AbstractID: 1841 Title: Comparison of optimal beam orientations: IMRT versus 3D conformal

Previous researchers have shown that beam orientation selection plays a major role in the ability to escalate dose within certain dose-volume constraints. With Intensity Modulated Radiation Therapy (IMRT), a fluence modulation optimization must be performed for each possible orientation arrangement, which is very time consuming. In this study, we investigate if beam orientations optimized for 3D conformal therapy (3DCT) can be used to simplify this search task. Contoured volumes of five prostate cancer subjects were analyzed. The target was defined as the prostate plus a margin. A three beam orientation selection global search was performed with candidate beams evenly spaced axially at 10°, starting at 0°. This global search was conducted for both 3DCT and IMRT treatment plans using a previously developed heuristic algorithm from our lab that uses target equivalent uniform dose (EUD) maximization as the objective. Our results show three major findings: 1) The optimal orientation for IMRT beams are different than the optimal orientations for 3DCT. 2) Three beam orientation optimized IMRT can deliver, on average, 15% higher EUD to target versus the optimized 3DCT. 3) Using the best five orientations for 3DCT as a pre-selected subset for investigating orientation selection for IMRT would result in a minimal decrease of 3.3% to target EUD compared to that achievable with beam orientations chosen specifically for IMRT. In conclusion, optimal orientations for 3DCT are not optimal orientations for IMRT plans; however, these orientations may be used to rapidly generate slightly sub-optimal orientation arrangements with minimal loss of target dose.