

## AbstractID: 12628 Title: A quantitative assessment of the improvement in lung treatment accuracy with IGRT in TomoTherapy

**Purpose:** The use of extremely high dose gradients in IMRT has made patient positioning accuracy even more critical than in previous modalities. Our purpose is to quantify the improvement in setup accuracy with the use of IGRT for patients undergoing radiation therapy of the lung with TomoTherapy. We also investigate whether the first few imaging sessions could serve as a predictor of subsequent daily shifts for a given patient. **Method and Materials:** Megavoltage computed tomography (MVCT) was carried out at each treatment fraction immediately prior to treatment. The MVCT was fused to the planning KVCT and the resultant X,Y,Z offsets determined by a combination of automatic registration as well as operator adjustments. A total of 2,496 X,Y,Z measurements from 34 patients were collected for this study. **Results:** All three axes contributed significantly to the overall mean vector shift of 10.5 mm. The mean vertical shift (Z direction) is 6.5 mm. The mean shift in the longitudinal direction (Y) is 5.2 mm, while the mean in the lateral direction (X) is 3.7 mm. The variation in shifts between different patients was significant and varied by at least a factor of five. We also found that variations in daily position for an individual patient could vary by at least a factor of five. **Conclusion:** This study demonstrates quantitatively, that the potential improvement in radiotherapy geometric treatment accuracy is approximately 10.5 mm, with the use of IGRT in lung TomoTherapy. Given the variability in daily patient positioning, averaging initial patient shifts is not an accurate predictor of subsequent patient setup position.