Results: On average, outlier cleaning (ModelUC vs ModelC) had minimal impact on HIB/HIE and OAR sparing, although in 1/10 patients, outlier removal resulted in substantial deteriorations to the sparing of two swallowing OAR (>10Gy increase). Adding 5/10 outliers to the model marginally improved average compsal while increasing the number of outliers to 40 led to a 3.9Gy increase in compsal (Table). The increase in OAR dose, even with 40 outlier plans added to the model, was modest compared to the average increase of 14.9Gy in compsal, in the outlier plans themselves. This is due to the placement of optimization objectives along the lower boundary of the DVH prediction range, which progressively widened with the addition of outliers.

Conclusion: This study reveals that extensive outlier cleaning from this large model comprising 70 consistently made plans had limited impact on the performance of RP. Furthermore, the replacement of >20 plans with those in which the salivary glands were not spared only modestly deteriorated RP performance. In summary, RP demonstrated robustness for moderate proportions of salivary gland dosimetric outliers.

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Clinical simulation of nodal boosting in cervix cancer using reduced margin and coverage probability
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Purpose or Objective: We examined the feasibility of reducing PTV margin when using a simultaneous integrated boost (SIB) of pathological lymph nodes in locally advanced cervical cancer. Additionally the clinical performance of a coverage probability (CovP) planning strategy was investigated.

Material and Methods: 25 previously treated patients with regional lymph node metastases were included. All patients were treated with whole pelvic EBRT (45 Gy/25 fx) using IMRT or VMAT. Nodal GTV contouring was based on MRI in supine treatment position. A CTV-N was constructed based on the combined (fused) nodal GTV-N contoured on MRI and PET-CT. Treatment planning was performed in Eclipse with three margin strategies for the SIB: 1) 10 mm GTV-PTV margin (ICRU PTV10mm plan), 2) 5 mm GTV-PTV (ICRU PTV5mm plan) and 3) 5 mm CTV-PTV margin using CovP (CovP plan). Constraints for the ICRU plans (1+2): PTV coverage of 95-107% of prescribed dose. Running a number of CovP plans in the research dose planning software Hyperion developed dose constraints for CovP planning in Eclipse. CovP dose constraints: PTV5mm D98 >90%, CTV D98 > 100% and a soft constraint of CTV D50 > 101.5% of prescribed dose (Figure 1).

Results: In total 47 lymph nodes were boosted of which 41 (87%) were visible on CBCT. Median number of nodes per patient was 2 (range 1-4). Median GTV D98 and Dmax (%) are listed in Table 1. All nodes treated with ICRU plans had a D98 above 98% and no difference was found between the ICRU plans with regard to target coverage. For CovP the D98 was significantly lower but Dmax significantly higher when compared to the two ICRU plans. Only one node positioned in the true pelvis had a D98 below 95% using CovP. In this patient, bladder filling varied during EBRT, which resulted in large shifts of GTV-N. V50 of body, bones and bowel were significantly lower (p<0.001) with the 5mm margin strategy. A further significant reduction was seen with the use of CovP (p<0.001).

Conclusion: Pathological nodes are visible on CBCT in the majority of patients with locally advanced cervical cancer. Sequential analysis of CBCT taken during EBRT shows that nodal boosting by use of SIB and CovP is clinically feasible providing an increased central dose in the nodes, full target coverage and a significant reduction in near by OAR volumes treated to high doses. CovP based SIB using the above planning aims are now standard at our institution for nodal boosting and will be implemented in the forthcoming Embrace II study.