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SHORT COMMUNICATION

AFOMP POLICY STATEMENT No. 2: recommended clinical radiation oncology medical physicist staffing levels in AFOMP countries

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Abstract This document is the second of a series of policy statements being issued by the Asia-Oceania Federation of Organizations for Medical Physics (AFOMP). The document was developed by the AFOMP Professional Development Committee (PDC) and was released by the AFOMP Council in 2009. The main purpose of the document is to give guidance as to how many medical physicists are required to staff a radiation oncology department. Strict guidelines are difficult to define as work practices vary from country-to-country and from hospital-to-hospital. A calculation scheme is presented to aid in estimating medical physics staffing requirements that is primarily based on equipment levels and patient numbers but also with allowances for staff training, professional development and leave requirements.

Keywords Radiation oncology · Staffing · Medical physicists

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Introduction

The Asia-Oceania Federation of Organizations for Medical Physics (AFOMP) was founded during the World Congress on Medical Physics and Biomedical Engineering in Chicago in July 2000.

The current membership includes seventeen national organizations which together represent about 3,000 medical physicists.

AFOMP was officially inaugurated and admitted by IOMP as one of its Regional Chapters in 2000. The formation of AFOMP aims to provide a solid platform for closer collaboration and mutual support amongst the medical physics organizations in the Asia and Oceania regions for the primary purpose of promoting the advancement of medical physics and related scientific activities and the development of the standard of practice and professional status of the medical physicists. To help achieve these goals and objectives, AFOMP has established three committees, namely Professional Development Committee (PDC), Education and Training Committee (ETC.) and Scientific Committee (SC) to work on a number of important tasks. Among them are drafting of a set of policy statements which give recommendations and guidelines on issues such as the definitions on the roles and responsibility of medical physicists, their professional and quality standards, and the standard and structure of education and training of medical physicists. This policy statement, which is the second of a series of documents being prepared by the joint efforts of the Committees, outlines the official views of AFOMP on recommended clinical medical physicist staffing levels in radiation oncology departments. It aims to serve as a guideline or reference document for AFOMP organizations.

Defining suitable radiation oncology medical physicist staffing levels

The roles, responsibilities and the status of clinical medical physicists in AFOMP countries are defined in AFOMPs Policy Statement Number 1 [1]. It is difficult to define how many qualified clinical medical physicists are required in radiation oncology departments in all countries represented by the AFOMP. This is because staff requirements are difficult to specify because work practices vary from country-to-country, within a country from hospital-to-hospital, and within a department, from procedure-to-procedure [2–5]. In some places, due to the current shortage of qualified clinical radiation oncology physicists, tasks carried out by physicists elsewhere are carried out by radiation technologists, technicians, commercial providers, service engineers, radiation safety officers, administrators, etc. under the supervision of a qualified physicist. This is not ideal, and the supply of qualified clinical radiation oncology physicists must be improved.

The level of service and technical expertise will vary from department-to-department depending on

- Funding availability
- Expertise availability
- Equipment availability
- Workload
- The clinical procedures and types of treatment offered
- Training and teaching requirements
- Research opportunities
- Legal requirements and responsibilities

A broad figure of one physicist per 400 treatment patients suggested by the IAEA is sufficient to provide a very basic service for routine treatments, especially when highly technical and sophisticated equipment is used. This is inadequate for many modern situations. Recommendations have been made by medical physics organizations in other countries. Some of these are quite detailed and permit the qualified clinical radiation oncology physicist requirements to be estimated for any particular department according to the equipment levels, patient numbers, complexity of treatments offered, etc.

The duties of a radiation oncology physicist are quite diverse and require a high level of education, training and expertise for the physicist to operate safely and effectively. It is important that as well as sufficient staff being employed to provide an adequate and safe medical physics service, time is also provided for continuing professional development. To ensure that medical physicist staffing needs are met in the future, senior physicists must be provided with sufficient time to train and mentor trainee/junior/registrar/resident physicists. Time for continuing professional development, and teaching and training time must be factored into the physicists' workload requirements of a radiation oncology department.

It must be stressed that every radiation oncology department must employ at least one qualified clinical radiation oncology medical physicist as specified in AFOMP Policy Number 1. The number of qualified medical physicists in a department must generally exceed the number of clinical radiation oncology medical physicist being trained within the department.

Recommended staffing guideline

The following table (Table 1) could be used to ascertain the number of clinical radiation oncology medical physicists required by a department. Generally a range of equivalent full time (EFT) physicist numbers is given. The lower values would be adequate in situations where the tasks are mostly carried out by non-physics and trainee physicist staff under the supervision of a qualified physicist. The higher values are more pertinent to where the tasks are mostly carried out by a qualified physicist. The higher values should be used in a modern, properly staffed and well-equipped radiation oncology department.

In using the table total number of qualified physicists required is determined by summing up all of the EFT physicists numbers under all of the individual categories.

Example calculations

The following table (Table 2) contains example calculations for three radiation oncology departments, labeled A, B and C. The calculations are based on actual departments and the EFTs used are chosen to be reasonably valid for the

Table 1 Suggested physicist staffing requirements of a radiation oncology department in relation to various equipment, patient, staff-related and miscellaneous factors

	EFT physicist
Equipment related	
Multiple-energy photon/electron linac (per linac)	1.0–1.5
Single-energy linac (including tomotherapy, cyberknife, gamma knife etc.) (per linac)	0.5–1.0
Multileaf collimator, portal imaging, IGRT and other accessories	0.0–0.5
Co60 unit (per unit)	0.25–0.5
Simulation or patient imaging systems (per system)	0.1–0.5
2-D planning system (per system)	0.2–0.5
3-D planning system (per system)	0.5–1.0
Afterloading brachytherapy system with treatment planning system (per system)	0.1–0.4
Dosimetry equipment QA (per QA system)	0.05–0.2
Patient related	
Planning per 1,000 courses per annum	0.2–1.0
Complex treatment plans per 100 cases (e.g. conformal, IMRT)	0.2–0.8
Basic brachytherapy per 100 cases per annum	0.2–0.5
Direct patient monitoring and related measurements per 100 cases per annum (e.g. TLD, diode, MOSFET)	0.05–0.2
Special therapies per 100 cases per annum (e.g. stereotactic, intraoperative, TBI, HBI, TSET, LTI, hyperthermia, I-131, Sr-90, neutron generation)	0.1–0.5
Miscellaneous	
Departmental Radiation Safety Officer	0.05–0.2
Teaching/examination (for non-physics staff, students etc.)	0.0–0.2
Equipment maintenance	Extra as required
Commissioning	Extra as required
Physics staff related	
Management/administration per staff supervised	0.05–0.1
Staff development per staff (e.g. conferences, courses, workshops)	0.02–0.05
Leave relief per staff member	0.1
Training and mentoring trainee (per trainee physicist)	0.1
Research, development, clinical projects per staff involved	Extra as required

Table 2 Suggested physicist staffing requirements of a radiation oncology department for three different departments A, B and C calculated with regard to the factors in Table 1

	A	B	C
Equipment related			
Multiple-energy photon/electron linac (per linac)	5	1	1
Single-energy linac (per linac)	0.5	0	1
Multileaf collimator, portal imaging, IGRT and other accessories	0.7	0.2	0.1
Co60 unit (per unit)	0	0	0.5
Patient imaging systems (per system)	0.1	0.1	0.1
2-D planning system (per system)	0	0	0
3-D planning system (per system)	0.8	0.5	1
Afterloading brachytherapy system (per system)	0.1	0	0.4
Dosimetry equipment QA per system	1	0.2	0.2
Patient related			
Planning per 1,000 courses per annum	2.2	0.3	1
Complex treatment plans per 100 cases (e.g. conformal, IMRT)	0.8	0.2	0
Basic brachytherapy per 100 cases per annum	0.2	0	0.6
Direct patient monitoring and related measurements per 100 cases per annum (e.g. TLD, diode, MOSFET)	0.3	0	0.1
Special therapies per 100 cases per annum (e.g. stereotactic, intraoperative, TBI, HBI, TSET, LTI, hyperthermia, I-131, Sr-90, neutron generation)	0.6	0	0
Miscellaneous			
Departmental Radiation Safety Officer	0.1	0.05	0.1
Teaching/examination (for non-physics staff, students etc.)	0.2	0	0.5
Physics staff related			
Management/administration per staff supervised	0.7	0.05	0.2
Staff development per staff (e.g. conferences, courses, workshops)	0.7	0.02	0.2
Leave relief per staff	1.5	0.1	0.4
Training and mentoring trainee/physicist registrar per trainee/registrar	0.6	0	0
Research, development, clinical projects per staff involved	0.5	0	0
Total	16.6	2.7	7.4

work practices that should normally be followed in that department.

A is a large department in a developed country system and treats 3,500–4,000 patients per year. It has five multiple-energy linacs and one single-energy linac all with MLC and portal imaging, two simulators, one 3-D planning system and one afterloading brachytherapy device.

B is a small department in a developed country treating not more than 400 patients per year. It has two dual photon/electron linacs one of which has MLC and IGRT. The linacs are used only about half of the day.

C is a medium-sized department in a developing country. It treats approximately 1,500 new patients each year including 3–5 per day using brachytherapy. It has one dual-energy photon/electron linac and one single-energy linac. Both have MLC and portal imaging. It has one simulator.

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