Automated Data Mining of Lung SBRT Cases for Predicting Dosimetric Indices in Prospective Plans

A screenshot from the scripted workflow, illustrating the automatically generated structures used for measuring mean dose gradients and creating OVHs, is shown below (Fig. 1). The resulting ipsilateral lung OVHs for the 10 pilot study patients, consisting of lung SBRT targets with various sizes (15.2 - 87.5 ml) and locations (upper, middle or lower lobe), are illustrated below (Fig. 2).

![Scripted workflow screenshot](image1.png)  ![Ipsilateral lung OVHs](image2.png)

Fig. 1 – Scripted workflow screenshot  
Fig. 2 – Ipsilateral lung OVHs

The mean dose gradients used to quantify the dose fall-off from the PTV as it is expanded into the ipsilateral lung are illustrated to the right (Fig. 3). The PTV was expanded in 1 mm increment shells for the first cm, followed by 5 mm increment shells for the remaining 14 cm. The region illustrated in inset highlights the similar plan quality throughout the 10 evaluated patients (an average mean ± SD dose gradient of -4.1 ± 0.6). The average mean dose gradient indicated that all of the SBRT plans had similar and acceptable quality.

![Mean dose gradients for the SBRT plans](image3.png)

Fig. 3 – Mean dose gradients for the SBRT plans

OVHs were created to evaluate potential predictors of achievable lung dose constraints by measuring the amount of ipsilateral lung volume overlapping the uniformly expanded PTV. Based on the knowledge that OVHs depend on the size and spatial relationship of the lung and PTV structures, we examined OVH-derived indices as predictors of achievable lung dose. OVH data indicated that 0 mm and 10 mm PTV expansions (Fig. 4, left and right, respectively) correlated with the mean lung dose (correlation coefficients of 0.71 and 0.56, respectively).

![OVH with PTV expansions of 0 mm (left) and 10 mm (right) versus mean lung dose](image4.png)

Fig. 4 – OVH with PTV expansions of 0 mm (left) and 10 mm (right) versus mean lung dose