was maintained as long as the effect metric used for Cox regression had a linear correlation with the true effect metric of at least 0.50. The conclusions held if the trial cohort consisted of an expected high benefit population (22% reduced sample size), but the effect was even stronger if the cohort was a population with modest expected benefit (31% reduced sample size).

### Table 1: Standard trial design (log-rank statistics) compared to model based Cox regression. Risk factors included were, pre-existing pulmonary co-morbidity (HR = 2.27), mid or inferior tumour location (HR = 1.97), current smoker (HR = 0.62) and old age (HR = 0.56). The consequences of a misspecified effect metric were examined for correlations ranging from 0 to 0.65; example results are shown.

<table>
<thead>
<tr>
<th>Population</th>
<th>Estimated trial size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard population</td>
<td></td>
</tr>
<tr>
<td>JM/40 Gy, s.d. 2 Gy, normal risk factor prevalence</td>
<td>744 patients</td>
</tr>
<tr>
<td>Model-based (Cox regression to JM/40)</td>
<td>614 patients</td>
</tr>
<tr>
<td>Model-based (misspecified effect metric, correlation 0.80)</td>
<td>743 patients</td>
</tr>
</tbody>
</table>

**Conclusion:** We have demonstrated that the required patient sample size for randomized trials in radiation oncology may be considerably reduced by taking heterogeneous dose-effect into account. Dual planning provides support for the statistical outcome modelling that increases trial power even if the dose-response model is moderately misspecified. The outcome of a trial in the example studied would be a randomized measure of benefit per Gy ∆MLD with confidence interval.

### EP-1725
**Predictors of diarrhea after whole-pelvis post-prostatectomy radiotherapy**

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**Purpose or Objective:** Gastrointestinal (GI) toxicity is a side-effect induced by whole pelvis intensity modulated radiotherapy (WP-IMRT), affecting importantly patients’ quality of life. The aim of this study was to identify predictors of diarrhea in a cohort of chemo-naïf patients treated with WP-IMRT after prostatectomy.

**Material and Methods:** The Inflammatory Bowel Disease questionnaire (IBDQ) was used to assess the degree of GI symptoms after WP-IMRT, investigating 4 distinct areas: bowel and systemic symptoms, emotional and social functions. This study focused on the most clinically relevant item 5 relative to the bowel domain, in order to evaluate the differences between patients with versus without diarrhea toxicity. It was used to select the most discriminative DVH parameters.

**Results:** No significant correlation emerged for sigmoid colon, then the analysis was focused on intestinal loops. Patients without basal score and with -IBDQ≤3 were excluded from the analysis: 23/77 pts showed acute GI toxicity. At univariate analysis, volumes receiving 4 to 30 Gy (V5-V20) were correlated with -IBDQ≤3 (p<0.03). Multivariate analysis confirmed a leading role of dosimetric variables, while no significant correlation for clinical parameters was found. Best cut-off values (assessed by ROC) discriminating patients with/without -IBDQ≤3 were: V20=250cc, V30=150cc and V40=90cc. The overall incidence equal to 10% and 50% resulted for the group of patients with DVH parameters lower/higher than thresholds, respectively (p=0.0028, OR=4.9, AUC=0.68).

### Intestinal loops

**Conclusion:** Low-medium IMRT doses to intestinal loops were correlated to diarrhea symptom at half/end of RT. This study proposed new dose volume constraints, that may be used to prevent much radiation-induced GI morbidity.

### EP-1726
**Biological modelling to identify proton therapy candidates in focal boosting of prostate tumours**

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**Purpose or Objective:** MRI-based focal tumour boosting is currently under clinical investigation for prostate cancer patients, e.g. in the FLAME trial. These highly conformal, focal dose distributions can be difficult to achieve with photons, depending on the size and location of the boost volume (i.e. proximity to critical organs at risk). Selected patients might therefore be candidates for proton therapy. In previous work we have established an MRI-based tumour control probability (TCP) model. Combined with published rectum and bladder normal tissue complication probability (NTCP) models we have in this study explored the use of biological (TCP and NTCP) models to identify prostate cancer patients that might be suitable candidates for proton therapy if treated according to FLAME-like trial protocols.

**Material and Methods:** CT scans of seven patients from a prospective trial in our institution were used for planning. To obtain realistic boost geometries, MRI-based index tumours from a different cohort were used (matched on prostate volume), propagated with rigid registration on the prostate volume. VMAT plans (Eclipse, Varian Medical Systems) with and without a boost to the index lesion (95 Gy / 35 fx) were created; both plans delivered a conventional dose (77 Gy / 35