Purpose:

To describe the joint effort to develop a comprehensive CT organ dose database for weight-specific adult and pediatric patients.

Methods:

Two validated CT scanner models (GE LightSpeed Pro 16 and Siemens SOMATOM sensation 16) operated at different tube voltages (80-140kVp) and beam collimations (1.25 mm, 5 mm, 10 mm and 20 mm) with both the head and body bowtie filters were adopted to calculate the organ dose. Detailed X-ray sources and bowtie filter geometry were modeled using the MCNPX v2.6 code. The x-ray source moved along a single axial trajectory to allow for the calculations of organ doses from a single CT slice. This simulation process was repeated to cover from the top of the head to the feet for one phantom. This approach was applied to a set of voxel phantoms covering 50th percentile of adults and children at different ages (1-, 5-, 10-, and 15-year-old), a pregnant female at three gestational stages, and obese patients of different body weights.

Results:

A detailed database of slice-by-slice organ doses was established for a total of 27 phantoms at RPI and the University of Florida. All the related organ doses are incorporated into a standardized database compiled using Microsoft SQL server 2008. The CT organ doses calculated in this study for a GE and Siemens scanner can be used to estimate dose from other scanners using organ-specific adjustment factors or CTDIvol normalization factor to account for the different organ doses from different scanner types.

Conclusions:

This set of new and comprehensive organ dose database is expected to improve both the accuracy and usability in CT dose reporting and tracking in the future. Combined with the additional knowledge that can be extracted from the DICOM file the software package can be a helpful tool in the management of CT dose.

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