AbstractID: 3787 Title: Accuracy of CT numbers and its effect on dose calculations

Purpose:
The CT-to-density conversion table can vary for various CT scanners or when using different scanning parameters (such as KVp, field-of-view etc.). These CT number variations could be up to -/+100 for the same material. However, the dosimetric impact of these CT number variations was not well studied in the past. This study is to report the variations of CT numbers and their clinical impact on dose calculations.

Method and Materials:
The CT-to-density conversion table was measured on six different scanners. Two special tables were created with +/- 100 CT-number shifts from the default conversion table in our clinic. Data showed that these two tables represented two bounding situations to accommodate the variations in different CT scanners or scanning parameters. Treatment plans using lung, head and neck, prostate, and breast cases were recalculated using these new CT conversion tables for both photon and electron beams.

Results:
There were noticeable differences across different density ranges for different CT scanners. Using the two extreme CT-to-density conversion tables, it was shown that the differences in dose calculations were -1.6% to 0.3% for head & neck (6MV), -2.5% to 0.9% for lung (6MV), -4.0% to 3.0% for prostate (6MV), and -2.3% to 1.7% for prostate (18MV), respectively. It showed that the impact was more notable for treatment targets at deeper depths or at lower beam energy. For electron beams, the distal 90% fall-off edge was changed approximately 2 mm for commonly used electron energies.

Conclusion:
Dose calculations seem to be not sensitive to different CT-density conversion tables from different CT scanners or using different CT scanning parameters. Considering most scanners were calibrated to water, our results could be the worst case scenario. A single CT-to-density conversion table could be used for all CT scanners.

Conflict of Interest (only if applicable):