



International Commission on Radiation Units and Measurements, Inc.

Dose prescription, reporting and recording in advanced optimization strategies: application to dose painting and robust planning

Terms of reference: ICRU Report 83 dealt with volume and dose prescribing, reporting and recording for Intensity Modulated Radiation Therapy (IMRT). In that report, both the target volumes and the dose within these volumes were assumed to be as homogeneous as possible. That report made it possible to have multiple target volumes to provide boost doses to the tumor, but, with the use of molecular imaging (e.g., PET with various tracers, DW-MRI), which can identify sub-regions within a tumor expressing a given biological characteristics (e.g., hypoxia, metabolism, cell density), one may consider prescribing (thus report and record) heterogeneous dose at a voxel or a group of voxels level. Clinical trials are ongoing in that regards. This progress requires revisiting the concepts of dose prescription and reporting to adequately embrace the issues of prescription, reporting and recording of planned dose heterogeneity.

The following topics will be covered:

- definition of dose painting, e.g., dose painting by number, dose painting by volume
- target volume delineation/segmentation in PET and MRI
- image reproducibility over time during treatment, and integration of these uncertainties in volume segmentation, dose planning and dose delivery
- dose prescription strategies and dose-volume constraints
- dose calculation, e.g., specific issues related to dose calculation in small volumes, optimization using multiple PTVs or using voxel-based prescriptions
- dose reporting, e.g., QVH, D_{median} , $D_{\text{near-min}}$, $D_{\text{near-max}}$, standard deviation
- clinical examples for H&N (e.g., PET), prostate (e.g., MRI) and brain (MRI and/or PET)