DOUBLE DOSIMETRY ALGORITHM FOR WORKERS IN INTERVENTIONAL RADIOLOGY

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The purpose of the study was to obtain effective dose estimates of lead apron workers in interventional radiology based on double dosimeter readings.
Typical radiation conditions for various exposure geometries encountered in interventional radiology procedures were simulated using the MCNPX 2.4.0 radiation transport code. The simulation model consisted of an X-ray source and an image intensifier, a patient phantom and a voxelized staff member phantom with lead apron. The effective staff dose and dosimeter readings for several positions and orientations of the worker relative to the patient, while imaging in PA, AP, lateral and 45° oblique directions, were simulated. Simulated organ doses were experimentally verified for a single geometry with a Rando-Alderson anthropomorphic phantom placed in a scatter field.
The dosimeter reading at neck level and under apron at thorax level showed the best correlation with the calculated effective dose. The effective dose to a physician, positioned in close proximity to the primary beam, can be estimated within a 10% under-estimation margin by $E = 1.64\ H_p(10)_{thorax,under} + 0.075\ H_p(10)_{neck,over}$. The dose to the eye lens can be estimated by the dosimeter reading at collar level (R^2=0.98). Only in the case of lateral projections with the physician positioned tube-side, slight under-estimation of the eye lens dose was observed.

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