows wide variations in different European countries, from less than 2 in Portugal to 14 in Sweden (1988). Figures can be used in comparisons between countries only if they are covering the same areas of physics related activities. Variations between departments in the same country also depend on the range of physics related activities together with the number and qualifications of the supporting staff. Largely for this reason, it is difficult to specify appropriate staffing levels. However in radiotherapy, nuclear medicine and partly in diagnostic radiology there now exists legal requirements for the services of a physicist, who has the status of a Qualified Expert in radiation physics related to these disciplines. Therefore, for these services it is appropriate to make recommendations on minimum staffing in the Medical Physics Department. The following general points apply to the staffing figures given.

1. Staffing provision has been made for immediate duties in radiation protection associated with the specialty. Additional staff will be needed if the Medical Physics Department has to act as a general radiation protection adviser to the Authority on measures it must take to comply with national regulations and has to advise on other health and safety matters connected with ionising and non-ionising radiation.
2. Additional staff are required if there are research activities or training responsibilities. Physicists who have academic commitments should be scored by only 0.5 whole time equivalent for service work.
3. In deciding the level of staffing based on major items of equipment allowance has also been made for minor items (e.g. in radiotherapy: a superficial X-ray unit, plotting tanks, secondary standard dose meters etc.).
4. Some duties may be interchangeable among the three services depending on local organization.

MINIMUM STAFFING OF THE MEDICAL PHYSICS SUPPORT OF RADIOTHERAPY

1.1. Only staff who have had an approved course of training in radiation physics related to radiotherapy should be included in the minimum staffing level.

1.2. In all departments there must be at least two medical physicists, each specialising in radiotherapy physics, at least one of whom is a qualified expert.

1.3. Minimum staffing levels should be calculated from factors depending both on equipment load, number of patients treated and sophistication of treatments.

General guidelines are given below (wte = whole time equivalent)

1	high energy linear accelerator	0.8 wte physicist
1	major item of equipment (e.g. cobalt unit, simulator, computer treatment planning system, high dose rate afterloading)	0.4 wte physicist
1000	new courses of treatment per annum with external beam therapy	1.2 wte physicist
100	new courses of treatment per annum with brachytherapy	0.25 wte physicist

The number of physicists should be summed to give the total.

1.1. The figure for a second standard subsequent accelerators may be reduced by 0.2 provided they do not have electron facilities and are not under computer control.

1.2. The number of physicists per item of equipment may be reduced by 0.1 if maintenance and repair is carried out by staff not managerially responsible to the physicist.

MINIMUM STAFFING OF THE MEDICAL PHYSICS SUPPORT OF NUCLEAR MEDICINE

2.1. Only staff who have had an approved course of training in radiation physicis related to nuclear medicine should be included in the minimum staffing level.

2.2. In all departments there must be at least one medical physicist who is a qualified expert with experience in nuclear medicine physics. If the department has responsibilities related to therapy with radionuclides a second qualified expert may be necessary.

2.3. Minimum staffing levels should be calculated from factors depending both on equipment load and patients examined or treated.

General guidelines are given below (wte = whole time equivalent)

1	gamma camera	0.50 wte physicist
5000	examinations per annum	0.50 wte physicist
500	dynamic studies involving significant data processing by a physicist per annum	0.25 wte physicist
250	studies involving single photon computed emission tomography per annum	0.25 wte physicist
50	new courses of treatment per annum	0.25 wte physicist

The number of physicists should be summed to give the total.

2.1. Additional staff are required if the Nuclear Medicine Department has other facilities such as sample counting or a whole body counter or the physics staff supervise work in the radiopharmacy.

2.2. The number of physicists required for second and subsequent cameras may be reduced by 0.2 provided they are used mainly for simple static imaging procedures.

2.3. The number of physicists per item of equipment may be reduced by 0.1 if maintenance and repair is not carried out by staff managerially responsible to the physicist.

MINIMUM STAFFING OF THE MEDICAL PHYSICS SUPPORT TO DIAGNOSTIC RADIOLOGY

3.1. Only staff who have had an approved course of training in radiation physics related to diagnostic radiology should be included in the minimum staffing level.

3.2. All departments using complex equipment or carrying out complex radiological procedures should have available to them the services of at least one medical physicist who is a qualified expert with experience in diagnostic radiological physics.

3.3. The number of physicists needed will very much depend on the quality assurance programme performed in the department, the involvement of radiographers or other staff in that programme and the involvement of the manufacturer.

3.4. Application of digital techniques demands extra expertise in computing and data handling for evaluation and analysis of digital images.

3.5. The medical physics staffing level is likely to depend on the size of the population served as well as on the range of equipment.

3.6. For a diagnostic radiology department utilizing a full range of techniques, including e.g. digital radiology, computed tomography, dedicated mammography to a population of 500.000 1.0 wte physicist would be appropriate.

3.7. Physics input to diagnostic imaging technique using nonionizing radiation is not considered.
