



# Radiation safety culture as an important part of the profession of radiographers

Gagova P., Boninska N., Slavova N.



## Introduction

- Radiation exists everywhere in different aspects of everyday life of the humankind. The main part of the radiation on the population comes from medical radiation exposure. The modern diagnostic imaging technologies give the doctors an opportunity to early detect various number of diseases.
- The knowledge of ionizing radiation effects regarding the dose and the biological reactions in humans, animals and plants is important in order to lead to safer procedures and purposefulness. It has been accented on the better understanding of the lower doses effect. Patients' safety is of paramount importance.
- Radiation protection is a complex of knowledge and action intended to protect the individual, as well as the whole population, from the harmful effects of ionizing radiation.
- Education on radiation protection gives an opportunity to the trainees to gain knowledge and practical skills in a safer work with ionizing radiation sources and assimilating the principles of radiation protection not only by the personnel, but by the patients also. It introduces the contemporary principles and concepts of radiation protection and the valid international conventions and legal agreements on radiation protection and control.



## Objective, materials and methods

- **The purpose of our current work is to present the educational statute in radiation protection of the Bulgarian radiographers, and its role in building radiation protection culture among professionals working with ionizing radiation for medical exposure.**

The methods used in this study are:

1. Documentary method:
  - literature resources
  - analysis of the educational courses in radiation protection and quality assurance in diagnostic imaging at the medical colleges in Bulgaria
2. Sociological study /method of investigation/ through our own authors questionnaire:

An inquiry of 30 questions has been conducted among 10 radiography students at Sofia Medical College “Yordanka Filaretova” and 40 radiographers working at five different hospitals – Military Medical Academy – Sofia, Alexandrovska University Hospital, First City Hospital for Active Treatment, University Multiprofile Hospital for Active Treatment and Emergency Medicine and National Heart Hospital. The following results have been delivered:

- whether the examined medical professionals are familiar with the general principles of radiation protection and do they apply them into their practice;
  - whether they know the standards of practice in diagnostic imaging;
  - whether their knowledge acquired during their study at the medical college is sufficient to safely work with ionizing radiation sources;
  - whether and how does the radiographer contribute to the lowering of the patients’ and personnel’s radiation exposure in his/her practice, etc.
3. Mathematical statistics and data analysis. Graphical analysis.



- Using ionizing radiation for medical purposes in diagnostic imaging and radiotherapy requires a good educational training of the radiography students in radiation protection. 30 lecture hours and 10 hours of practice are included in this discipline course. Radiation protection, sometimes known as radiological protection, is the science of protecting people and the environment from the harmful effects of ionizing radiation in different areas of the human activities (science, education, medicine, industry, agriculture, etc.) without obstructing the useful effects of its application. These effects concern the particular individual and the society as a whole. According to the application of ionizing radiation a number of different fields of radiation protection are separated:
  - Protection in professional exposure;
  - Protection of the population;
  - Protection in overexposure and accidents related to sources of ionizing radiation;
  - Protection in radiation for medical exposure;
  - Protection in work with sealed and unsealed radioactivity sources, in nuclear centrals and nuclear industry objects, etc.

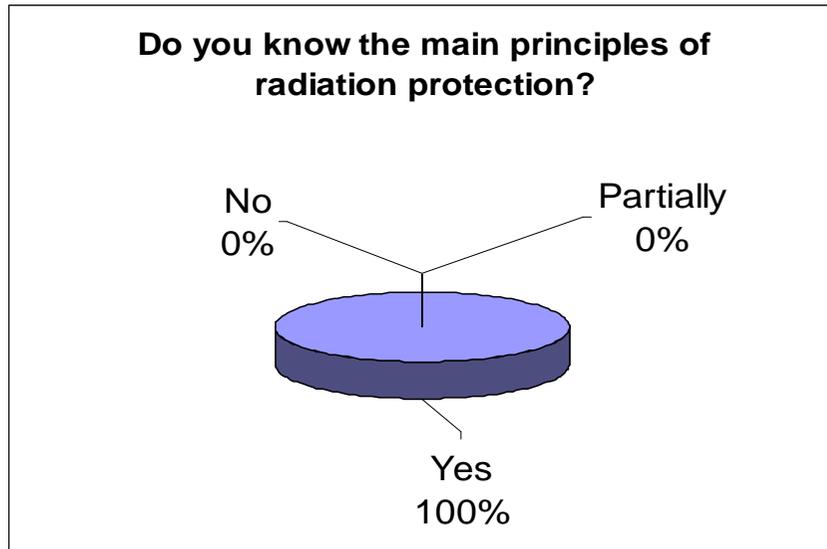


- Another discipline, closely related to radiation protection, is **Quality Assurance in Diagnostic Imaging** with curriculum 30 hours – 20 lecture hours and 10 hours of practice. The educational course makes the radiography students acquainted with:
  - The contemporary requirements and guidelines in order to obtain and assure images of good quality at lower radiation doses for patients and staff;
  - Discussion of the terms “quality assurance” and “quality control”;
  - Definition of the common diagnostic imaging terms describing the quality of an image – contrast, resolution, signal to noise ratio, etc.;
  - Discussion of the factors that determine the image quality and the patient dose;
  - The standards on Good Clinical Practice, stated in the European and national regulations in diagnostic imaging, nuclear medicine and radiotherapy;
  - Discussion of the possible medical errors in the radiographers’ daily work and the ways to reduce or preferably prevent them;
  - Building up practical skills to perform quality control measurements in diagnostic imaging.
- Every practicing radiographer goes through a specialized postgraduate educational course in handling with ionizing radiation sources at the National Centre of Radiobiology and Radiation Protection in order to obtain a certificate of competence. The course is being taken every 5 years and ends with an exam. Radiation Protection training is being taken as a postgraduate course at Military Medical Academy – Sofia.

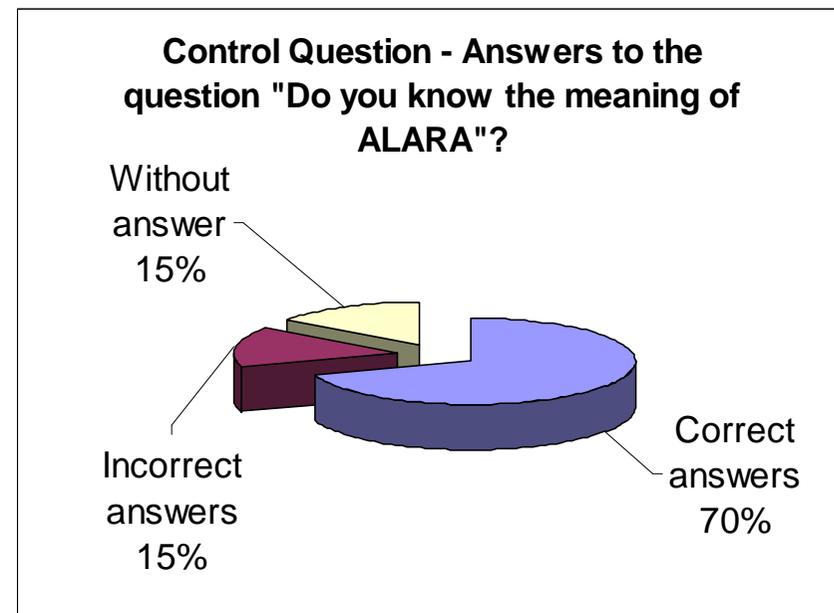
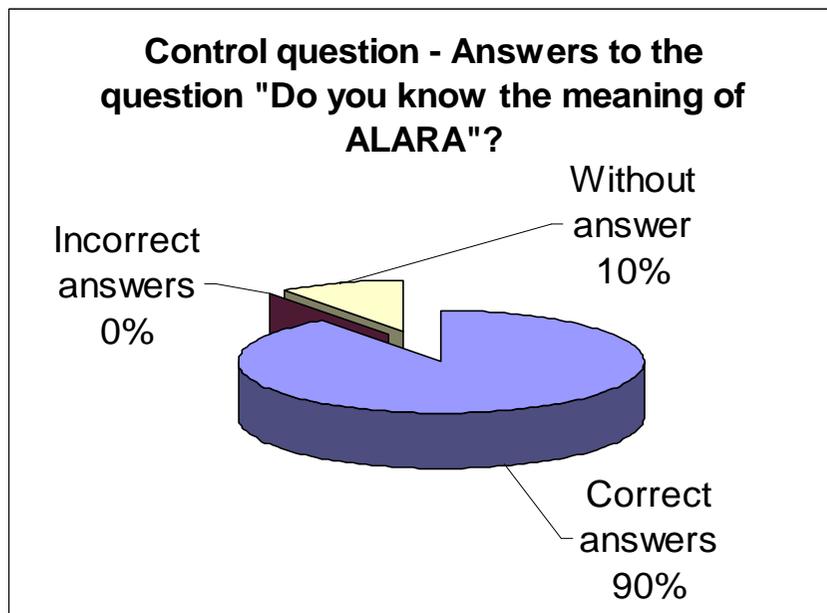
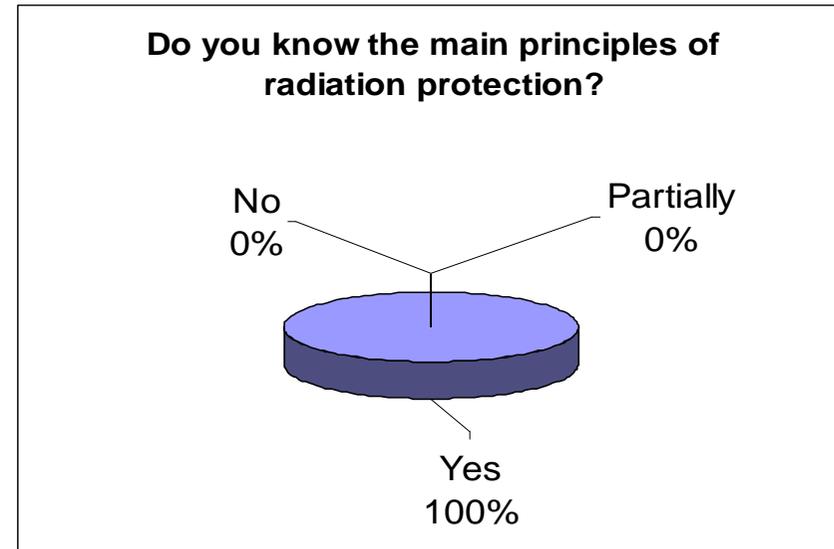


# QUESTIONNAIRE RESULTS

## Students' Answers



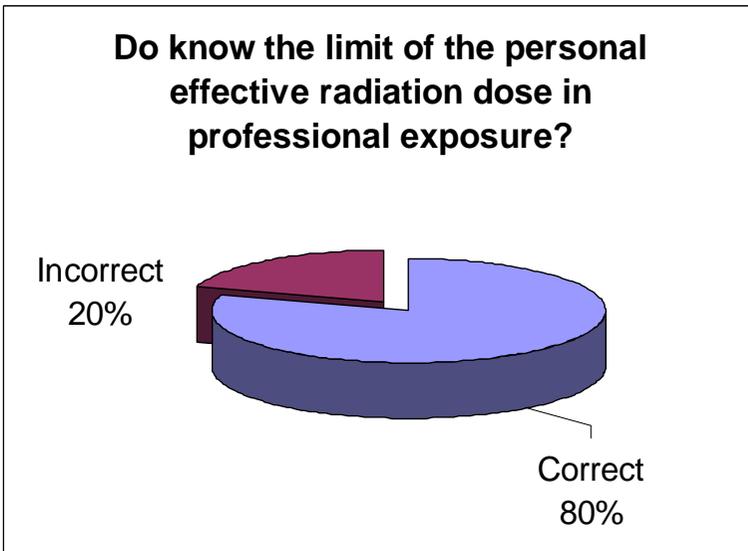
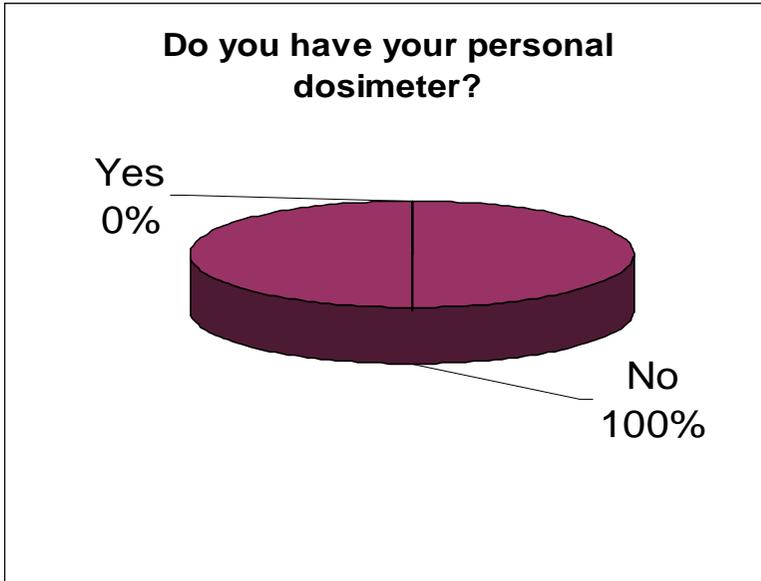
## Radiographers' Answers



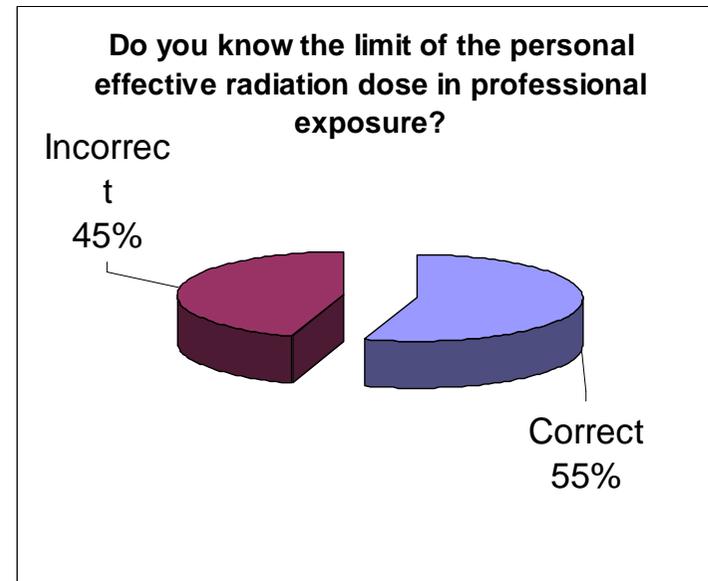
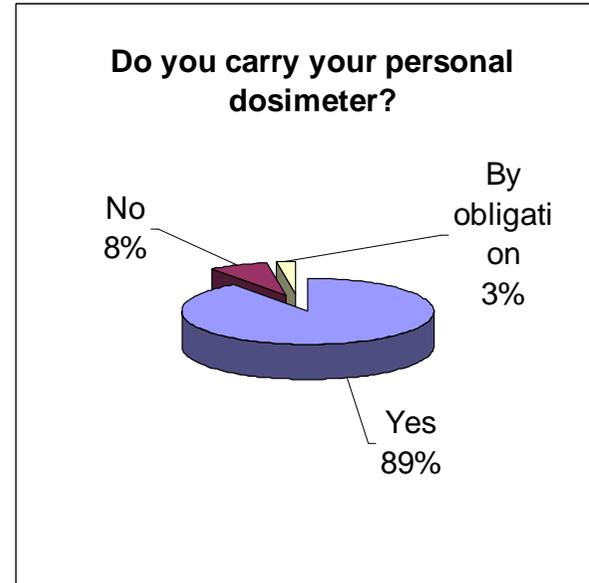


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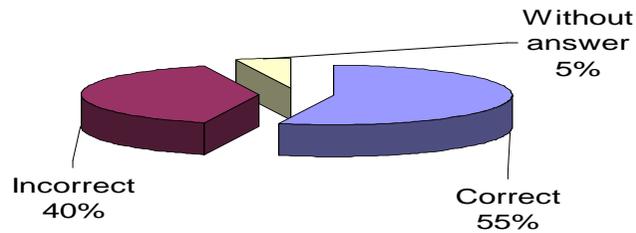




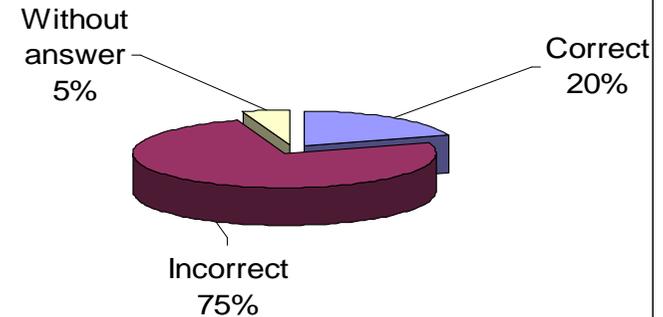
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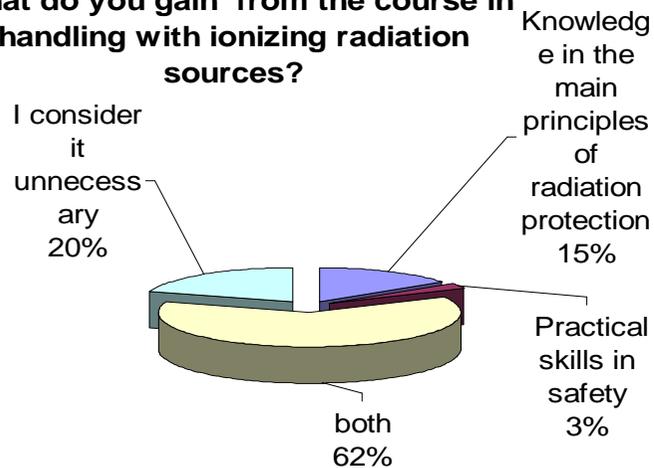
**Do you know the optimum x-ray beam tube voltage for chest radiography according to the Standards in Diagnostic Imaging?**



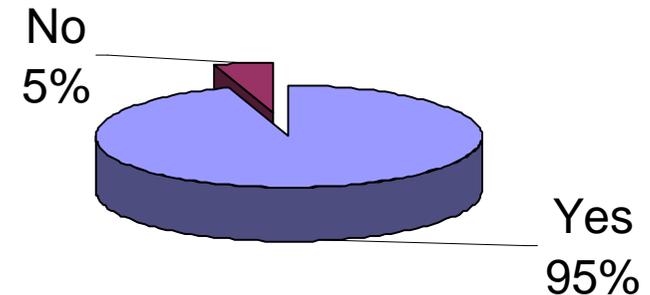
**What x-ray beam tube voltage do you personally use when making a chest x-ray and do you use the recommended value?**



**What do you gain from the course in handling with ionizing radiation sources?**



**Do you know the rights of the personnel working with ionizing radiation?**





## CONCLUSION

- **The students** are excellently theoretically prepared, know the standards in diagnostic imaging and the principles of radiation protection, and they intend to put them into practice
- The students do not possess personal dosimeters but are being examined prophylactically on an annual basis at the National Centre of Radiobiology and Radiation Protection
- The students know the rights of the healthcare professionals working with ionizing radiation
- All the students would like to work at a fully digitalized radiology department because they think there they could reduce their own radiation load.
- **The practicing radiographers** are also excellently familiar with the standards in diagnostic imaging and the principles of radiation protection but only a part of them apply the radiation protection equipment into practice, besides – only in certain situations
- The training in radiation protection gives theoretical and practical knowledge in the methods of radiation protection of patients and staff and builds up lasting radiation protection culture among personnel working with ionizing radiation
- All the practicing radiographers possess personal dosimeters, give them read regularly but a few of them are interested in the actual dose absorbed
- The interviewed radiographers know the rights of staff working with ionizing radiation and their rights are being protected at their work area
- It becomes clear by the answers that the course on getting a competence in working with ionizing radiation contributes to refreshing the knowledge in the field of radiation protection. In the hospitals whose personnel has recently taken such course, the theoretical preparation was better in comparison with the others, whom such course lies ahead.



## CONCLUSION

- The radiation protection culture of the radiographers is being developed during their tuition at the medical college through periodical courses on getting a competence in working with ionizing radiation and through annual postgraduate courses which make healthcare professionals acquainted with additional specific radiation protection measures
- The new technical equipment in radiology rises to a serious challenge but also offers opportunities to radiation protection. In practice the way of exploiting this equipment could significantly reduce or on the contrary – could increase the radiation load. The key role in not allowing the latter has the education as a whole, not only the training in radiation protection, which has to be subordinated to the new guidelines on working with ionizing radiation sources
- The education at the medical colleges gives the students theoretical and practical skills needed in the radiographers' everyday work in order to limit the biological effect of ionizing radiation, teaches the students how and in which way they should protect the patients and themselves.
- And let us say:  
**"As low doses as reasonably achievable"**.

And that could be achieved by continuous learning.