Abstract 1137; Table

	Intercept Adjustment	Calibration Slope (not adjusted)	Log-Likelihood	AUC	HL-test (p-value)
QP	0.48	1.97	-51.8	0.72	0.002
AQP	0.63	0.90	-53.1	0.69	0.36
NQP	-1.18	0.90	-49.0	0.74	0.20

evaluated the performance of the QUANTEC pneumonitis (QP) model, QUANTEC model adjusted for clinical risk factors (AQP), as well as the newer NQP model (ESTRO 2017, which has a steeper slope and includes current smoking) for predicting RP from PBT.

Materials/Methods: The external validation cohort consisted of 110 consecutive patients with LA-NSCLC treated with CRT using PBT. Patient, tumor, dosimetric, and other treatment characteristics were collected. RP was retrospectively scored at 3 and 6 months post treatment using CTCAE v4.0. Model performance was tested for goodness of fit (log-likelihood), discrimination (area under the curve, AUC), and calibration (Hosmer-Lemeshow test, HL-test). A closed testing procedure was performed to test the need for model updating, either by recalibration-in-the-large (re-estimation of model intercept), recalibration (re-estimation of intercept and slope) or model revision (re-estimation of all coefficients).

Results: There were 23 events (21%) of Grade 2 or higher RP. On univariable analysis, mean lung dose ($p<0.001$), V5 ($p=0.002$), V20 ($p=0.002$), V40 ($p<0.001$) and total lung volume ($p=0.02$, protective factor) were found to be significantly associated with RP. The closed testing procedure indicated adjustment of the intercept only for all three models.

The overall best performance was found for the NQP model with adjusted intercept. Recalibration of the slope or refitting the entire model did not significantly improve the model. Model-extension by adding other predictors like total lung volume, V5, V20 and V40, which were found to be significant on univariate analysis, also did not significantly improve the model.

Conclusion: The similarity between dose response relationship for PBT and photons for normal tissue complications has been an assumption until now; however, the widely used QP and AQP models did not fit PBT data well for our cohort. We demonstrate that the recently presented NQP NTCP model that was developed for photons can also be valid for PBT with minor modifications. The negative intercept adjustment needed for protons is intriguing and indicates that the complication rate for protons was lower than expected by the model. This model, if further validated, can provide the critical need to predict RP using PBT and facilitate model-based treatment modality selection.

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Impact of Intensity Modulated Radiation Therapy on Acute Toxicity in Locally Advanced Lung Cancer: Results of a Large Statewide Multi-center Cohort

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Purpose/Objective(s): Secondary analysis of RTOG 0617 has shown lower rates of pneumonitis and less decline in patient quality of life with the use of intensity modulated radiation therapy (IMRT) versus three-dimensional conformal external beam radiation therapy (3D-CRT) in locally advanced non-small cell lung cancer patients undergoing definitive radiation therapy. In a large statewide radiation oncology quality consortium, we sought to evaluate impact of IMRT vs. 3D-CRT treatment technique on acute esophagitis and pneumonitis.

Materials/Methods: From 2013 to 2017, 1919 patients with non-metastatic lung cancer were enrolled in the consortium. Physician reported toxicity by CTCAE and patient reported outcomes using FACT Lung Cancer Subscale (LCS) and FACT Trials Outcomes Index (TOI) were collected at 1, 3 and 6 months from the end of radiation. We compared physician and patient reported quality of life by treatment technique. Normal tissue dose volume constraints and PTV objectives were not prospectively controlled. To account for differences in prognostic factors between IMRT and 3D-CRT patients, we performed inverse probability of treatment weighting (IPTW) via a propensity score. The propensity score was estimated via a logistic regression model and included age, smoking status, comorbidities, stage, PTV volume, chemotherapy, prescription dose, total number of structures and individual structures (e.g. esophagus, heart) within 2cm of the PTV.

Results: There were 1237 non-surgical locally advanced lung cancer patients met inclusion criteria. After excluding patients with missing variables, 1062 (86%) were included in the analysis. 31% were treated with 3D-CRT and 69% were treated with IMRT. Compared with 3D-CRT patients, IMRT patients had significantly larger PTVs (mean 370 vs 474cc) and were more likely to be stage IIIB (24% vs 32%). In logistic regression models using IPTW, there were no significant differences between 3D-CRT and IMRT in rates of esophagitis (Odds Ratio $=0.95$; 95% CI$=0.70$, 1.32; $p=0.76$) or pneumonitis (OR $=0.91$; 95% CI:0.43, 1.92; $p=0.80$). At 6 months after completion of RT with a compliance of 45%, 3D-CRT and IMRT resulted in similar proportions of patient experiencing a decline of at least 2 points on LCS (38% vs 45%, $p=0.33$) and at least 5 points on TOI (48% vs 54%, $p=0.72$).

Conclusion: In these data from a statewide consortium of academic and community radiation oncology practices, despite the PTV being larger among patients treated with IMRT vs 3D-CRT, no significant difference in acute esophagitis or pneumonitis by radiation treatment technique was found. Further analysis is underway seeking to use patient variables and dose relationships to identify a subgroup of patients in which IMRT may reduce toxicity relative to 3D-CRT.

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Late Gadolinium Enhancement (LGE) in Cardiac Magnetic Resonance Imaging (CMR)

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Purpose/Objective(s): Mechanisms of radiation-induced cardiac toxicity are not well understood and are currently being investigated. In this proof-of-concept study, we hypothesize that regions of high radiation dose in the myocardium correlate with late gadolinium enhancement (LGE) on cardiac magnetic resonance imaging (CMR), which is a marker of myocardial damage.

Materials/Methods: There were 28 patients without cardiac history with chest tumors treated with radiation therapy and a heart dose $V_{5Gy} \geq 10\%$