EFOMP

European Medical Physics News

Summer 2013

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MEDRAPET

Medical Radiation Protection EDUCATION AND TRAINING

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European Medical ALARA Network

ACCIRAD

Editorial

Dear Readers

Within the overall enormous excitement and wall-to-wall media coverage about the eagerly-awaited new addition to the royal UK family, we tried really hard again this year for our "summer baby", the European Medical Physics News!!! Although summer is here, we are all looking with great interest the NASA astronauts space walk project. For one of the astronauts it was a routine, but for another a disaster, due to the liters of water that seeped into his helmet.

But what about the statuses of projects that EFOMP is involved in? We have a lot of updates on quite a number of European projects such as the MEDRAPET, the EMAN and the ACCIRAD projects.

The new vice chairman of the EFOMP Communication and Publications Committee is introducing himself in this issue. Coming from a different scientific environment than the current chair we are sure that he will give a new fresh air to our Committee and our publications. We are really proud that the president of EFOMP, Peter Sharp, has been awarded the Lady Margaret MacLellan award for his work in medical imaging, a prize given biennially to recognise distinguished medical research. Read all about this great honour in page 3. You all know the European School of Medical Physics (ESMP) at Archamps in France for more than 15 years now. Will the school continue now that the director of the school is going to retire? Read all about it in page 5. Finland is the country that this issue is devoted in. Learn about the history of medical physicists and medical physicist education in Finland and what the situation currently in this country is in page 6. What would you do with an old MR imager in your hospital? Check what Abberdeen is going to do with his machine in page 20.

Do you really feel that gender disparity in science is getting better or not? According to the study published in page 28, the European Commission states that "There is no evidence of spontaneous reduction of gender inequality over time. All these policies, and many more, are needed to ensure that constant progress is made towards gender-equality in research and scientific careers". Let us have your views and feedback on this interesting issue after reading our article.

Despite the fact that the southern part of Europe experiences strange rainy summer this year, we still wish to you all a beautiful and sunny July and August as always and from our side all the best for whatever awaits you in the second half of this year.

Your editorial team




European Medical Physics News is published by the EFOMP Communication and Publications Committee and distributed free of charge in electronic form © EFOMP 2013. Please register at the EFOMP web site to receive this publication free by e-mail: www.efomp.org

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The new Vice-chairman of the EFOMP Communication and Publications Committee

Dear Colleagues,

I would like to take this opportunity to introduce myself as the new vice chair of the Communication and Publications Committee. At present I am the Director of Biophysics at the Middlesex University Centre for Investigative Oncology. My expertise is interdisciplinary and ranges from biomedical imaging, deep brain stimulation, biomodelling, electrical impedance tomography (EIT), nanotechnology, tele-medical systems, instrumentation, biosensors and VLSI. I started my career as an engineer at Marconi space and defence Ltd. working on simulating defences systems using analogue computers then progressed to VLSI design and sensors, at that time I developed a strong interest in modelling and medical systems. I pioneered the first reconstruction algorithm to image impedance changes inside the human head. I have also led EPSRC, EU and industrial sponsored research projects and recently led and developed a major EPSRC Nanotechnology Grand Challenges Healthcare project "New imaging methods for the detection of cancer biomarkers," consisting of seven partners in which Middlesex was the lead partner. I have co-ordinated and led a major ten-tel EU project which included 10 partners in the UK and across the EU, "Medical Diagnosis, Communication and Analysis Throughout Europe" (MEDICATE) to develop a system to identify links between asthma and air quality which involved the design of peak flow sensors for home use. My principal area of research focuses on the development of image reconstruction algorithms and hardware development for imaging brain functions. I have had a long collaboration with multidisciplinary research groups both in the UK and overseas on biomedical applications of EIT and bio-impedance. I have published over 200 scientific papers and have patents in controlling fields of activation in DBS. I am also the Editor-in-Chief of the IoP Physiological Measurements Journal, a member of the editorial board of the International Journal of Biomedical Imaging and chair the Publication committee for IPEM. There will be an opportunity to meet me at the forthcoming ICMP meeting in Brighton, UK (*www.icmp2013.org*) where I will be taking part in a meet the editor's secession.

Richard Bayford,
Vice-chairman of EFOMP Communication and Publications committee

Prize for the President

Peter Sharp, the president of EFOMP, has been awarded the Lady Margaret MacLellan Award for his work in medical imaging.

The prize is given biennially to recognise distinguished medical research in Scotland in a specific area. Medical imaging was chosen for the latest award and it recognises Professor Sharp's work in PET imaging, which led to the setting up of PET imaging centres across Scotland, and on the development of software for the early detection of eye disease, which is now routinely used in the screening for diabetic retinopathy in NHS Scotland,

The prize is awarded by TENOVUS Scotland. This charity, whose patron is HRH The Princess Royal, supports innovative medical research projects across the full spectrum of medical sciences, within Scottish Universities and Teaching Hospitals.

Professor Sharp has recently retired as the Head of the Department of Biomedical Physics and Bioengineering at the University of Aberdeen. The department has a high reputation for its pioneering research in medical imaging; its past successes include the development of the first MR imager capable of clinical whole body imaging. Its current research includes the development of fast field-cycling MRI to work at zero magnetic field, with applications focussed on enhanced diagnosis of neurodegenerative conditions.

The photo shows the presentation being made at a celebration lunch, by Sir Malcolm Macnaughton, the vice-President of Tenovus.


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European School of Medical Physics

EFOMP and the European Scientific Institute (ESI) have been responsible for running the European School of Medical Physics (ESMP) at Archamps, France since 1997. It is aimed at physics graduates in the early stage of their career in medical physics or those considering such a career.

The school's programme consists of 6 weeks of lectures and practicals covering the main areas of medical physics from Medical Imaging through to Radiotherapy. One of the characteristics of the school is that it allows a small group of 30 or so students to work and study together for a week or longer. A major factor in its success has been that Yves Lemoigne, the Director of the School, has put in an enormous amount of work, both in facilitating attendance, dealing with the myriad of problems that appear, and mentoring the students during their time in Archamps.

However it was felt that it was time to look at the future of the school. The educational process for training medical physicists is developing, largely due to the efforts of EFOMP. Therefore a meeting was held at Archamps in early June to discuss this. Invitees included EFOMP, ESI and the leaders of each course week.

There was strong support for continuing with the concept of the school, while it was recognised that it was important to get some form of official recognition for the training that students had received. There was also a need to direct some effort towards short courses at the MPE level, as EFOMP has pioneered with the Prague School in July this year. It was recognised that there is a wealth of scientific expertise at CERN that could be tapped into, particularly for scientists working in radiation physics.

Yves took the opportunity to announce that he would be retiring as Director of the school in the near future. It was agreed that ESI would look for a suitable candidate from the local pool of scientists and that this person would work alongside Yves for the next two schools.

A working group has been set up under the chairmanship of Günter Hartmann, the Chair of EFOMP's education and Training Committee, to take forward the actions.

EFOMP is proud of its involvement with ESMP. It is clear that it still has much to offer young physicists and that EFOMP and ESI can work together to ensure that it remains as relevant for many years to come.

Peter Sharp,
EFOMP President

75 years of Medical Physicists in Finland

History of medical physicists and medical physicist education in Finland

In the year 2012, the Finnish Association of Medical Physicists (Sairaalafyysikot ry) celebrated the 75-year journey of medical physicists in Finland. It was in 1936, when the first medical physicist position was established in Helsinki general hospital in the first radiotherapy clinic of Finland. That position was filled 75 years ago in 1937 by Ph.D. Paavo Erik Tahvonen (Figure 1). His duties included radiological instruments, measurement of radioactive materials, radiation protection and radiation safety, sometimes covering not only the clinic, but the entire Finland. Tahvonen became a professor in applied physics at the University of Helsinki in 1949. After Tahvonen, the position was filled by M.Sc. Kauno Salimäki the same year. The third appointed Finnish medical physicist was M.Sc. Aaro Rytilä in 1953. In the 1960's, medical physics expertise expanded to the whole country, as radiation therapy and nuclear medicine began to require radiation physics expertise at different centers around Finland employing more medical physicists. This is when the number of medical physicists began to increase in Finland.

Figure 1: Paavo Erik Tahvonen, the first medical physicist in Finland.

Until 1966, the medical physicists qualified through practical training. In 1964 Rytilä gathered 10 medical physicists to found a Section of Medical Physics. This was officially accepted to the Finnish Association of Mathematicians and Physicists in 1965. The same Section was later made a section in the Finnish Society for Medical Physics and Medical Engineering.

In 1966 the Medical Physics Section of Finnish Association of Mathematicians and Physicists appointed a committee for establishing the competence of medical physicists. The committee had representatives also from the Central Medical Board and from different universities. The education and training requirements for Qualified Medical Physicists (QMPs) were set then. The committee was later established as a working group of the Central Medical Board in 1977. The competence of medical physicists was first formally given for already appointed medical physicists. After this, the requirements for the competence included a degree of M.Sc. in physics or electronics and special education of four years in a hospital or a research institute plus an examination. The educational requirements were considered comparable to specialists in medicine.

Although, in the early days, there were only a few medical physicist positions, the number has been increasing rapidly since the 1960's (Figure 2). The increase in demand of medical physicists has been caused by the forming of the nationwide hospital system and purchase of equipment applying ionizing radiation and other measurement technologies in health care in the fields of radiation therapy, nuclear medicine and clinical physiology, radiology, and clinical neurophysiology. QMPs in Finland have long been working in those specialized areas.

In 1986, medical physicists separated from the Finnish Association of Mathematicians and Physicists and formed the Finnish Association of

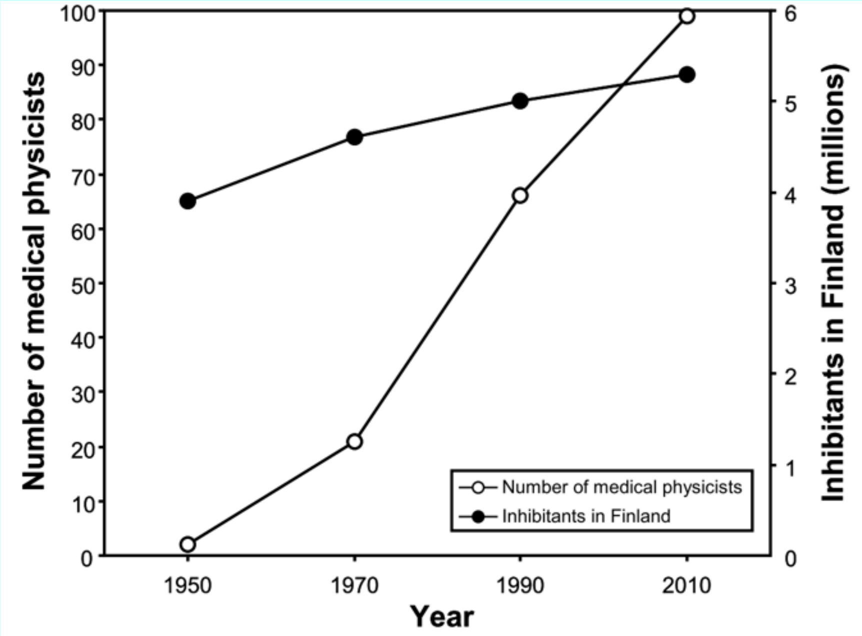


Figure 2: The number of QMPs has been increasing since the 1960's. Still, at present it is seen that more sophisticated diagnostic and radiotherapy techniques require more QMP expertise and therefore it is expected that the number of QMPs to continue increasing, although the rate of increase will likely slow down.

Hospital Physicists (the name has recently been changed to Finnish Association of Medical Physicists). This association has and still continues to actively drive the interests of medical physicists in Finland. This article is intended to familiarize readers on the high level of Finnish edcation of QMPs and to celebrate the 75 year journey of Finnish medical physicists.

Structure of the present education system for QMPs

A new structure for education was established in 1995, when the qualification of a medical physicist was considered a post-graduate university education under the Ministry of Education. This education comprises of four parts: theoretical education, practical training, radiation safety examination and final examination. This means that theoretical education, radiation safety examination and final examination are organized by the University, while the practical training is fully conducted in a hospital with a possibility to substitute one year related to post-graduate level research. The structure of the present educations system for QMPs is summarized in figure 3, and presented in more detail below. Based on the requirements and duration of the QMP education, it can be considered one of the most extensive ones in Europe.

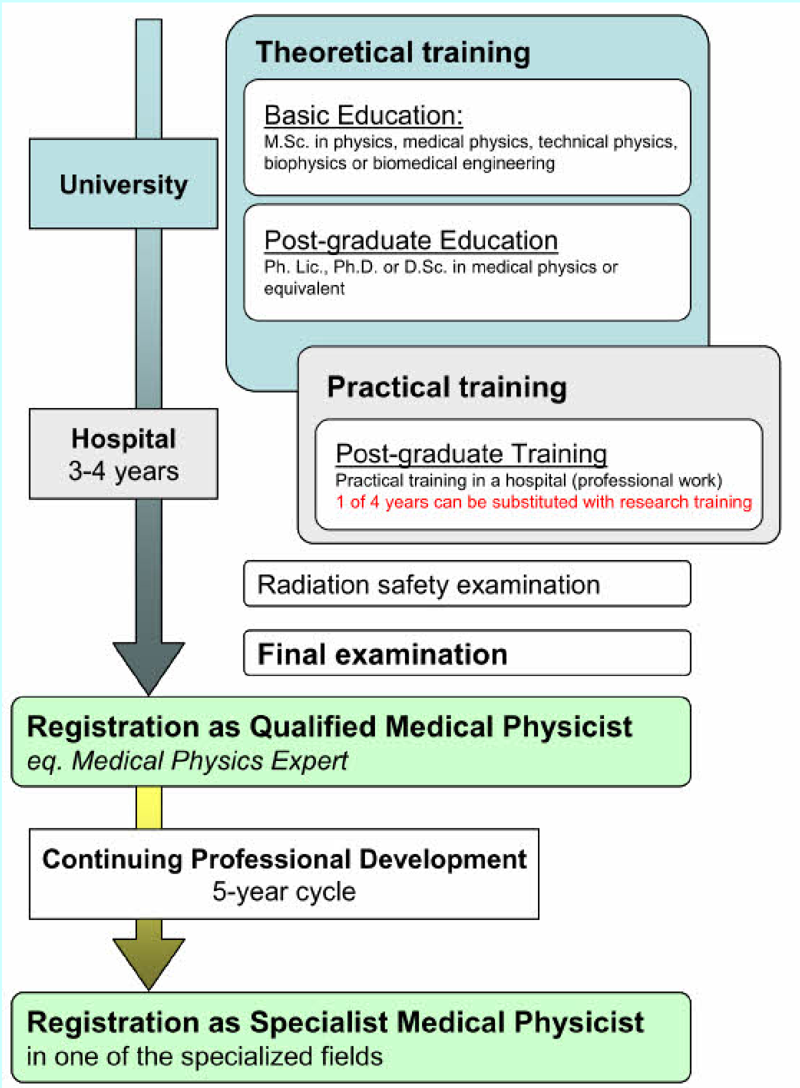


Figure 3: Structure of the present educations system of QMPs in Finland. After registering as QMP, continuing professional development (CPD) in conducted and followed in 5 years cycles. After 5 years service in one specialized field, the QMP can register as specialist medical physicist in that field.

Theoretical education

After a M.Sc. degree in physics, medical physics, technical physics, biophysics or biomedical engineering, a responsible mentor will plan with the student the program for the studies to obtain the qualification as a medical physicist. According to the Finnish act 834/2000, the student has to pass at least an examination for a Licentiate in Philosophy (Ph.Lic.). However, the trend now is to have pass examination for Ph.D. or D.Sc. QMPs with M.Sc. have qualified before the year 1995, under the previous education system. At present, about 10 physicists qualify as QMP every year.

Practical training

A student can begin practical training after M.Sc. degree. Practical training takes four years. One of the four years can be substituted by post-graduate university research in medical physics while completing the thesis for Ph.D. or D.Sc. Therefore, the minimum of practical training is three years. The practical training is carried out in centers approved by the Education Committee of Medical Physicists. Different training centers can have full rights (full four years of training), or partial rights (one to three years). Commonly, full rights are granted to university hospitals and partial rights to central hospitals and other institutes with a qualified mentor (QMP with professorship or docentship in medical physics). The mentor is responsible that the student has sufficient training in all the main areas of medical physics: radiotherapy, nuclear medicine, clinical physiology, diagnostic radiology, and clinical neurophysiology.

Radiation safety examination

Certain universities in Finland have a permission to organize radiation safety examinations of different levels. The permission is granted by the Finnish Radiation and Nuclear Safety Authority. The students have to pass the examination on the level: “The general use of ionizing radiation in medicine”, equivalent of 6 ECTS. In addition to the examination, practical training is required in an appropriate field of medical physics. At present, the universities with permission to organize that examination are: Tampere University of Technology, University of Helsinki, University of Oulu and University of Turku.

Final examination and qualification for medical physicist

Since the year 2000, the final examination for medical physicist qualification has been organized by the universities, also granting the degree of QMP. The examination is held three times during a year together with final examinations organized for qualification for specialists in medicine. It is possible to seek permission to take part in the final examination 12 months before the practical training is completed.

When the final examination has been passed and all other parts of the education scheme have been completed, it is possible to apply for the registration from The National Supervisory Authority for Welfare and Health (Valvira). The medical physicist is the profession which has an accreditation in Finland. According to the Finnish law for professionals in health care, the title of QMP (*sairaalafyysikko*) is protected. It means that the title can only be used, if a person has the formal (registered) qualification as medical physicist. In Finnish legislature, all the QMPs have the competence of Medical Physics Expert (MPE).

Continuing professional development and specialist medical physicist

To maintain the high level of expertise, the QMPs of Finland take part in the Continuing Professional Development (CPD) -system, the agreed rules of Professional Conduct and Interpretation of Professional Misconduct and procedures for disciplinary action in accordance to EFOMP guidelines. The CPD records are archived and supervised by the Registration Council of the Finnish Association of Medical Physicists in 5 year cycles. At present, participation of individual QMPs in CPD is voluntary. After registered 5 years experience as QMP in one specialized field with documented participation in the CPD system, a QMP can register as specialist medical physicist through the Registration Council of the Finnish Association of Medical Physicists.

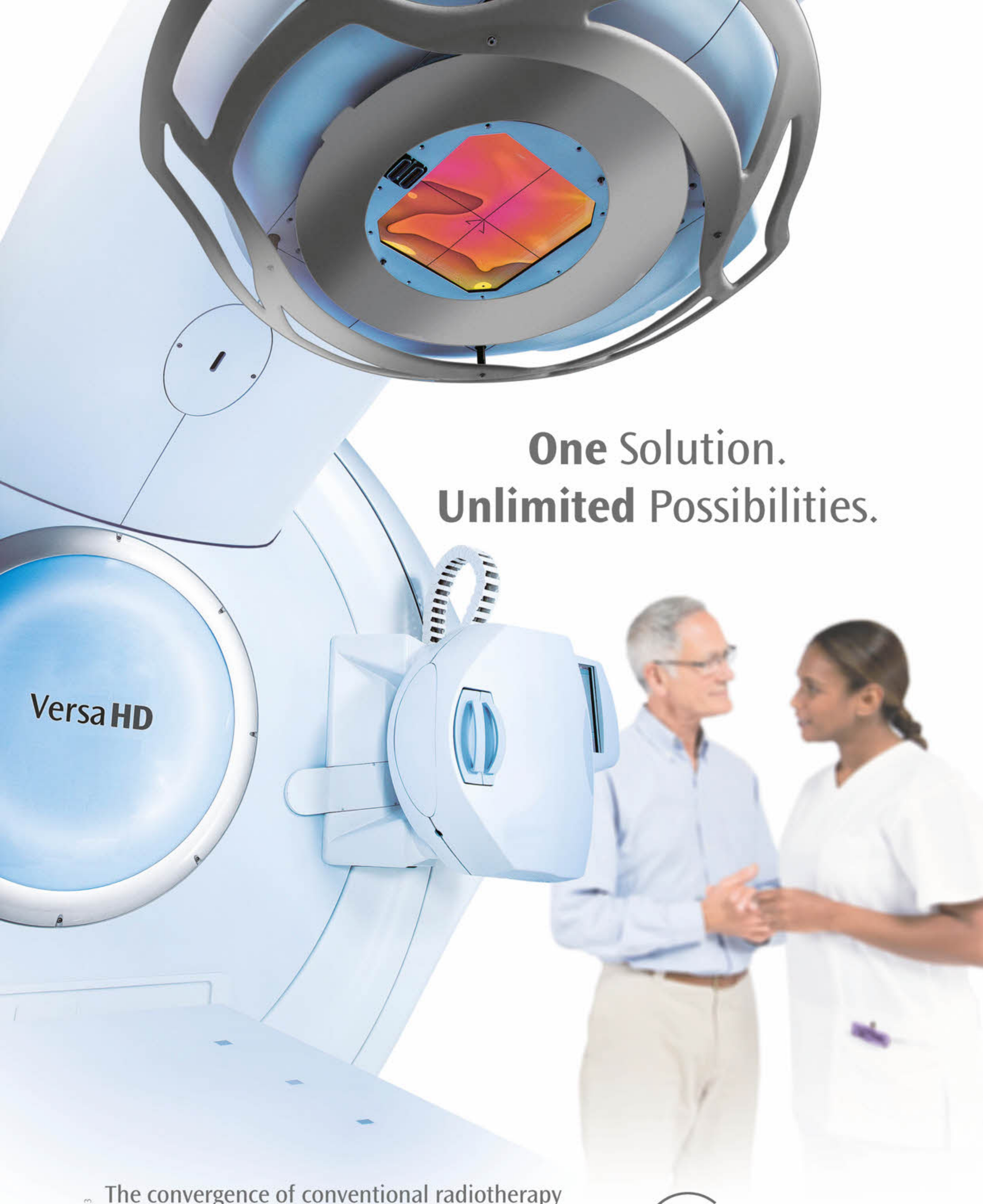
Recognition of Finnish medical physicists

The Finnish Association of Medical Physicists has been a member of International Organisation of Medical Physics (IOMP) since 2010 after the membership in Finland was passed from the Finnish Society for Medical Physics and Medical Engineering. The Finnish Association of Medical Physicists has been a member of European Federation of Medical Physics (EFOMP) since the beginning of the Association. The Finnish Registration Scheme of QMPs has been granted the approval by the EFOMP Standing Committee on Registration from 1.1.2004, and the current 5-year approval extends until 1.1.2015. In addition, the Finnish medical physicists are a part of Nordic Association for Clinical Physics (NACP).

Nationally, QMPs of Finland have been active in various professional associations. These cover a variety of specialized medical fields. These associations include Radiological Society of Finland, Finnish Society of Oncology, Finnish Society of Nuclear Medicine and Finnish Society of Clinical Neurophysiology.

Employment and specialized fields

The QMPs are primarily employed by the five university hospitals (in Helsinki, Kuopio, Oulu, Tampere and Turku) and 14 central hospitals. 83 % of all QMPs work in public health care of which 73 % work in university hospitals. Universities,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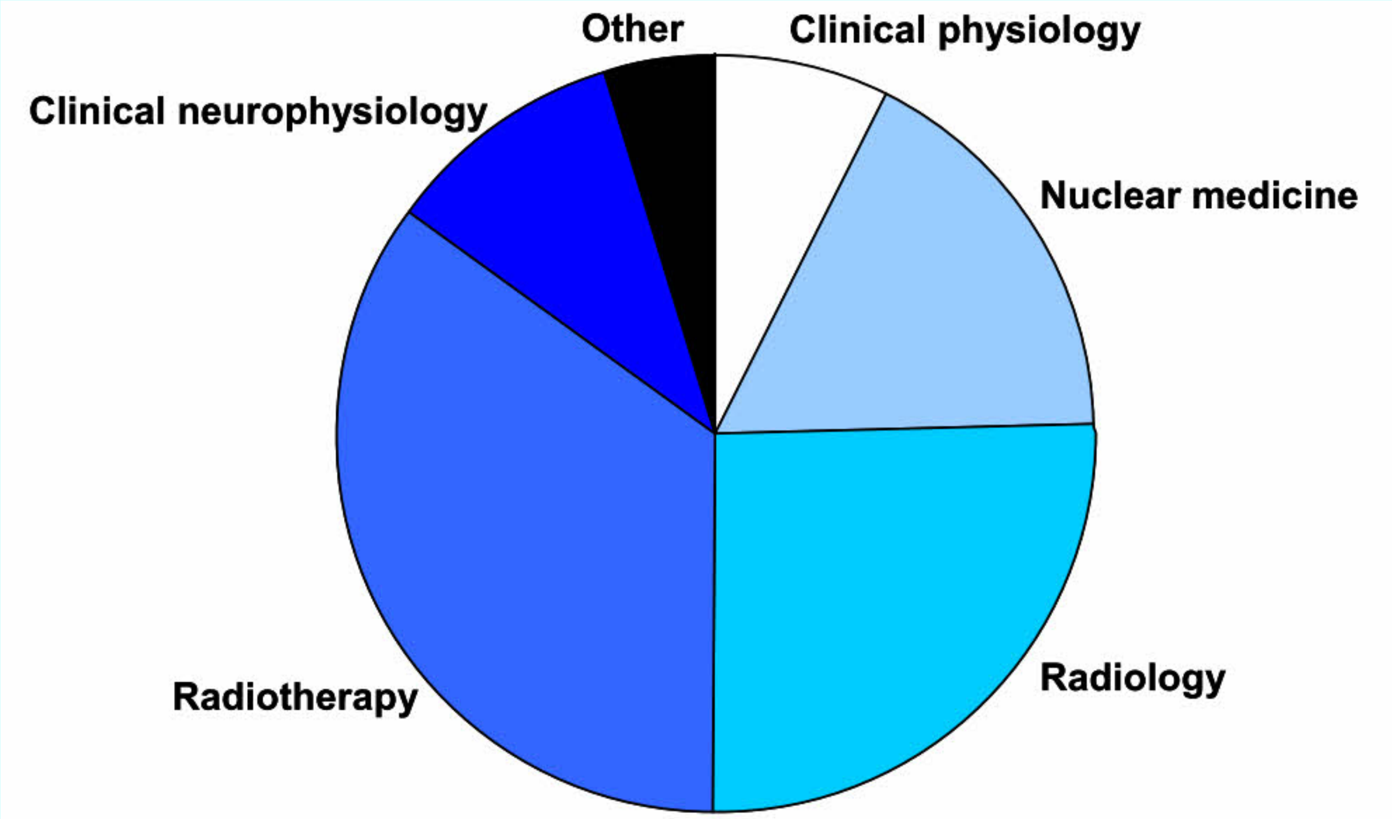

Figure 4: Distribution of Finnish QMPs to different specialized fields in 2012.

government institutions, few medical device companies and private clinics also employ QMPs. For a long time, Finnish QMPs have served in few specialized fields in medicine including radiotherapy, nuclear medicine, clinical physiology, diagnostic radiology and neurophysiology. These specialized fields constitute the expected expertise of QMPs, and all QMPs have to have the basic knowledge and capabilities of medical physics requirement in those fields. In the beginning of 2012, of all QMPs working in public health care 34 % worked in radiation therapy, 25 % in radiology, 17 % in nuclear medicine, 7% in clinical physiology, 10 % in clinical neurophysiology and 4 % were working in other specialized fields like cardiology or surgery (Figure 4). About 20 % of QMPs work in areas where ionizing radiation is not used. Therefore, they do not have to work as MPEs, even though all the QMPs in Finland have the competence of MPE. To implement the EC-directive 97/43/Euratom (MED) into Finnish legislation a new statute by the Ministry of Social Affairs and Health was passed. In that law a formal qualification (registered QMP) is required to work in radiotherapy and nuclear medicine (in practice also in other fields).

Independent MPE services

Due to changes in legislation and the rapid development in medical technology, especially in the field of radiology require speciality of MPEs. Among other things, quality control requirements and device purchasing processes require MPEs in hospitals and medical centers not having a QMP post. For this reason, there are a few companies which offer consulting MPE-services to medical centers and hospitals. All MPEs in those companies are QMPs.

Participation of QMPs in scientific projects

Finland has long tradition in academic, scientific research in the field of medical technology. QMPs play a key role in those projects developing, testing and setting up new technologies for clinical use and ensuring safety. Also, application of modern medical instrumentation for custom research purposes often requires the expertise of QMPs. Among the projects in which the QMPs in Finland have participated are the development of Boron Neutron Capture Therapy (BNCT) for clinical and research purposes and setting up and managing the Turku PET center, Finnish National Research Institute for the use of short-lived positron emitting isotopes in the field of medical research. In addition to previous examples, most QMPs work in several research projects; some manage research groups, and are essential parts in research consortiums.

Summary

The first medical physicist position in Finland was filled 75 years ago in 1937 by Ph.D. Paavo Tahvonen in the field of radiotherapy. Since then, the expertise of medical physicists in several specialized areas of medicine has become essential all over Finland, and the number of QMP positions has increased to ~100. The education of QMPs has long traditions in Finland. The education for QMP in Finland is among the longest ones including theoretical training at a postgraduate level, practical training of 3–4 years in a hospital and two examinations. The QMPs work in several specialized fields, some of which do not include ionising radiation (Figure 4). All QMPs in Finland also have the competence of MPE. The QMPs in Finland continuously take part in professional development to maintain the high level of expertise and knowledge required to perform the tasks of medical physicists. Education for QMPs is considered one of the most extensive ones in Europe.

References

Rekonen A, "*Medical Physics in Finland*" in Finnish Society for Medical Physics and Medical Engineering, 20th Anniversary Publication, eds. Malmivuo J and Nousiainen J, Tampere, Finland, 1988.

Tenhunen M, "*Paavo E. Tahvonen – sairaalafyysikon uran aukaisija Suomessa*", Sairaalafysiikan päivät, Porvoo, 16.11.2012.

Hyödynmaa S, Sippo-Tujunen I, Ihalainen T. "*Statistical overview and key figures of the numbers of qualified medical physicists and medical physics experts in Finland*". MPE Workshop, Sevilla, 2011.

Pitkänen M, Hyödynmaa S. "*The education and training of qualified medical physicists in Finland*". MPE Workshop, Sevilla, 2011.

An update on the CERN-HERMES project

The CERN-HERMES (HEllenic Research network on Medical and novEl technologieS) proposal on the creation of a proton beam therapy center for cancer treatment in Crete has been approved by the District Council in March 2013.

Proton therapy is the most modern technologically and clinically most effective method of radiotherapy, with a success rate of nearly 90% for various types of cancer. The vision is to build a center that will become a beacon for promoting scientific knowledge and innovation while also making the island an excellent destination for medical tourism since there exists no such centre in South Eastern Europe or the broader Mediterranean basin. CERN-HERMES aims to bridge the achievements of science from CERN with the needs of the Greek and the broader European society.

The proposal was submitted in July 2012 by the Development Managing Director Mr Kokolakis, also a member of the District Council of Crete, with the help of CERN-HERMES partners; the challenges in developing such a complex project are obvious; however, an important step forward has been made. We are certain that CERN's unprecedented competences and know-how in accelerator and detector technology together with the scientific support of the CERN-HERMES partners, will enable this vision for Greece in the not so distant future.

On behalf of the project committee:

Dr Evangelia Dimovasili,

Technical Coordinator of CERN-HERMES

European Laboratory for Particle Physics
Laboratoire européen pour la physique des particules

CERN-HERMES

The Abdus Salam
International Centre for Theoretical Physics

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MASTER'S PROGRAMME IN MEDICAL PHYSICS

The Abdus Salam International Centre for Theoretical Physics (ICTP) and the University of Trieste, Italy, announce a Master's Programme in Medical Physics (MMP), a two-year advanced training programme in the field of medical physics, co-sponsored by the Academy of Sciences for the Developing World (TWAS).

The programme will be held from 1 January 2014 until 31 December 2015 and will lead to a Master's Degree in Medical Physics. The first year will be spent in Trieste, Italy, while the second year will be dedicated to clinical professional training in a medical physics department of a hospital in the programme's training network.

The minimum qualification for applicants is a degree equivalent to an M.Sc. (or an exceptionally good B.Sc.) in physics or related fields. The selection of candidates will be based on their university performance, research activity and professional experience in the field. Adequate proficiency in the English language is required. The programme is open to young (generally below 30 years of age) qualified graduates from all countries that are members of the United Nations, UNESCO or the IAEA.

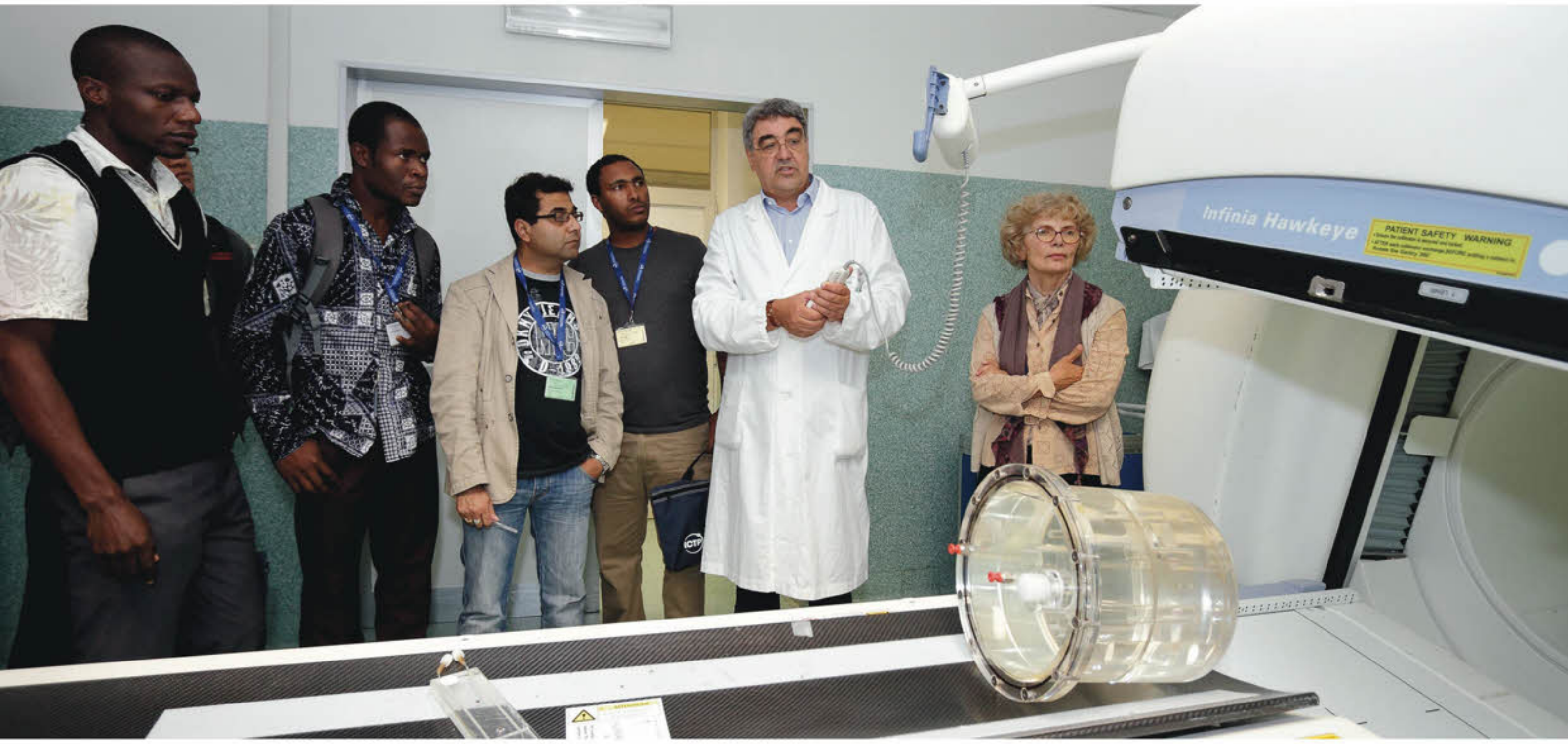
A limited number of full scholarships will be awarded to successful candidates from developing countries; ICTP will also cover travel costs and course fees for a limited number of successful candidates from developing countries who are not awarded the full scholarship.

FIRST YEAR PROGRAMME:

Anatomy and Physiology as Applied to Medical Physics • Radiobiology • Radiation Physics •Radiation Dosimetry •Physics of Nuclear Medicine Medical Physics Imaging Fundamentals • Physics of Diagnostic and Interventional Radiology (X rays, US, MRI, Hybrid systems) • Physics of Radiation Oncology • Radiation Protection • Information Technology in Medical Physics (330 hours of lessons and 230 hours of guided exercises)

SECOND YEAR PROGRAMME:

Clinical training in radiotherapy, diagnostic and interventional radiology, nuclear medicine and radiation protection (1200 hours)
Thesis work (125 hours)



For more details and to apply, visit the programme website: www.ictp.it/programmes/mmp.aspx

APPLICATION DEADLINE: 31 August 2013

The Abdus Salam
International Centre
for Theoretical Physics
www.ictp.it

International Organization for Medical Physics

TRAINING COURSE ON MEDICAL PHYSICS FOR RADIATION THERAPY

DOSIMETRY AND TREATMENT PLANNING FOR BASIC AND ADVANCED APPLICATIONS

25 November - 6 December 2013

Miramare, Trieste, Italy

The Abdus Salam International Centre for Theoretical Physics (ICTP), will organize a Training Course on Medical Physics for Radiation Therapy to take place from 25 November to 6 December 2013. The topic will be: Applied Physics of Medical Radiation Therapy - From Science to Effective Clinical Medicine. The Course will specially address the needs of Healthcare in low and middle income countries.
This two-week training course will precede the Training Course on "Accuracy requirements and uncertainties in radiation therapy". Participants can apply for both courses.

OBJECTIVE OF THE COLLEGE ON MEDICAL PHYSICS
The objective of the Training Course on Medical Physics is to contribute to the understanding of Physics applied to Radiation Therapy and the development of competent medical physicists who can make a direct contribution to the improvement of health care in their countries through better radiation therapy.
This will be achieved by providing participants with education and practical training to enhance their effectiveness as future disseminators of this knowledge, who can provide in turn educational and training opportunities to other medical professionals and students.

PROGRAM
The program of the Training Course will consist of lectures, interactive discussions and problem solving sessions and applied learning experiences in local hospitals.
The two-week Training Course will be devoted to the physics applied to radiation therapy with the aim to introduce to conventional and advanced therapy principle, methods and technology:

- disseminating information about issues on radiotherapy physics and defining innovations that could improve the quality of radiotherapy services;
- outlining a systematic approach to the assessment of the appropriateness of conventional and advanced radiotherapy techniques; and
- facilitating the creation of a network for the exchange of information on radiotherapy physics among scientists in developing and developed Member States.

Traditionally, medical physicists have played a significant role in driving development in radiation medicine. This school will take a comprehensive approach for the implementation of conventional and advanced therapy methods, including the integration in treatment planning and patient setup of imaging modalities relevant in radiation therapy.

PARTICIPATION
Medical physics scientists and students from all countries which are members of the United Nations, UNESCO or IAEA may attend the School. Participants should hold a university degree in physics, engineering, medical physics, or related subjects and have some professional experience in medical physics and/or physics/engineering related to radiation therapy or medical imaging. As it will be conducted in English, participants should have an adequate working knowledge of this language.
Although the main purpose of the Centre is to help research workers from developing countries, through a program of training activities within a framework of international cooperation, students and post-doctoral scientists from developed countries are also welcome to attend.
As a rule, travel and subsistence expenses of the participants should be borne by the home institution. Every effort should be made by candidates to secure support for their fare (or at least half-fare). However, limited funds are available for some participants from developing countries, to be selected by the organizers. There is no registration fee.

HOW TO APPLY FOR PARTICIPATION

The application form can be accessed at the activity website

http://agenda.ictp.it/smr.php?2501

Once in the website, comprehensive instructions will guide you step-by-step, on how to fill out and submit the application form.

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Fax: +39-040-2240-7226
E-mail: smr2501@ictp.it
ICTP Home Page: http://www.ictp.it

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M.R. Malisan (Udine)

R. Padovani (Udine)

LOCAL ORGANIZER

L. Bertocchi (ICTP)

TOPICS

Radiobiology

Dosimetry

Therapy equipment

Dosimetry algorithms

3D conformal and advanced (IMRT, VMAT) treatment delivery

Treatment planning and its practical implementation

Treatment verification

Quality assurance

Case studies

APPLICATION DEADLINE

25 July 2013

European Commission's MEDRAPET Project: Study on the Implementation of the Medical Exposures Directive's Requirements on Radiation Protection Training of Medical Professionals in the European Union

Background

Article 7 of Council Directive 97/43/EURATOM, June 30, 1997, on the protection of individuals against the dangers of ionising radiation in relation to medical exposures (MED), lays down requirements for education and training [1].

The European Commission realised that certain aspects of this article required some clarification and orientation for Member States and in 2000 published the Radiation Protection Report 116 "Guidelines on Education and training in Radiation Protection for Medical Exposures (RP116) [2]. These guidelines contain some specific recommendations for the application of the Directive and it has served the Member States well.

However, the rapid technological development of the past decade and the constant growth of ionising radiation use in medicine have necessitated an update of this document. Furthermore, RP116 does not provide learning outcomes compatible with the European Qualifications Framework (EQF) [3] and does not provide adequate coverage of requirements and guidance for new specialists using ionising radiation, in particular those outside imaging departments.

On the 17th of December 2010, the European Commission has signed with a consortium of European organisations a twenty seven (27) month contract with the objective to provide for improved implementation of the MED provisions related to the radiation protection training of medical professionals in the European Union (EU) Member States (MS). In order to achieve these objectives the project's consortium has fulfilled three main tasks:

- Conducted an EU-wide study on the radiation protection education and training of medical professionals in the EU MS;
- Organised a European Workshop on this matter, and;
- Developed a European Guidance document.

The professional organisations comprising the MEDRAPET project consortium were the:

- European Society of Radiology (ESR) as coordinator,
- European Federation of Organisations for Medical Physics (EFOMP),
- European Federation of Radiographer Societies (EFRS),
- European Society for Therapeutic Radiology and Oncology (ESTRO),
- European Association of Nuclear Medicine (EANM), and
- Cardiovascular and Interventional Radiological Society of Europe (CIRSE).

EU-Wide Study

The survey was aimed at the main stakeholders within the EU and associated countries, which are responsible for ensuring the application of the MED, particularly in relation to articles 7 and 9.

The response rate from the Radiation Protection Authorities was 57% and was considered extremely positive. The survey revealed that the regulatory framework of Radiation Protection Education and Training is well developed at the national level, its implementation, however, is rather poor.

The responses from the Professional Societies showed that the fundamental understanding of the complexities of Radiation Protection and the concomitant knowledge base varies between different specialist groups.

All Professional Societies claim to have some kind of Radiation Protection Education and Training. The majority of this Education and Training conducted at the undergraduate level or during residency, with a lower percentage at the Continuous Professions Development (CPD) level.

The results from the Educational Institutes suggested the need to increase communication between Radiation Protection Authorities, Professional Societies and Educational Institutions, taking into account that the Educational Institutions should train health care professionals according to the professional profile defined by Professional Societies and the relevant European Commission Directives.

An overview of the results from the survey of key stakeholders clearly shows an urgent need to build a bridge between Radiation Protection Authorities, Professional Societies and Educational Institutions, in order to achieve the goals of the MED.

Creating legislation and providing guidelines at EU or national level is, by itself, not enough to create a Radiation Protection safety culture among health care professionals.

The main conclusion from the study was that Radiation Protection Education and Training is far from being harmonised, and in some instances has not been implemented in EU MS.

MEDRAPET Workshop

The aim of the Workshop was to present the current status, difficulties and future opportunities in the field of education and training in radiation protection and to provide data for the development of the Guidelines on Radiation Protection Education and Training of Medical Professionals in the European Union.

The workshop included presentations from guest speakers and members of the MEDRAPET project. It consisted of five round table sessions:

- MEDRAPET Project presentation
- Current status in Radiation Protection Education and Training of Medical Professionals in Europe: Results of MEDRAPET Project.
- Education and Training in Radiation Protection for Professionals Involved Directly with the Use of Radiation: The views of Experts
- The Role of International and National Organisations in Medical Radiation Protection Education and Training
- Education and Training in Radiation Protection for Medical Professionals: The views of European Societies

The Workshop was also complemented by a poster session. It was attended by 108 participants from 29 countries.

The workshop conclusions, session reports and the workshop abstracts comprised the Workshop proceedings and are available on the Project's website together with a gallery of photographs at: *http://www.medrapet.eu/*.

The participants, consisting of regulators, representatives of professional societies, equipment manufacturers' associations and individuals have provided a lot of constructive feedback for the development of the guidelines document.

Radiation Protection Education and Training Guidelines

In developing the "Guidelines on Radiation Protection Education and Training of Medical Professionals in the European Union", the conclusions of the EU-wide Study and the MEDRAPET Workshop were taken into account as well as the relevant documents issued by the International Commission on Radiological Protection (ICRP), the International Atomic Energy Agency (IAEA) and the World Health Organization (WHO). Particularly, the Guidelines document was developed with the inclusion and understanding of the following aspects:

- According to the EU recommendations on the establishment of the European Qualifications Framework (EQF) for Lifelong Learning (LLL), professional qualifications are classified in eight (8) levels [3, 4]. Each of the 8 levels is defined by a set of descriptors indicating the Learning Outcomes (LOs) relevant to the qualifications at that level in terms of Knowledge, Skills and Competence (KSC).
- Each profession consists of major and minor subject areas. The major subject areas are considered as core areas to the profession and their LOs must be at the general level of the profession. Other subject areas that are auxiliary or supporting are at lower levels. An example of such a subject area is Radiation Protection, for which the LOs level depends very much on the level of involvement of a particular health profession with ionising radiation. For example, while entry into the profession as a medical doctor will require KSC at least at level 7 for the medical subject areas, Radiation Protection KSC at level 5 may be sufficient if the particular medical doctor acts as referrer for the use of ionising radiation.
- The Guidelines document has been divided into sections according to the professions of the healthcare professionals in question, and each section includes KSC and CPD at the required level.

Each chapter includes two subsections, one on Radiation Protection level requirements upon entry to the particular profession and the other on the type of CPD in Radiation Protection for the profession. The first subsection specifies the KSC and the required EQF level in Radiation Protection upon entry to the particular profession and the second subsection specifies the type of CPD in Radiation Protection required for the particular profession, i.e. whether the Radiation Protection CPD is to acquire more KSC or to bring the entry KSC to a higher EQF level.

The structure of the document will facilitate future amendments by various professions and the inclusion of new professions.

- The document does not detail on the number of hours for Radiation Protection Education and Training. In accordance with the new European recommendations for LLL [3], only LOs are specified. It is up to the Education establishments to decide the time required to achieve these LOs for the particular profession at the corresponding level of LLL. The levels for Radiation Protection Education and Training required are different for the different professions and the KSC of each individual profession is currently at a different level. Guidance on the number of hours for Radiation Protection Education and Training with respect to diagnostic and interventional radiology (IR) can be found in ICRP publication 113 (tables 3.1 and 3.2) [5].
- It is also important to note that healthcare professionals involved with multimodality imaging studies acquired using multimodality systems, such as Positron Emission Tomography/Computed Tomography (PET/CT) and Single Photon Emission Computed Tomography/Computed Tomography (SPECT/CT) [6] require the competence and certification in Radiation Protection for both diagnostic radiology and Nuclear Medicine.

Current Project Status

The Projects final report consisting of the EU-wide Study results, Workshop proceedings and the guideline document was submitted to the European Commission at the end of February 2013 and was presented to the Article 31 Group of Experts Working Party on Medical Exposures (WP MED) on the 4th of April 2013.

The document was received by the WP MED very well with only minor comments and suggestions for improvement. These are expected to be provided to the project consortium in writing by the end of April 2013 and the final document submitted to the European Commission by the end of May 2013. The European Commission is expected to publish the document before the end of 2013 in their Radiation Protection Series as Report 175 (RP 175).

Acknowledgements

The MEDRAPET project was financed by the European Commission under Service Contract no. ENER/10/NUCL/S12.581148. The contribution of all the consortium partners and that of the project's advisory committee was essential for the successful conclusion of the project and the guidelines document.

It is also acknowledged that during the MEDRAPET workshop, a lot of constructive feedback was received from the wide range participants that included regulators, representatives of professional societies, equipment manufacturers' associations and individuals.

Stelios Christofidesc
EFOMP Vice-President

References

[1] Council Directive 97/43/Euratom of 30 June 1997 on health protection of individuals against the dangers of ionizing radiation in relation to medical exposure, and repealing Directive 84/466/EURATOM, Official Journal L-180 of 09.07.1997, p 22, *http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31997L0043:EN:HTML* (Last time accessed was on the 16th of April 2013)

[2] EC, 2000, RP 116. Guidelines on Education and Training in Radiation Protection for Medical Exposures. Directorate-General Environment, Luxembourg *http://ec.europa.eu/energy/nuclear/radiation_protection/doc/publication/116.pdf* (Last time accessed was on the 16th of April 2013)

[3] EC, 2008. Explaining the European Qualification's Framework for Lifelong Learning. Office for the official publications of the European Union, Luxembourg.

[4] European Parliament and Council (2008) Recommendation 2008/C 111/01 on the establishment of the European Qualifications Framework for Lifelong Learning. Official Journal of the European Union 6.5.2008. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=oj:c:2008:111:0001:0007:en:pdf (Last time accessed was on the 17th of December 2012)

[5] ICRP, 2009. Education and Training in Radiological Protection for Diagnostic and Interventional Procedures. ICRP Publication 113. Ann. ICRP 39 (5).

[6] EANM-ESR, 2007. White paper of the European Association of Nuclear Medicine (EANM) and the European Society of Radiology (ESR) on Multimodality Imaging. Eur J Nucl Med Mol Imaging, 34:1147-1151

ACCIRAD: Guidelines on a risk analysis of accidental and unintended exposures in radiotherapy

The ACCIRAD project group ran a well-attended workshop in Poznan on 4-6 June 2013. The workshop began by ACCIRAD project members providing a clear and informative summary of the work undertaken. This was followed in the afternoon of the first day by feedback from invited European and international umbrella organisations including EFOMP and other interested professional bodies and organisations. On the second day, good quality papers were presented from a variety of sources of their work in the field of risk assessment and analysis of adverse events. This was followed by interesting talks on preventative measures. During the third day, there was a short session on the promotion of risk management and event reporting followed by a short session on harmonisation of classification scales. The workshop was closed with reflections by the ACCIRAD project group on the comments made during the workshop and they identified where they plan to make changes to the document.

Feedback from the various invited parties all had consistent themes that closely resembled the feedback from EFOMP.

It was noted that this project is very valuable and important in addressing an area of major concern in radiation oncology of patient safety. The project's objectives to propose and develop guidelines for use throughout the European Union is paramount to the aims and purpose of our constitution. It directly supports our own guidelines on the development of safety and quality management systems (see Policy №: 13). We therefore offered EFOMP's full endorsement of the project and stressed our willingness to be involved in further developments.

We congratulated the working groups for their excellent and very comprehensive collection and review of the various different types of reporting schemes for adverse events and near misses together with the different approaches to risk assessments and controls. We recognised it was a huge challenge to provide guidance on risk assessment and incident analysis and reaching a final report is always a difficult task when it needs to consider all the different contributors from different personal backgrounds and different native languages. We considered this document as a good first draft towards the final goal and understand the present version will undergo a substantial review.

Specific technical and editorial comments were prepared by our Scientific Committee on the draft ACCIRAD document which we hope will help further develop the draft document. Some of the more general comments are given below.

We emphasised that the first 6 chapters of the draft document contained valuable information and highlights the lack of common criteria regarding radiotherapy adverse events and near misses in Europe. There are weaknesses and strengths in these chapters and we felt the document would be improved by further summarisation of these chapters. We also felt chapter 7 should be developed to provide the necessary directions to ensure harmonization of guidelines between member states.

Although the scope for the project was to consider guidelines only for external beam radiotherapy, we thought the document could mention that other forms of radiation therapies such as brachytherapy and unsealed source therapy could make use of the guidelines recommended.

Of some interest was the rationale to avoid the use of the term 'accidents' in favour of 'adverse events'. Although we understood the benefit in using a term that avoids the potential complacency that could be associated with reference to an adverse event being an accident, we also made the point that the term 'accident' is more commonly used and understood by lay people, including the press, and of course by most patients when adverse events occur. For this reason we felt the document should not state this term must not be used. We offered that to remedy its misuse, it could be stated that there must be no use of it to imply that an adverse event (accident) is something which is beyond human control or intervention. We believe that by acknowledging that this word is in common usage would help ensure there is complete openness and transparency which is a key aspect of any positive safety culture.

To assist in the clarity of the nomenclature used to describe the severity of events we also suggested that 'adverse events' is used to imply both minor and moderate events and 'serious adverse events' is used for major events (e.g. see FDA definitions).

With respect to the potential for having anonymous reporting, we believed this may not be practicable or appropriate for the initial local reporting of adverse events due to the need for a no-blame, positive performance management process and also for the potential for legal undertakings. The advantages are seen in confidential reporting to external authorities or other undertakings.

The importance of proactive risk analysis prior to a major change we saw as very important although we offered that retrospective reactive risk analysis of adverse events/incidents/near misses rather than those based on 'what if' scenarios can often be the most useful.

The workshop identified that there were variabilities between organisations in what they consider is a near-miss as opposed to a non-conformance. To avoid over or under use of this term we suggested the term ‘near miss’ is clearly defined to ensure its proper and consistent use.

We hope that the comments made during the workshop were received as positive and constructive and confirmed our offer to help with this very important project.

In the summing up of the workshop, ACCIRAD project group made some key reflections:

- To place the detail of the surveys into annexes
- To weight the document more towards practical tools and procedural guidelines with templates
- To emphasise the Safety Culture
- To improve the structure and clarity of the recommendations
- To have more focus on the clinical perspective
- To stress the document can be applied to brachytherapy
- To highlight the importance of clinical audit
- To avoid the term ‘accident’

With respect to risk management, it was identified that two approaches are needed; the study of risk, i.e. proactive assessments and the analysis of risks e.g. reactive measures from actual incidents. It was also identified that quality management plays an important integral part in any safety culture and this needs to be stressed. The need to collect and share experiences, and the study of risks, especially in the implementation of new technologies, is one of the tasks that professional societies may be tasked to help provide. Proactive risk assessments that look at potential failure points, safety barriers and the evaluation of consequences plus criticalities needs a deeper analysis to identify probabilistic risk measures.

We very much look forward to the next version of the document.

Stephen Evans,
Vice-chairman of EFOMP Projects Committee

References

The European Federation of Organisations for Medical Physics Policy Statement No.: 13 Recommended Guidelines on the Development of Safety and Quality Management Systems for Medical Physics Departments, Physica Medica Volume 25, Issue 4 (2009), 161-165

U S Food and Drug Administration (FDA), Promoting and protecting your health, www.fda.gov/safety/medwatch/howtoreport/ucm053087.htm accessed June 2013

What do you do with an old MR imager?

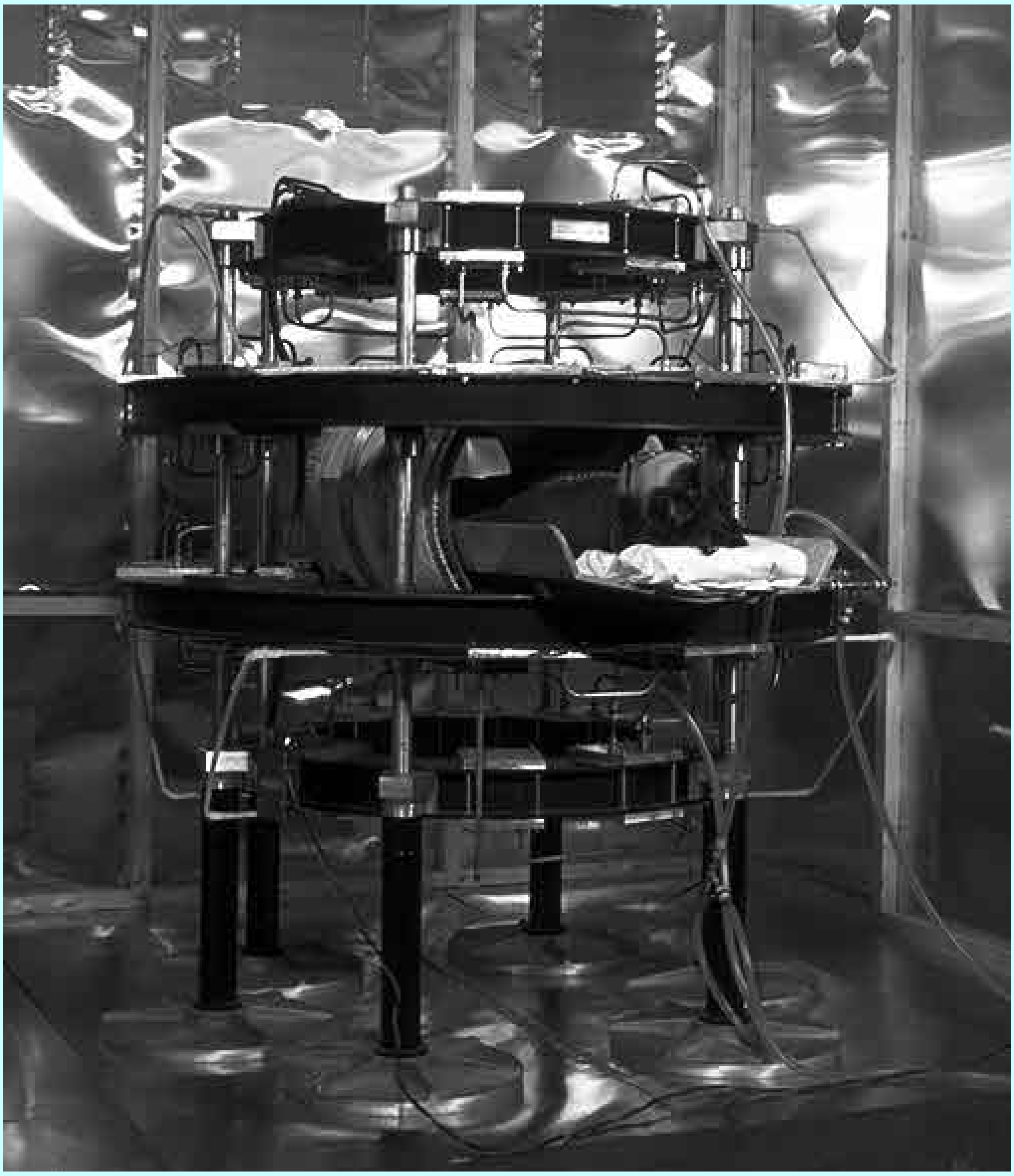


Fig. 1: Photo of the first MR Imager capable of producing clinical whole body Images at Abberdeen..

There are many answers to this question, but here is one solution that may not have occurred to you – put it in an art gallery.

This imager is rather a special one, built in the Department of Biomedical Physics and Bioengineering in the late 1970s it was the first machine to be capable of producing whole body clinical images. Featuring the technique of spin-warp, invented at Aberdeen, it overcame the problem that had beset previous attempts at MR imaging where any movement, such as the beating of the heart, would completely ruin the image. After that MRI took off to become the world renown technique that it is today.

So the machine is of historical importance, so why not put it into a museum. Well that was an option until we were approached by members of the hospital's Art Trust. They have been working for many years to introduce examples of art throughout the hospital, it having been shown that these could help speed a patient's recovery as well as making a hospital a less threatening place. They were now raising funds for a new art's space. They saw this as much more than being simply a gallery but rather forming a Healing Environment. It would provide a much needed private zone for reflection, respite and quiet conversation; a tranquil area away from the stressful clinical environment where anyone, patients, visitors or NHS staff, can come to restore their spirits and energy.

Central to this space would be the MR machine; it would not only be of interest to visitors and patients but, while occupying its place in history, it was felt that this prototype machine also had artistic potential, both symbolising and concretely expressing the link between science, health and everyday life. Its raw construction, with none of the finished cosmetic coverings found in today's commercial machines, emphasised the interface between the basic sciences and health, and demonstrated, as few machines can, how science allied with creativity can provide hope and healing for patients.

Fund raising is now well advanced so at the start of next year we will see this rather unlikely marriage between art and science.

Peter Sharp,
EFOMP President

The European Medical ALARA Network (EMAN)

The key aims of the EMAN project funded by the European Commission (EC) has been to establish a sustainable European Medical ALARA Network where different stakeholders within the medical sector will have the opportunity to discuss and to exchange information related to the implementation of the ALARA principle.

After successful conclusion in October 2012 of the project, the three professional organisations involved – the European Society of Radiology (ESR), the European Federation of Radiographer Societies (EFRS) and the European Federation of Organisations of Medical Physics (EFOMP) – decided to ensure sustainability of the EMAN network.

The three professional organisations involved – ESR, EFRS and EFOMP – shall constitute the core partners and drive the sustainable post-project network. Together they represent over 160,000 professionals working in health sector.

Summary of achievements of EC-funded EMAN Project

Three working groups with representatives of the professionals involved, medical radiologists and cardiologists, radiographers, medical physicists and regulators, worked 2 years identifying need and priorities for the implementation of elements to increase the level of protection, both for patients and, when relevant, involved staff.

The experience gained by the three multidisciplinary groups provides the methodology to apply in other fields of diagnosis and therapy and in the hospitals where a multidisciplinary "core teams" should implement exposure optimisation. The role of the "core team" is to develop optimised procedure protocols, train the staff and supervise the practice. Knowledge, competence and skill of the members of the core team have to be defined together with training initiatives to be supported by EMAN and scientific societies.

Optimisation in Computed Tomography

The WG recognising the need of important interventions aiming to reduce, or optimise, patient dose developed a series of recommendations, the more relevant here reported:

a. The European Commission should develop actions, both on research and regulation:
   - research should compare exposures and associated radiation risks with clinical benefit from the increasing use of CT, by taking into account information on age of the patients and clinical indication
   - guidelines should be developed to promote the ALARA approach to the principle of justification, with the help of harmonized referral guidelines on a European level and to promote standardised and optimised protocols
   - to promote an European action to assess and promote the use of DRLs for adult and paediatric patients

b. Manufacturers should develop software tools to populate databases with individual patient-specific and exposure parameters, to compare exposures with DRLs and to develop automatic techniques to adapt kV settings.

c. On the dosimetry site, it is seen necessary to clarify the concept of organ dose, as compared to the effective dose, to develop new dosimetry quantities to express dose for wide x-ray beam and relative measurements protocols.

Optimisation of patient and occupational exposures in interventional radiology and cardiology

As part of the medical procedures using ionising radiation, interventional radiology and cardiology procedures are performed in increasing large numbers worldwide. These procedures often imply high radiation doses to patients, but also to the healthcare personnel. Many specialists performing interventional procedures do not have proper education and training in radiation protection. As a consequence, there are more and more concerns about radiation protection of patients and healthcare personnel. Major areas of concern are high patient skin doses, as well as to the eye lens of the physicians. Recent data on the effects of eye lens exposure increase the concerns about late effects such as lens injuries or cataracts for the medical staff. Agreed recommendations aiming to increase optimisation level are here summarised:

a. European Commission and, where appropriate, National authorities should promote:

- the assessment and the use of DRLs for adults and children. DRLs, taking into account complexity factor of procedures, should be part of the revised EC Guidelines on DRLs
- the development of staff monitoring methods and protocols, in particular for doses to extremities and lens of the eyes
- the assessment and use of “trigger or alert levels” to identify patients for follow-up for skin lesions
- the implementation of audits and the accreditation of radiation protection training

Optimisation in x-ray practices performed outside radiology department

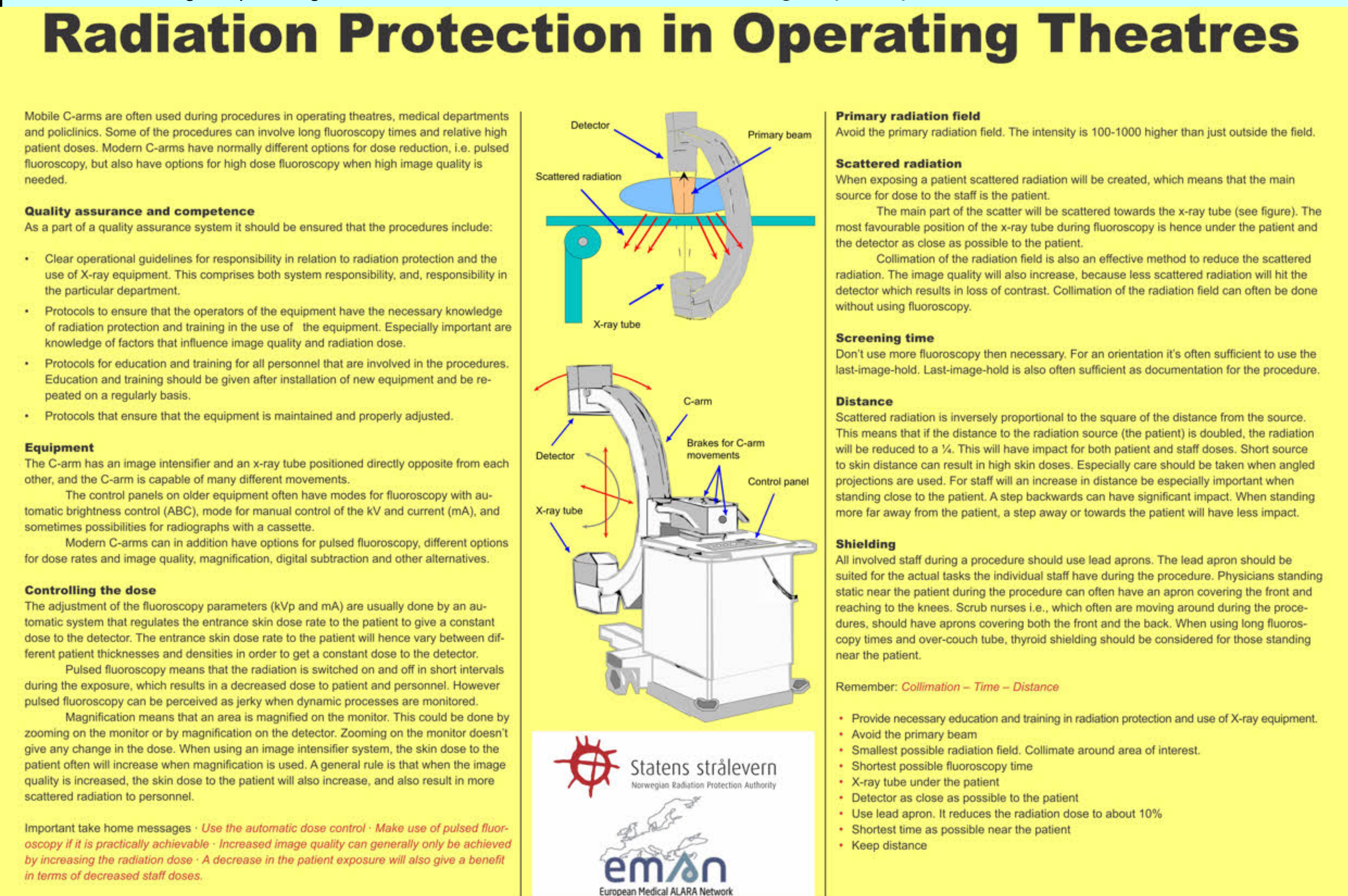
Radiation protection of patients and staff for practices performed outside radiological departments are of particular interest due to: the limited information on type, frequency of procedures and doses, the increased frequency of complex procedures in surgical theatres, the fact that procedures are performed by non-radiologists and nurses with poor or without training on radiation protection. The identified practices to study were vascular surgery, gastroenterology, urology, orthopaedics, neurosurgery, anaesthesiology and gynaecology. Extensive literature data analysis has been performed together with specific set of data collected from hospitals accessed by the members of the working group.

The identified lack of optimisation allowed to develop the following recommendations:

a. The European Commission should:
   - strengthen the patient dose monitoring at the hospital level and the assessment of national figures to fill the gap of knowledge
   - revise the EC Guidance on Diagnostic Reference Levels for Medical Exposure (RP 109) including DRLs for these practices
   - recommend to apply harmonised staff exposure monitoring guidelines developed by HERCA and EMAN
   - promote clinical audit and inspection activities
   - develop a Radiation protection Guideline for the optimisation of radiological practices performed outside radiology departments

b. HERCA should also work on the harmonisation of national staff dosimetry databases where the inclusion of radiological workload will allow extracting dose information for specific group of specialists.

Fig. 1: Poster developed by the Norwegian Radiation Protection Authority as a tool to help health professionals working in operating theatres to use mobile C-arms.



Radiation Protection in Operating Theatres

Mobile C-arms are often used during procedures in operating theatres, medical departments and policlinics. Some of the procedures can involve long fluoroscopy times and relative high patient doses. Modern C-arms have normally different options for dose reduction, i.e. pulsed fluoroscopy, but also have options for high dose fluoroscopy when high image quality is needed.

Quality assurance and competence

As a part of a quality assurance system it should be ensured that the procedures include:

- Clear operational guidelines for responsibility in relation to radiation protection and the use of X-ray equipment. This comprises both system responsibility, and, responsibility in the particular department.
- Protocols to ensure that the operators of the equipment have the necessary knowledge of radiation protection and training in the use of the equipment. Especially important are knowledge of factors that influence image quality and radiation dose.
- Protocols for education and training for all personnel that are involved in the procedures. Education and training should be given after installation of new equipment and be repeated on a regularly basis.
- Protocols that ensure that the equipment is maintained and properly adjusted.

Equipment

The C-arm has an image intensifier and an x-ray tube positioned directly opposite from each other, and the C-arm is capable of many different movements.

The control panels on older equipment often have modes for fluoroscopy with automatic brightness control (ABC), mode for manual control of the kV and current (mA), and sometimes possibilities for radiographs with a cassette.

Modern C-arms can in addition have options for pulsed fluoroscopy, different options for dose rates and image quality, magnification, digital subtraction and other alternatives.

Controlling the dose

The adjustment of the fluoroscopy parameters (kVp and mA) are usually done by an automatic system that regulates the entrance skin dose rate to the patient to give a constant dose to the detector. The entrance skin dose rate to the patient will hence vary between different patient thicknesses and densities in order to get a constant dose to the detector.

Pulsed fluoroscopy means that the radiation is switched on and off in short intervals during the exposure, which results in a decreased dose to patient and personnel. However pulsed fluoroscopy can be perceived as jerky when dynamic processes are monitored.

Magnification means that an area is magnified on the monitor. This could be done by zooming on the monitor or by magnification on the detector. Zooming on the monitor doesn't give any change in the dose. When using an image intensifier system, the skin dose to the patient often will increase when magnification is used. A general rule is that when the image quality is increased, the skin dose to the patient will also increase, and also result in more scattered radiation to personnel.

Important take home messages · *Use the automatic dose control · Make use of pulsed fluoroscopy if it is practically achievable · Increased image quality can generally only be achieved by increasing the radiation dose · A decrease in the patient exposure will also give a benefit in terms of decreased staff doses.*

Primary radiation field

Avoid the primary radiation field. The intensity is 100-1000 higher than just outside the field.

Scattered radiation

When exposing a patient scattered radiation will be created, which means that the main source for dose to the staff is the patient.

The main part of the scatter will be scattered towards the x-ray tube (see figure). The most favourable position of the x-ray tube during fluoroscopy is hence under the patient and the detector as close as possible to the patient.

Collimation of the radiation field is also an effective method to reduce the scattered radiation. The image quality will also increase, because less scattered radiation will hit the detector which results in loss of contrast. Collimation of the radiation field can often be done without using fluoroscopy.

Screening time

Don't use more fluoroscopy then necessary. For an orientation it's often sufficient to use the last-image-hold. Last-image-hold is also often sufficient as documentation for the procedure.

Distance

Scattered radiation is inversely proportional to the square of the distance from the source. This means that if the distance to the radiation source (the patient) is doubled, the radiation will be reduced to a ¼. This will have impact for both patient and staff doses. Short source to skin distance can result in high skin doses. Especially care should be taken when angled projections are used. For staff will an increase in distance be especially important when standing close to the patient. A step backwards can have significant impact. When standing more far away from the patient, a step away or towards the patient will have less impact.

Shielding

All involved staff during a procedure should use lead aprons. The lead apron should be suited for the actual tasks the individual staff have during the procedure. Physicians standing static near the patient during the procedure can often have an apron covering the front and reaching to the knees. Scrub nurses i.e., which often are moving around during the procedures, should have aprons covering both the front and the back. When using long fluoroscopy times and over-couch tube, thyroid shielding should be considered for those standing near the patient.

Remember: *Collimation – Time – Distance*

- Provide necessary education and training in radiation protection and use of X-ray equipment.
- Avoid the primary beam
- Smallest possible radiation field. Collimate around area of interest.
- Shortest possible fluoroscopy time
- X-ray tube under the patient
- Detector as close as possible to the patient
- Use lead apron. It reduces the radiation dose to about 10%
- Shortest time as possible near the patient
- Keep distance

c. COCIR should promote development of standards aiming to reduce patient and staff doses also for mobile interventional equipment
d. Education and training of professionals in radiation protection is seen as a priority. Specific methodologies have to reach the large number of practitioners (medical specialists, nurses and radiographers). The MEDRAPET project is providing hints to be used in developing proper training packages.
e. The experience and the agreement reached with the European Society of Gastrointestinal Endoscopy (ESGE) is seen as a model to propose to other professional specialities to join the network.

Complete information on the achievements and recommendations from the three WG are contained in the synthesis and final documents posted on the EMAN website.

Outcomes of the EMAN Workshop

The EMAN workshop was held in June 2012 at the end of the EC funded project with the aims of presenting the results of the EC project to other stakeholders: regulatory authorities (EC, HERCA, national authorities), international organisations (ICRP, IAEA), industry (COCIR) and professional societies (ESPR, EANM, ESTRO, ESGE, CIRSE and a representative of Interventional Cardiology) as well as to hear their approach to optimisation and proposals for further activities.

Ten thematic sessions served to analyse the needs for optimisation, to present current activities of all participating partners, and to jointly look for good examples of practical optimisation, for chances of improvement, and for the requirements and solutions of implementing a sustainable EMAN network.

Extract of Presentations and Discussions

First, it was essential that the EC, the regulatory authorities and international organisations presented the global trends in radiation protection in medicine, their top projects and willingness to contribute to optimisation in Europe. COCIR showed the voluntary self-commitment of the imaging industry through concrete actions in CT and its interest in cooperating with the medical partners and the authorities. Beyond the formal EMAN members that presented the achievements obtained in the three working groups, professional societies presented ways to improve optimisation in their specific areas. Experiences with clinical audits, with the cooperation between hospitals and manufacturers as well as between radiographers, radiologists and physicists, and with e-learning in Italy to reach persons outside the departments of radiology were very illustrative. The working groups concentrated on their specific areas of activity and were able to point out many practical approaches to optimisation, such as to reduce occupational exposure in intervention.

The future of EMAN was intensively discussed and presented in the following part of this article.

Conclusions

In the Conclusion Session, important needs for the future EMAN network were listed: Most participants suggested to include as many professional partners as possible working with X-rays, radioisotopes and therapeutic radiology in order to cover the whole medical field.

It was also a broadly identified need that EMAN should include the whole range of radiation protection activities, i.e. above all justification, clinical audits and education/training in addition to optimisation. Interdisciplinary cooperation was recognised as one of the most important achievements of the EC project; as medical radiation protection is a multidisciplinary task, the cooperation of all partners including the referrers is essential, and within the departments of radiology, the core team of radiographers, radiologists and medical physicists has an extraordinary role.

Finally, the need for increasing the visibility of EMAN and for reaching all medical actors was pointed out as a major goal for the further work.

Activities & outlook of the new Network

Involvement of Stakeholders and Observers

As the key asset of the EMAN Network lies in a multi-stakeholder approach, the Steering Committee is currently reaching out to the various stakeholders with a potential interest in the scope of the network and who share a common interest to improve medical radiation protection. Interested medical professional organisations are en-

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couraged to join the Network as **Stakeholders**, while European and international organisations and bodies are invited to take on an observer and/or advisory role as **Observers** of the Network. Both types of engagement imply regular interaction with the Steering Committee and active participation in the activities of the Network through representation in the EMAN Stakeholder Group.

As a first step the consortium partners of the EC funded project were successfully invited to join the post-project EMAN Network:

- Swedish Radiation Protection Authority (Observer)
- German Bundesamt für Strahlenschutz (Observer)
- European Radiation Dosimetry Group (Observer)
- Centre d'étude sur l'Evaluation de la Protection dans le domaine Nucléaire (Stakeholder).

As a second step, the Steering Committee has extended invitations to a number of medical professional organisations and international and European bodies, including the European Commission, IAEA, WHO, HERCA. The Cardiovascular and Interventional Radiological Society of Europe (CIRSE) and the European Society of Paediatric Radiology (ESPR) have already formally accepted to be part of the Network.

Activities in the first year of the new Network (2013)

In addition to the stakeholder outreach, the first activities of the new Network include a revision and update of the project website (*www.eman-network.eu*), as wide dissemination of the valuable documents developed during the EC funded phase is one of the key tasks to ensure uptake and implementation of the suggested optimisation measures.

Collaboration for the time being focuses on the scope of activities of the EC-funded project, i.e. on the three following application areas of ionising radiation

- Computed tomography (CT)
- Interventional procedures
- The use of x-ray equipment outside the radiology department

To that end, the three working groups of the EC-funded project will resume their activities, update their documents and build upon the achievements during the EC-funded period.

Moreover, EMAN will continue to support the European Commission (EC) in its activities relating to the optimisation of radiation protection of individuals submitted to medical exposures; formulate proposals to the EC on harmonization issues, and propose to the EC solutions of identified issues at the European level.

An annual EMAN meeting is envisaged to review activities, discuss the way forward and to disseminate the Network's achievements to the interested communities. The first meeting, gathering the Steering Committee, the Stakeholder Group as well as the working group leaders and members, has been organised during ECR 2013 in March. From the conclusions of the meeting the following points will be considered for the Network developments:

- the Network has to maintain an European focus;
- the benefits of joining the network to other partners need to be made clear; a strength aspect to consider is the multidisciplinary nature of the network;
- the Network has to be fully established before to open to several partners; with the new partners the Network has to be ready to set-up specific working groups;
- the Network should establish relationship with other European projects like the MEDRAPET and the Referral Guidelines; again, EURADOS could disseminate through the Network their excellent results and data;
- present weak points: the need to develop activities able to financially sustain the network, important areas, like nuclear medicine and radiotherapy, are not at present Network partners.

Long-term vision

The long-term vision of collaboration of the Steering Committee members is to establish a single point of contact (SPOC) for the health professionals workforce, covering all aspects of medical radiation protection to avoid fragmentation of activities and duplication of effort. The activities of EMAN will potentially be integrated into the SPOC once established.

How individuals can contribute to EMAN

EMAN has set itself ambitious goals and has embarked on resource-intensive activities in order to establish and improve a radiation protection and patient safety culture in Europe.

If you are interested in the scope of the Network and share our interest to improve this safety culture, you are most welcome to contribute to the activities of the working groups. Please contact the EMAN Secretariat, who will be happy to put you in contact with the relevant chairperson.

For more information, please visit the EMAN website at www.eman-network.eu/ , download EMAN Newsletters (www.eman-network.eu/spip.php?article220) or contact the EMAN Secretariat at eu-affairs@myesr.org

Renato Padovani,
chairmän of EFOMP European Matters Committee

An MRI educational course in Greece

Magnetic Resonance Imaging (MRI) was first introduced in the 1970s. Since then, millions of scans have been carried out. It is a medical imaging procedure that uses strong magnetic fields and radio waves to produce cross-sectional images of organs and internal structures in the body. Over the years, it has become a very popular imaging modality providing high resolution images of a number of tissues within the human body. It is also the method of choice due to its ability to provide metabolic and functional information non-invasively with no involvement of ionising radiation. A growing number of hospitals or clinics around the world possess one ore more MRI systems to battle the conquest for more precise and accurate imaging techniques in order to facilitate the diagnosis of pathology. Due to the increase of the use of the MRI technology, the demand for more and more qualified staff is also increasing. Despite the fact that today, unlike past years, the operation of MRI scanners has become easier with the new software release, the operation and proper application of MRI protocols require properly educated clinical scientists for best use of the equipment. Another important fact is that in the early years of its use, there was no evidence to suggest that either the static magnetic fields or radiofrequency electromagnetic waves used during MRI scans pose any health risks. However, during the years a number of accidents occurred suggesting that safety precautions should be taken

Fig. 1:Thomas Maris, assistant professor of Medical Physics Department of the University of Crete and chair of the MRI workshop during the practical session of the MRI workshop.

Due to all these facts and recognizing the need for further and in depth education, the Hellenic Association of Medical Physicists (HAMP) decided to carry out an educational "hands on" course in MRI. This course is addressed to all accredited medical physicists who, according to the revised national legislation, would be in charge of Radiation Safety issues on the MRI clinical scanners. The aim of the course was to effectively train the participants in safety and quality control issues in MRI clinical scanners. Specifically, by the completion of the course the participants should be able to:

- perform quality control and measurements following the MRI national safety and quality control protocols, in various types of MRI clinical scanners
- effectively use the appropriate phantoms and measuring devices
- evaluate and quantitatively/qualitatively analyse the acquired images and results.

In order to facilitate this process the number of participants is limited to thirty people.

The duration of the course is two days. During the first day all participants attend a full day lecture course which is focused on the basic principles as well as infrastructure and technological improvements of MRI clinical systems. This course also provides information on routine quality control in MRI as well as in quantitative, functional and in vivo MR spectroscopy and final-

Fig. 2: This is the multimodality phantom that it is used for the measurements in the MRI course.

ly gives the latest scientific information regarding patient and personnel safety in MRI. During the second day, the participants are divided into groups of 5 people and perform simple MRI quality control and MRI safety measurements using the appropriate equipment, all supervised by established medical physics expert personnel.

More specifically, they learn how to set the appropriate phantoms and measuring devices, obtain routine Quality Control (QC) data and images as well as all the required post-processing methodologies for evaluating their results. In addition, the participants will perform all the necessary safety measurements regarding the static magnetic field, Gradients and RF field for the specific clinical scanner. The whole procedure is mainly focused on the practical contribution of the participants.

In December 2012 the first such course was held in the city of Thessaloniki and specifically in the Interbalkan Medical Center. Due to the high interest of the medical physicists in Greece the course was repeated twice in March and June 2013 in Hygeia hospital in the city of Athens, which is the first large private hospital operated in Greece since 1974 and is currently one of the largest private hospital units in our country.

Until now, the course is held in the Greek language. Due to the high interest in MRI, HAMP is now considering to continue this course in English. The first of these courses will be held in Thessaloniki due to the proximity of the town to be Balkan region. For more information on the course please contact the Secretary General of HAMP (ktheodor@med.uth.gr).

Virginia Tsapatki,
Chairman of EFOMP Communication and Publications Committee

Unconscious unfairness against women inside Medical Physics profession?

Many people have the feeling that gender disparity in science is getting better: the increased presence of women in scientific fields during last years is a prove of it. Moreover, women's preference for non-science disciplines, their tendency to take on a disproportionate amount of child- and family-care, and life choices that may compete with women's pursuit of the most demanding positions, seem to be for many researchers the primary causes of the gender disparity in science, and not the discrimination in this domain. But even if we acknowledge that all of these factors are likely to contribute to the imbalance of women in science, could other key factor be responsible for this situation too? According to a recent research [1], there is an unconscious bias against female students that contribute to the gender disparity in academic science and in their future careers.

Psychologists from Yale University carried out an ingenious study that found that researchers assessing the employability of early-career scientists subconsciously favour male students over females. The study involved 127 faculty members, across six universities in the United States, being asked to provide feedback on an excerpt from a job application for a laboratory manager position at another institution. The excerpt was designated to be as realistic as possible and was identical, except that 64 of the scientists received the excerpt in which the applicant's name was Jennifer, while the other 63 received the excerpt in which the applicant's name was John. The study assessed the perceived student competence, salary offers, and the extent to which the student was viewed as deserving of faculty mentoring. Their results found not only that both male and female faculty judged a female student to be less competent and less worthy of being hired than an identical male applicant, but also that the hirers would have offered her a smaller starting salary and

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less career mentoring. It's noteworthy that female faculty members were just as likely as their male colleagues to favour the male student, indicating subconscious bias against women and that both genders appear to be affected by enduring cultural stereotypes. The study results also pointed out that women receive less faculty encouragement and rewards than identical male counterparts. This fact will possibly influence decisions much later in their careers.

This peculiarity that women are judged less competent than men in science, is particularly evident at conferences in scientific fields, in which women are underrepresented. The organizing committees usually choose the components of the various committees without setting gender-blind criteria, which makes them to be represented mostly by men. Only for those cases in which gender-blind criteria is applied the selection results in an increased presence of women. For instance, for the last conference of the Spanish Society of Medical Physics recently held in Cáceres (Spain), the organizing committee consisted of 5 men and no women, and the scientific committee consisted of 23% of female representation. Moreover, the presence of women as oral speakers at the different lectures and symposiums of the conference was limited too: the percentage of women in the plenary sessions, invited lectures and debates was 11%, 25% and 25% respectively. However, there was a greater representation of women in oral communications, reaching 42% of the total sessions, which coincided with gender-blind criteria for the selection of candidates.

The introduction of gender-blind selection criteria to increase female participation is an evident fact, which draws attention not only in scientific fields. There is a story that is particularly revealing in showing the effect of gender-blind selection criteria: specifically, over the past 30 years, the number of women in the top US orchestras has increased fivefold. This increase coincided with a small but significant change in the manner in which orchestra auditions were held: The insertion of a screen between the auditioning musician and the judges.

These scenarios show the power of human subconscious, showing that everyone, regardless of how much we struggle against it, is subject to the influence of the subconscious in the form of gender bias. Whereas we all would vehemently deny any bias, a better approach is to accept it and investigate ways in which we can reduce the influence of our subconscious bias.

There is a variety of policies that are generally evoked for this purpose: a gender-mixed composition of nominating commissions, an increase in the objectivity of the applied selection criteria, or even the fixing of quotas. The European Commission states it clearly [2]: "There is no evidence of spontaneous reduction of gender inequality over time. All these policies, and many more, are needed to ensure that constant progress is made towards gender-equality in research and scientific careers".

And as for our National Medical Physics Organizations (NMOs), what could we do to improve this issue? Focusing, for instance, on our conferences or on any other society-sponsored event, we could start some strategies, already implemented in other scientific discipline conferences, that appear to work:

- Ensure reasonable representation of women on organising and scientific advisory committees.
- Enforce guidelines to ensure that keynote and other invited speakers reflect the diverse membership of the society.
- Ensure that women are recognized for their contributions to the society through nominations for awards (at the last ESTRO conference held in Barcelona, ESTRO31, only two out of eight awards were adjudicated to women).
- The organising and the scientific advisory committees should make an effort to minimize gender bias through applying blind selection criteria for speakers in all conference sections as possible.

So, who will be the first NMO to apply them at its next conference?

Guadalupe Martin, Spain

References:

[1] Corinne A. Moss-Racusin, John F. Dovidio, Victoria L. Brescoll, Mark J. Graham, Jo Handelsman. Science faculty's subtle gender biases favor male students. PNAS. October 9, 2012. Vol 109.nº 41.

[2] She figures 2012. Gender in research and innovation. Statistics and indicators. European Commission. Directorate-General for Research and Innovation

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Brighton, UK
Info:www.icmp2013.org

12-13 September 2013
2nd World Congress of Clinical Safety
Heidelberg, Germany
Info: www.iarmm.org/2WCCS/

18–21 September 2013
44th Annual Meeting of the German Society for Medical Physics(DGMP)
Cologne, Germany
Info: www.dgmp-kongress.de

22-25 September 2013
ASTRO Annual Meeting
Atlanta, GA USA
Info: www.astro.org/Meetings-and-Events/2013-Annual-Meeting/Index.aspx

19-23 October 2013
EANM'13 - Annual Congress of the European Association of Nuclear Medicine
Lyon, France
Info: eanm13.eanm.org/

1-6 December 2013
RSNA Annual Meeting, Radiological Society of North America
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Info: www.rsna.org/Annual_Meeting.aspx

6-10 March 2014
European Conference of Radiology (ECR)
Vienna, Austria
Info: www.myesr.org

4-8 April, 2014
ESTRO 33
Vienna, Austria
Info: www.estro.org/congresses-meetings/items/estro-33

7 – 9 May 2014
15th European ALARA Network Workshop
Rovinj, Croatia
Info: http://www.eu-alara.net/

27–30 May 2014
The Second International Conference on Radiation and Dosimetry in Various Fields of Research
Nis, Serbia
Info: www.rad2014.elfak.rs

30 May-2 June 2014
2nd International Conference on Radiation Protection in Medicine
Varna, Bulgaria
Info: rpm2014.org

20-24 July 2014
AAPM 56th Annual Meeting
Austin, TX USA
Info: www.aapm.org/meetings/

27-30 August 2014
Three Country Medical Physics Congress
SGSMP - ÖGMP - DGMP
Zürich, Switzerland

11-13 September 2014
8th European Conference Medical Physics,
Athens, Greece

8-15 November 2014
2014 IEEE Nuclear Science Symposium and Medical Imaging Conference,
Seattle (WA), USA
Info: *www.nss-mic.org/2014*

30 Nov- 5 Dec 2014
RSNA Annual Meeting
Chicago USA
Info: rsna.org/

7-12 June 2015
World Congress of Medical Physics (WC2015), IOMP,
Toronto, Canada

12-16 July 2015
AAPM 57th Annual Meeting
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info: www.aapm.org/meetings/