

## AbstractID: 5675 Title: Evaluation of immobilization devices using EPID measurements of patient set up variations

**Purpose:** Methodology to evaluate the performance of immobilization devices for head and neck (H&N) treatments using EPID measurements and a multiple linear regression model.

**Method and Materials:** The immobilization devices considered for the analysis were: UON™ mask, Type-S™ and Bear Claw™ head/neck/shoulder systems. We acquired daily electronic portal images for 35 H&N patients. PortalVision™ software was used to perform anatomy matches using the Digital Reconstructed Radiograph from the CT-simulation, as the matching anatomy reference. The two-dimensional mismatch data decomposed into the appropriate components along each body axis and the orientation of the patient, gantry and couch angles were considered. In order to evaluate the impact of the immobilization device on the deviation of a particular reference structure between simulation and treatment, we used a multiple linear regression model.

**Results:** Although the mean values of the estimators are adequately estimated under the simple statistical procedures, the standard deviations of those estimators will be biased due to the clustered nature of data. The biasness in standard deviations will invalidate the T- and F-tests. In order to correct for biasness of the standard deviations, we used a linear regression approach to generate robust standard errors corrected for clustering. We compared the results of an uncorrected linear regression with the corrected ones. Even though the uncorrected model showed statistically significant impact of using a particular device on the mean of the variation, the significance is eliminated when using corrected standard errors.

**Conclusion:** By correcting for clustered and heteroscedastic nature of the data in a multiple regression setting, we assessed the degree of inter-fractional variation and concluded that it is independent of the immobilization method. The effect of other factors (i.e. patient characteristics, experience of staff) on mean deviation may need to be considered for further analysis.

**Conflict of Interest:** Partially funded by Varian.