

# Online Research @ Cardiff

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## Supplementary Information

### S1 Additional Manually Delineated AuxROI Required for PPN

#### 1. Overview

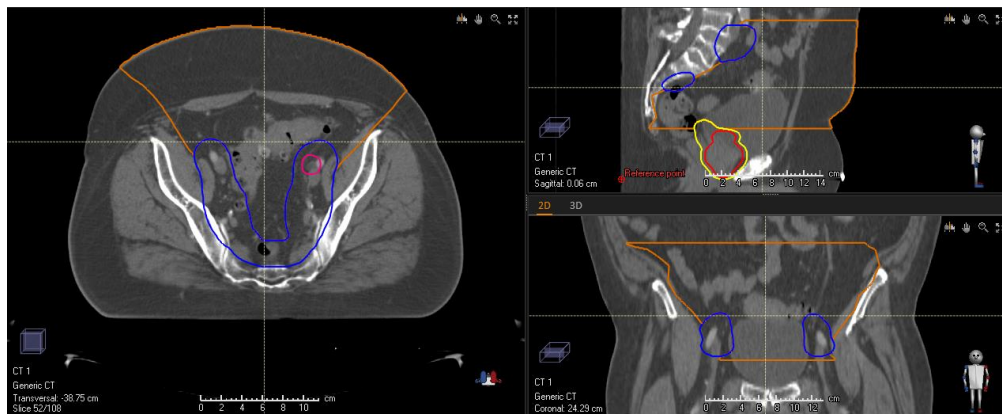
The following details the additional anatomically related BowelBagRegion volume which was manually delineated for all patients prior to automated plan generation.

#### 2. AuxROI Purpose

Bowel is delineated as standard for all patients treated at our centre. During the course of treatment bowel may move within the abdominal cavity and fall outside regions spared by the IMRT/VMAT optimiser. Our clinical practice is therefore to delineate an AuxROI which corresponds to the abdominal cavity, and reduce dose to this region during the optimisation. This ensures that dose is minimised across the whole abdominal cavity and therefore plans are more robust to bowel movement during treatment. BowelBagRegion is delineated manually and does not need to be accurately defined to fulfil its purpose.

#### 3. AuxROI Delineation

Abdominal cavity and tissue anterior to the cavity delineated. Inferior boundary defined as two slices superior to PTV60 and superior boundary defined as at least two slices superior to PTV44. Delineated volume retracted from skin surface and all PTVs to create final ROI (Fig. [S1](#)).



**Fig. S1** Example BowelBagRegion AuxROI (Brown) required for PPN automated planning. PTV60 (red), PTV50 (pink), PTV48 (yellow) and PTV44 (blue) ROIs are also shown.

## S2 Local Clinical Planning Goals for PSV and PPN

**Table S2**

Local Clinical Planning Goals for PSV and PPN

**Priority 1: Primary OAR Objectives**

ROI Name	Dose Parameter	Actionable*
Bowel	D0.1 cm <sup>3</sup>	≤52.7 Gy

**Priority 2: Target and Max Dose Objectives**

ROI Name	Dose Parameter	Actionable*
All PTVs	D99%	≥95% of PTV prescription
Patient Outline	D1.8 cm <sup>3</sup>	≤107% of Prescribed Dose

**Priority 3: Secondary OAR Objectives**

ROI Name	Dose Parameter	Optimal	Actionable*
Rectum	V24.3 Gy	≤80%	-
Rectum	V32.4 Gy	≤65%	-
Rectum	V40.5 Gy	≤50%	≤60%
Rectum	V48.6 Gy	≤35%	≤50%
Rectum	V52.7 Gy	≤30%	≤30%
Rectum	V56.8 Gy	≤15%	≤15%
Rectum	V60.8 Gy	≤3%	≤5%
Bladder	V40.5 Gy	≤50%	-
Bladder	V48.6 Gy	≤25%	-
Bladder	V52.7 Gy	-	≤50%
Bladder	V56.8 Gy	≤5%	≤35%
Bowel	V36.5 Gy	≤78 cc	≤158 cc
Bowel	V40.5 Gy	≤17 cc	≤110 cc
Bowel	V44.6 Gy	≤14 cc	≤28 cc
Bowel	V48.6 Gy	≤0.5 cc	≤6 cc
Bowel	V52.7 Gy	≤0.0 cc	≤0.0 cc

\*Deviations from actionable planning goals are permissible if approved by the treating oncologist.





### S34 Post Calibration Nominal Weights for PPN AutoPlan Protocol

**Table S34**

Nominal weights ( $w_n$ ) for the calibrated PPN AutoPlan protocol planning goals

Priority	Type/Group	$w_n^*$
Priority 1	Primary OAR Goals	1000
	Primary Conformality Goals**	1000
Priority 2	Target Goals	250
Priority 3	Group 1	1.23
	Group 2	4.65
	Group 3	0.500
	Group 4	70.0
	Group 5	1.73
	Group 6	6.30
	Group 7	7.78
	Group 8	24.00
	Group 9***	365
	Group 10	0.800
	Group 11	24.0
	Group 12	5.00
	Group 13	1.26
	Group 14***	31.9
	Group 15	4.27

\* Rounded to 3 significant figures

\*\*Nominal weight manually increased during PPN calibration to match Primary OAR nominal weight

\*\*\*For PTV44 normal tissue fall off goals, the final dynamically adjusted weight was observed to be orders of magnitude smaller than the initial weights ( $w_i$ ) loaded into the optimiser. This discrepancy was reduced by setting the constant  $F_N$  to 0.01. Details of  $F_N$  are provided by wheeler *et al* [1]

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#### **S45 Supplementary Information References**

- [1] Wheeler PA, Chu M, Holmes R, Smyth M, Maggs R, Spezi E, et al. Utilisation of Pareto navigation techniques to calibrate a fully automated radiotherapy treatment planning solution. *Phys Imag Radiat Oncol* 2019;10:41–8. doi:10.1016/j.phro.2019.04.005.

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