MEDRAPET
Medical Radiation Protection
EDUCATION AND TRAINING

European Workshop on Education and Training in Medical Radiation Protection

April 21–23, 2012
Athens/Greece

Book of Abstracts and Meeting Guide

MEDRAPET is financially supported by the European Commission.

European Commission

www.medrapet.eu

Vienna, April 2012

Coordination: Monika Hierath, Angelika Benkovszky

ESR Office, Vienna/ AT

Layout: Fludi

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Welcome

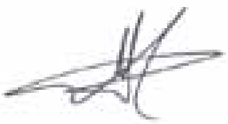
Dear colleagues,

It is a great pleasure to welcome you to Athens and to the MEDRAPET workshop. This workshop is organized as part of the MEDRAPET project. The professional organisations involved include the European Society of Radiology (ESR) as coordinator as well as the European Federation of Organizations for Medical Physics (EFOMP), the European Federation of Radiographer Societies (EFRS), the European Society for Therapeutic Radiology and Oncology (ESTRO), the European Association of Nuclear Medicine (EANM) and the Cardiovascular and Interventional Radiological Society of Europe (CIRSE).

We will discuss a range of topics pertaining to the current status, difficulties and future opportunities in the field of 'Medical Radiation Protection Education and Training'. Results of the MEDRAPET project are going to be presented during the MEDRAPET workshop. The outcomes will form the basis for a European Guidance on radiation protection education and training of medical professionals.

The scientific committee of the MEDRAPET workshop has endeavoured to set up an exciting programme which includes invited lectures, panel discussions, oral presentations and poster sessions with ample viewing time. Besides our scientific programme, I hope you will enjoy sightseeing, archaeological sites and dining in Athens.

I would like to express my sincere thanks to everybody who has contributed to organizing this meeting and I am very happy to welcome you to the fascinating city of Athens.



John Damilakis

Scientific Coordinator of MEDRAPET Project

Overview of the MEDRAPET Project

The European Commission has recently launched the MEDRAPET project (MEDicalRAdiation Protection Education and Training) to assess the implementation of the Medical Exposure Directive provisions related to radiation protection education and training of medial professionals in the EU Member States. The overall aim of the MEDRAPET project is the identification of needs in radiation protection training.

An integrated approach to education and training with high-standard training programmes harmonised at EU level is a key prerequisite to ensure excellence in radiation protection and to implement programmes for dose optimization in medicine. It is essential that all stakeholders in radiation protection ensure that proper education and training are in place, in particular with regard to new technologies and complex medical exposure procedures that have been developed in the past years and that are introduced into clinical practice at a rapid pace.

The professional organizations involved include the European Society of Radiology (ESR) as coordinator as well as the European Federation of Organizations for Medical Physics (EFOMP), the European Federation of Radiographer Societies (EFSR), the European Society for Therapeutic Radiology and Oncology (ESTRO), the European Association of Nuclear Medicine (EANM) and the Cardiovascular and Interventional Radiological Society of Europe (CIRSE).

The results of the MEDRAPET project will be the basis for the revision of the Radiation Protection 116 Guidelines on Education and Training in Radiation Protection for Medical Exposures. Detailed information about MEDRAPET can be found at the project website www.medrapet.eu

Committees

Scientific Committee

John Damilakis (ESR, Greece), chair

Stelios Christofides (EFOMP, Cyprus)

Alberto Del Guerra (EFOMP, Italy)

Wolfgang Eschner (EANM, Germany)

Susanne Huber (EFRS, Germany)

Dag Run Olsen (ESTRO, Norway)

Renato Padovani (EFOMP, Italy)

Graciano Paulo (EFRS, Portugal)

Madan Rehani (IAEA, Austria)

Dimitrios Tsetis (CIRSE, Greece)

Eliseo Vano (Article 31 GoE, Spain)

Local Organizing Committee

Panagiotis Dimitriou

Vasiliki Kamenopoulou

Thomas Maris

Michael Mazonakis

Kostas Perisinakis

Project Management

Monika Hierath (ESR, Austria)

Angelika Benkovszky (ESR, Austria)

General Information

Meeting venue
Divani Caravel Hotel
2, Vas. Alexandrou Avenue,
16121 Athens
+30 210 7207000
info@divanicaravel.gr
Meeting room "Mycenae"

Organiser's contact
Ms. Angelika Benkovszky, ESR
Email: angelika.benkovszky@myesr.org
Mobile (April 20-April 23): +43 664 9639943
Office number: +43 1 533 40 64-530

Abstract submission
All submitted abstracts were evaluated by peer review. In total 22 abstracts were accepted for presentation and the evaluation committee decided that 8 abstracts should be presented as oral and 13 as poster presentations.

Badges
It is obligatory for all participants to wear their badges visibly throughout the meeting.

City information
Ample information on the city of Athens can be found on the internet, e.g. www.athensguide.org
www.lonelyplanet.com/greece/athens
City information and maps are available from the hotel reception.

Coffee Breaks / Lunch
Refreshments during coffee breaks are included for all workshop participants on a complimentary basis. We thank you for your understanding that lunch cannot be provided free of charge. There are a number of restaurants and snack base in the immediate vicinity of the venue hotel.

Congress Language
English

Internet
Wireless internet access will be available to delegates free of charge in the workshop room and the coffee area.

Poster Presentations
13 posters will be presented in a loop during coffee breaks in the coffee area in the Pella room. The posters are thematically adjusted to the talks of invited speakers and underline the subject of Medical Radiation Protection Education and Training in a relevant and illustrative way.

Registration
Participants are asked to pick up their badge and book of abstracts at the registration desk. The registration desk will be located in front of Room Mycaene and will be staffed from April 21, 10:00 throughout the duration of the Workshop.!

Workshop Programme Overview

Workshop Programme

Saturday, April 21, 2012

	13:00-14:30	**ROUND TABLE 1:** MEDRAPET Project Presentation Moderators: Madan Rehani, AT, Maria Perez, CH
1	13:00-13:20	Welcome – Overview of the MEDRAPET Project John Damilakis, GR
2	13:20-13:40	Is a European Guidance on Radiation Protection Education and Training of medical professionals important for EU Member States? Remigiusz Baranczyk, LU
3	13:40-14:00	WP1: EU Study on Radiation Protection Education and Training Graciano Paulo, PT
4	14:00-14:20	WP3: European Guidance on Radiation Protection Education and Training Stelios Christofides, CY
	14:20-14:30	**Discussion**
	14:30-18:00	**ROUND TABLE 2: Current Status in Radiation Protection Education and Training of Medical Professionals in Europe. Results of MEDRAPET Project** Moderators: Dag Rune Olsen, NO, Dimitrios Tsetis, GR
5	14:30-15:00	The EU-wide survey: Methodology and Results Graciano Paulo, PT
6	15:00-15:30	European Guidelines on Education and Training in Radiation Protection for Medical Exposures: Do they Need an Update? Stelios Christofides, CY
	15:30-16:00	**Discussion**
	16:00-16:30	**Coffee Break** (Poster presentations shown in loop in coffee area)
7	16:30-17:00	Training in Radiation Protection for Nuclear Medicine: The Experience from the ORAMED project Moderator: Wolfgang Eschner, DE, Speaker: Marta Sans Merce, FR
8	17:00-17:30	Training Methods for Newer Audience of Medical Practitioners Moderator: Alberto Del Guerra, IT, Speaker: Madan Rehani, AT
9	17:30-18:00	Radiographers and Radiation Protection: Education, Training and CPD Moderator: Michalis Mazonakis, GR, Speaker: Luis Lanca, PT

Workshop Programme Overview

Workshop Programme

Sunday, April 22, 2012

	09:00-11:25	**ROUND TABLE 3: Education and Training in Radiation Protection for Professionals Involved Directly with the Use of Radiation. The view of experts** Moderators: Ritva Bly, FI, Peter Sharp, UK
10	09:00-09:20	Education and Training in Radiation Protection for Professionals involved directly with the use of Radiology – The view of Radiology Erich Sorantin, AT
11	09:20-09:40	Education and Training in Radiation Protection for Nuclear Medicine Alberto Del Guerra, IT
12	09:40-10:00	Radiation Protection for Radiotherapy Edwin Aird, UK
13	10:00-10:20	Education and training in radiation protection for dentists Kostas Tsiklakis, GR
14	10:20-10:40	Education and training in radiation protection for professionals involved directly with the use of Radiology – the view of Vascular Surgery Christos Liapis, GR
	10:40-10:55	**Discussion**
15	10:55-11:25	Accreditation and Certification of the Training in Radiation Protection: Needs, Opportunities and Difficulties Moderator: Peter Vock, CH, Speaker: John Damilakis, GR
	11:25-11:55	**Coffee Break** (Poster presentations shown in loop in coffee area)
	11:55-13:30	**ROUND TABLE 4: The role of International and National Organizations in Medical Radiation Protection Education and Training** Moderators: Carmel Caruana, MT, Sija Geers-van Gemeren, NL
16	11:55-12:15	The role of International and National Organizations in Medical Radiation Protection, Education and Training – The view of the WHO Maria Perez, CH
17	12:15-12:35	The role of International and National Organizations in Medical Radiation Protection Education and Training: View of IAEA Expert Madan Rehani, AT
18	12:35-12:55	The role of HERCA Working Group on Medical Applications in Medical Radiation Protection Education and Training Ritva Bly, FI
19	12:55-13:15	The role of international and national organizations in Medical Radiation Protection Vasiliki Kamenopoulou, GR

Workshop Programme Overview

Workshop Programme

Sunday, April 22, 2012

	13:15-13:30	**Discussion**
	13:30-14:30	**Lunch** (Poster presentations shown in loop in coffee area)
20	14:30-14:45	Radiation Protection Education and Training Projects and activities in Europe Moderator: Efstathios Efstathopoulos, GR Speaker: Annemarie Schmitt-Hannig, DE
	14:45-16:00	**Oral Presentations** Moderators: John Damilakis, GR, Erich Sorantin, AT
21		The Cypriot experience on the Radiation Protection Education and Training of Health professionals using Ionising radiation Stelios Christofides et al., CY
22		Radiation protection education in the use of mobile C-arm for the nurses Anja Henner et al., FI
23		Scandinavian project for evidence based course in digital imaging Anja Henner et al., FI
24		A medical radiation protection educational course for Radiographers Thomas Maris et al., GR
25		Education and Training in Radiation Protection at the University Hospital of Iraklion Michalis Mazonakis et al., GR
26		Development and Impact of Educational Multimedia on Medical Radiation Physics/Technology and Radiation Protection for Medical Students in the University of Crete Kostas Perisinakis et al., GR
27		Level of education and training in radiation protection in the curriculum of health professionals in Norway Reidun Silkoset et al., NO
28		Radiation protection training of healthcare staff in Bulgaria – what can be improved? Jenia Vassileva, BG
29	16:00-16:30	Training in Radiation Protection for Interventionalists Moderator: Kostas Perisinakis,GR Speaker: Jost Philipp Schaefer, DE
	16:30-17:00	**Coffee Break** (Poster presentations shown in loop in coffee area)
30	17:00-17:30	Knowledge, Skills and Competences Requirements in Radiation Protection of Medical Physicists Moderator: Panayiotis Dimitriou,GR Speaker: Carmel Caruana, MT
31	17:30-18:00	Medical Education and Training in Radiation Protection in Greece: Current Situation and Perspectives Moderator: Thomas Maris, GR Speaker: Panayiotis Dimitriou, GR

Workshop Programme Overview

Workshop Programme

Monday, April 23, 2012

	09:00 – 11:00	**ROUND TABLE 5: Education and Training in Radiation Protection for Medical Professionals. The View of European Societies** Moderators: Stelios Christofides,CY, Graciano Paulo, PT
32	09:00-09:20	Education and Training in Medical Radiation Protection: The view of the ESR Peter Vock, CH
33	09:20-09:40	Education and Training in Radiation protection for medical Professionals – The view of the EFRS Sija Geers-van Gemeren, NL
34	09:40-10:00	Education and Training in Radiation Protection for Medical Professionals. The View of Cardiovascular and Interventional Radiological Society of Europe (CIRSE) Dimitrios Tsetis, GR
35	10:00-10:20	ESTRO perspective on education and training in radiation protection Dag Rune Olsen, NO
36	10:20-10:40	Education and Training in Radiation Protection for Medical Professionals – The View of EANM Wolfgang Eschner, DE
37	10:40-11:00	Education and Training in Radiation Protection for Medical Professionals – The View of EFOMP Peter Sharp, UK
	11:00-11:30	**Coffee Break** (Poster presentations shown in loop in coffee area)
	11:30-12:30	**Panel Discussion** John Damilakis (coordinator) Remigiusz Baranczyk, Ritva Bly, Stelios Christofides, Wolfgang Eschner, Dag Rune Olsen, Graciano Paulo, Maria Perez, Madan Rehani, Dimitrios Tsetis

Overview Poster Presentations

Thirteen (13) posters were selected by the MEDRAPET reviewers. A digital version of these posters is shown in two loops during the four coffee breaks according to the following programme:

April 21, 16:00-16:30 and April 22, 16:30-17:00

38	Radiation protection training program in Interventional Radiology Ioannis Antonakos et al., GR
39	Education and Training in Radiation Protection: MEDRAPET results for Image-Guided Endovascular Intervention Societies Gabriel Bartal et al., IL
40	Intermittent courses for x-ray technicians as one of the directions in quality assurance and radiation safety of x-ray examinations Yuriy Kovalenko et al., UA
41	Participation of professional association in radiologists and X-ray technicians training in quality and radiation safety of X-ray studies Yuriy Kovalenko, UA
42	Radiation Protection education of Radiology trainees Maria Lyra Georgosopoulou et al., GR
43	Interactive training in the “radiologist-trained engineer” as a rational method of X-ray department staff training the quality and safety of digital radiography Iuliia Myronova et al., UA
44	Training through gaming in radiation protection; a virtual radiation protection workshop in Second Life Panagiotis Antoniou et al., GR

April 22, 11:25-11:55 and April 23, 11:00-11:30

45	Survey on CT Scanning Parameters in Pediatric Patients in Greece: Are Settings Adjusted? Dimitris Koumarianos et al., GR
46	Clinical medical physicists’ education and training framework. Part A: Europe-Australasia Antonis Stefanoyiannis et al., GR
47	Clinical medical physicists’ education and training framework. Part B: North America Konstantinos Psichis et al., GR
48	Energy Spectra and scattered Radiation Intensity determination around Dental X-Ray Equipment through the employment of a Schottky CdTe Detector Basile Spyropoulos et al., GR
49	Reporting on the Educational and Research Impact since 2003 of a Course on Industrial Property Rights focused on Medical Physics and Biomedical Engineering Basile Spyropoulos, GR
50	ENETRAP II: WP3 – Establishment of European Guidance for RPO Training Annemarie Schmitt-Hannig et al., DE

Abstracts – Oral Presentations (1-37)

Saturday, April 21, 2012

13:00-14:30
ROUND TABLE 1: MEDRAPET Project Presentation
Moderators: Madan Rehani, AT, Maria Perez, CH

1 13:00-13:20
Welcome – Overview of the MEDRAPET Project
John Damilakis, GR

The overall aim of MEDRAPET project is to provide an improved implementation of the Medical Exposure Directive provisions related to radiation protection education and training of medical professionals in the EU Member States. The professional organisations involved include the European Society of Radiology (ESR) as coordinator as well as the European Federation of Organizations for Medical Physics (EFOMP), the European Federation of Radiographer Societies (EFRS), the European Society for Therapeutic Radiology and Oncology (ESTRO), the European Association of Nuclear Medicine (EANM) and the Cardiovascular and Interventional Radiological Society of Europe (CIRSE).

The activities of the project mainly focus on the conduction of an EU-wide study on medical radiation protection education and training in the EU Member States and on the development of a European Guidance document on radiation protection education and training of medical professionals.

The project is divided into 4 Work Packages (WPs); each work package covers specific tasks contributing to achieve the common objective of improving implementation of the Medical Exposure Directive provisions related to radiation protection education and training of medical professionals in the EU Member States.

WP0 chaired by the coordinator of the project is responsible for the management and general coordination of the project. The coordinator acts as contact person between the Consortium and the European Commission.

WP1 is in charge of developing the methodological approach for the study on radiation protection education and training of medical professionals in the EU Member States, to carry out the study as well as to develop a structured evaluation/summary document of the study as a basis for the European Workshop under WP2. The work package is chaired by EFRS.

WP2 is responsible for organising the MEDRAPET workshop on radiation protection education and training of medical professionals in the EU Member States. WP2 is chaired by the coordinator.

WP3 will develop the European Guidance document on radiation protection education and training of medical professionals, which will be the core task of the project. This work package is chaired by EFOMP.

The MEDRAPET workshop is a platform for exchange of ideas and knowledge relevant to radiation protection education and training for healthcare staff. It will also facilitate assessment of the level of implementation of the Medical Exposure Directive Provisions and identification of the needs and persistent gaps in radiation protection education and training of health care professionals. Results of the MEDRAPET project are going to be discussed during the MEDRAPET workshop. The outcomes will form the basis for a European Guidance on radiation protection education and training of medical professionals.

2 13:20-13:40

Is a European Guidance on Radiation Protection Education and Training of medical professionals important for EU member states?

Remigiusz Baranczyk, LU

INTRODUCTION

The European Union has a long and successful history of dealing with radiation protection in medical exposures. This includes the adoption in the 1980s of specific Euratom legislation and its later updates, issuance of European guidance documents, support of research and facilitation of information exchange and stakeholder involvement. Today we experience rapidly developing medical technology combined with increasing number of patients undergoing radiological procedures leading to global increase of population doses from medical exposure. This is happening in a situation of growing concerns regarding the justification and optimization of some radiological procedures and also radiation protection training and education of medical personnel. Therefore an integrated approach to education and training with high-standard training curricula harmonised at EU level is a key prerequisite of excellence in radiation protection and dose optimisation in medicine. In line with this a development of an up-to-date European guidance on radiation protection education and training of medical professionals is very important for EU Member States. Such a document should provide a framework which can be used by national organisations and societies to recognise differences in education and training programmes and guide their own curricula development.

LEGAL BASIS

The work of the European Commission in the field of radiation protection is governed by the Euratom Treaty [1] and the Council Directives made under it. The most prominent is the Council Directive 96/29/Euratom laying down the basic safety standards (BSS) for radiation protection of the workers and the members of the public [2]. The BSS Directive is supplemented by the Council Directive 97/43/Euratom (Medical Exposure Directive, MED), defining the European legal requirements for radiation protection of individuals submitted to medical exposures [3].

Articles 7 (1) and 7 (3) of MED requires that „Member States shall ensure that practitioners and those individuals mentioned in Articles 5 (3) and 6 (3) have adequate theoretical and practical training for the purpose of radiological practices, as well as relevant competence in radiation protection" and that „Member States shall ensure that continuing education and training after qualification is provided and, in the special case of the clinical use of new techniques, the organization of training related to these techniques and the relevant radiation protection requirements." Article 7 (4) stipulates that Member States shall encourage the introduction of a course on radiation protection in the basic curriculum of medical and dental schools. Article 9 requires Member States to ensure that practitioners conducting special practices (medical exposures of children, medical exposures as part of a health screening programme and medical exposures involving high doses to the patient) receive appropriate training.

REVISION OF THE EURATOM BSS

Soon after the publication of the 2007 Recommendations of the International Commission on Radiological Protection [4] the European Commission launched a revision of the Euratom BSS. This involved also a simplification of the Community legislation on radiation protection by integrating five current Euratom Directives, the MED included, into a single revised Euratom BSS Directive [5]. The European Commission adopted the proposal for revised Euratom BSS in September 2011 [6].

Even though the MED has been widely recognized as one of the most advanced pieces of legislation on radiation protection in medical exposure some changes in the current requirements have been proposed stemming from the need to have a coherent text of the revised Euratom BSS, from experience in the implementation of the legislation in the past ten years and from developments in the medical area not fully foreseen back in 1990s.

Requirements on education and training of medical professionals have been strengthened and the introduction of a course on radiation protection in the basic curriculum of medical and dental schools was made mandatory. New legal provision requires Member States to ensure that mechanisms are in place for the timely dissemination of appropriate information relevant to radiation protection in medical exposure on lessons learned from significant events.

EUROPEAN GUIDANCE ON EDUCATION AND TRAINING IN RADIATION PROTECTION FOR MEDICAL EXPOSURES

In order to support the Member States in the implementation of the MED legislative requirements related to radiation protection training of medical professionals the European Commission published in 2000 „Guidance on Education and Training in Radiation Protection for Medical Exposures" (Radiation Protection no. 116) with the aim to provide some clarification and orientation for the application of the MED [7]. However rapid technological development occurring in the past decade and constantly growing use of ionizing radiation in medicine call for an update of this document. Today, medical procedures are by far the most significant man-made source of exposure to people. Since training in radiation protection is widely recognised as one of the basic components of optimization programmes for medical exposures, it is necessary to establish high standards training programmes harmonized at EU level.

Therefore the European Commission launched in 2011 a project, called MEDRAPET (MEDical RAdiation Protection Education and Training), to perform a study on the implementation of the MED requirements on radiation protection training of medical professionals in the EU Member States and to develop European guidance document containing appropriate recommendations on harmonization at EU level.

REFERENCES

1 The High Contracting Parties of Euratom (1957) Treaty establishing the European Atomic Energy Community, consolidated version. Official Journal of the European Union (OJEU) 2010/C 84/01

2 Council of the European Union (1996) Council Directive 96/29/Euratom of 13 May 1996, laying down basic safety standards for the health protection of the general public and workers against the dangers of ionizing radiation. OJEU 1996/L 159/1

3 Council of the European Union (1997) 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. OJEU 1997/L 180/22

4 nternational Commission on Radiological Protection (2007) Publication 103. Elsevier Ltd

5 S. Mundigl (2010) Revision of the Euratom Basic Safety Standards Directive – current status. Radiat Prot Dosim Special issue October 2010

6 European Commission (2011) Proposal for a Council Directive laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation. COM(2011)593; http://ec.europa.eu/energy/nuclear/radiation_protection/doc/com_2011_0593.pdf

7 European Commission (2000) Guidance on Education and Training in Radiation Protection for Medical Exposures, Radiation Protection no. 116; http://ec.europa.eu/energy/nuclear/radiation_protection/doc/publication/116.pdf

3 13:40-14:00

WP1: EU Study on Radiation Protection Education and Training

Graciano Paulo, PT

MEDRAPET (MEDical RAdiaton Protection Education and Training) consortium (ESR, EFRS, EFOMP, ESTRO, EANM, CIRSE) was created after a tender invitation by the European Commission, to develop a study on the Implementation of the Medical Exposures Directive's requirements on Radiation Protection Training of Medical Professionals in the European Union.

The overall aim of this project is to provide an improved implementation of the Medical Exposure Directive provisions related to radiation protection education and training of medical professionals in the EU Member States, as a baseline to update Radiation Protection 116 document, published in the year 2000.

WP1, chaired by EFRS (European Federation of Radiographers Societies) was in charge of developing the methodological approach for the study on radiation protection training of medical professionals in the EU Member States, to carry it out and to develop a evaluation/summary document, with the objective to establish the status, the legal and practical arrangements in the Member States, regarding radiation protection training of medical professionals.

During this presentation an overview of the WP1 progress will be made, emphasizing the importance of its organizational structure and the contribution of the external advisors members.

4 14:00-14:20

WP3: European Guidance on Radiation Protection Education and Training

Stelios Christofides, CY

INTRODUCTION

This is the fourth paper on the MEDRAPET project and it is concentrating on the presentation of the Work Package 3 (WP3) tasks.

PURPOSE

The main purpose of MEDRAPET WP3 is the development of European Guidance on radiation protection education and training of medical professionals containing appropriate recommendations on harmonization in this field.

MATERIALS AND METHODS

The outcome of the study (WP1) as well as the discussions of the workshop (WP2) will form the basis for the European Guidance. In addition, WP3 will take into account the relevant documents issued by the International Commission on Radiological Protection (ICRP), the International Atomic Energy Agency (IAEA) and the World Health Organisation (WHO). The Expert Advisory Panel and representatives of the above organisations will be invited to contribute to the guidance elaboration.

EXPECTED RESULTS

The expected results of the WP3 work will be the delivery of a final draft of the European Guidance document that will take into account the comments provided by the Working Party on Medical Exposures of the Article 31 Group of Experts of the EURATOM treaty and by other European professional Organisations.

Additionally, WP3 will provide recommendations on the establishment of a permanent multidisciplinary working party to draft and maintain European standard sets of competences at various levels for minimum Radiation Protection Education, training and Continuous Professional Development required for all the different groups of medical staff working with ionising radiation.

CONCLUSIONS

It was evident from the first Project Steering Committee meeting which was held in Luxembourg on the 4th of February 2011, that the starting date of the WP3 work was left too late and it would not have been possible to complete its tasks within the foreseen timeframe. It was therefore decided that the WP3 work begin as soon as possible and to take into account the conclusions and recommendations of the study (WP1) as soon as these were made available.

ACKNOWLEDGEMENTS

The author of this paper would like to acknowledge the close collaboration and contribution of all the representatives of the WP3, namely: Carmel J. Caruana and Jim Malone (EFOMP), John Damilakis, Natasa Brasik and Monika Hierath (ESR), Dean Pekarovic and Sija Geers-van Gemeren (EFRS), Dag Rune Olsen (ESTRO), Wolfgang Eschner (EANM), Efstathios P. Efstathopoulos and Dimitrios K. Tsetis, (CIRSE). The support and contribution of the observer organization's representatives is also acknowledged, namely: Ruzica Maksimovic (WHO), Madan Rehani (IAEA) and Annemarie Schmitt-Hanning (BfS).

14:20-14:30

Discussion

14:30-18:00
ROUND TABLE 2: Current Status in Radiation Protection Education and Training of Medical Professionals in Europe. Results of MEDRAPET Project

Moderators: Dag Rune Olsen, NO, Dimitrios Tsetis, GR

5 14:30-15:00

The EU-wide survey: Methodology and Results

Graciano Paulo, PT

THE EU-WIDE SURVEY – METHODOLOGY AND RESULTS

MEDical RAdiation Protection Education and Training project is related to the Council Directive 97/43/EURATOM (Medical Exposure Directive-MED), defining the European legal requirements for radiation protection of individuals submitted to medical exposures, in order to update RP 116, published in the year 2000.

To achieve that objective WP1 decided to target National Radiation Protection Authorities (RPA), Health Professionals Societies (PS) and Educational Institutions (EI) from European countries (EU, EFTA and candidates), through a web-based questionnaire.

WP1 members developed the questionnaire, with the valuable contribution of the external experts from IAEA, ICRP and BFS.

The survey questions were validated through, a pilot study conducted using national organizations contacts, recommended by WP1 consortium members, taking into consideration a good geographical representation from different European regions to guaranty that questions were understandable by countries with different cultures and language background.

Each consortium member had the responsibility to organize a contact database that was centralized and controlled by MEDRAPET project officer.

A total of 1023 contacts were obtained. An average response rate of 24,3% by type of organization and 29% by country was obtained. Considering the 3 main groups targeted through the survey, the response rate was 57,1% for RPA, 25,3% for PS and 19,8% for EI. All consortium members considered the reply rates positive.

The survey was targeted to the main stakeholders of European countries, with responsibility for ensuring the application of the MED, particularly in relation to Articles 7 and 9. As expected by the MEDRAPET consortium members, Radiation Protection Education and Training (RP E&T) are far from being harmonized and in some instances not even implemented in EU countries despite the MED Directive requirements.

6 15:00-15:30

European Guidelines on Education and Training in Radiation Protection or Medical Exposures: Do they Need an Update?

Stelios Christofides, CY

INTRODUCTION

The European Guidelines on Education and Training in Radiation protection for Medical Exposures (RP116) was published by the European Commission in 2000. This document was basically a review of the existing education and training recommendations available from various organisations at that time and has made basic recommendations on the education and training required by medical professionals. Upon reviewing this document and also taking into consideration the evolution of the radiological technology since 2000, WP3 has decided that it does not only needs updating but it needs to be redrafted from the beginning. This paper reports on the progress of the MEDRAPET project Work Package 3 (WP3) tasks that also include the drafting of a new report with the title "Guidelines on Radiation Protection Education and Training of Medical Professionals in the European Union".

PURPOSE

The main purpose of MEDRAPET WP3 is the development of European Guidance on radiation protection education and training of medical professionals containing appropriate recommendations on harmonization in this field.

Materials and Methods: The outcome of the study (WP1) as well as the discussions of the workshop (WP2) will form the basis for the European Guidance. In addition, WP3 will take into account the relevant documents issued by the International Commission on Radiological Protection (ICRP), the International Atomic Energy Agency (IAEA) and the World Health Organisation (WHO). The Expert Advisory Panel and representatives of the above organisations will be invited to contribute to the guidance elaboration. Also an extensive bibliographic search was and it continuous to be carried out to locate relevant references.

RESULTS

Since the start of the project, 52 relevant reference documents and papers have been located and have been reviewed by the representatives of the WP3 partners, that included the documents published by ICRP, IAEA and WHO. The main conclusion of this review has supported the decision to draft a new document and also provided a lot of material for its drafting. The content of the new document has been decided and it consists of the following main chapters:

1. Introduction (Background, MEDRAPET survey, Role of organizations, The structure of this document),
2. Basic learning outcomes for radiation protection,
3. Learning outcomes for referrers,

4. Learning outcomes for physicians and dentists involved directly with the use of radiation (Diagnostic Radiologists, Interventionalists, Nuclear Medicine Physicians, Radiation Oncologists, Dental Surgeons),
5. Learning outcomes for Radiographers (Radiology, Nuclear Medicine, Radiation Oncology),
6. Learning outcomes for Medical Physicists/Medical Physics Experts (Diagnostic & Interventional Radiology, Nuclear Medicine, Radiation Oncology),
7. Learning outcomes for Nurses,
8. Learning outcomes for maintenance engineers and maintenance technicians,
9. The certification and accreditation process,
10. Education and training resources,
11. Glossary,
12. ANNEXES: Exemplars of detailed learning outcomes.

These will be preceded by a preface, an executive summary and a contents table. The drafting of the above chapters was allocated to the representatives of the WP3 partners.

CONCLUSIONS

The draft document that is available to the Workshop participants reflects the drafting that has been completed so far and it is open to all participants for comments and suggestions for improvement.

ACKNOWLEDGEMENTS

The author of this paper would like to acknowledge the close collaboration and contribution of all the representatives of the WP3, namely: Carmel J. Caruana and Jim Malone (EFOMP), John Damilakis, Natasa Brasik and Monika Hierath (ESR), Dean Pekarovic and Sija Geers-van Gemeren (EFRS), Dag Rune Olsen (ESTRO), Wolfgang Eschner (EANM), Efstathios P. Efstathopoulos and Dimitrios K. Tsetis, (CIRSE). The support and contribution of the observer organization's representatives is also acknowledged, namely: Ruzica Maksimovic (WHO), Madan Rehani (IAEA) and Annemarie Schmitt-Hanning (BfS).

15:30-16:00
Discussion

16:00-16:30
Coffee Break (Poster presentations shown in loop in coffee area)

7 16:30-17:00
Training in Radiation Protection for Nuclear Medicine: The Experience from the ORAMED project

Moderator: Wolfgang Eschner, DE, Speaker: Marta Sans Merce, FR

INTRODUCTION

Nuclear medicine (NM) is related to all uses of unsealed radioactive sources for diagnosis or therapy purposes. The skin of the hands of workers is generally the most exposed organ, with a large variation of doses across the hands, as pointed out by nearly all authors in the literature. Therefore, reducing extremity doses of workers is a major concern in NM.

PURPOSE

The purpose of the work package 4 of the European ORAMED (Optimization of RAdiation protection for MEDical staff) project was to enlarge the general knowledge of hand doses delivered to NM staff when handling most frequently used radiopharmaceuticals, i.e. those labelled with Tc-99m and F-18 for diagnostics procedures, and those labelled with Y-90 for therapy procedures.

MATERIALS AND METHODS

A wide measurement program including 124 workers from 32 NM departments was performed in Europe. Dose distribution across the hand was obtained by measuring skin doses at 11 points of each hand using appropriate thermoluminescence dosemeters attached on gloves or taped to the operator's hands. All relevant information for radiation exposure was gathered in a unified protocol. The database obtained represents the largest number of collected data on extremity dosimetry in NM. Furthermore, more than 200 Monte Carlo simulations were performed to better understand the parameters influencing the hand dose. For this purpose, realistic scenarios involving voxelized hand phantoms were used. Finally, guidelines were elaborated by merging the statistically analyzed results of measurements with those from the simulations.

RESULTS

The results show a large variation of personnel doses to the hands between NM departments and even between individuals of the same department. There is a clear need, for some NM departments, to improve present handling procedures in order to reduce hand exposure. To some extent, the spread of the doses, even within the same procedure, has been partially justified by the Monte Carlo sensitivity analysis, as being due to the influencing parameters. We found that the annual skin dose limit of 500 mSv was exceeded by 20% of the workers.

While experienced workers had generally lower doses, it was observed that some very experienced workers had deeply rooted inappropriate habits whereas beginners may work with extra carefulness. Therefore, good working habits were found to be more important than experience. Further studies carried out for therapy procedures demonstrate that doses can be reduced to an acceptable level when workers are aware of the expected doses and dose distribution across their hands and when appropriate training and suitable radiation protection measures are provided.

Thus, training and education in good practices such as procedure planning, repeating procedures using non radioactive sources and estimating doses to be received are more relevant parameters than the worker's experience level. Several tools have been developed within the ORAMED project for training purposes. A dose estimation tool has been developed to estimate the expected doses and their distribution across the hands. Furthermore, a radiation protection training course has been conceived for NM trainees to teach the bases of radiation protection. A video, showing the good practices during manipulations has also been created. Additionally, a leaflet summarizing the general trends observed and the nine recommendations as outcome from the project is also available. All the material is downloadable for free from the ORAMED website.

CONCLUSIONS

"Training and education in good practices are more relevant parameters than the worker's experience level". This is one of the nine recommendations of the ORAMED project. For this purpose several training material has been developed within the project and is available for free download on the project web page.

8 17:00-17:30

Training Methods for Newer Audience of Medical Practitioners

Moderator: Alberto Del Guerra, IT, Speaker: Madan Rehani, AT

Madan M Rehani, PhD

International Atomic Energy Agency, Vienna, Austria

WHICH NEWER AUDIENCE?

The extensive use of fluoroscopy outside the radiology departments has created newer audience of medical specialists that includes interventional cardiologists, electro physiologists, vascular surgeons, urologists, orthopaedic surgeons, gastroenterologists, gynaecologists and anaesthetists involved in pain management. This list is not complete but representative. Further surgeons involved in sentinel lymph node biopsies on patients administered with radiopharmaceuticals are also important audience. Paramedical staff associated with these specialists also need to be covered.

WHY DO THEY NEED TO BE TRAINED?

The usage of radiation by these specialists has become more than an average radiologist and in many instances equivalent to interventional radiologist. The ICRP recommends that the levels of education and training should be commensurate with the level of usage of radiation. Unfortunately, in many countries, rather most, there is no systematic training of these specialists. Lack of radiation protection training can increase the radiation risk to workers and patients.

ARE RADIATION RISKS SIGNIFICANT?

About a dozen cases of radiation induced skin injuries to patients are occurring every year in US alone among patients undergoing interventional procedures. Besides cardiac procedures, endovascular aneurysm repair (EVAR), renal angioplasty, iliac angioplasty, ureteric stent placement, therapeutic endoscopic retrograde cholangio-pancreatography (ERCP) and bile duct stenting and drainage have the potential to impart skin dose to patient exceeding 1 Gy. Recent reports of opacities in the eyes of workers who use fluoroscopy have drawn attention to the need to strengthen radiation protection measures for the eyes of workers.

IS CONVENTIONAL TRAINING APPROACH NOT VALID?

The conventional training lays significant emphasis on physics and includes basic topics like atomic structure, interaction of radiation with matter, radiation detection...and so on. That kind of training may suit those professionals who are going to be full time workers in radiation department like radiologists, radiation oncologists, nuclear medicine specialists. That approach is not suitable in this case. The approach has to be based on dealing with practical aspects and while deliberating those practical issues that practitioners face, bring basic issues wherever necessary to explain rather than starting with basic issues as essential item of training.

ARE THERE EXAMPLES OF SUCCESSFUL TRAINING PROGRAMS AND RELEVANT TRAINING MATERIAL FOR SUCH AUDIENCE?

The IAEA has been conducting training programs in large part of the world for such specialists and has developed standardized training material that is available for free download from IAEA website (http://rpop.iaea.org). ICRP has just completed two documents on this subject and Annals of ICRP entitled "Radiological protection in fluoroscopically guided procedures performed outside the imaging department" and another "Radiological Protection in Cardiology" are in press.

WHAT SHOULD BE FOCUS AND ORIENTATION OF TRAINING?

The main purpose of training is to make a qualitative change in practice that helps operators use radiation protection principles, tools and techniques to reduce one's own exposure without cutting down on work and to reduce patient's exposure without compromising on image quality or intended clinical purpose. The focus has to remain on achievement of skills. Unfortunately, in many situations it takes the form of complying with requirements of number of hours of lectures. While number of hours is an important way to provide a yardstick, actual demonstration of skills to reduce occupational and patient exposure is an essential part. A worker's competency to carry out a particular function should be assessed by those who are themselves suitably competent.

9 17:30-18:00

Radiographers and Radiation Protection: Education, Training and CPD

Moderator: Michalis Mazonakis, GR, Speaker: Luis Lanca, PT

INTRODUCTION

Radiographers play an effective role while planning, preparing and performing accurate and safe radiological procedures within the diagnostic or therapeutic field. While using a wide range of sophisticated equipment and techniques in several radiological procedures, radiographers are directly responsible for the radiation delivered to the patient. Thus, their role and accountability within the healthcare team includes patient safety assurance resulting from the undertaken actions in a certain radiological procedure. Education, training and continuing professional development (CPD) constitutes a triad pointing towards the radiographers development of competences in the radiation protection field.!

PURPOSE

This presentation aims (1) to get a global overview about the effective role of radiographer in the performance of radiological procedures; (2) to understand the competences hold by radiographers in radiation protection; (3) to reflect about the need of education, training and CPD to ensure a safer radiological practice.

MATERIALS AND METHODS

A literature search was performed in PubMed, in selected searching journals and in academic and professional websites. A search was undertaken using a Boolean logic combining key-words such as radiographers, radiological technologists, radiation protection, education, training and continuing professional development. Several studies were identified and a review was undertaken.

RESULTS

A radiographer operates all types of radiological equipment both in diagnostic and/or therapy. A wide range of radiological equipment is directly handled by radiographers. The undertaken technique options and actions by these healthcare providers directly affect the dose delivered to the patient and the quality of the radiological procedure.

The competences hold by radiographers in radiation protection includes the optimization of radiation exposure for patients (aiming the establishment of dose reference levels), staff and carers. The need to understand and use radiation protection protocols is mandatory while the knowledge of the radiographer should be used to advise other healthcare professionals regarding safe practice in this area. The radiographer owns the competence to critical appraise to the use of ionising radiation.

The need of education, training and CPD to ensure a safer radiological practice is thus a major topic of concern. Radiographers need to understand how the different technical options affect dose and the results of their actions.

CONCLUSION

Radiographers are highly qualified professionals that play an effective role in radiation protection. While members of a healthcare team their accountability should be acknowledged. Their direct actions in within their field of competence and expertise influence the radiation dose received by the patients. Education, training and CPD are a requirement to achieve the competences in radiation protection.

Sunday, April 22, 2012

09:00-11:25
ROUND TABLE 3: Education and Training in Radiation Protection for Professionals Involved Directly with the Use of Radiation. The view of experts
Moderators: Ritva Bly, FI, Peter Sharp, UK

10 09:00-09:20
Education and Training in Radiation Protection for Professionals involved directly with the use of Radiology – The view of Radiology
Erich Sorantin, AT

INTRODUCTION

Today imaging represents an integral part of the diagnostic workup, sometimes performed as the first step. On the other hand the amount of radiation delivered by radiology has increased dramatically, being responsible for 15% of the Collective Dose in early 1989s to almost 50% in 2006, Computed Tomography (CT) being responsible for about halve of that.

Digital imaging offers several challenges but limitations too. As an example, in analog film based imaging, the irradiated area was clearly depicted and film blackening served as a parameter of the applied dose. Using digital equipment everything can be manipulated afterwards eg by electronic shutters and intensity windowing.

All professionals engaged in radiology underwent teaching in radiation protection during their education – the question is how this knowledge is kept and transferred to daily practice. Purpose: On the example of pediatric digital chest films and CT it will be demonstrated that unfortunately it the acquired knowledge in radiation protection is hardly applied in daily practice.

Material & Methods: 89 pediatric unprocessed digital DICOM chest films were selected from a digital radiography unit. On these unprocessed images the irradiated area is depicted completely. Following international guidelines, the minimal exposed area (MEA) was determined by drawing a rectangle. By drawing rectangles above, below, left and right of MEA the overexposed area could be assessed (E.Sorantin et al, Pediatric Radiology 2011).

For CT in 90 patients 743 pediatric chest CT from oncologic follow-up were analyzed for overscanning – meaning the amount of unnecessary scanrange in the cervical and abdominal area.

RESULTS

In digital unprocessed chest films an overexposed area of 42±18.9% could be determined, there was a statistical significant correlation, that overexposedure within the neck decreased by age, whereas increased by age in the abdominal area.

For an individual pediatric patient CT overscanning could be determined with a mean of 15.2

±5.1% (mean range 32.9%).

CONCLUSION

Both examples demonstrate, that even everywhere taught rules of image acquisition are not obaeyed in daily routine – neither from radiographers nor requested by the reporting radiologist.

A plan of actions could include:
A) Continuous medical education in radiation protection on all levels – teleteaching could be an option.

B) Radiological departments itself should underwent and certification (including evaluation of a random sample of examinations for proper settings, image quality and appropriate indication) with follow-up audits.

C) Obligatory regular courses for clinicians in doses delivered by radiology and the inherited associated radiation risks.

E) Enforcement of diagnostic pathways as basis for imaging decisions (see "RCR Referral Guidelines" – http://www.rcr.ac.uk/content.aspx?PageID=995 or their national adaptions - for Austria http://orientierungshilfe.vbdo.at/). Rules should be even stronger for those departments engaged in Pediatric Radiology – it is not acceptable that children get imaged by professionals being not familiar with the special need of this vulnerable patient group with higher radiosensitivity than adults.

11 09:20-09:40

Education and Training in Radiation Protection for Nuclear Medicine

Alberto Del Guerra, IT

This presentation will be focused on education and training in radiation protection for Medicine (including PET-CT). The following questions will be addressed:

- Why is dose optimization important in Nuclear Medicine?
- Is education and training in radiation protection important for effective dose optimization in Nuclear Medicine?
- What topics should be included in radiation protection training for Nuclear Medicine?
- What level of knowledge of these topics is needed and how this level is related to the different kinds of work and responsibilities (nuclear physicians, medical physicists, technologists…)?
- why new modalities such as PET-CT have increased the necessity for a greater awareness of radiation protection in Nuclear Medicine?
- How could be training and continuing education in radiation protection of Nuclear Medicine be certified?

Finally, as a specific example, the training and education scheme as implemented in Italy will be fully illustrated.

12 09:40-10:00

Radiation Protection for Radiotherapy

Edwin Aird, UK

The aim of this talk will be to describe briefly the essentials of radiation protection within radiotherapy and outline the knowledge base necessary for radiotherapy practitioners. Radiotherapy relies on the accurate irradiation of the tumour to an appropriate level of dose within a standard fractionation/time regime. This ensures optimal differentiation between cell killing within the tumour and survival of normal tissue to minimise morbidity. The ALARA principle together with "optimisation" are therefore different from diagnostic radiology. The principle of justification is, however, the same.

As well as accuracy, the reduction of error is a vital part of safe radiotherapy and quality assurance, which includes error management, will be discussed.

Deterministic effects are not the only tissue effects within radiotherapy; the induction of cancer must also be considered:

- Low levels of radiation outside the high tumorcidal region
- New imaging processes within Image Guided Radiotherapy
- Use of radiotherapy in paediatrics and young persons

As some of subjects within a brief syllabus the following will be considered;

- Justification and Optimisation in R/T
- Outline of the equipment used in EBRT and Brachytherapy
- To explain the role of optimisation, particularly within treatment planning, within radiotherapy
- To relate the response to radiation at cellular level to macroscopic response of tissue to radiation
- To discuss the response of tumours and normal tissue to therapeutic levels of radiation, including fractionation, dose rate etc.
- To consider radiation reactions early and late.
- To explain the assessment of efficacy of radiotherapy and its role in the justification of radiation treatment.
- The role of quality management in accuracy and reduction of error

13 10:00-10:20

Education and training in radiation protection for dentists

Kostas Tsiklakis, GR

Dental radiology and radiation protection are extremely important subjects within the undergraduate and postgraduate curriculum of the dental science. Dental graduate students must be well educated and adequately trained in these subjects, in order to undertake an effective and safe clinical practice. Radiation protection in particular, is an issue of major consideration, not only because of its contribution to the dental profession, but also because of its relevance to everyday life and the current environmental conditions.

Guidelines for dental radiation protection have been issued by European and American organisations and scientific societies, comprising the whole range of radiographic examinations that are performed by or related to the dental professional. These guidelines aim to underpin the evidence-based clinical practice and to provide guidance for the dental professional. For the purpose of a comprehensive curriculum development, they are complemented by the relevant competences that a dental graduate must possess to exercise its profession. A European academic association (ADEE, Association for Dental Education in Europe) has identified, through peer-review and consensus procedures, the competences on this field for the graduating European dentist. These general competences may be adopted or modified by each Dental School, according to its individual needs and purposes.

On graduation, a dentist must be competent in decision-making, clinical reasoning and judgement to develop a differential, provisional or definitive diagnosis by interpreting and correlating findings from the history, clinical and radiographic examination and other diagnostic tests, taking into account the social and cultural background of the patient.

Undergraduate dental students are educated on the various aspects of dental radiography, including radiation protection. Dental graduates must be competent at implementing the ionising radiation regulations including leading the dental team on radiation protection measures. They must also be competent at taking radiographs of relevance to clinical practice, interpreting the images, including managing and avoiding the hazards of ionising radiation.

These competencies comprise both a sound theoretical knowledge and understanding of the subject and an adequate clinical experience of the graduate dentist.

Dental graduates must also have knowledge of (sound theoretical knowledge and understanding of the subject but limited clinical experience) the hazards of ionising radiations and their effects on biological tissues, together with the regulations relating to their use.

14 10:20-10:40

Education and training in radiation protection for professionals involved directly with the use of Radiology – the view of Vascular Surgery

Christos Liapis, GR

Endovascular therapy is a minimally invasive method that can reduce morbidity and mortality and diminish the length of stay in vascular patients who often have serious comorbidities. Many fields of vascular disease including aortic aneurysms, the lower extremity, carotids, mesenteric vessels, and the venous system are being approached using fluoroscopic radiologic guidance. Some of these procedures can involve a high level of radiation exposure as fluoroscopy is used to localize the lesion, monitor the procedure, and control and document the end result. With respect to the risk to health care personnel, the safe occupational environment begins with education and training. All personnel directly and indirectly involved in a radiation-exposed environment should understand the safe use of material and equipment, as well as the use of personal protective equipment.

Factors that affect radiation exposure and injury to vascular surgery patients and health care personnel include radiation dose and time, modes of operation and position of the image intensifier (manual vs automatic modes, normal operating vs high dose modes, continuous vs pulsed fluoroscopy, last image hold, field of view – collimation and magnification), additional patient factors (patient size, angulation of the x-ray unit), distance and scatter, cumulative/prior exposure and positioning of portable C-arms.

The effective doses for some vascular interventional procedures are presented in table 1. Endovascular aneurysm repair (EVAR), is a procedure frequently performed solely by vascular surgeons in the operating room and involves substantial amounts of radiation. Radiation in EVARs increases in emergency cases, in obese patients, and in complex cases when multi-branched stent grafts are used. Radiation is decreased with the use of pulse and low dose fluoroscopy. Endograft type and familiarity of the surgical team may affect the amount of radiation. In a study performed in our department including 65 patients with different endografts (suprarenal or infrarenal fixation and with or without contralateral limb cannulation magnetic aid) we found that infrarenal fixation and contralateral cannulation aid was associated with decreased fluoroscopy time and radiation dose. Cumulative radiation dose after EVAR increases with subsequent follow up investigations. For patients complying with a postoperative protocol that includes abdominal CT scan at 1, 3, 12 months during the first year and yearly thereafter, along with annual abdominal plain radiography, in accordance with the EVAR trials, the cumulative radiation dose can reach up to 280 mSv after 25 years of follow up.

Endovascular procedures offer the advantages of minimal invasion in high risk vascular patients. However cumulative radiation may be a risk factor for professionals involved direct with the use of radiology. Two principles of radiation protection must be always considered: appropriate justification for the procedure, and optimization of the radiation dose utilized.

In conclusion, training and education in radiation protection is of paramount importance and the collaboration of the specialties involved (Radiologists and Vascular Surgeons) are essential. Structured postgraduate courses should give both the theoretical and practical know-how of endovascular procedures with special attention to radiation protection. The use of modern equipment (either C-arm or fixed apparatus) is essential and strict guidelines regarding the operating rooms and the personnel involved should be applied.

Procedure (mean or range)	Effective dose
Renal stenting	42 mSv
	1.3-39.1 mSv
	10.29 mSv
Iliac stenting	17 mSv
Lower extremity stenting or angiography	12 mSv
	3.9-16.8 mSv
Infrarenal aneurysm repair	10.5 mSv
	11.7 +/- 7.1 mSv
Aneurysm repair, including branched grafts	27 (16-117) mSv
Abdominal computed tomography scan	10 mSv

Table 1: Effective dose for different vascular interventional procedures

10:40-10:55
Discussion

15 10:55-11:25
Accreditation and Certification of the Training in Radiation Protection: Needs, Opportunities and Difficulties

Moderator: Peter Vock, CH,
Speaker: John Damilakis, GR

There is high demand for developing education and training courses in medical radiation protection due to the rapid development of medical techniques based on ionizing radiation, growth of hospitals and the continuous need to produce competent health professionals in radiation protection. However, external assessment of the quality of education or training provision is needed (1).

Accreditation is the formal process by which a recognized body assesses and recognizes that education and/or training on medical radiation protection provided by an institution meets acceptable levels of quality. Therefore, there are two parties involved in this process: the institution that provides education and training and an external organization which performs the external assessment and awards accreditation as a result of positive evaluation.

Certification is a process that recognizes an individual medical professional who has demonstrated special knowledge and expertise on medical radiation protection and has completed successfully the education or training provided by an accredited organization. Medical personnel certified in radiation protection bring important benefits to their patients and themselves. Because of their special education and training, certified medical personnel demonstrate knowledge and confidence in the field of medical radiation protection, enabling them to justify and optimize medical procedures and provide better patient care.

Accreditation should be based upon established standards and guidelines (2). The minimum requirements for accreditation of a training programme should take into account aspects related to admission policy, facilities, staff, certification program, educational material, teaching methods, administration and archive, course update and quality control. Training in medical radiation protection should be provided in clinical radiation facilities. Hands-on training can be very effective because it provides real world experience by allowing the trainee to carry out measurements and understand radiation protection techniques rather than just hear about them. All staff should possess appropriate qualifications and experience in medical radiation protection. Scientific program contents and educational material should be reviewed periodically to ensure they remain up-to-date. An accreditation decision should be made following a periodic on-site evaluation by a team of experts in the field of medical radiation protection.

Certification is usually based on examinations. Several evaluation methods can be considered including written examinations, oral examinations and research projects. Re-certification programs ensure that certified professionals maintain, develop or improve knowledge in the area of medical radiation protection they are certified.

The establishment of a European commission is needed to promote education and training in medical radiation protection. This can be done by a) encouraging the development of medical radiation protection programs, b) evaluating and accrediting training programmes and organizations that meet high standards and c) encouraging and supporting networking of educational institutions.

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11:25-11:55
Coffee Break (Poster presentations shown in loop in coffee area)

11:55 – 13:30
ROUND TABLE 4: The role of International and National Organizations in Medical Radiation Protection Education and Training

Moderators: Carmel Caruana, MT, Sija Geers-van Gemeren, NL

16 11:55-12:15

The role of International and National Organizations in Medical Radiation Protection, Education and Training – The view of the WHO

Maria Perez, CH

Rapid developments in health technology bring new diagnostic and therapeutic applications of ionizing radiation, and modern equipment makes those applications safer. However, inappropriate or incorrect handling may lead to unnecessary or unintended radiation exposures with potential health hazards for patients and staff. UNSCEAR has reviewed radiation accidents occurred between 1945 and 2007, and reported that a large number of fatalities and the highest number of acute injuries resulted from accidents happened in the medical sector. Many other accidents either not recognized or reported may have occurred. Justification of the procedures and optimization of protection, the two pillars of radiation protection (RP) in health care, are implicit in the notion of good medical practice. Indeed, effective health service delivery implies to deliver safe and effective health interventions to those that need them, when and where needed, with minimum waste of resources. However, health professionals are not familiar with the RP principles and have a low awareness of radiation doses and risks. Primary prevention requires a strong radiation safety culture in health care providers and this poses a challenge in terms of education, training and staffing. This is consistent with WHO's policy to improve the alignment between the education of health workforce and population health needs, calling for a new era of health professional education. Transformative scale up of health professional education encompasses RP education and training. The WHO Global Initiative on Radiation Safety in Health Care Settings (GI) advocates the inclusion of RP contents in the education of health professionals. Guidance on this topic has been provided by the International Commission on Radiological Protection (ICRP) and the new International Basic Radiation Safety Standards (BSS) include requirements on this matter. It has been addressed in Europe under national and multinational projects, and MEDRAPET EC project is updating and expanding those achievements by engaging key stakeholders. WHO welcomes this initiative and offers the GI as a platform to facilitate the dissemination of MEDRAPET products at global level. Improving radiation safety culture of medical practice will ensure that patients benefit from the use of radiation in health care and will contribute to a more cost-effective allocation of health resources. and. This is particularly relevant to support the implementation of the new BSS in health care settings.

17 12:15-12:35

The role of International and National Organizations in Medical Radiation Protection Education and Training: View of IAEA Expert

Madan Rehani, AT

It is fact that international organization play important and significant role in driving actions in most countries. For example, recent emphasis on cataract by the International Commission on Radiological Protection (ICRP), importance of collective dose by the United Nations Scientific Committee on Effects of Atomic Radiation (UNSCEAR) and European Commission (EC), the need to have patient exposure history by the International Atomic Energy Agency (IAEA) through its Smart Card/SmartRadTrack project, the use of principles of justification and optimization as developed by the ICRP and promoted by almost all national and international organizations, and national legislation based on Basic Safety Standards (BSS), European or International by the IAEA, are only few of the examples to illustrate important role played by these organizations.

The BSS developed by the IAEA in cooperation with and sponsorship by a number of international organizations and endorsed by its Member States is an important tool that helps Member States design its national regulations on radiation protection. There are specific requirements in BSS on training. There are requirements for Governments, regulatory bodies, principal parties, employers, registrants and licensees. There has been emphasis on retraining in the new BSS an interim version of which was released in Nov 2011. Requirements are also specified for persons under 18 years of age who are undergoing training. Employers, registrants and licensees shall ensure that persons under the age of 18 years are allowed access to a controlled area only under supervision and only for the purpose of training for employment in which they are or could be subject to occupational exposure or for the purpose of studies in which sources are used.

There are requirements of training of various category of staff like medical physicists, radiological technologists, radiological medical practitioners, referring medical practitioners and so on..

The actions by the IAEA do not stop at providing requirements in BSS or providing guidance through Safety Guides and Safety Reports on how to meet these requirements. IAEA conducts large number of training courses. In the area of medical radiation protection, there are thematic training programmes on radiation protection in: diagnostic and interventional radiology; radiotherapy; nuclear medicine; accident prevention in radiotherapy; PET/CT; digital imaging; cardiology; paediatric radiology and doctors using fluoroscopy. The training material in the form of power point slides is available for free download from IAEA website: http://rpop.iaea.org .

The IAEA couples training actions with projects so as to develop competence in areas such as patient dose assessment and dose managements. The participants are then supposed to provide results on six monthly basis and form part of the network of professionals involved in patient protection. Thus training is targeted to meeting needs of project and corresponding skill development.

18 12:35-12:55

The role of HERCA Working Group on Medical Applications in Medical Radiation Protection Education and Training

Ritva Bly, FI

INTRODUCTION

HERCA (Heads of the European Radiological protection Competent Authorities) is a voluntary association in which the Heads of Radiation Protection Authorities work together in order to identify common issues, propose practical solutions and to publish position statements for these issues. The focus of the HERCA

Working Group on Medical Applications (WG MA) is to harmonize the implementation of radiation protection regulation in Europe especially concerning new medical applications. Training and education are one of the key issues in applying optimization of radiation protection and performing a proper justification process based on the triple A-concept, awareness, appropriateness and audit.

PURPOSE

HERCA WG MA is emphasizing the importance of proper education and training for justification and optimization of radiation protection in the use of radiation in medicine. To maximize the impact of an inspection with respect to justification and optimization, the inspectors and auditors must have some clinical competence. HERCA WG MA has surveyed the level of clinical competence of inspectors in Europe.

MATERIALS AND METHODS

The HERCA WG MA engages in stakeholder involvement on training and education for radiation protection issues with professional organizations by:

- Enhancing the exchange of information on best available radiation protection practices and scientific knowledge.
- Co-coordinating national and international efforts under the umbrella of HERCA to maximize impact in stakeholder involvement.

To promote good practices among authorities, HERCA WG MA has surveyed the competence of inspectors in Europe. The survey described three potential clinical optimization inspection models

- Model 1: the authority had clinically trained inspectors
- Model 2 inspectors had some clinical skills or they used assistance of external expertise
- Model 3 Optimization is not inspected.

The survey covered EU Member States, Norway and Switzerland. So far 12 countries have replied and the survey is still going on.

RESULTS

HERCA WG MA organized a meeting with professional organizations in connections with the MEDRAPET workshop to initiate exchange of information on training and education.

The results of the survey on competence of authorities on the European level will be discussed in the workshop. Moreover, plans for raising the level of competence of authorities by training will be introduced.

CONCLUSION

HERCA WG MA welcomes the MEDRAPET platform to enhance the importance of training and education in radiation protection on medical exposure. As an organization of authorities the aim for HERCA is to raise awareness of the importance of proper optimization on medical exposure and to emphasize that through competent regulatory control.

19 12:55-13:15

The role of international and national organizations in Medical Radiation Protection

Vasiliki Kamenopoulou, GR

ABSTRACT

The establishment and optimization of a Radiation Protection system is an ongoing process based on the experience and the knowledge of the individuals participating in this effort. International organizations (IAEA, ICRP, EU, etc.) emphasize the necessity that the people occupationally involved in procedures using ionizing radiation, have appropriate Education and Training (E&T) on radiation protection issues. The Greek Atomic Energy Commission (GAEC) is the national authority in the country, responsible for matters related to nuclear technology and radiological protection from ionizing radiation. The legal framework in force determines, among others, the GAEC's responsibilities in the provision of E&T, as well as, in the certification of the competence on radiation protection of the occupationally exposed workers.

Historically, GAEC provides E&T on radiation protection since 1960. In nowadays, it has a range of activities, in providing post-graduate and continuing E&T on radiation protection, at national and regional level.

At national level and in the particular field of medical exposures, GAEC is a participant and a major contributor to the Inter-University Post-Graduate Program on Medical Radiation Physics, running under the administration of Athens University in co-operation with the Medical Schools of five Greek Universities and the Research Center "Demokritos". GAEC's participation in this Program aims at the provision of a number of highly qualified Medical Physicists who may also act as Radiation Protection Experts in the

hospital environment. It also aims at producing a pool of trainers who can play an important role in the implementation of E&T programmes on radiation protection - locally in the hospitals - addressed to occupationally exposed workers. Recently, GAEC organised and accomplished a nation wide E&T project, dealing with three days courses on radiation protection in medicine, addressed to medical radiological technologists, which was implemented in collaboration with academic institutions and locally with the Medical Physics Departments of Universities and major General Hospitals.

Since 2003, GAEC is the IAEA's Regional Training Center for the European Region in the English language, and through IAEA TC Programmes, organizes and hosts in Athens the 22 weeks Post-graduate Educational Course on "Radiation Protection and the Safety of Radiation Sources", based on the relevant IAEA's Standard Syllabus.

E&T in radiation protection is one of the mechanisms and primary strategies of GAEC for the application of the Safety Standards at national level. GAEC welcomes the new provisions of the draft EC BSS Directive related to E&T, and emphasizes the importance of issuing relevant guidelines in order to have specialized E&T programmes for different occupational categories, harmonized among the Member States.

Sunday, April 22, 2012

13:15-13:30
Discussion

13:30-14:30
Lunch (Poster presentations shown in loop in coffee area)

20 14:30-14:45
Radiation Protection Education and Training Projects and activities in Europe
Moderator: Efstathios Efstathopoulos, GR Speaker: Annemarie Schmitt-Hannig, DE

The draft Euratom Basic Safety Standards (Euratom BSS) specifies requirements for radiation protection education, training and information in Title V, requesting Member States to establish an adequate legislative and administrative framework for providing appropriate radiation protection education, training and information to all individuals whose tasks require specific competences in radiation protection. In particular, appropriate education, training and retraining has to be in place to allow the recognition of radiation protection experts, medical physics experts, occupational health services, and dosimetry services.

The European Commission has launched a number of projects with different objectives. A substantial part of their results will contribute to support the implementation of the Euratom BSS requirements on E&T in radiation protection by the EU Member States.

New and updated guidance documents with regard to E&T in radiation protection for Radiation Protection Experts (RPE), Radiation Protection Officers (RPO), Medical Physics Experts (MPE) and other medical professions are proposed or are already being developed.

In order to illustrate relationship and interaction of projects and networks on the European level, an overview of their objectives as well as a proposal for new guidance documents within the Radiation Protection Series of the Commission is given. The objective of this guidance is to assist EU Member States to establish an adequate framework for providing appropriate radiation protection training for those professionals whose work is closely related to radiation protection of workers, patients and public in all exposure situations on different levels and/or in various functions.

14:45-16:00
Oral Presentations
Moderators: John Damilakis, GR, Erich Sorantin, AT

21 The Cypriot experience on the Radiation Protection Education and Training of Health professionals using Ionising radiation

S. Christofides, C. Yiannakkaras, G. Kokona, C. Papaephstathiou, G. Menoikou, D. Kaolis
Medical Physics Department, Nicosia General Hospital, Nicosia, Cyprus

INTRODUCTION

The use of Ionising Radiation and effectively Radiation Protection has always been a component of the curriculum of non-physics healthcare professions. Current curricula content varies extensively across Europe and indeed the World. The Radiation Protection syllabus component of non-physics healthcare professionals becomes progressively more important, mainly due to the rapid increase in the number and sophistication of radiological equipment. This paper presents the experience of the Medical Physics Department of Nicosia General Hospital in healthcare personnel Radiation Protection education and training.

PURPOSE

This work intends to cover the gap in the required Radiation Protection related Knowledge, Skills and Competence (KSC) of the hospital's personnel accounting for the nature and degree of their involvement with ionising radiation.

MATERIALS AND METHODS

Since 2005, an induction course is provided for all new personnel before they start working in the hospital environment, mainly intending to fulfil the requirements of the Health and Safety at work laws and regulations. This is a three day course covering all the hazards within the hospital environment. Within this course there are two 45-minute presentations on Ionising Radiation and Radiation Protection.

Furthermore, all the hospital's personnel are invited to attend a 4-hour basic course on Radiation Protection that covers in more depth the effects of Ionising Radiation and Radiation Protection.

The main aim of this short course is to assist the personnel in comprehending the safety issues as regards the use of ionising radiation and inform their perception on health risks.

The Personnel involved in the use of ionizing radiation in their daily work are invited to attend an additional more specialised course specific to their routine work (e.g. a dedicated course for the Nuclear Medicine Technologists).

The duration of such specialised courses varies depending on the needs of each group and ranges from 4 to 10 hours.

RESULTS

A significant improvement in personnel's knowledge of radiation use and radiation protection has been evident through the course evaluation process. It is interesting to note that so far radiographers, radiologists and radiotherapist did not attend the basic course despite them being the major users of ionising radiation in hospitals.

Conclusions: Carefully designed and developed courses targeting the non-physics personnel of our hospital has proven extremely effective in improving their knowledge and perception as regards the use of ionising radiation and associated health risks and protection.

22 Radiation protection education in the use of mobile C-arm for the nurses

A. Henner, K. Paalimäki-Paakki
Oulu University of Applied Sciences, Finland

INTRODUCTION

Nurses and medical doctors are allowed to use the mobile C-arm in operating theatres and emergency rooms in Finland. According to Finnish legislation nurses working in operating theatres have 40 hours (1,5 ects) course in radiation protection in Bachelor degree. Training includes fundamentals of Radiation Physics and Radiation Biology, Radiation Protection Provisions, Radiation Safety Measures at the Workplace and Medical Use of Radiation in the area of mobile C-arm.

Purpose: of this study was to find which the critical points in education are and how well the key factors affecting to the radiation protection and safe use of mobile C-arm in operating theatres and emergency are learned during the course.

METHODS AND MATERIALS

The course consists of 5 areas given in EU legislation including 16 hours lectures and 2 hours demonstration, 2 hours written exam and 20 hours independent work (reading legislation and articles). Features and technical parameters of C-arm are demonstrated step by step in practice. A written exam has to be passed. More than 1600 answers have been analyzed.

RESULTS

About 80% of the participants passed the test in first exam and only 1% needed third exam. The most difficult areas were the basic concepts: radiation and it's features, effects of radiation at the molecular, cellular and tissue levels, deterministic and stochastic effects of radiation, dose motoring and categories A and B, controlled and supervised areas and monitoring of radiation exposure of workers. The operational radiation protection was quite well known but dose optimising methods were not understood very well.

CONCLUSION

Radiation and Nuclear Safety Authority (STUK) performed in 2010 a study to the Radiation Safety Officers in duty in hospitals. According to the results there is lack in training. Only few nurses have radiation protection education during their Bachelor Degree because all Universities of Applied Sciences don't offer course in radiation protection.

The nursing staff is very willing to involve into good safety culture but the use of equipment and all properties in radiation dose optimisation are difficult to understand. More hands on training is needed. During the courses there has been discussion about factors influencing to the interpretation of fluoroscopic procedures and expose of children and pregnant women.

23 Scandinavian project for evidence based course in digital imaging

A. Henner, E. Metsälä, T. Saloheimo, H. Varonen, J. Kurtti, T. Hellebring, D. Waaler and B. Ween
Oulu University of Applied Sciences, Finland

INTRODUCTION

Change from film/screen (conventional) radiography imaging systems to digital imaging has brought radiographic imaging departments in front of vast challenges in many respects. First of all general guidelines and working models for performing the imaging process with the new technique optimising the radiation dose and image quality of radiographs are needed. The second challenge derived from the first one is to update the competence of the staff working in imaging units and educate the new health care personnel who are in the middle of their studies to match the needs of the new technique.

PURPOSE

The project purpose was to increase the competence of staff working in imaging units by evidence based education in digital imaging and dose optimisation according to the principles of ICRP and DIMOND 3 in three Scandinavian countries: Finland, Sweden and Norway. Also students of these organizations are involved in the project from very beginning.

METHODS AND MATERIALS

The project group planned and implemented Scandinavian evidence-based course plan in digital imaging and dose optimisation and the materials needed on the basis of national and international regulations about the subject in bachelor degree and masters and lifelong (adult) education. The project group produced materials for the courses in quality of digital imaging, evaluated the evidence-based course plan and the materials produced.

The project run between autumn 2008 and spring 2011. The first Scandinavian meeting of the project group took place 1st – 2nd December 2008 and ended in May 2011 in Helsinki, Finland. As a result of the first meeting e.g. the core competencies of the learning modules for Degree level education were formed as well as the view of multimedia solutions used in the e-based course. During the project there were only 5 contact meetings and otherwise the meetings were in internet.

RESULTS

There is now a course with 15 ECTS both for Bachelor and Master level including all materials, evaluation and guidelines for teacher. The course consists of modules,2 -5 ects each, for bachelor Degree and courses for Master level. All material is in English. There are videos, power point presentations, articles, tests etc.

CONCLUSION

The projects was organised well and all participants have learned a lot as well from evidence based radiography, digital imaging as co-operation with foreign language. Tens of students have been involved to the project. The modules have been tested by students in different schools and countries. Feedback was encouraging

24 A medical radiation protection educational course for Radiographers

T.G. Maris, K. Perisinakis, M. Mazonakis and J. Damilakis
Department of Medical Physics, University of Crete, Faculty of Medicine

PURPOSE

To evaluate the impact and professional adequacy figures for a pool of radiographers enrolling a medical radiation protection education program course organized by the Medical Physics department of the University of Crete (MPUC) and the Greek Atomic Energy Commission (GAEC).

METHODS AND MATERIALS

A total of one hundred forty eight (148) professional radiographers [99 females (F) and 49 males (M)] enrolled a medical radiation protection education course organized by the (MPUC) and the (GAEC). The duration of the course was three days. The course was repeated three times, each time taking place at a different city of the island of Crete. Four academic professors (A, B, C, D), all members of the faculty of the University of Crete, were involved in the education procedure. The educational material related to medical radiation protection covered the clinical areas of X-ray diagnostic imaging, Nuclear Medicine and Radiotherapy. All course participants undertook a written final test based on a set of multiple choice questions. From the results of this test the participants professional adequacy was estimated. The participants demographic data and their written output scores were analyzed. Participants were further divided in two professional status groups. Firstly, at those working at Public health service entities (PUB) and secondly at those working at Private practice health service entities (PRV). All outcomes in relation to the two professional status groups were further analyzed. Finally, the four course instructors (A, B, C, D) were all validated by the participants.

RESULTS

The mean ages of the course participants were 39.1± 5.7 yrs for the female population and 40.5 ± 6.5 yrs for the male population respectively. The impact of the course in reference to the island of Crete total radiographer's pool was 95.7 %. The observed percentages related to the radiographer's professional status were: 63.8 % for the PUB group and 36.2 % for the PRV group respectively. A rather homogeneous outcome in relation to radiographer's professional adequacy was observed (F: 82.1 ± 11.0 %, M: 81.2 ± 11.4 %). The same outcome was observed in relation to their professional status groups [PUB: (F: 81.5 ± 10.8 %, M: 80.5 ± 10.6 %)] and [PRV: (F: 82.8 ± 10.1 %, M: 83.9 ± 10.5 %)]. All course instructors were validated with a score > 90 %.

CONCLUSION

The impact and the professional adequacy figures for the radiographer's pool attending the specific medical radiation protection course organized by the MPUC and GAEC were considered excellent.

25 Education and Training in Radiation Protection at the University Hospital of Iraklion

M. Mazonakis, J. Stratakis, K. Perisinakis, T. Maris, J. Damilakis
Department of Medical Physics, University of Crete, Faculty of Medicine

INTRODUCTION

The department of Medical Physics of the University Hospital of Iraklion organizes an annual post-educational course in the area of medical physics from the academic year 2007-2008.

PURPOSE

The purpose of this study was to analyze the syllabus of this post-educational course in relation to radiation protection issues.

MATERIALS AND METHODS

One or two lectures are given on a weekly basis by the staff of the department or by invited speakers from other universities or other departments of the hospital. Undergraduate and postgraduate students and healthcare professionals who are directly involved with the use of radiation or simply prescribe diagnostic/therapeutic exposures can attend these lectures depending upon their interests and their area of expertise. A retrospective analysis of the course program was performed to find the topics of radiation protection education and training that have been covered by the aforementioned lectures in accordance with the guideline "Radiation Protection 116" of the European Commission. A questionnaire has been designed to evaluate whether the attendance of lectures can improve the knowledge of participants in radiation protection in every day clinical practice.

RESULTS

Ninety one of 164 lectures (55 %) are directly associated with the education and training of radiation protection in radiology (40 lectures of 91 or 44 %), in radiotherapy (27 %), in nuclear medicine (20 %) and in general fundamental subjects (9 %). The topics of radiation protection included in the above presentations were related to staff/patient protection (20 %), radiation detection/dosimetric quantities (17 %), optimization of procedures (17 %), equipment used/installation considerations (16 %), radiation risks (13 %), quality assurance (9 %) and others (8 %). Six presentations have also been focused on the possible health risks from procedures with non-ionizing radiation. The structure of the newly developed questionnaire will be presented in detail.

CONCLUSION

The annual post-educational course of the Medical Physics department provides education and training in radiation protection covering a wide range of topics for all diagnostic and therapeutic modalities existing in clinical environment.

26 Development and Impact of Educational Multimedia on Medical Radiation Physics/Technology and Radiation Protection for Medical Students in the University of Crete

K. Perisinakis, J. Stratakis and J. Damilakis
Department of Medical Physics, University of Crete, Faculty of Medicine

INTRODUCTION

Universities are responsible for the education of medical professionals involved in the use of radiation in healthcare. Despite education on radiation-based medical procedures and radiological protection is generally included in medical degrees, medical students may occasionally face difficulties in familiarization with advanced radiation physics and technology of modern radiological equipment.

PURPOSE

The aims of the current work were to

a. describe the development of an interactive multimedia educational platform for undergraduate medical students of the University of Crete on the medical use of radiations and radiation protection issues.

b. depict the impact of this multimedia educational material on the capacity of medical students to efficiently comprehend medical radiation physics/technology and radiation protection.

MATERIALS AND METHODS

Physics of radiations used in healthcare, radiobiology and radiation protection issues constitute the main content of the course 'Medical Physics' taught during the 1st semester to medical students of the Medical School of the University of Crete. Aiming towards more efficient comprehension of the above subjects, an interactive educational multimedia platform was developed to take advantage of simulation and modeling offered by novel computer technology and internet. This material was used as an additional educational approach to conventional education methods such as lectures and laboratory exercises. The implementation team comprised from two Medical Physics professors, one medical radiation-physicist, one computer scientist, one web page designer and one animation specialist. The educational platform was enriched with several animations, simulations, interactive virtual experiments, and multiple choice questions for self-assessment.

Medical students were asked to evaluate the educational material through questionnaires at the end of the semester.

RESULTS

More than 95% of the students of the 1st semester have appraised the developed educational multimedia as extremely valuable for efficiently perceiving medical radiation physics/technology and radiological protection issues.

The role of computer specialists and especially computer graphics design experts was crucial for the quality of the educational multimedia platform developed. However, several difficulties in communication and interaction between medical physics experts and computer specialists arose during the project implementation, because the comprehension capacity of computer specialists regarding medical radiation physics was low and familiarization of medical physics experts regarding novel software tools for image and video processing and web-page design and construction was also limited.

CONCLUSION

An interactive multimedia educational platform on medical radiation physics and radiological protection may improve the perception ability of medical students regarding advanced technology medical radiation physics and radiological protection.

27 Level of education and training in radiation protection in the curriculum of health professionals in Norway

R.D. Silkoset, E. Friberg
Norwegian Radiation Protection Authority (NRPA)

INTRODUCTION

Medical use of ionizing radiation is the largest man-made source to human exposure. The population dose from radiological examinations reached 1.1 mSv per inhabitant in 2008, showing an increase by 40% since 1993. New technology allows for more advanced diagnostic and interventional procedures which demands higher patient doses and fluoroscopy has become a common guiding tool for surgical operations. Today, medical exposure is widely used outside the radiological departments, often with no involvement of radiologists and radiographers. All medical use of ionizing radiation must be justified and optimized to reduce the associated detrimental health effects. Proper skills in radiation protection and medical radiological practices among the referring physicians and operating staff are therefore essential. During 2008 and 2009 the Norwegian Radiation Protection Authority (NRPA) carried out inspections at 52% of all Hospital Trusts (HT) in Norway. The inspections revealed lack of skills in radiation protection at 91% of the inspected HTs. Insufficient knowledge in radiation protection were mostly associated to medical exposure outside radiological departments. This result gives rise to concern and indicate a general lack of education and training in radiation protection in the curriculum of health professionals using ionizing radiation.

PURPOSE

The purpose of this survey is to get an overview of the level of education and training in radiation protection in the curriculum of health professionals who is involved with medical exposure. Based on the results, NRPA will consider the need for revision of the curriculums to improve the learning outcomes in radiation protection.

MATERIALS AND METHODS

Educational institutions and health authorities responsible for the education of physicians, radiologists, cardiologists, nuclear medicine specialists, orthopedist, radiographers, theatre nurses, dentists and dental hygienist were requested to provide the NRPA with detailed information about their curriculum with respect to radiation protection. A questionnaire were developed to collect information about the provided theoretical topics within radiation protection, practical training, number of educational hours, defined learning outcomes and information about any exams to evaluate the obtained knowledge in radiation protection.

RESULTS

The data will be received and analyzed early in 2012. The results will be compared with the recommended radiological protection training requirements in ICRP 113.

CONCLUSION

This survey will give valuable information about the implemented level of education and training in radiation protection among the educational institutions for different health professionals associated with medical exposure.

28 Radiation protection training of healthcare staff in Bulgaria – what can be improved?

J. Vassileva
National Center of Radiobiology and Radiation Protection, Bulgaria

PURPOSE

The current status of the training in radiation protection of healthcare staff in Bulgaria is presented, its strong and weak points, as well as the author's view on what can be improved to increase the effectiveness and efficacy of the training at a national level.

METHOD

According to the existing national regulation, the specialised training in radiation protection is performed by training providers licensed by the Nuclear Regulatory Agency. The regulation does not recognise the radiation protection training included in the curricula of medical universities and colleges, and requires additional specialised training with fixed duration and periodicity. National Centre of Radiobiology and Radiation Protection is the main licensed training provider on radiation protection for the healthcare staff.

Dedicated training programs were elaborated for each qualification level of the staff in diagnostic radiology, nuclear medicine, radiotherapy, as well as in interventional radiology, operational theaters and in dentistry. The programs contain several common modules: Basic terminology and dose quantities; Radiobiological effects, National legislation, Practical methods for radiation protection of the staff, Optimisation of patient protection and Quality assurance and Quality control. The training is dedicated to every group of workers from a specific field and is practically oriented. Lecturers are experienced experts with different background – medical physicists, radiobiologist, medical doctors and inspectors.

RESULTS

The training approach was dramatically changed, moving from formal lecturing to interactive training on practical aspects of radiation protection of patient and staff. The results from the final exams and the trainees' feedback demonstrate increased level of awareness and radiation protection culture. At a national level however the situation differs because of the lack of national standard requirements for this training, and the divergency of the training programs among different training providers.

CONCLUSIONS

National regulation should be changed giving stronger requirements on the training content and achieved practical skills. Several groups with specific training needs should be elaborated and their training programs, duration and training frequency should be recommended. Main lecturers should be medical physics experts and medical professionals experienced in the field of work of trainees. Patient protection should be always in the focus together with the staff protection. It is recommended practicals in a clinical environment to be also included. Medical universities and colleges are the most appropriate training providers for healthcare staff. The initial training in radiation protection should be standardised as a part of the educational and residency curricula.

29 16:00-16:30

Training in Radiation Protection for Interventionalists

Moderator: Kostas Perisinakis,GR

Speaker: Jost Philipp Schaefer, DE

In European countries, the medical use of ionising radiation for diagnostic and therapeutic purposes is strictly regulated by government and local authorities with implementation of a specific X-ray Act and/ or a specific Radiation Protection Act. Following these regulations, a comprehensive training and education setting is necessary especially for interventional procedures to reduce the risk of radiation exposure. The reduction of radiation exposure for all parties concerned – patient, physician and technician – is the key issue to minimize the risk of ionising radiation. To reduce radiation exposure, there are features non-related and related to the interventional facility used. Non-related features are such as lead clothing, lead walls and inverse square law. System related features are mechanical equipment, such as imaging geometry, shutters, focusing, filters, and electronic equipment, such as pulsed fluoroscopic imaging, automatic dosage adjustment. Prerequisites for use of ionising radiation are proper indication, justification and optimization based on training and experience. It is essential for physicians and technicians working in interventional units to understand the different aspects of direct and scattered radiation. While the patient is faced with direct radiation as the conditio sine qua non during the interventional procedure, the physician and technician are affected by scattered radiation originating from the patient. Both aspects of direct and scattered radiation are directly influenced by and depend on the above mentioned prerequisites of indication, justification, optimization, training and experience.

There are two major principles of practised radiation protection, which are non-related to the interventional facility: #1 principle covers all aspects of lead protection, and #2 principle covers in-room rules for interventional units. Adequate lead protection must be available for everyone working in interventional units, and includes devices with body contact and devices positioned between the patient and the physician/ technician. Devices with body contact are used for body protection, thyroid gland protection and lens protection. These devices must be intact and must be worn during every interventional procedure with exposure to ionising radiation. Additional devices such as lead walls and lead window shields must be positioned between the patient and the physician/ technician to offer additional radiation protection. In-room rules deal with the presence of the physician/ technician in the interventional unit, the hot spots of exposure to scattered radiation, and mainly the inverse square law.

There is a great variety of mechanical and electronic features, which are related to the interventional facility, to reduce radiation exposure mainly for the patient, but through scattered radiation also for the physician/ technician. To keep the radiation exposure as low as responsibly achievable while achieving adequate image quality, the physician/ technician has to respect the interaction between imaging geometry and mechanical and electronic features.

It is the responsibility of the physician to keep the exposure to ionising radiation as low as possible for all parties concerned – patient, physician and technician – and to implement everything that is possible for sufficient radiation protection.

16:30-17:00
Coffee Break (Poster presentations shown in loop in coffee area)

30 17:00-17:30
Knowledge, Skills and Competences Requirements in Radiation Protection of Medical Physicists
Moderator: Panayiotis Dimitriou,GR
Speaker: Carmel Caruana, MT

INTRODUCTION
Radiation protection in medicine is the collective responsibility of the various healthcare professionals involved, however responsibility weighs heavier on the shoulders of medical physicists.

PURPOSE
To develop an inventory of learning outcomes in radiation protection (expressed in terms of knowledge, skills and competences) for medical physicists.

MATERIALS AND METHODS
As potential medical physics experts, the learning outcomes of programmes for medical physicists are heavily inspired by the duties of the former as set out in Article 85 of the recast European Council directive ('Council directive laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, September 2011'). This states that: "Depending on the medical radiological practice, the medical physics expert shall take responsibility for dosimetry, including physical measurements for evaluation of the dose delivered to the patient, give advice on medical radiological equipment, and contribute in particular to the following:

(a) optimisation of the radiation protection of patients and other individuals subjected to medical exposure, including the application and use of diagnostic reference levels;
(b) the definition and performance of quality assurance of the medical radiological equipment;
(c) the preparation of technical specifications for medical radiological equipment and installation design;
(d) the surveillance of the medical radiological installations with regard to radiation protection;
(e) the selection of equipment required to perform radiation protection measurements;
(f) the training of practitioners and other staff in relevant aspects of radiation protection"

The inventory of learning outcomes in radiation protection for medical physicists was developed on the basis of the above responsibilities with three groups of medical physicists in each of Diagnostic and Interventional Radiology, Nuclear Medicine and Radiation Oncology using a Delphi approach.

RESULTS
The inventory is structured with a common core of learning outcomes expected of medical physicists in any of Diagnostic and Interventional Radiology, Nuclear Medicine and Radiation Oncology followed by separate learning outcomes specific to each specialty.

CONCLUSION
Because of the relatively high level of responsibility of medical physicists with respect to radiation protection, the education and training requirements for the latter include a high level of knowledge, skills and competences in radiation protection.

31 17:30-18:00
Medical Education and Training in Radiation Protection in Greece: Current Situation and Perspectives
Moderator: Thomas Maris, GR
Speaker: Panayiotis Dimitriou, GR

Medical Education and Training (E&T) in Radiation Protection is well developed and has a long-standing tradition in Greece. Currently, several University Departments provide education and training in this field at pre and post graduate level and conduct relevant research. At pre graduate level all medical and dental schools of the Greek Universities conduct courses on radiation protection included in their basic curriculum, this being also encouraged by the regulatory authority according to the Article 7 of the 97/43 MED EURATOM

Directive. These courses are part of the obligatory course of medical physics conducted by the medical physics departments. In most cases, medical schools provide also radiation protection lectures and exercises within the obligatory course of radiology. In addition some universities conduct elective courses on radiation protection in medicine, attended by several students. Extensive obligatory courses on radiation protection are also conducted in the Technological Educational Institutions addressed to the pre graduate students of the medical radiological technologists departments. At post graduate level two Medical Physics Programs are currently conducted in the country namely: the Inter – University Postgraduate Program in Medical – Radiation Physics (PGPMRP), and the Medical – Radiation Physics Program of the University of Patras. The PGPMRP is running under the administration and co-ordination of the Medical School of the University of Athens, in collaboration with the Universities of Ioannina, Thessaloniki, Crete and Thrace, as well as, the NCSR "Demokritos", and the Greek Atomic Energy Commission. Both the PGPMRP and the Patras' Program are leading to an MSc degree in Medical Physics. Graduates can participate to the examinations given by a Committee of the Ministry of Health, in order to obtain a professional license of a Medical Radiation Physicist. Medical radiation physicists, staff mainly the existing medical facilities in the country. Their role is important in establishing a safety culture the country, as among their responsibilities is the on-site provision of education and training on radiation protection to the radiation workers. Continuing education and training on radiation protection is provided to the medical and paramedical staff of the medical radiation facilities by different educational institutions and professional organizations among which are universities and technological institutions, the Greek Atomic Energy Commission, medical societies and the Greek Association of Medical Physics. A recent low on the tertiary education and the provisions for E&T of the new EU directive, will give the opportunity to strengthen the educational system on radiation protection in the country.

Monday, April 23, 2012

09:00-11:00
ROUND TABLE 5: Education and Training in Radiation Protection for Medical Professionals. The View of European Societies
Moderators: Stelios Christofides,CY, Graciano Paulo, PT

32 09:00-09:20

Education and Training in Medical Radiation Protection: The view of the ESR

Peter Vock, CH

INTRODUCTION:
Radiation protection has become more and more important, due to new scientific data about cancerogenesis, an increasing medical population exposure and an increasing political interest. Training of practitioners and of newly formed medical professionals is essential to bring the knowledge and skills into daily practice.

PURPOSE:
To present the policy for radiation protection of the European Society of Radiology (ESR), and to show the actions derived, the projects and cooperations of the ESR.

MATERIAL AND METHODS:
The EU legislation is the common European base in medical radiation protection. The ESR policy is stated in the „White Paper on Radiation Protection by the European Society of Radiology" (Insights imaging 2011;2:357-362). The European Training Charter for Clinical Radiology defines the training curriculum of radiologists. Mandated by the Executive Council, the „Education Committee" and the „Radiation Protection Subcommittee" are the bodies of the ESR responsible for education and training in radiation protection.

RESULTS:
Education and training in medical radiation protection have a long tradition in European radiology; however, the common European legislation has enhanced the Europe-wide coordination of training and education in radiation protection. The rapidly growing activities and projects of the ESR as well as its partnership in different European projects and the perspectives for the future will be presented.

CONCLUSION:

Education and training in medical radiation protection are subjects of extraordinary importance for the ESR. The presentation will overview the activities and show how the main goal is slightly shifting from optimisation towards justification.

33 09:20-09:40

Education and Training in Radiation protection for medical Professionals – The view of the EFRS

Sija Geers-van Gemeren, NL

INTRODUCTION

Exposure to ionising radiation may lead to damaging health effects. That is why individuals who use radioactive materials or equipment that emits ionising radiation, must receive suitable training and education on the subject of radiation protection.

There exists a considerable variation in the approaches of European countries to the

radiation protection education and training for radiation protection.This diversity creates a large difference in patient safety.

PURPOSE

To present the view of the EFRS regarding the development of a European Guidance Document with a standard set of competences for minimum radiation protection (RP) education, training and CPD requirements for all different groups of medical staff working with ionising radiation.

MATERIALS AND METHODS

In several European projects high-quality reference standards and good practice for education and training in radiation protection (RP) already have been developed .

The difference with the MEDRAPET project is that the standard sets of competences for minimum RP training at various levels and the required CPD will be based on the results from a broad survey among stakeholders and will be tailor made for all different groups of medical staff working with ionising radiation.

The European Qualification Framework is used for the harmonisation and a better understanding of levels, definitions and descriptors.

The strong opinion of the EFRS (European Federation of Radiographer Societies) is that to improve Radiation Protection in general there should not only be a good EU education guideline but that other factors should also be considered, like staffing levels and possibilities of the stakeholders to invest money and manpower to improve the professional competences and herewith the safety of patients and staff.

As part of clinical governance, healthcare organisations are accountable for continuously improving the quality of their services. It is the opinion of the EFRS that Clinical audit, conducted in a correct and professional way is a powerful tool to improve patient safety and patient care.

CONCLUSION

High priority should be given to the implementation of clinical audit throughout Europe as a professional quality instrument. It will serve to safeguard and control the minimum standards of education, training and the use of the European Guidelines regarding RP.

Results of clinical audit should Europe wide be the input for evaluation, review and improvement.

To facilitate the implementation of the new EU RP guideline It is mandatory to establish a permanent multidisciplinary working party to reach and maintain the required levels of competency and to fulfil CPD requirements in the EU.

34 09:40-10:00

Education and Training in Radiation Protection for Medical Professionals. The View of Cardiovascular and Interventional Radiological Society of Europe (CIRSE)

Dimitrios Tsetis, GR

Training interventional radiologists (IRs) in the present era is a very complex process. The required knowledge for providing high quality care is increasing continuously. Certainly, knowledge on medical radiation protection is necessary to ensure the highest-quality training of IRs and other interventionalists and healthcare staff.

The number of interventional therapeutic procedures using ionising radiation and resulting in higher patient and staff doses is steadily rising. Unfortunately many interventionists are not aware of the potential for injury from these procedures and the simple methods for decreasing their incidence. The aim of this presentation is to express the view of CIRSE on radiation protection (RP) education and training of interventionalists and their staff.

Scientific societies such as CIRSE have an important role in the promotion, organization and accreditation of the training activities in RP for medical exposures. For this purpose CIRSE could implement a second, specific, level of training in RP, additional to that undertaken for diagnostic radiology, especially when new x-ray systems or techniques are implemented in an interventional radiology (IR) centre. The Society could potentially include refresher courses on RP, in its annual congress or European School of Interventional Radiology (ESIR) courses, at which attendance could be a requirement for continuing professional development for IRs in using ionizing radiation. CIRSE could also contribute in the development of appropriate syllabuses. Furthermore, CIRSE could also play a key role in attracting interventionalists and other clinicians to the training programmes. Continued collaboration between CIRSE and other societies focused on interventional procedures is critical to the mission of training competent interventional specialists on radiation protection issues.

The assessment and evaluation of competency is important for IR programs. CIRSE's training activities in RP could potentially be followed by an evaluation of the knowledge acquired from the training programme including the development of self-assessment examination system. This will allow the certification of the training activities for the attendants.

An important challenge for CIRSE is to train IRs and other interventionists to counsel patients undergoing difficult IR procedures on the radiation risks, and to follow clinically patients in whom the associated radiation doses may lead to injury either deterministic or stochastic. In addition the patient's personal physician should be informed by the interventionalist when there is a possibility of radiation effects.

These initiatives and actions will ensure that IRs and other interventionists employing fluoroscopically guided procedures will be both trained and certified so that they can avoid unnecessary exposures. CIRSE has increased responsibility for the education and training of IR medical and non-medical staff in radiation protection, as this need is now even more compelling that in the past.

35 10:00-10:20

ESTRO perspective on education and training in radiation protection

Dag Rune Olsen, NO

INTRODUCTION:

ESTRO is a scientific and educational society that aims at developing and promoting standards in clinical radiation therapy of cancer as well as in education and training of radiation oncologists, medical physicists and radiation therapy technologists (RTTs) in Europe. Radiation protection of patients undergoing radiotherapy of a cancerous disease is in particular warranted by the optimization requirement of the 97/43/EURATOME-directive, Article no 4, stating that "For all medical exposure of individuals for radiotherapeutic purposes, .., exposures of target volumes shall be individually planned; taking into account that doses of non-target volumes and tissues shall be as low as reasonably achievable and consistent with the intended radiotherapeutic purpose of the exposure."

PURPOSE:

In its endeavours to promote better clinical standards in radiation oncology, ESTRO has since long developed educational guidelines to ensure sufficient knowledge and skill accommodating the requirements also with respect to radiation protection. A new core curriculum was published recently that focuses on the competences rather than a traditional academic curriculum.

MATERIALS & METHODS:
The development of the curricula over the years has been based on surveys amongst European countries with respect to their education and training requirements and needs. The newly published curriculum has been developed by a group representing broad radiation oncology communities in Europe and has been adopted by national societies and the UEMS-Radiation oncology board.

RESULTS:
The curriculum describes a number of different competencies with specific learning-outcomes and can be downloaded from the ESTRO web-page.

36 10:20-10:40

Education and Training in Radiation Protection for Medical Professionals – The View of EANM

Wolfgang Eschner, DE

The European Association of Nuclear Medicine (EANM), founded in 1985, is the umbrella organization of nuclear medicine in Europe. EANM aims at advancing science and education in nuclear medicine as well as at promoting and coordinating discussion and exchange of ideas and results relating to the diagnosis, treatment, research and prevention of diseases through the use of unsealed radioactive substances. The goal of the EANM is thus to provide a suitable medium for the dissemination and discussion of the latest results in the field of nuclear medicine and related subjects, among these radiation protection.

Educational activities of the EANM are organized under the umbrella of the European School of Nuclear Medicine (ESNM), which since 2001 has been organizing a full programme of Continuing Medical Education (CME) at the annual congresses, directed not only at nuclear medicine physicians but also physicists, radiopharmacists and radiochemists. Further courses are conducted at the EANM Educational Facility in Vienna, as well as Central and Eastern European (CEE) Seminars.

The topics of these courses range from Pediatrics to PET and PET/CT to Dosimetry. Wile radiation protection issues have always been an integral part of those courses, there is not yet a dedicated education or training in radiation protection through ESNM. Likely reasons for this are a) the lack of a common European syllabus or curriculum due to the differing regulatory and organizational frameworks of radiation protection in the countries involved, and b) the necessity of a controlled area environment for any practical training involving unsealed radioactive substances.

Plans are underway for a cooperation between the EANM Physics Committee and IAEA in organizing a nuclear medicine physics and RP course with practical training at the IAEA facilities in Seibersdorf, Austria.

The Guidance Document being developed as work package 3 of the MEDRAPET project is expected to be used a) as the basis for curricula of radiation protection courses organized under the ESNM umbrella and b) as a tool for the implementation of a European accreditation scheme for such courses or for educational programmes in nuclear medicine radiation protection.

37 10:40-11:00

Education and Training in Radiation Protection for Medical Professionals – The View of EFOMP

Peter Sharp, UK

The European Federation of Organisations for Medical Physics (EFOMP) represents 34 medical physics organisations in Europe. Not surprisingly, education and training is seen as an important part of EFOMP's role and we have one officer who is responsible for the Education and Training Committee. Within that committee there are two. Special Interest Groups (SIGs) ; one researches curriculum development for Medical Physicists and Medical Physics Experts, whilst the other researches curriculum development in Biomedical Physics for the medical, dental and healthcare professions. EFOMP through these SIGs would be very pleased to cooperate with other healthcare professionals to produce improved curricula.

Radiation protection has always been part of our remit as medical physicists (see, for example, "The role of the biomedical physicist in the education of the healthcare professions: An EFOMP project." C.J. Caruana et al, Physica Medica (2009) 25, 133-140). We are glad that the EC has recognized this in a more official manner in the revised directive.

EFOMP's view is that one of its main tasks with respect to the education and training of medical and healthcare professionals is in the area of the effective use of medical devices and protection from associated physical agents; radiation is the main physical agent of greatest importance (see A comprehensive SWOT audit of the role of the biomedical physicist in the education of healthcare professionals in Europe C.J. Caruana et al, Physica Medica (2010) 26, 98-110, and A strategic development model for the role of the biomedical physicist in the education of healthcare professionals in Europe. C.J. Caruana et al, Physica Medica (in press))

Together with the European Scientific Institute and CERN, EFOMP runs an annual European School of Medical Physics aimed primarily at the younger medical physicist. The school consists of 6 weeks of lectures of which EFOMP has recently introduced a week on Radiation Protection, underlying its commitment to this area.

The final product of the MEDRAPET, the guidelines on the Radiation Protection education and training of Medical Professionals, will be a reference document for years to come and EFOMP is proud to be associated with it.

11:00-11:30
Coffee Break (Poster presentations shown in loop in coffee area)

11:30-12:30
Panel Discussion
John Damilakis (coordinator)
Remigiusz Baranczyk, Ritva Bly, Stelios Christofides, Wolfgang Eschner, Dag Rune Olsen, Graciano Paulo, Maria Perez, Madan Rehani, Dimitrios Tsetis

Abstracts – Poster Presentations (38-51)

38 Radiation protection training program in Interventional Radiology

I. Antonakos, MSc1, I. Pantos, MSc[1], N. Parmenidou[1], E.P. Efstathopoulos, PhD[1]
2nd Department of Radiology, University of Athens, Greece

INTRODUCTION

Interventional radiology (IR) procedures can be complex and involve long fluoroscopic times and cine acquisitions which can lead to high patient and staff doses. Thus it is important that IR personnel have sufficient knowledge of radiation protection principles and the factors that determine patient and staff radiation exposure.

PURPOSE

A training program on radiation protection in IR has been developed in our Department, targeting medical physics students, interventional radiologists and radiation technologists. The training program covered the relevant international standards, the effect of various acquisition parameters on patient and staff dose, dose management techniques, examples of good clinical practice and demonstration of the efficacy of radiation protection measures.

MATERIALS AND METHODS

More than 50 practitioners were trained at the IR laboratory of 2nd Radiology Department of University Hospital "ATTIKON" which is equipped with an image intensifier (II) based angiographic system. Acrylic glass plates were used to build up phantoms with varying total thickness. Entrance Surface Air Kerma (ESAK) measurements were conducted using a calibrated digital electrometer (Barracuda, RTI Electronics AB) and a calibrated survey meter (Fluke 451 P) was used to monitor staff radiation exposure. All practitioners wore protective aprons and thyroid collars and used a ceiling suspended protective shield. Practitioners were asked to record the effect of specific acquisition factors such as position of the II, simulated patient size, acquisition mode, image magnification and protective shield on patient and staff exposure.

RESULTS

Participating practitioners experienced how various acquisition factors influence radiation exposure to patients and staff in a simulated IR procedure. It was recorded by the practitioners that decreasing the gap between the scatterer and the II decreases the staff dose, increasing the thickness of the scatterer increases the dose to both the patient and staff and increasing the image magnification also increases the dose to the patient. The effect of various fluoroscopic and acquisition modes on patient and staff doses were also recorded. Finally the practitioners measured the exposure reduction provided by the protective barrier.

CONCLUSIONS

An introductory radiation protection training program was developed in our Department in order to familiarize IR personnel to radiation protection and facilitate ongoing training on patient and staff radiation protection.

39 Education and Training in Radiation Protection: MEDRAPET results for Image-Guided Endovascular Intervention Societies

G. Bartal, G. Paulo, J. Damilakis, N. Brasik, W. Eschner, S. Geers, R. Maksimovic, D.R. Olsen, M. delRosario Perez, M. Rehani, A. Schmitt-Hannig, A. Torresin, R. Uberoi, E. Vano

INTRODUCTION

Medical procedures are recognized as the most significant manmade source of radiation exposure. Most of the physicians tend to underestimate real radiation dose. Especially in image (Fluoroscopy) guided interventional procedures, where the combination of prolonged localized fluoroscopy, multiple radiographic exposures, and repeated procedures with relatively high patient dose levels are practiced. This particular group of Physicians is also exposed to Ionizing radiation during the procedures, which represents a serious occupational hazard. A MEDRAPET (MEDical RAdiation Protection Education and Training) consortium of 6 European Professional Societies (CIRSE, EANM, ESR, EFOMP, EFRS, ESTRO) conducted an EU-wide study in 35 European Countries for evaluation of current condition of radiation protection education and training of medical professionals as well as legislation and practical arrangements for training in radiation protection by Health professional societies and National Health Authorities in Europe. Several International societies as CIRSE, are expected to enforce and ensure that education and training in Radiation Protection (RP) are an essential part in the curricula of their members.

PURPOS

One of the aims of the project was to assess the current status of RP education and training in most dedicated groups of fluoroscopy guided endovascular interventionists: Interventional Radiology (IR), Interventional Cardiology (IC) and Vascular Surgery (VS).

MATERIALS AND METHODS

The web-based survey was available from September 13 to the October 31, 2011.

We used an online comprehensive and validated questionnaire on issues related to the status of medical RP education and training. This study focused on National Radiation Protection Authorities, National Professional Societies (IR, IC and VS) that basically use the same methods and similar X-ray Fluoroscopy systems in their daily practice. We extracted a relevant data and compared various groups based on their basic residency training and following fellowship in Image Guided Endovascular Interventions. CIRSE was responsible for providing the list of the relevant National Societies. Moreover, we examined the replies from 28/49 National Radiation Protection Authorities from 35 European Countries.

RESULTS

We achieved overall response rate of 24,3%, by type of professional organization and 29% by country. The responses of targeted professional Societies IR, IC, VS were 6/23 (26.1%), 1/1, and 2/11 (18.2%) respectively. We also looked at the main specialties like Radiology for IR's and Cardiology for IC's. The responses were 0/23 Cardiologists and 23/34 (67.6%) of Radiologists Societies respectively. Any IR had a residency in Radiology, therefore the basic training in RP is covered in about 65% of IR's, while Cardiologists and VS have not reported on such training for there residents at all. As to the remaing questions there was no high enough response rate to be reported. There is a clear motivation in all relevant societies for education and training in RP without real means to deliver it.

CONCLUSIONS

Fluoroscopy Guided interventions carry high doses of patient and staff exposure.

IR's have a basic training in radiation protection as part of there training in Radiology. IC's and VS's did not report basic training at all. All three specialties lack curricula and dedicated training in RP for Fluoroscopy guided endovascular interventions. ICRP, 2000 proposed a second level of RP training for IR's and IC's. National as well as Multinational Professional Societies should have dedicated training for radiation safety, when IR's require mainly second level of training while IC's and VS require both basic and dedicated second level training.

40 Intermittent courses for x-ray technicians as one of the directions in quality assurance and radiation safety of x-ray examinations

Yu. N. Kovalenko1, S.V. Balashov[1]
Center for X-ray Technologies of Association of Radiologists of Ukraine, Kiev, Ukraine

THE PURPOSE OF THE WORK

X-ray technician is a main element in quality assurance and radiation safety of x-ray examinations. Therefore, a system of continuous updating of knowledge of x-ray technicians is an important component in ensuring quality and safety in X-ray diagnostics. Intermittent courses on quality and safety of X-ray examinations are one of the forms of updating the knowledge of X-ray technicians. The aim of the work is to review such courses, and evaluate their effectiveness.

MATERIALS AND METHODS

In autumn of 2011 the Association of Radiologists of Ukraine with the support of the Swedish Radiation Safety Authority held two-day courses for the X-ray technicians, which were attended by 39 people from 18 regions of the country among 27 of existing ones. Teachers training radiologists and engineers serving the X-ray equipment the quality and radiation safety, leading experts in quality and major regional radiologists involved in technicians training were involved in courses. The program included eight topics related to general issues of organization of the X-ray departments, functional responsibilities of the X-ray technicians, the characteristics of film and digital imaging technology, X-ray technicians` activities in the provision of emergency care.

DISCUSSION

Classes were held online. Duration of each of those was 1.5 hour. Each session began with a test of audience with 20 questions on the topic to assess the prior knowledge, then a 30-minute lecture was delivered, followed by re-testing with 20 questions to assess the assimilation of the subject.

This method of training allows to include in the education process visual, auditory, and motor memory of listeners, to identify the „weak" points in the preparation of x-ray technicians, as well as to assess the quality of lectures.

Processing test results showed that if the initial testing of correct answers was in the range (65 ± 10)%, then re-testing – (81 ± 10%). Thus, an increase of correct answers was – (17 ± 4%).

CONCLUSIONS

Past courses have shown their usefulness. The chosen form of employment would make active use of all major types of trainees memory to assimilate the proposed material, which provided a sufficiently high increase in the number of correct answers in the retest. Therefore it was decided to conduct in 2012 such courses in the regions to cover as much as possible X-ray technicians.

41 Participation of professional association in radiologists and X-ray technicians training in quality and radiation safety of X-ray studies

Yu. N. Kovalenko
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THE PURPOSE OF THE WORK

The main trend in radiology is the transition to digital X-ray imaging technology. While proper use digital technology allows to reduce the radiation dose to the patient, and wrong – to increase it. The successful implementation of advanced technology significantly depends on the quality of X-ray technicians training. Purpose of the work is to show the role of professional public organizations in staff training on the quality and safety of X-ray examinations.

MATERIALS AND METHODS

The Role of public organizations in staff training is considered by the example of the Center for X-ray technologies activities, created by the Association of Radiologists of Ukraine to facilitate the introduction of digital radiology into clinical practice.

DISCUSSION

Center for X-ray technologies of Association of Radiologists of Ukraine was established in 1998. Leading radiologists of the country, teachers of higher educational institutions that train radiologists and engineers serving the X-ray equipment, representatives of the developers and manufacturers of digital x-ray equipment have been attracted in Center working. In 1999 the center organized one week training courses which prepared more than 2,000 radiologists and X-ray technicians for work on a digital x-ray equipment during 7 years. Center has participated in the workshops on digital X-ray diagnostics and in the development of curricula for training courses on safe and efficient use of x-ray equipment at the base of the National Medical Academy. Specialists of the Center supervise Section of X-ray technology, quality and safety of X-ray examinations at congresses and conferences held by the Association regularly publish scientific and practical materials on these topics in professional journals and are currently actively involved in the Ukrainian-Swedish project „Quality Assurance and Quality Control System for Medical Radiology in Ukraine „.

CONCLUSIONS

Integrated in the Center knowledge of radiologists, physicists and engineers can more effectively address new technologies into clinical practice, as well as quality assurance and radiation safety of radiological studies.

42 Radiation Protection education of Radiology trainees

M. Lyra, C. Arbillia, C. Antypas and A. Gouliamos, A' Radiology Department- University of Athens

Total exposure of population to ionizing and non- radiation has nearly doubled over the past 2 decades. There many imaging modalities in Radiology that use different technologies and may offer unnecessary radiation exposure by the use imaging parameters further than the optimal ones.

The aim of this topic is to expose and analyse the radioprotection program used for education of the Radiology trainees joining A' Radiology department of the University of Athens.

Training program organized and taught by the Medical Physicists of the department lasts 7 weeks (1.5 hour lecture/week). 3 laboratory exercises – small groups of trainees in order to catch their attention- are also included in the course, dedicated to radioprotection of practical issues of the radiological applications.

Program starts by a reviewing of the knowledge acquired during undergraduate years of medical education. Radioprotection aspects of ionizing and non- radiation techniques used in our department are taught for evaluating performance, risks and quality of images in radiological examinations. Factors contributing to unnecessary radiation exposure and initiatives to reduce them in radiological imaging processes are analyzed in order to promote safe use of imaging devices. Radiobiological effects, especially in children and pregnant examinations are discussed. Tutorial for how to increase patient awareness about radiation exposure in various radiological modalities has a positive result in reduction of radiation risk.

The assessment of the course is carried out taking into account educational evaluation and a satisfaction questionnaire of the trainees, before and after the course.Trainees' suggestions and comments at the completion of the course are focused mainly on radiation protection principles illustrated by practical exercises. They seems to be fulfilled more when practical tests are more, radiation physics formulae and complexity less and diminished and medical physicist-tutor experience great.

Continuous improvement by evaluation of the course is essential to achieve a standard effective radiation protection program for Radiology trainees.

Radiologists are between the scientists that have the responsibility to know how to minimize radiation exposure to individuals and to the population as a whole but still to maintain the image quality diagnostically perfect, keeping in mind the ALARA (as low as reasonable achievable).

43 Interactive training in the "radiologist-trained engineer" as a rational method of X-ray department staff training the quality and safety of digital radiography

Yu.A. Mironova, S.V. Balashov, Yu.N. Kovalenko
Center for X-ray Technologies of Association of Radiologists of Ukraine, Kiev, Ukraine

INTRODUCTION

A subjective factor provides the greatest influence on radiation safety in X-ray diagnostics, because at right and wrong performance of examination patient dose can vary by tens and even hundreds of times. Therefore, emphasis should be done on staff training of rules of radiological examinations performing.

Purpose is to show the benefits of training on the workplace, in close cooperation „radiologist – trained-an engineer" as a method of training of radiation safety.

MATERIALS AND METHODS

This paper deals with methods of training on the workplace that are used by specialists of the Center X-ray Technologies of Association of Radiologists of Ukraine for training of X-ray departments personnel to work on a digital X-ray equipment.

RESULTS

In the Digital radiography quality image is one to allow to solve clinical problem with minimal radiation load on the patient. Therefore, on the one hand, the radiologist must show the X-ray technician X-ray quality image which allows to solve diagnostic problems. On the other hand, the engineer must show the technology to produce such images with minimal radiation load on the patient. Typical structure of training sessions includes: goal setting – definition of entry-level of trained – the analysis of actions of trained – a demonstration by coaches of a X-ray image model with analysis of the most common human errors – the debate – the performance of examination by trained. Before the demonstration coaches discuss the question of the validity of examination holding, all the available means of reducing patient exposure: from placing and the election of the exposure to restricting the field of irradiation with collimators and personal protective equipment, as well as post-processing capabilities of digital X-ray images. There are the examples of training sessions for the implementation of digital radiography of the chest and hips in children.

CONCLUSIONS

Interactive training in the „radiologist – trained – an engineer," is a rational method of training in X-ray rooms, as the quality and safety of X-ray examinations depends on a number of medical and technical factors.

44 Training through gaming in radiation protection; a virtual radiation protection workshop in Second Life

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1Lab of Medical Informatics, Medical School, Aristotle University of Thessaloniki

INTRODUCTION

Due to the rapid increase in the volume of the medical curriculum new and innovative ways must be implemented in order for all medical professionals to absorb the learning material. This need is exacerbated in the subject of medical physics and, specifically, radiation protection because they are sometimes considered secondary subjects in medical education while they are, often, a topic of public controversy. In light of these facts, engaging new ways of learning such as project based learning and serious gaming are necessary for the adequate training of medical professionals.

PURPOSE

The purpose of this poster is to present the virtual radiation protection workshop that was created in the Multi-User Virtual Environment (MUVE) Second Life to facilitate training of medical professionals. Additionally it is hoped that the dissemination of this effort in the radiation protection community will provide a broad and varied sample on which to assess the effectiveness of this learning tool.

MATERIALS AND METHODS

The virtual workshop was created in the privately owned island of the Medical Informatics Lab within the Linden Lab's Second Life MUVE. The layout, building and graphical representation was done through the building tools provided by Second Life. The introduction of the learning material into the environment was facilitated through the Sloodle module of the popular Moodle Learning Management System. This module allows for seamless integration of the electronic classroom into the second life virtual environment full with presentations, quizzes, blogs and chat.

Regarding the learning approach, we utilized a theme park paradigm where each person visiting the environment would choose a path according to her/his professional specialization which would expose her/him to the relevant learning material. The learning material consisted mainly of interactive presentations which were followed by self evaluation quizzes and choice menus which would accommodate the absorption of the learning material.

RESULTS/CONCLUSION

At the moment, this virtual workshop is being assessed by health professionals of varying backgrounds and specializations. Previous experience in other fields suggests that experiential learning methods such as serious gaming and virtual environments engage the user in many levels assisting in the intuitive absorption of the relevant material. Moreover, developments in MUVEs are blended with technical developments, results and best practices drawn from the mEducator project (www.meducator.net). The overarching goal of this work is to provide a point of reference on the subject of radiation protection in medicine in the most popular non game MUVE Second Life.

45 Survey on CT Scanning Parameters in Pediatric Patients in Greece: Are Settings Adjusted?

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Technological Educational Institution of Athens, Department of Radiologic Technologists, Greece

INTRODUCTION

The expanding use of MSCT, may result in an increase in both frequency of procedures and levels of patient exposure.

PURPOSE

To determine if specific protocols related with children ages are used in CT

METHODS AND MATERIALS

The survey consisted of 14 questions addressing scanner details and scanning parameters used for three examinations (brain, chest, and abdomen CT) for four age groups (1, 5, 10 years and adults).

RESULTS

The survey was sent to 133 radiographers and 135 hospitals. The web based questionnaire was filled out by 110 people, yet only 38 questionnaires were fully completed. The scanner was mainly in public hospital (52.6%), multislice (65.8%) with 16 detectors (26.3%). The paediatric CT examination was applied without parameter change with respect to adult protocol in 12.4% of cases. Paediatric CT parameters were not adjusted on the basis of the age of the child in 52.6% of cases. For children among 1, 5, 10 years old and for adults correspondingly, the third CTDI quarter was calculated at 42.7, 50.9, 55.4 and 66.9 mGy for brain, 12, 13.5, 15.6 and 24.9 mGy for chest and 16.9, 17.7, 17.7, and 27.7 mGy for abdomen CT.

CONCLUSION

There is a considerable potential for dose reduction by optimization of scan protocols and better education of the personnel. A reduction of CTDI in adult protocols (up to 38%) is required which will result in a significant dose reduction in paediatric protocols.

46 Clinical medical physicists' education and training framework. Part A: Europe-Australasia

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5 University of Waikato, Hamilton, New Zealand

INTRODUCTION

Intellectual property laws are concerned with the legal regulation of mental products, and they facilitate the cooperation of industry and academia. However, training of Engineering and Science students in these areas is rather neglected worldwide.

PURPOSE

Therefore, an appropriate course, focused on Industrial Property (IP) Rights in Medical Physics and in Biomedical Engineering, has been developed and is being offered in our Department since 2003, for graduating and postgraduate students. The developed course approaches intellectual property as a regulatory system, balancing incentives to foster human creativity, while at the same time is seeking not to unduly restrict its diffusion. It focuses mainly on Biomedical Science and Technology issues, and it attempts to combine practice-directed material with public policy concerns.

MATERIALS AND METHODS

The course lasts around 15 hours, and addresses all relevant aspects of IP such as, the origin and the historical development of Intellectual Property protection, Trade Secrets, Trademark Rights of Publicity and Moral Rights, Copyright, Patent International Protection, Licensing, Royalties, etc. Special care is taken in training on equipment classification, information retrieval out of patent documents and their use in research projects, by the employment of the Esp@cenet, the specialized Internet based search-engine of the European Patent Office. Finally, ethical and social issues, concerning Intellectual property in Biomedical Sciences are systematically taken into account.

RESULTS

The response to the course is very positive, and about 30-40 students are being trained every academic semester. As a consequence of this educational activities, some Industrial Property related Research and Development activities, related to the definition of the present State of the Art and the prediction of emerging technologies in the near future, in the field of Medical Physics and Biomedical Technology, synopsized in 10 publications in peer-reviewed International Journals and Conference Proceedings, during the last 5 years.

CONCLUSION

Although it is not realistic enough to predict in advance specific physical settings and technical details, expected to appear during the next decade, it seems feasible to attempt to follow the innovation trail defined by outstandingly innovative patents. Combining the premature hints, often embedded in patent documents, aiming to extend the claimed legal protection, and based upon already existing and effortlessly predictable health-related needs and demands, we might extrapolate our guesstimate towards a decade ahead. Finally, an example of such an approach will be presented, concerning the historical development of the Ionizing Radiation Dosimetry in Medicine, during the last 30 years, as well as, the future expectations in the field.

47 Clinical medical physicists' education and training framework. Part B: North America

K. Psichis[1], A.P. Stefanoyiannis[2], S. Christofides[3], D.S. Geoghegan[4], I. Gerogiannis[3], W.H. Round[5], X. Geronikola-Trapali[2], I. Armeniakos[2], P.A. Kaplanis[3], A. Prentakis[2], S.N. Chatziioannou[2]

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INTRODUCTION

Medical radiation protection provision is supervised in hospitals by qualified personnel, Medical Physicists (MPs). They are responsible for the radiation protection of patients, hospital personnel and general public. This is achieved through quality control of radiological equipment and relevant procedures, studies of shielding requirements, estimation of the risk to patients and personnel, design and subsequent implementation of novel clinical protocols, dosimetry and treatment planning, as well as active participation in the training programs of health professionals (doctors, MPs, technologists and nurses) on topics related to radiation protection.

PURPOSE

Because of the nature and responsibility of the work of MPs affects patient care, and because they are an essential link of a multi-professional chain, responsible for the effective and safe implementation of radiation-based medical procedures, their education and training must be of high level. The present study is a structured collection of information regarding the present status of the education of MPs in the USA and Canada.

MATERIALS AND METHODS

The data collected for the organizations that certify MPs in the USA and Canada, were based on a pre – existing questionnaire prepared by the European Federation of Organisations for Medical Physics (EFOMP) for a previous study. It consists of three parts concerning the education and training of MPs, the different professional levels of MPs and the existence of a national register of clinical MPs.

Answering the questions of this questionnaire for both countries from publicly accessible sources, facilitates classification and further processing of relevant information.

RESULTS

In the majority of organizations that certify MPs in the USA and Canada, an MSc. or higher degree in medical physics is required.

Hospital training is absolutely essential in both countries, the duration of which depends on the level of education.

Accreditation from the responsible bodies is sufficient for the majority of the USA and Canada with the exemption of four states of the USA where a license is also required.

In both countries MPs can be registered as certified individuals recognized by some national regulatory body.

CONCLUSION

The basic components of the education and training of MPs are common between the organizations that certify MPs in the USA and Canada, but with differences depending upon the speciality of certification. Hospital training of at least two years is required depending on the level of education, and Continuous Professional Development (CPD) is required as a means of quality assurance of professional competence.

48 Energy Spectra and scattered Radiation Intensity determination around Dental X-Ray Equipment through the employment of a Schottky CdTe Detector

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INTRODUCTION

The analysis of X-ray spectra is important for quality assurance (QA) and quality control (QC) of Radiographic systems. According to the European Guidelines on Radiation Protection in dental Radiology, 65-70 kV is recommended as the High-Voltage of choice for dental (intraoral) X-ray sets using AC equipment, and 60 kV for those using DC X ray sets. Since high voltage in this equipment is usually, either fixed, or minimally variable, the spectrometric determination of the employed High-Voltage is the most accurate method.

PURPOSE

The aim of this study was to develop a Method to determine, under clinical conditions, the diagnostic Dental X-ray equipment emitted spectra, by employing a high-resolution Schottky CdTe detector, in order to accurately determine the actually applied High-Voltage on the Tube.

Materials and Methods: The Molybdenum 17.5 keV and 19.6 keV characteristic spectral lines, from a Mammography System and the Isotope 241Am 59.5 keV line have been employed for the Energy Calibration of the system.

RESULTS

Three Dental X-ray equipment of various types and manufacturers, as well as, a Newtom 9000 (QR Verona) Cone Beam Computed Tomography (CBCT) system has been tested with the developed method. Spectra from the same X-ray unit were taken repeatedly to check the influence of counting statistics on the cut-off Channel kVp values and errors. The accuracy of the calibration was examined by altering the X- and Gamma spectral-lines considered and verifying the final kVp variation. A standardized setup has been employed; measurements have been carried out for nominal High-Voltage settings from 50-70 kV and for angles from 45o-170o, beyond the typical alignment 0o-180o. Comparing the acquired data under clinical conditions to the reference spectra, it is easy to estimate the cut-of channel and thus the applied Tube High Voltage on the X-ray Dental equipment. Further, the angular dependence of scattered radiation, both, its Intensity (counts) and its Energy (keV) for nominal settings of 50-70 kV concerning the Tube High Voltage applied on the X-ray Dental equipment. The measured spectra show comparable shapes to published Monte-Carlo approaches and to ones obtained with high-purity Ge-detectors.

CONCLUSION

The results show a symmetric dependence on the said parameters, allowing for correction of measurements, usually taken under strongly distorted clinical conditions, dictated by the architecture of the dental practice offices. Individual Energy spectra determination and the scattered radiation Intensity distribution, in front of and around Dental X-Ray Equipment, through the employment of a Schottky CdTe detector, may contribute significantly to the improvement of routine dental-patient Dose Monitoring and Radiation Protection.

49 Reporting on the Educational and Research Impact since 2003 of a Course on Industrial Property Rights focused on Medical Physics and Biomedical Engineering

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INTRODUCTION

A plethora of radiation-based diagnostic and therapeutic tools are currently available in clinical environment. In order to ensure high quality of the corresponding services, the professionals responsible for their safe and competent provision should be adequately educated and trained. An important link in the imaging or therapeutic chain is the clinical medical physicist. However, a common education and training program is not available world-wide, this fact prohibiting the completely free movement of this professional.

PURPOSE

As a first step to the establishment of international guidelines on the responsibilities of medical physicists, as well as their education and training requirements, recording of the present status is essential. The aim of this study is to provide a structured description of the present status of the clinical medical physicists' education and training framework in 25 European and 2 Australasian countries.

MATERIALS AND METHODS

Data collection was based on an EFOMP questionnaire filled in by the corresponding scientific societies and the authors. Nine main questions were classified in three core sections: education and training, different professional levels and the existence of a national register.

RESULTS

In the majority of the countries investigated, an MSc degree in medical physics, biomedical engineering or equivalent is required, in addition to 1-3 years of clinical experience. The education and training program, which is approved by a responsible government ministry, a professional body or a university, takes place in both university and hospital environment for a total period of 2.5-9 years. Concerning accreditation and licensure, in 56% of all European countries holding a license is compulsory to work as a medical physicist. In Australasia, there is typically a requirement for departments to have at least one certified medical physicist who holds a recognized certification and has been granted a license by an appropriate government body. In 22 European countries, as well as Australasian states without licensing, professionals are eligible to work as medical physicists without holding a license, under specific conditions. There are, in general, national registers of medical physicists. The inclusion on the register is typically voluntary, while maintenance on the register is based on CPD schemes.

CONCLUSION

In conclusion, a common policy on matters concerning education and training as well as professional affairs is followed in the countries investigated, despite the presence of a few differences. Processing of these results may lead to the formulation of international guidelines by organizations such as EFOMP, ACPSEM and IMPCB.

50 ENETRAP II: WP3 – Establishment of European Guidance for RPO Training

A. Schmitt-Hannig and the ENETRAP II WP3 Team: M. Coeck (SCK-CEN), F. Draaisma (NRG), E. Fantuzzi, ENEA, M. Marco (CIEMAT), S. Möbius (KIT), J. Stuart (HPA), P. Vaz (ITN)

Employees, appointed to act as radiation protection officers (RPO) in hospitals, private practices, industrial companies (such as industrial radiography or pharmaceutical and biotech industry), nuclear installations or teaching and research institutions should have an adequate level of understanding of concepts related to radiation protection and understand the radiation protection issues pertinent to their radiation application. Therefore, the level and format of training required by an RPO is dependant on the complexity of that application. It is essential, on the European level, (i) to define requirements for the competencies of RPO according to their area of work and specific radiation protection tasks, and (ii) to establish European guidance or RPO training. This is the objective of the ENETRAP II Work Package WP3.

In order to cover RPO radiation protection training and work experience for all job categories and/or practices involving ionising radiation, 4 tables are proposed, summarising radiation protection courses and work experience necessary to act as RPO:

- Table RPO in the field of handling of radioactive substances, radiation sources, and practices in installations producing ionising radiation
- Table RPO in the field of x-ray equipment (does not cover x-ray equipment used for patients)
- Table RPO in the field of medicine
- Table RPO in nuclear power plants or research reactors

The variety of jobs/practices in these fields (jobs could be in all areas of medicine, industry or research) has been grouped into a number of competence groups with appropriate subgroups. For each subgroup, radiation protection training courses and work experience are necessary to build competence. Course contents and duration are proposed.

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List of invited speakers and moderators

Dr. Edwin Aird
Mount Vernon Cancer Centre / UK

Mr. Remigiusz Baranczyk
European Commission, Radiation Protection Unit / Luxembourg

Dr. Ritva Bly
Radiation and Nuclear Safety Authority, STUK / Finland

Dr. Carmel Caruana
University of Malta / Malta

Dr. Stelios Christofides
Nicosia General Hospital / Cyprus

Assoc. Prof. John Damilakis
University of Crete / Greece

Prof. Alberto Del Guerra
University of Pisa / Italy

Assoc. Prof. Panagiotis Dimitriou
University of Athens / Greece

Assoc. Prof. Efstathios Efstathopoulos,
University of Athens / Greece

Dr. Wolfgang Eschner
University Hospital Cologne / Germany

Mrs. Sija Geers-van Gemeren
Dutch Society of Medical Imaging and Radiotherapy (NVMBR) / Netherlands

Dr. Vasiliki Kamenopoulou
Greek Atomic Energy Commission / Greece

Assist. Prof. Kostas Perisinakis,
University of Crete / Greece

Prof. Luis Lanca
Escola Superior de Tecnologia da Saúde de Lisboa (ESTeSL) / Portugal

Prof. Christos Liapis
Attikon University Hospital / Greece

Assist. Prof. Thomas Maris,
University of Crete / Greece

Assist. Prof. Michalis Mazonakis,
University of Crete / Greece

Prof. Dag Rune Olsen
University of Bergen / Norway

Prof. Graciano Paulo
College of Health Technology of Coimbra / Portugal

Dr. Maria Perez
World Health Organisation / Switzerland

Dr. Madan Rehani
International Atomic Energy Agency / Austria

Dr. Marta Sans-Merce
University Hospital Center of Lausanne / France

Dr. Jost Philipp Schaefer
University Hospital Schlewig Holstein Kiel / Germany

Dipl.-Phys. Annemarie Schmitt-Hannig
Bundesamt für Strahlenschutz / Germany

Prof. Peter Sharp
Department of Biomedical Physics and Bioengineering / UK

Prof. Erich Sorantin
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MEDRAPET

Medical Radiation Protection
EDUCATION AND TRAINING