AbstractID: 3674 Title: Investigation of variables affecting residual motion for respiratory gated radiotherapy

**Purpose:** Breathing training may help improve respiration motion regularity. This study was conducted to statistically and clinically determine if residual motion was affected by some characteristics of patients. The aims of this study were: 1) To identify significant characteristics affecting respiratory motion for respiratory-gated radiotherapy, 2) To investigate time trends of respiration motion over a period of days (inter-session) and 3) To investigate time trends of respiration motion within the same day (intra-session).

**Method and materials**: 24-lung cancer patients were enrolled in an IRB approved protocol; acquiring 331, 4-minute, respiration motion traces with free breathing, audio-instructions and audio-visual biofeedback for approximately 5-sessions each. The residual motion was quantified by the standard deviation of the displacement within the gating window.
The generalized linear model was used to obtain coefficients for each variable within the model and evaluate the clinical and statistical significance. The statistical significance was determined by a p-value $<0.05$ while effect sizes of $\geq 0.05$cm were considered clinically significant. Effect size is calculated as the product of estimated coefficients with the range of that variable.
This data analysis was applied to: time independent analysis, inter-session analysis and intra-session analysis.

**Results**: Disease type and dose-per-fraction were significant for both inhale and exhale-based gating. In addition, for inhale-based gating visual training displacement, breathing type and Karnosky-performance status values were significant for inhale-based gating. The inter-session and intra-session analysis did not show significant time trends for any of the variables considered.

**Conclusion:** Certain variables were found to be significant for time independent analysis. The results of the inter-session analysis indicated that the margin component to account for residual motion during gated radiotherapy remained constant throughout the treatment. Also, the patients breathing did not alter over a period of time within a session and they could maintain the reproducibility during a treatment fraction.