

AbstractID: 1897 Title: Principle Component Analysis as Applied to Volume Effects in Treatment Outcomes for Patients with Prostate Cancer Treated with 3D-CRT

Dose-volume histogram (DVH) variables are widely used to investigate volume effects in treatment outcome. However, due to specific beam geometries used to treat patients, volumes exposed to \geq particular doses are often strongly correlated with each other, making it difficult to detect the dose levels that may underlie the outcome.^{1 2} To attack this problem, a principle component analysis (PCA) of DVHs for patients who received 70.2 or 75.6 Gy prescription dose with 6 field 3D-CRT for prostate cancer

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Bookmark not defined. is performed. Patients were classified as bleeding if they developed bleeding before 30 months from the end of treatment and non-bleeding if they did not. We assess the correlation of the % rectal wall volume exposed to radiation, and the absolute unexposed rectal wall volume (absolute volume receiving \leq a given dose), with rectal bleeding within the PCA framework. The PCA constructs a new set of uncorrelated variables via a linear transformation of the original (DVH) variables. Most of the variance in the original data can be explained by a small number of principle components that embody the independent possibilities available to the treatment planner in practice, thereby reducing the number of degrees of freedom necessary to explain the variability in the data. The utility of this methodology is discussed vis-à-vis the segregation of bleeding and non-bleeding patients and the interpretation of doses relevant to rectal bleeding.

¹ Marks et. al Proceedings of the 45th Annual ASTRO Meeting , 153

² Deasy et. al Int. J. Radiat. Oncology, Biol., Phys. 57(2) Supp. 2003