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Estimation of entrance surface dose and compliance with diagnostic reference levels for selected plane film X-ray radiographic procedures in Poland

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Introduction:
In 2011 National Centre for Radiation Protection in Health Care (NCRPHC) together with sanitary inspections accomplished the pilot project for estimation of the entrance surface dose (ESD) for the most frequent plane film X-ray examinations. As a result the compliance with diagnostic reference levels (DRLs) in routine practice of the supervised departments were analysed.

Materials and Methods:
During the survey the measurements of air kerma and DAP were performed using the measuring equipment of sanitary inspections (ionisation chambers and semiconductor dosimeters). The following types of X-ray examinations were studied: scull (AP/PA and LAT), chest (PA and LAT), lumbar spine (AP, LAT and LSJ) and pelvis (AP). A number of data were collected i.e.: brand, type, year of the manufacturing, total filtration, exposure settings (kV, mAs, table-source distance, radiation field area) and average number of the particular examination per year. Accordingly to the methodology given by NCRPHC all measurements were performed for exposure settings routinely used for a reference patient (170 cm hight and 70 kg weight).

Results:
Sixty-seven radiology departments in 8 of 16 districts have been inspected. The measurements were performed for the total number of 407 radiographic examinations. The reviewed radiology departments used 24 brands of X-ray equipment. The dominant manufacturers were GE, Philips and Siemens in comparable proportions. The oldest X-ray equipment was manufactured in 1979 and the newest one in 2010. The minimum, maximum and mean values of ESD were compared to the national DRLs. For all the examinations the values of effective dose were calculated using the PCXMC 2.0 software.

Conclusions:
The comparison of the ranges and mean values of ESD and DAP has shown a reasonable agreement with previously published data. The DRLs has been exceeded in a considerable number of radiology deprtments. In most of the cases the recorded values of the high voltage were lower than the values recommended in the publication of EUR 16 260 EN.

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