Purpose: To assess the usefulness of treatment volume (V100) in patient specific HDR treatment plan quality assurance.

Methods: The Nucletron Plato and Oncentra treatment planning systems were used in this study. Results from both film-based 2D and CT-based 3D planning have been included. Plots of time x activity/dose (T*A/D) versus V100 were constructed for various "fixed " geometry systems such as vaginal cylinders (n=167), endobronchial and esophageal tubes, (n=79) and tandem/ring systems (n=352; pt A dosimetry) as well as for larger interstitial volume implants (n=25). For single catheter applicators, plots of V100 as a function of active length (AL) or treating distance (d) were also made.

Results: The T*A/D vs V100 plots for the fixed systems above were all very linear (r2 of at least 0.98); a slight improvement in some cases was noted when a second order polynomial was used to fit the data. The volume implant data were best fit with a second order polynomial (r2 = 0.98). For a given treating distance, V100 not surprisingly was a linear function of active length (2.5 to 17 cm) for single or quasi-single (2 or 3 catheter esophagus) line applicators. We found that V100 values were extremely consistent for a given treating distance and active length (e.g. 36.64 ± 0.45 cm3 for d= 1.5 cm and AL = 4 cm). For tandem/ring applicators, V100 values could achieve similar consistency only if considerable care was taken in defining the catheters.

Conclusion: Volume data provide a simple, fast and consistent method of checking new treatment plans against historic data (representative samples of which need to be independently verified). For simple applicators, both the V100 and the value of T*A/D may be used for this comparison.