

Radiation Transmission through Lead Equivalent Aprons Used in Cardiac Catheterization Laboratories

A study was performed to investigate the radiation transmission through lead equivalent aprons used in Cardiac Catheterization Laboratories. Real conditions were simulated by using “bad geometry” (beam much larger than ionization chamber) and by placing the chamber on top of a 7” thick Lucite slab to account for backscatter. The typical aprons used in Cardiology have 0.5-mm lead equivalent fronts and sides and 0.25-mm lead equivalent backs. 39 aprons were evaluated. Transmission measurements were made through the 0.25-mm and 0.5-mm sections of each apron at 70 kVp and 100 kVp. Transmission through 0.508-mm pure lead was also measured and was found to be 1.1% at 70 kVp and 5.4% at 100 kVp. At 70 kVp the range of measured x-ray transmission through the 0.5 mm lead equivalent apron sections was 0.6% to 8.5% with a mean value of 2.8% and a standard deviation (s) of 2.8%. Corresponding values for the 0.25-mm sections were 0.5% to 8.8%, mean 5.2% and s 2.0%. At 100 kVp, the transmission range for the 0.5-mm apron sections was 3.8% to 7.7%, mean 5.2%, and s 1.2%. Corresponding values for nominal 0.25 mm sections were 6.7% to 21.2%, mean 15.0% and s 4.5%. In conclusion there is a wide range of radiation transmission through aprons with the same nominal lead equivalence. Therefore, there is a need for the development of a standardized method for measuring the lead equivalence of aprons, and the specification of acceptable transmission values.