Purpose: Intensity Modulated Radiation Therapy (IMRT) is currently the modality of choice for optimum dose conformability for head and neck (H&N) patients. We have quantified the sensitivity of H&N treatment delivery to errors in the gantry angle (GA) using EPIDose[1], an IMRT QA tool used in our centre.

Methods: EPIDose was modified to read in the planned GA for each field, add an 'error' term, and continue with analysis. Systematic errors (shifting all fields' GA together by same value) and a subset of random errors (using different values for each field) up to 5 degrees were studied.

Analysis consisted of recreating the dose based on the captured images (including the modified GAs), and creating Chi distributions (using 3% dose-difference, 3mm distance-to-agreement parameters) between planned and reconstructed doses for two dose ranges: dose above 80% of prescription dose, for primary tumour volume, and the region with 40% to 80% of prescription dose, focusing on organ-at-risk. For the planned and reconstructed dose to be considered clinically equivalent at least 90% of the data-points being compared in either region needed to have a Chi value between -1 and +1.

Results: Based on 20 plans, the average systematic error that can be introduced into H&N IMRT plans without having the planned and reconstructed dose considered clinically different, via the metric discussed above, is 2.4±0.5 degrees. Random error affected 13 of these plans, with the average error being 4.4±0.8 degrees.

Conclusion: During delivery of H&N treatments, discrepancies in the GA less than approximately 1 degree (3 standard deviations from average systematic error) are not flagged as clinically relevant by our QA procedure, suggesting no accuracy impact to IMRT plan delivery. Fortunately, this is greater than 0.5 degrees standard tolerance set by CAPCA (Canadian Association of Provincial Cancer Agencies).

1. Medical Physics 33 (2006) 3369-3382 W.Ansbacher