

DOSEMETER READINGS AND EFFECTIVE DOSE TO THE CARDIOLOGIST IN A SIMULATED CARDIAC INTERVENTIONAL PROCEDURE

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When a cardiologist performs an interventional procedure, in general the exposure to (scattered) ionising radiation is relatively high. Hence a lead equivalent apron is worn for protection, and often a thyroid collar as well. The personal dosimeter that is issued for mandatory individual monitoring is calibrated in terms of personal dose equivalent (usually $H_p(10)$), which is assumed to reflect effective dose, without protective clothing, reasonably well. Due to the protective clothing the relation between $H_p(10)$ and effective dose, the quantity of importance for risk assessment, is disturbed. Depending on the wearing position of the personal dosimeter, the reading will yield too high (above the apron) or too low (below the apron) an estimate of effective dose, and should be corrected.

In this study the influence of the wearing position of the personal dosimeter on effective dose is quantified. A cardiac interventional procedure is simulated, using recent information on exposure conditions typical for a modern hospital in the Low Countries (e.g. 80 kV postero-anterior and lateral beams, 24 cm x 24 cm at skin entrance at 60 cm focus to skin distance). The personal dosimeter is placed on the trunk of the cardiologist at various locations (left, central, or right at several levels from waist to chest, both above and below a 0.25 mm Pb wrap-around apron). Also unshielded positions on the arms and forehead are selected. The dosimeter readings and the effective dose to the cardiologist, per unit dose area product, are calculated using a Monte Carlo code for simulation of radiation transport.

It is concluded that the personal dosimeter may best be worn above the apron at a central position high on the chest as the reading then will be least dependent on the beam direction. It will overestimate effective dose by approximately a factor of 20 (apron and thyroid collar of 0.25 mm Pb).

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