AbstractID: 12666 Title: Current Status of the Histogram Analysis in Radiation Therapy (HART): an Open-Source Software System

Purpose: HART is a useful tool in radiation therapy research utilizing 3D conformal radiation therapy (3DCRT) and intensity modulated radiation therapy (IMRT) techniques in the treatment of cancer. Various applications of the software were also presented and published earlier in different journals (*Med Phys 36(6), p.2547 (2009); J Appl Clin Med Phys 11 (1), 2010*). The main objective of this work was to review the applications of the program, and to present its current status.

Method and Materials: Matlab based codes were primarily designed to read RTOG data formats exported from the Pinnacle[3] treatment planning system (TPS; Philips Healthcare, Best, Netherlands), and to write into a simpler HART format. This format is the basis to execute various applications in the software, such as the conventional and spatial dose-volume (or surface) histogram (CSDH) analyses, universal plan indices (UPI) evaluation, biological modeling based outcome analyses (BMOA), radiobiological dose response modeling (DRM), and physical parameterization (PP) modules to estimate the differential attenuation coefficients and center of mass of a region of interest. The program executes efficiently due to the simple computational mechanism, graphical simulations, and flexible interactive modes. The CSDH computational module was the most applicable feature for the global users of HART in the past three years. The fundamental results in various applications were validated with the Pinnacle[3] data.

Results: Currently, HART offers CSDH computational modules, UPI evaluations, BMOA features, DRM simulations, and PP modules respectively for the IMRT and 3DCRT plans. The program is also available online.

Conclusion: Several applications have been upgraded into a simpler, user-friendly, and automated software package (HART). The open-source mechanism would be useful to the radiation oncology community. We expect to develop HART for various applications in radiotherapy research, and its expansion to other TPSs in the future. This work was partially supported by NIH/NIDCD grant.