Purpose: Histogram Analysis in Radiation Therapy (HART) is an efficient dose-volume histogram (DVH) computational tool in radiation therapy and radiation oncology research. Various applications of the software were also presented and published earlier in different journals (Med Phys 37(6), p.3217, 2010; J Appl Clin Med Phys 11(1), p.3013, 2010). The main objective of this work was to review the important applications of the program.

Method and Materials: MATLAB based codes were primarily designed to read and write a simpler HART format of the DVH statistics, from the standard RTOG data formats exported from the Pinnacle3 treatment planning system (TPS; Philips Healthcare, Best, Netherlands). Various applications such as conventional DVH (cDVH) analysis, and spatial DVH (sDVH; x-, y-, and z-DVHs respectively) analysis, universal-plan indices (UPI) evaluation, biological modeling based outcome analyses (BMOA), radiobiological dose-response modeling (DRM), and physical parameterization (PP) modules have been incorporated in the program. The fundamental results obtained in these applications, were thoroughly validated using the primary data derived from the DVH statistics extracted from the Pinnacle3 system. The program also comprises the simple computational mechanism, the graphical simulations, and the flexible interactive modules.

Results: HART offers cDVH and sDVH computational modules, UPI evaluations, BMOA features, DRM simulations, and PP modules respectively for the radiotherapy plans. The cDVH and BMOA were the most applicable features among the HART users in the past year. Nearly 50% of the users (N=91) have found the program useful around the globe. The program is also available freely online*.

Conclusions: Several applications have been upgraded into a simpler, user-friendly, and automated software package, HART. The program is useful to the medical physics and radiation oncology communities. We further expect to develop HART for various applications in radiotherapy research, and its expansion to other TPSs that utilize DICOM-RT objects.

*http://www2.uic.edu/~apyaku1