Purpose: This study sought to characterize the effect on image quality and the potential for dose reduction in computed tomography (CT) scanning with an adaptive statistical iterative reconstruction (ASiR™) technique.

Methods: The study consisted of (1) characterizing image quality metrics established by the American College of Radiology (ACR) CT accreditation program as a function of ASiR™; (2) calculating the noise power spectrum (NPS) to assess the effect of ASiR™ on noise quality and texture in the reconstructed images; (3) establishing theoretical and practical maximum dose reduction limits with ASiR™ reconstruction for a pediatric population ranging from 1 year old through adolescence.

Results: ASiR™ was shown to have no deleterious effects on image quality as assessed by ACR criteria. The assessment of low contrast resolution was found to improve due to reductions of noise magnitude in the reconstructed images. The NPS was calculated for (0-100)% ASiR™ reconstruction. The 0% ASiR™ NPS was centered at 3.2 lp cm-1 and the 100% ASiR™ spectrum was shown to have shifted to 1.6 lp cm-1 with a 50% diminished noise power spectral peak. As the noise spectrum shifted towards lower frequencies, the noise texture took on a coarser graininess. When compared with 0% ASiR™, lower frequency reconstructed images (50%, and 100%) ASiR™ demonstrated increased object boundary blurring of (0.3 and 0.5) mm, respectively. For the entire pediatric population, a maximum dose reduction of (50-55)% was demonstrated at (60-70)% ASiR™, but with low contrast boundary blurring of ~0.4 mm; however, 40% ASiR™ had dose reductions between (20-31)% with a blurring of ~0.1 mm.

Conclusions: All image quality tests were found to meet ACR criteria. A dose reductions of (20-31)% can be achieved for pediatric populations with no change in image quality, little impact on low contrast object boundary blurring, or change in noise texture quality.