Abstract ID: 15878 Title: Model prediction of radiation induced duodenal toxicity for a dose escalation in radiation therapy of Pancreatic Cancer using Published Reports.

Purpose: Safe dose escalation for RT of pancreatic cancer is limited by the surrounding organs at risk, particularly the duodenum, which is adjacent to the pancreas. The purpose of this work is to estimate the radiation induced duodenal toxicity using dose-volume response data extracted from the literature for a proposed dose escalation of 72 Gy in 28 fractions via IMRT simultaneously integrated boost.

Methods: Two patients treated for pancreatic cancer at our institution were randomly selected to retrospectively alter their treatment plan to simulate the testing dose escalation of 50.4 and 72 Gy in 28 fractions to the pancreatic head and the GTV, respectively. The report by Murphy et al. on SBRT of Grade 2 or higher duodenal toxicity was used to estimate NTCP using testing protocol DVHs. The Modified LQ model by Guerrero and Li was used to calculate the iso-effective dose in the testing protocol producing the same effect as doses in the SBRT regime. Additional analysis of NTCP variation considered alpha-beta ratios of 3 to 5 Gy for small bowel/duodenum late effects.

Results: The testing protocol iso-effective dose, D, associated with 25 Gy in a single fraction had a median value of 61.2 Gy and ranged from 56.3 to 68.0 Gy. The first patient had a high estimated risk of toxicity (0.45) due to the duodenal volume being greater than 0.21 cubic centimeters. A lower risk of toxicity was estimated for the second patient due to the duodenal volume being less than 0.21 cubic centimeters.

Conclusion: Estimates of duodenal toxicity can be made despite the limited number of toxicity data available. A conservative dose-volume constraint would limit 0.21 cubic centimeters of the duodenal volume to no more than 56 Gy. The estimates of duodenal toxicity exhibit a dependence on the value of alpha-beta ratio of the duodenum.