AbstractID: 12730 Title: SABER: A software tool incorporating spatial and biological information into radiotherapy treatment planning

Purpose: In radiotherapy treatment planning, 3D radiation dose distributions are commonly distilled into 2D dose-volume histograms (DVHs), which are used both to optimize and evaluate treatment plans. Unfortunately, the DVH presents only static and physical absorbed dose and contains no spatial or biological information. Spatial and biological information is necessary in order to perform true computational optimization and for predicting clinical outcome. The goal of this project is to develop a new treatment plan evaluation and optimization tool which incorporates biological and spatial information. **Methods**: Matlab-based software SABER (Spatial And Biological Evaluation for Radiotherapy) was developed. It utilizes widely-accepted radiobiological models to convert physical absorbed doses to equivalent biological doses. Corrections to dose distributions may be applied within the software to simulate dose wash-out effects due to cell migration and/or other tissue motion during treatment. Radiobiological models are applied to calculate radiobiological quantities of interest. The software can calculate tumor control probability (TCP) and normal tissue complication probability (NTCP) as a function of prescribed radiation dose. **Results**: SABER incorporates spatial information and provides biological evaluation capabilities not currently available in commercial treatment planning systems. Intuitive methods are offered to restore spatial dose information back into DVH format. Plans with similar physical DVHs may appear significantly different once spatial characteristics and biological information are included. Depending on 3D dose distribution and radiosensitivity of structures, TCP and NTCP predicted based on biologically modified dose can be significantly different than those predicted based on physical absorbed dose, thus changing the clinical course of action. **Conclusions**: SABER provides both spatial and biological information about the dose distribution. Incorporating this information can help create better plans and more accurately predict treatment outcome. It may significantly alter predicted TCP and NTCP and thus the choice of treatment plan. **Conflict of interest:** Supported by Varian Medical Systems.