AbstractID: 11026 Title: Randomized Prescription Dose IMRT Inverse Planning

Purpose: To incorporate patient-specific spatially-dependent prescription dose selection and optimization into IMRT inverse treatment planning. To improve the quality of planning using customized variable prescription. **Method and Materials:** The standard prescription dose—100% of the dose to 100% of the target volume and 0% to the rest of structures—is not achievable in practice. A more realistic prescription dose distribution would be a voxel specific prescription which can be automatically tuned during optimization procedure. One of the ways to realize that in practice is to think about prescription as it were a random variable with some restrictions on its probability distribution function (PDF) which plays the role of a preference function guiding optimization process. We demonstrate that, under the assumption that the prescription dose obeys a normal distribution, IMRT planning with random prescription can be formulated as a quadratic problem. **Results:** Clinical prostate and head and neck cases were studied to test this method. We compare treatment plans generated using this method to standard prescription plans for the same sets of importance factors. Depending on model parameter values improved plans were generated using the randomized prescription. Larger improvements were observed for the prostate case which may indicate that our technique works the best when the target is closely surrounded by organs at risk. **Conclusions:** We demonstrated how IMRT treatment planning can be improved via considering customized prescription dose.