AbstractID: 3549 Title: Dose-response explorer: An open-source-code Matlab-based tool for modeling treatment outcome as a function of predictive factors

Purpose: Radiotherapy treatment outcome models are a complicated function of treatment parameters and/or clinical factors. Our objective is to provide clinicians and scientists with an accurate, flexible, and user-friendly tool to explore radiotherapy outcome models with different factors leading to tumor control or normal tissue complications. We refer to this tool as the dose response explorer (DREX).

Method and Materials: DREX, based on Matlab named-field structures, provides tools for multi-term logistic regression modeling, correlation calculations, and graphical comparisons between model predictions and observations. A GUI-driven interface was constructed using Matlab tools. Named-field structures in Matlab support development of very human-readable databases

Results: The DREX tool provides the NTCP or TCP analyst with multiple features which include: (1) Combination of multiple dose-volume variables (mean dose, max dose, Vx (percentage volume receiving x Gy), Dx (dose to x percentage volume), EUD (equivalent uniform dose), etc) and clinical factors (age, gender, ethnicity, etc), (2) Model analysis using logistic regression, (3) Performance assessment using Spearman's rank correlation and receiver operating characteristics (ROC) curves, and (4) Graphical capability to visualize NTCP or TCP prediction versus selected variable model using contour and histogram plots. DREX has been in constant use in our research group for the last nine months.

Conclusion: We developed user-friendly software to explore and model radiotherapy dose-response correlations. DREX facilitates convenient study of different treatment and clinical factors which may correlate with complication or control. We believe that the DREX software combined with CERR archiving would provide the clinical researcher with convenient tools to accrue and model radiotherapy outcomes data. DREX will be freely distributed via the web. We expect to continue developing DREX, including adding methods to automatically select model terms, find the optimal model size, and estimate parameter uncertainties.