Radiation Protection education of Radiology trainees

A' Radiology Department- Aretaieion Hospital-
National & Kapodistrian University of Athens

M. Lyra, C. Armpilia, C. Antypas and A.Gouliamos

The aim of this topic is to exhibit the Radiation Protection program used for education of the Radiology trainees in 1st Radiology department of the 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 of imaging parameters further than the optimal ones.

EC Guideline Radiation protection 116

on Education and Training in Radiation Protection for Medical Exposures.

EC Directorate General Environment2000.

Article 7:

European Directive on health protection against the dangers of ionising radiation in relation to medical exposure (on training) states that:

European Commission

World Health Organization

"Member States shall encourage the introduction of a course on Radiation Protection in the basic curriculum of medical and dental schools"

•Over the last year, ongoing re-evaluation have been made to structure the way physics- radiation protection education is provided to radiology trainees in the University of Athens, 1st Department of Radiology in Aretaieion Hospital.

- Lack of dedicated programs ?!

Give advice on the structure of dedicated educational programs for basic and continuing training in RADIATION PROTECTION topics in RADIOLOGY

- Substantial needs were identified for additional educational resources in Physics, better integration of Physics into clinical training, and a standardized Physics- Radiation Protection curriculum, closely linked to the certification examination of the Hellenic Health Ministry & Board of Radiology.

•Radiology education Programs from other European countries were surveyed about how physics and Radiation Protection is being taught and what resources are currently being used for their residents.

Which of the following do we encounter by RADIATION PROTECTION learning?

IMPROVEMENT OF IMAGE/ DOSE RELATIONSHIP?

PROTECTION OF THE PATIENT?

PROTECTION OF THE PERSONNEL?

ALL OF THE ABOVE

Which resources are now used FOR RADIATION PROTECTION EDUCATION in our University Hospital?

Training on the job (learning by doing)
Workshop at scientific meetings
Dedicated educational program

Which ongoing training measures do we use?

In house Presentations,...
In house Educational program
On the job Workshops, scientific meetings ...
Visits by specialists

Training program is organized and taught by the Medical Physicists of the department

- **The Radiation Protection modules are included to the radiological training of our residents**

- **The Radiation Protection lectures last 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.**

The aim of this radioprotection module is to ensure that candidates will obtain a strong foundation in Radiation Protection, patients and staff alike.

- with a good understanding of the interactions of X-rays with matter
- **The importance of the delicate balance between diagnostic** image quality and minimum patient effective dose.
- **Basic knowledge of the technology of each technique with an emphasis on dose and artefacts is expected as core knowledge for RADIATION PROTECTION.**

Patient safety and factors affecting image quality are the two pillars underlying the principles of imaging technology as applied to radiology.

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.**

- **The physical basis of image formation including conventional X-ray, computed tomography, magnetic resonance imaging and ultrasound**

- **Quality control; radiation protection; including the ALARA principle (As Low As Reasonably Achievable)**

Subjects of Imaging Technology in Diagnostic Radiology Physics

- **Radiation physics**
- **X-rays**:
- Concepts of electromagnetic waves, Interaction between X-rays and matter, Filters, collimators and grids, Digital radiography, Radiographic image acquisition, Fluoroscopic image acquisition
- X-ray production, with emphasis on the effects on dose and image quality of altering kV and mA and on the trade-off between diagnostic quality imaging and minimising the effective dose, , Factors affecting image quality

- **Computed tomography (CT):**
- Principles of computed tomography, Sources of artefacts, CT Dosimetry

- **Magnetic resonance imaging:**
- Principles of diagnostic applications, Biological effects of magnetism, Causation of imaging artefacts, MRI contrast agents, physical principles, biological effects, toxic reactions

- **Dosimetry and radiation biology:**
- Molecular structure, classification dose and side effects of all radiographic techniques

Factors Contributing to Unnecessary Radiation Exposure

- Issues Related to Device Use
- Issues Related to Clinical Decision Making
- Initiative to Reduce Unnecessary Radiation Exposure from Medical Imaging
- Promote Safe Use of Medical Imaging Devices
- **Increase Patient Awareness**. A balanced public health approach seeks to support the benefits of medical imaging while reducing the risks.

- Tutorial for how to increase **patient awareness** about **radiation exposure** in various radiological modalities has a positive result in reduction of radiation risk.

- **Radiobiological effects, especially in children and pregnant examinations are discussed.**

Radiation Protection Education continuous Improvement:

- by continuous evaluation of the course to achieve a standard effective radiation protection program for Radiology trainees.
- by trainees' suggestions and comments at the completion of the course focused mainly on radiation protection principles illustrated by practical exercises.

- by roll out an e-learning course to provide our residents with knowledge about Radiation Protection. Knowledge of our doctors in the Radiation Protection subject can be improved through a combination of virtual learning environments and traditional educational schemes.
- we intend to attach the e-learning module at the end of the first year of their residency. After that time of their residency, they could interpret images efficiently, understand the potential adverse effects ionising radiation can cause and to know how to use the technology properly.

•The assessment of the course is carried out taking into account educational evaluation and a satisfaction questionnaire of the trainees, after the course.

Radiation Protection Legislation

✓Current legislation governing the use of ionising radiation and of the responsibilities as defined in national and European legislation

✓The need to minimise the radiation dose received by the patient/client

✓Risk/benefit analysis associated with imaging using ionising radiation compared with other techniques as ultrasound, MRI

- The radiology training must ensure an understanding of the implementation of processes of justification and optimisation as laid down in the EURATOM directive97/43.

RADIATION SAFETY IN IMAGING

- 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).