RADIATION PROTECTION TRAINING FOR DENTAL STUDENTS - EXPERIENCE IN BULGARIA

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Abstract

The paper presents the experience in providing training on radiation physics and radiation protection for students in the Faculty of Dental Medicine of the Medical University in Sofia. A 15-hour module on Radiation Physics and Radiation Protection was integrated into the course on Medical Imaging, with the final aim to increase the understanding of dental students in how to obtain good diagnostic images at minimum exposure to patient and medical staff. The students' knowledge is assessed using a test of 20 multiple-choice questions, and 70% correct answers are required for the student to be allowed to continue with the next medical imaging modules. The five years' experience demonstrated that when well designed and integrated into the basic curriculum on medical imaging, the radiation protection training creates interest in the subject and increases the awareness of dental students.The introduction of a similar course in all dental schools is highly recommended.

1. INTRODUCTION

Education and training are the basic pillars of the radiation protection culture of the medical and dental specialists prescribing and performing medical exposure. The important need for systematic training on radiation protection is recognized by international organizations providing requirements and guidelines [1-3]. According to the EC Medical Exposure Directive (MED), 'Member States shall encourage the introduction of a course on radiation protection in the basic curriculum of medical and dental schools' [4]. This paper presents the experience in providing such training for the students in Dental Medicine at the Faculty of Dental Medicine of the Medical University in Sofia.

2. TRAINING TOPICS AND LEARNING OBJECTIVES

The training module on Radiation Physics and Radiation Protection was formally introduced in the course syllabus for students in Dental Medicine in 2005, and the first lectures took place in 2008, at the fourth year of study of students in Dental Medicine. This is a 15-hours module integrated into the course on Medical Imaging. The purpose is to introduce students to the basics of medical and dental image formation; different types of imaging modalities and their characteristics; image quality parameters and important factors influencing image quality and patient dose. Then, basic principles of radiation protection are introduced, as well as practical approaches for patient and staff protection. The final aim is to increase understanding on how to obtain diagnostic images at minimum exposure to patient and medical staff.

Table 1 presents the training topics and learning objectives.

TABLE I. TRAINING TOPICS AND LEARNING OBJECTIVES OF THE TRAINING MODULE ON RADIATION PHYSICS AND RADIATION PROTECTION FOR STUDENTS IN DENTAL MEDICINE

Topic	Hours	Learning objectives
1. X-ray production. Brehmsstrahlung and characteristic X rays. X ray spectrum. Interaction of X rays with matter, characteristics of interaction with human tissues.		The student should understand the basics of X ray production; X ray system main characteristics and how X rays interact with matter.
2. X ray tubes – construction, characteristics. High voltage generators. Dental X ray systems – types, basic characteristics.	2	The student should understand what the main components of an X ray system are, how the X ray tube and high voltage generator work, as well as the main characteristics of dental X ray systems.
3. Image formation. Image detectors – X -ray film, screen-film combination, digital detectors. Image quality – contrast, unsharpness, noise.	2	The student should distinguish between different imaging modalities – radiography, fluoroscopy, CT, and detectors used in image formation, as well as the basic image quality parameters.
4. Basics of radiation protection. Basic quantities and units. Natural and man-made sources of radiation. Medical exposure as a main contributor to the man-made radiation. Radiation effects and risk.	3	The student should understand the risks associated with the use of radiation in medicine; main radiation quantities and units, main sources of radiation – natural and man-made, and the contribution of medical exposure to the population exposure. This forms the basis for the introduction of the three main principles of radiation protection.
5. Principles of radiation protection – justification, optimization, dose limitation. Basic norms of radiation protection. Methods of radiation protection for medical staff in dental radiology. Radiation protection requirements for the facilities. Radiation protection tools. Dosimetry monitoring.	2	The regulatory framework of radiation protection will be introduced, as well as practical methods for radiation protection of medical staff and the general public. At the end, the student should know how to work safely with an X ray system.
6. Patient doses and image quality. Radiation protection of patient. Methods for patient dose reduction. Optimization of radiation protection.	2	Patient exposure is the main man-made source of radiation and this lecture should introduce the factors influencing patient doses and how to reduce them without compromising image quality. Also, the student should know radiation dose and the risk associated with the different imaging modality.
7. Quality assurance and quality control in dental radiology. Requirements to X ray systems. Quality control program. Acceptance testing, Commissioning, performance testing.	2	Regulatory requirements for X-ray systems will be introduced; how to design quality assurance and quality control programs, and what are their main components.

3. ASSESSMENT

The students' knowledge is assessed using a test of 20 multiple-choice questions covering the training topics. A minimum of 70% correct answers are required in order for the student to be allowed to continue with the next modules of the course on medical imaging. In both the 'physics' and 'clinical' modules, the European and other national guidelines for the safe use of X ray imaging modalities in dental practice are promoted [5-7].

4. CONCLUSION

The five years' experience demonstrated that when well designed and integrated in the clinical training, the module on radiation protection creates interest in the subject and increases the awareness of dental students.

The introduction of a similar course in all dental schools is recommended.

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