Conclusions: We found that dose to the intestinal cavity ($V_{32Gy}$ and $V_{46Gy}$) was associated with acute diarrhea and chemotherapy treatment compliance in patients treated with IMRT for primary rectal cancer. The results are not in direct agreement with results from patient cohorts treated with 3D-CRT, where $V_{15Gy}$ has consistently been reported as an optimal dose cut-off.

**PO-0910**

Local control prediction for NSCLC using a common LQ-based TCP model for both SABR and 3D-CRT fractionation

C. Baker1, A. Carver1, A. Nahum1

1The Clatterbridge Centre NHS Foundation Trust, Physics Department, Wirral, United Kingdom

**Purpose/Objective:** Opinion in the literature is divided as to whether the LQ model of cell kill, and consequently TCP models based on it, are applicable for the relatively high dose per fraction delivered during SABR treatments of NSCLC. This work aimed to establish whether LQ-based TCP modelling can adequately describe observed local control in NSCLC radiotherapy for both 3D-CRT and SABR deliveries, through fitting model parameters to reported outcomes for both techniques.

**Materials and Methods:** Two patient cohorts, each comprising approximately 25 clinical PTV DVHs, were constructed from retrospective clinical data for mixed-stage 3D-CRT and stage I SABR treatments. Cohorts differed in GTV sizes (averaging 106 cm$^3$ for 3D-CRT and 15 cm$^3$ for SABR) and dose variation due to the lower isodose level (67 to 80% of isocentre dose) covering the PTV for SABR. An LQ-based TCP model was used to predict local control for individual PTV DVHs, which were then averaged over each cohort to estimate local control for that population. Fixed parameters were clonogen density within the GTV (1e7 cm$^{-3}$), alpha-beta ratio (10 Gy), time to the onset of accelerated repopulation, $T_a$ (21 days) and doubling time, $T_d$ (3.7 days). Free parameters fitted to published outcome data were mean radiosensitivity, $\alpha$, and standard deviation $\sigma_\alpha$. Parameters were fitted to reported local control at 2 years for a range of dose/fractionation schedules using maximum likelihood estimation. Best fit parameters were derived for combined 3D-CRT and SABR outcome data and for each technique separately. Uncertainty estimates on derived parameter values were derived from likelihood profiles to assess the significance of parameter set differences.

**Results:** Best-fit TCP model parameters (and 95% confidence intervals) for combined 3D-CRT and SABR cohorts were $\alpha = 0.293$ (0.286 to 0.302) Gy$^{-1}$ and $\sigma_\alpha = 0.051$ (0.042 to 0.067). Best-fit parameters resulting from separate fitting to only 3D-CRT data fell within the 95% confidence limits of these values. For SABR-only fitting, $\alpha$ (only) fell outside this confidence interval; $\sigma_\alpha = 0.313$, $\sigma_\alpha = 0.06$, however the 95% confidence interval on SABR-derived $\alpha$ (0.292 to 0.342) encompassed the fit to combined data. Resulting local control estimates are compared with the literature in the figure below, along with the predictions for separate model fitting to 3D-CRT and to SABR data. Repopulation-corrected equivalent 2Gy dose (EQD2) to the isocentre is used as the metric, indicating a smooth transition from 3D-CRT to SABR techniques.

**Conclusions:** An LQ-based TCP model was found to adequately reproduce reported 2-year local control for both 3D-CRT and SABR NSCLC techniques. Further, a common parameter set ($\alpha$, $\sigma_\alpha$) was found to be consistent with data for both techniques, despite the large dose and GTV size differences between patient cohorts. No significant advantage was found in fitting parameters to each technique separately.

**PO-0911**

Method to estimate tumour response in boost scenarios based on clinical data

A. Lühr1, S. Löck2, A. Jakobi3, K. Stützer3, C. Richter3, M. Baumann4, M. Krause1

1German Cancer Consortium (DKTK) and German Cancer Research Center (DKFZ), Partner Site Dresden, Dresden, Germany
2OncoRay - National Center for Radiation Research in Oncology, Medical Radiation Physics, Dresden, Germany
3OncoRay - National Center for Radiation Research in Oncology, High Precision Radiotherapy, Dresden, Germany

**Conclusions:** An LQ-based TCP model was found to adequately reproduce reported 2-year local control for both 3D-CRT and SABR NSCLC techniques. Further, a common parameter set ($\alpha$, $\sigma_\alpha$) was found to be consistent with data for both techniques, despite the large dose and GTV size differences between patient cohorts. No significant advantage was found in fitting parameters to each technique separately.