175. THE IMPACT OF NEW GENERATION OF X-RAY DEVICES ON IMAGE QUALITY AND RADIATION DOSE

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Introduction. According to the International Commission on Radiological Protection (ICRP), the radiation doses to exposed personnel should not exceed 20 mSv per year, averaged over 5 years. For patient safety, it is mandatory that the radiation doses need to be clinically justified and optimized according to ALARA principles (As Low As Reasonably Achievable). For this reason, the new generation of X-ray equipment is more often used in the healthcare system because of their function, such as, digital radiography, additional filters, flat-panel digital detectors, to minimize the radiation dose but at the same time keeping the image quality at a high level.

Aim of study. To evaluate the efficiency of new methods and the new generation of X-ray devices in reducing radiation doses and improving image quality.

Methods and materials. The literature review was made by selecting relevant databases indexed between 2023-2025 and published on PubMed and ScienceDirect.

Results. The digital radiography system provides a radiation dose that is 90% lower than the original film-based system. Using extra filters and different parameter adjustments for X-ray equipment, such as the tension of the X-ray tube and additional filters, the radiation dose can decrease by 13% and at the same time the image quality increases by almost 9%. Also, by keeping the tension (kVp) at a great level and reducing the exposure time, the radiation dose can drop off considerably without heavily affecting the image quality. The radiography system stocked with a high-resolution flat panel, offers superior image quality even at low doses. Also, studies show that, in the case of a cardiac CT examination, the prospective synchronization technology activates the X-ray beam only during specific phases of the heart rhythm, which minimizes exposure approximately 70%.

Conclusions. The modernization of X-ray devices leads to a significant reduction in radiation doses, simultaneously improving image quality for patient safety, medical staff protection and a more accurate diagnosis, in comparison with the previous generations of X-ray machines, that offers a high radiation and poor image quality.

Keywords. Radiation dose reduction, image quality, new generations of X-ray devices.

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