AbstractID: 6490 Title: A simple and quantitative method to optimize and monitor pediatric CT image quality

Purpose: To describe a simple quantitative method to optimize and monitor pediatric CT image quality and dose.

Method and Materials: Measurements were performed on a multi-detector CT using helical pediatric brain and body protocols. Water phantoms were used to evaluate HU accuracy and image noise (HU standard deviation) with increasing mAs (dose). A commercial 20-cm water phantom was used and homemade 15-cm and 10-cm diameter water phantoms used to simulate pediatric conditions. Images were inspected for artifacts. Low contrast and noise measurements were performed with the Catphan 15-cm diameter low contrast module inside and outside the Catphan phantom. Quantitative contrast, noise and contrast-to-noise ratio (CNR) measurements were obtained by placing ROIs over the target and background areas.

Results: Noise decreased with increasing mAs and was proportional to 1/SQRT (mAs). Noise were strongly dependent on object size. At constant mAs, image noise was 33% and 58% lower in the 15-cm and 10-cm objects respectively than in the 20-cm object. CT number accuracy in the 10-cm object was outside the ± 5 HU range (AAPM TG-66). Ring artifacts were observed on the 10-cm images. Measured contrast was in agreement with the Catphan's nominal contrast. Measured noise in the low contrast module was in agreement with the water-phantom measurements and provided an independent noise measurement in addition to providing a CNR measurement. At constant technique, CNR increased with decreasing object size.

Conclusion: Simple 10-cm and 15-cm water phantoms and the 15-cm Catphan low contrast module can be used to rapidly and quantitatively assess HU accuracy, image contrast, noise and CNR of pediatric CT protocols. Scanning requires less than 15 minutes. Quantitative analysis can be performed rapidly on most CT viewing consoles. This quantitative method can be used to optimize pediatric CT image quality and dose, to monitor pediatric CT scanner performance routinely.