actual indication for protons thus heavily rests on individual clinical and patient dependent a priori risk factors.

Table 1
Dosimetric parameters for lung and heart for the different techniques and corresponding NTCP for symptomatic radiation pneumonitis (values in Gy or %).

<table>
<thead>
<tr>
<th></th>
<th>H-VMAT (reference)</th>
<th>L-VMAT</th>
<th>H-LNPT</th>
<th>L-LNPT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Lung Dose</td>
<td>18.3±3.6</td>
<td>19.4±3.9</td>
<td>8.9±2.1</td>
<td>8.6±2.3</td>
</tr>
<tr>
<td>V20 Lung</td>
<td>34.7±2.4</td>
<td>25.0±2.7</td>
<td>17.0±4.0</td>
<td>14.9±4.4</td>
</tr>
<tr>
<td>Mean Heart Dose</td>
<td>9.5±3.1</td>
<td>15.0±2.9</td>
<td>3.2±1.1</td>
<td>4.9±1.1</td>
</tr>
<tr>
<td>V20 Heart</td>
<td>10.1±3.9</td>
<td>19.1±2.9</td>
<td>4.3±2.0</td>
<td>7.1±2.1</td>
</tr>
</tbody>
</table>

Table 2
Risk of radiation pneumonitis
- QUANTEC dose only: 17.2±4.5, 11.4±2.4, 6.2±1.6, 5.4±1.6
- QUANTEC, low clinical risk: 10.1±1.4, 6.0±1.5, 3.0±0.9, 2.6±0.9
- QUANTEC, high clinical risk: 54.8±6.1, 41.2±5.2, 25.3±5.7, 23.0±5.8

Conclusion: These results demonstrate that the potential of proton therapy to reduce the risk of radiation pneumonitis requires considerable reduction in lung dose, but translation into clinical significance is heavily driven by patient and clinical a priori risk factors. Therefore, multivariable NTCP models should play a major role in identifying patients eligible for proton therapy.

Material and Methods: Ten lung patients who were previously treated with Linac-based SBRT were included. For each patient, GTV, PTV, cord, lungs, heart, esophagus, and ribs were delineated. All Linac-based SBRT plans were generated using VMAT and consist of 2-10 6MV Rapid Arcs. Patients received prescription doses of 48 Gy/4fx to 50 Gy/5fx. The Linac-based plans were imported into the View Ray MR-IGRT system for planning. Three-source Co60 plans were generated using step-and-shoot IMRT and utilized Monte Carlo dose calculation including the magnetic field correction of 0.35T. The PTV coverage for both Linac-based three-source Co60 SBRT plans were such that 95% of the PTV received 100% the prescription dose. Finally, Linac- and three source Co60 - based plans were evaluated using dose-volume constraints for critical structures and target conformity index (CI), homogeneity index (HI) for the PTV.

Results: The differences between PTV HI for Linac- and three-source Co60 - based SBRT plans were not statistically significant, ranging from 1.05 to 1.15. Three patients with the CIs >1.2 had target volumes <20cc although the location of the target did not have much influence on meeting the criteria for the target conformity. For all patients, the critical structure doses, such as maximum cord dose (<26 Gy), dose to <15 cc of the heart (28Gy<15cc), and <5cc of the esophagus (18.8 Gy<5cc) were satisfactory with both techniques. For lung, although both the dose to <1500cc (11.6 Gy<1500cc) and <1000cc (13.6Gy<1000cc) criteria were met with both techniques, on average, the lung volumes receiving the 11.6Gy and 13.6Gy were 59.5% and 61.28% higher with three-source Co60 as compared the Linac-based SBRT plans respectively (P<0.05). As expected, low dose portion of the DVH for all critical structures generally covered much higher percentage of the critical structure volumes with three-source Co60 SBRT plans as compared to the Linac-based SBRT plans.

Conclusion: Overall, a three-source Co60 integrated MR-IGRT system produced comparable dose distributions to the ones obtained with the Linac-based lung SBRT. Further studies are needed to evaluate benefits of this novel MR-IGRT system for lung SBRT, especially its ability to image and plan in real time and online adaptive treatment delivery.

PV-0174
Experimental verification of 4D Monte Carlo calculations of dose delivered to a moving anatomy
J. Cygler1, S. Gholampourkashi2, J. Belec1, M. Vujicic1, E. Heath3
1The Ottawa Hospital Regional Cancer Centre, Medical Physics, Ottawa, Canada
2Carleton University, Physics, Ottawa, Canada

Purpose or Objective: To experimentally validate a 4D Monte Carlo (MC) simulation method to calculate the dose...