Purpose: To establish an organ dose database for pediatric reference individuals undergoing computed tomography (CT) examinations by using Monte Carlo simulations to readily provide organ doses for patients with different age, gender, examination type, and CT scanner models.

Methods and Materials: The Monte Carlo simulation model of Siemens Sensation 16 CT scanner we recently published was employed as base CT scanner model. The CT scanner model was coupled with a series of pediatric hybrid phantoms within MCNPX2.6. Organ doses from helical scans were approximated by the summation of doses from multiple axial slices included in the given scan range of interest which provided flexibility to the CT scan dosimetry calculations. Organ dose calculations were performed for a single axial scan which started from the top of head down to the bottom of the phantoms with an interval of 10 mm for a total of 10 pediatric phantoms: newborn, 1-year, 5-year, 10-year, and 15-year males and females.

Results: Absorbed doses (mGy/100mAs-mGy) normalized to 100 mAs and CTDIvol (mGy) were calculated for a total of 30 organs and tissues including active marrow under the tube potentials of 80, 100, and 120 kVp. The normalized organ doses for head, chest, and abdomen/pelvis scans were calculated and compared with the values from CT-Expo. Organ doses based on the hybrid phantom series in this study overall agreed with those from CT-Expo based on two voxel phantoms. Significant dose differences caused by the unrealistic organ locations which were observed for the adult stylized phantoms in the recently published study were not observed.

Conclusion: The organ dose matrix established for pediatric individuals will be coupled with the adult version which was recently published and be incorporated into a graphical user interface to provide user-friendly computer program for CT organ dose estimations.