

AbstractID: 5618 Title: Optimization of Image Quality and Minimization of Radiation Dose for Chest Computed Radiography

**Purpose:** To investigate the effects of x-ray exposure parameters and added beam filtration on patient dose and image quality for optimization of chest computed radiography (CR).

**Method and Materials:** A chest x-ray phantom (CardinalHealth Model 76-211) was used to simulate a patient of standard size. To achieve a small or a large patient size, one sheet of 25-mm acrylic was removed or added, respectively. Pre- and post-patient x-ray spectra were measured using a CdTe x-ray spectrometer at various exposure conditions and added filters. kVp stations of 80, 100, and 120 were selected. An Al plate of 0, 1.0, 2.0, 3.0 mm or a Cu plate of 0, 0.1, 0.3, 0.5 mm was placed at the tube exit window for each exposure setting. Patient entrance exposure was measured using a Radcal ion chamber under automatic exposure control at each exposure condition. Corresponding CR images were acquired at above conditions using a contrast-detail phantom (CDRAD) placed between acrylic plates of the chest phantom for evaluating image quality. The same protocol for processing of CR image plate was used throughout. Both printed films and digital images were archived. Reading sessions were conducted to interpret the 72 CR images.

**Results:** CD RAD images were ranked based on image quality. Corresponding patient dose and x-ray spectrum were analyzed. Beam effective energy and spectrum information were evaluated. Optimal imaging condition was determined. In general, with increased beam filtration and effective energy, image quality decreased with dose saving as expected. However, at certain conditions of patient size, filtration, and kVp, image quality actually appeared improved with reduced or comparable patient dose.

**Conclusion:** Proper use of pre-patient filtration can improve CR chest image quality while maintaining or reducing patient dose at carefully selected kVp setting for a patient. Optional filters should be made available for digital chest radiography.