

AbstractID: 5207 Title: Optimizing dose and image quality in pediatric computed tomography

**Purpose:** The goal of this work was to accurately quantify the doses delivered to pediatric patients during computed tomography (CT) exams while simultaneously evaluating the image quality of images obtained with the same protocols, and thus identify potential dose-saving protocols that maintain adequate image quality.

**Method and Materials:** A tomographic newborn physical phantom was constructed from tissue-equivalent materials for use in evaluating the doses delivered to pediatric patients as a result of diagnostic imaging. Fiber optic-coupled (FOC) dosimeters were used along with the physical phantom to measure average organ doses during CT exams across a wide range of protocol parameters (80-120 kV, 50-150 mAs, 12 mm and 24 mm collimated beam widths, pitches of 0.75, 1.0, and 1.25, for both head and body protocols). Then, images of the Catphan CTP515 low contrast module were acquired using the same protocols, and scored automatically with a custom-written scoring routine with threshold contrast-to-noise ratios (CNR) based on radiologists' scoring of similar phantom images.

**Results:** Measured effective dose values for head exams ranged from 0.33 mSv to 4.3 mSv, depending on protocol selection. These effective dose values are driven by doses to the bone marrow, bone surface, brain, and thyroid gland. Measured effective doses for CAP exams ranged from 1 mSv to 14.3 mSv, depending on protocol selection. A collimated beam width of 24 mm (16 x 1.5) was determined to be the optimal setting for both head and CAP imaging in terms of both image quality and dose.

**Conclusions:** Tube potential and tube current-time product are the two major contributors to both dose and image quality. However, the use of pitch values less than 1.0 does involve a substantial dose penalty (approximately 30 percent greater dose) without providing any significant gains in image quality for general imaging tasks.