

Purpose: The purpose of this project was to develop dose-volume histogram (DVH) analysis software that can be used for research with a large quantity of patient data in radiation therapy. Currently, the software converts RTOG output files from the Pinnacle treatment planning system (TPS) (Philips Healthcare, Best, Netherlands) into DVH analyzed data for all structures involved in the IMRT plans.

Method and Materials: IMRT patient data to be analyzed were exported into RTOG format files from the TPS. RTOG files, with differential DVH information, were read and transformed into cumulative DVH data. Matlab (The Mathworks Inc, Natick, MA) based codes were developed to identify all the target and normal structure volumes, and treatment planning parameters in RTOG formats. The software utilized the CERR (Washington University at St. Louis) and standard DICOM image manipulation tools. The DVH analysis was based on a cosine interpolation numerical analysis technique; and the uncertainty in data interpolation was controlled by using piecewise polynomial fittings in DVH curves. The accuracy of DVH analysis was compared with TPS produced DVHs and evaluated with a 4-mm resolution.

Results: The execution time for fully automated DVH analysis of all organs in the IMRT plan was typically 10 minutes per patient data with the clock speed of 1.8 GHz and 1024 MB RAM. The normalized root mean square deviation (NRMSD) was less than 1% for all DVHs except in the high dose gradient slope regions (<2% NRMSD).

Conclusion: A DVH analysis software system has been developed that can be efficiently used for research requiring the handling of a large number of structures or patient data. More user-friendly features of dose and volume selections, expansion to other TPSs, and statistical indices are under development. The software will be available to the radiation oncology community in the future.