

## AbstractID: 10715 Title: Correlations of Organ Growth with Age, Body Mass, and Height for Pediatric Radiotherapy Treatment Planning

**Purpose:** In an effort to accurately consider historical radiation in treatment planning and outcome analysis for pediatric radiotherapy patients, we investigate the correlations of the volume of the liver and kidneys with age, total body mass, and body height of pediatric patients. **Method and Materials:** The liver and kidneys were delineated upon CT images acquired for 48 patients (27 male, 21 female) ranging in age from 0.7 to 19.3 years at the first CT acquisition. For age-based correlations, statistics were compiled among all images and among only the images acquired pre-treatment. For the mass-based and height-based correlations, total patient body mass and height were obtained from supplemental chart information. Plots of total-kidney volume versus age were compiled among male and female patients separately. Plots of liver and total-kidney volume versus body weight and body height were compiled from among all patients. Linear fits were applied to each data set, and the standard deviation of the difference between the measurement and the linear fit was compiled. **Results:** Increased liver and kidney volume with increasing age, body mass, and height are apparent. Excluding post-treatment image data led to improved linear correlations. Linear fits suggest larger kidney volume at birth for males ( $99 \text{ cm}^3$  vs.  $63 \text{ cm}^3$  for females), although for both males and females the kidney growth rate is similar (approximately  $17 \text{ cm}^3$  per year). The ratio of the right- to left-kidney volume was  $0.95 \pm 0.14$ . Although there is relatively little variation in body mass among the patient set, greater body mass appears to predict greater organ volume. **Conclusions:** The correlation of liver and kidney volume with patient age, body mass, and height are apparent for pediatric patients, and can be used to construct organ-growth models that may be useful in image registration, dose accumulation and radiation-response assessment for pediatric radiotherapy treatment planning.