

AbstractID: 13081 Title: What fraction of the energy incident on patients is absorbed in x-ray imaging?

Purpose: To quantify the absorbed fraction of the total energy that is incident on patients in x-ray imaging.

Method and Materials: A software package CALDose_X was used to simulate radiographic examinations and compute the fraction of the energy incident on the patient that is absorbed by the patient. We simulated four types of body x-ray radiographic examinations (chest, abdomen, pelvis, and spine) with different projection angles of normal sized adult males and females. The x-ray beam quality (kV and filtration) used to perform these simulations were obtained from the British National Patient Dose Database (BNPDD). Values of the absorbed fraction are dimensionless, and are also independent of the absolute amount of the radiation used to perform each radiographic examination (mAs).

Results: For males, the average values of absorbed fractions were 0.64 for chest radiographs, 0.74 for abdominal radiographs, 0.71 for pelvic radiographs, and 0.70 for spinal radiographs. For females, the average values of absorbed fractions were 0.61 for chest radiographs, 0.66 for abdominal radiographs, 0.66 for pelvic radiographs, and 0.68 for spinal radiographs. Overall, 67% of the energy incident on adult patients is absorbed by the patient. In body imaging, normal sized male patients absorb 7% more of the incident energy than do females.

Conclusion: Approximately two thirds of the total x-ray energy that is incident on adult patients undergoing x-ray imaging is absorbed by the patient. Computing the incident energy is straightforward, and it offers a direct method of determining the energy imparted on patients in any type of radiographic examination.