

AbstractID: 11358 Title: How accurate are treatment planning system isodose values outside the treatment field?

Purpose: The purpose of this work was to quantify the discrepancy between the out-of-field doses as reported by a treatment planning system (TPS) to the actual measured doses.

Method and Materials: Out-of-field doses were determined at the same location in phantom for a range of distances from the field edge using the treatment planning system (TPS) and thermoluminescent dosimeters (TLD). A typical radiation plan for Hodgkin lymphoma was created using Eclipse TPS (Varian Medical Systems, Palo Alto, CA) for an anthropomorphic male dosimetry phantom. TLD capsules were placed in the phantom at distances ranging from 1.25 cm to 18.75 cm inferior to the field edge. The phantom was irradiated with the full treatment plan dose. TLDs were read using an established laboratory protocol with an error of $\leq 3\%$. For comparison, the out-of-field doses at the same positions were determined in the TPS using the point dose measurement tool.

Results: As expected, the doses from both the TLD and TPS decrease exponentially as a function of distance from the field edge. Close to the field edge (within 1.25 cm), the TPS overestimated the actual dose by approximately 13%. At larger distances from the field edge the TPS underestimated dose with the magnitude of the underestimation increasing with increasing distance from the field edge. At a distance of 11.25 cm from the field edge, the TPS underestimated the dose by 53%. The TPS reported no dose at distances greater than 12 cm from the field edge.

Conclusion: Studies requiring doses to organs out of the treatment field should not rely on the treatment planning system. Measurements using anthropomorphic phantoms or mathematical calculation models that are benchmarked for out-of-field doses should be used to determine doses to peripheral organs and tissues.

Conflict of Interest (only if applicable): n/a