

# Estimasi dosis pekerja radiasi dengan variasi ukuran lapangan posisi dan sudut kemiringan tabung sinar-x pada pemeriksaan kardiologi intervensional = Occupational dose estimation with field size position and c-arm gantry tilt variations during interventional cardiology procedures

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## Abstrak

Pada tindakan kardiologi intervensional, dosis yang diterima pasien relatif lebih tinggi, sedangkan pekerja radiasi akan menerima dosis hambur yang kualitasnya relatif lebih rendah. Namun, pekerja menerima dosis kumulatif dari seluruh tindakan kardiovaskuler yang dilakukannya selama bertahun-tahun. Oleh karenanya, tujuan penulisan ini akan difokuskan untuk mengestimasi distribusi radiasi hambur pada pekerja radiasi tanpa perisai pelindung di Cath Lab. Laju dosis hambur diukur menggunakan detektor survey unfors Xi. Detektor diletakkan pada 6 posisi berbeda di sekitar fantom. Setiap posisi memiliki sebelas titik pengukuran dari 25 sampai 175 cm di atas lantai dengan interval 15 cm, sebagai ilustrasi ketinggian parsial organ pekerja.

Secara eksperimen, fantom rando diradiasi dengan fluoroskopi pada kondisi 88-93 kV dan 5.7-9.4 mA berdasarkan variasi kemiringan gantry dan ukuran lapangan. Phillips C-arm divariasikan pada Kemiringan gantri 0o PA projection, 20o dan 30o Caudal, 20o dan 30o Cranial, dan 40o dan 50o Left Anterior Oblique dan Flat Panel Detector (FPD) pada 20x20 dan 25x25 cm<sup>2</sup>. Secara umum, laju dosis tertinggi terdapat pada daerah pinggang pekerja (100 cm) dan terendah pada daerah kepala pekerja (175 cm) yaitu berturut-turut sebesar 2.49 mGv/jam dan 0.02 mGy/jam. Data pengamatan menunjukkan bahwa fraksi hambur berada pada rentang 0.001–0.060% dari dosis primer di isocenter. Laju dosis hambur cenderung meningkat pada setiap peningkatan sudut kemiringan gantri di semua posisi. Semakin besar luas FPD maka akan menurunkan nilai fraksi dosis hambur yang juga akan meminimalkan laju dosis hamburnya.

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In Interventional Cardiology, dose received by the patient is relatively higher, while the occupational would receive scattered radiation dose whose quality is relatively lower. However, the occupational received accumulative doses of all cardiovascular procedures were done over the years. Therefore, the purpose of this paper will focus to estimate the distribution of scattered dose to occupational without any protective shielding in the Cath Lab. The scattered dose rate was measured by using survey detector of Unfors Xi. The detector was placed at 6 different positions around the phantom. Each measurement position has eleven points from 25 to 175 cm above the floor with increment of 15 cm as the illustration of partial height of occupational organ.

Experimentally a Rando phantom was irradiated by automatic pulsed fluoroscopy with condition varies in the range of 88-93 kV and 5.7-9.4 mA depend on gantry tilt and field size. The Phillips C-arm gantry tilt was varied at 0o PA projection, 20o and 30o Caudal, 20o and 30o Cranial, and 40o and 50o Left Anterior Oblique, and also Flat Panel Detector (FPD) was varied at 20x20 and 25x25 cm<sup>2</sup>. Generally, the greatest dose rate was known at level corresponding to Waist (100 cm) of occupational and the lowest at Head areas (175 cm) of occupational which is 2.49 mGv/h and 0.02 mGy/h, respectively. The given data showed that

the scattered fractions are in the range of 0.001-0.060% from its primary dose at isocenter. The scattered doses tend to increase with gantry tilt for all positions. Increasing field size of FPD will decreased the scattered fraction from its dose at isocenter, and also it affects the scattered dose rate.