Abstract ID: 16878 Title: A new approach to evaluating the impact of organ sub-volume sensitivity to irradiation by deforming cohort dose data onto a single ‘reference human’

Purpose:
We propose a new approach to normal tissue complication probability (NTCP) investigations by deforming doses from a patient cohort onto a single anatomic frame of reference in order to identify crucial anatomic features.

Methods:
To perform this study, IMRT treatment plans of seven different prostate cancer patients were used. Organs of interest (rectum, prostate) were delineated manually by an expert physician. CT scans, structures, and prescription dose distributions were exported into DICOM and then imported into the Computational Environment for Radiotherapy Research (CERR). The contrast of the organ of interest was enhanced at the surface boundary using the contour lines and overwriting the Hounsfield Unit (HU) of the CT scan. CTscans [2,7] were deformed onto reference scan CT1 using B-spline method for deformable image registration available in Plastimatch. The warping of doses [2,7] was then performed utilizing the corresponding B-spline transformation files.

Results:
Examination of the Dose Volume Histograms (DVHs) of the prostate reveals a substantial agreement in the mean dose within 1% between the initial prescribed dose and warped dose. However, for organs with large irregularity and heterogeneous dose distribution such as rectum, the DVHs of the warped dose showed larger deviation from the initial prescribed dose. Dose variance shows a significant variation along the rectum anterior wall.

Conclusions:
This study shows the feasibility of deforming a patient cohort onto a standard anatomy while retaining the dosimetric and volumetric information. This technique works better with organs which have simple geometry that can be indentified on the CT scan. Discrepancies between the initial and warped dose can be attributed to the low resolution CT scans and the choice of the DIR algorithm. This might be improved by mapping onto a reference anatomy with a high resolution CT scan such as the one provided by the Visible Human Project.

Funding Support, Disclosures, and Conflict of Interest:

NIH R01 CA85181