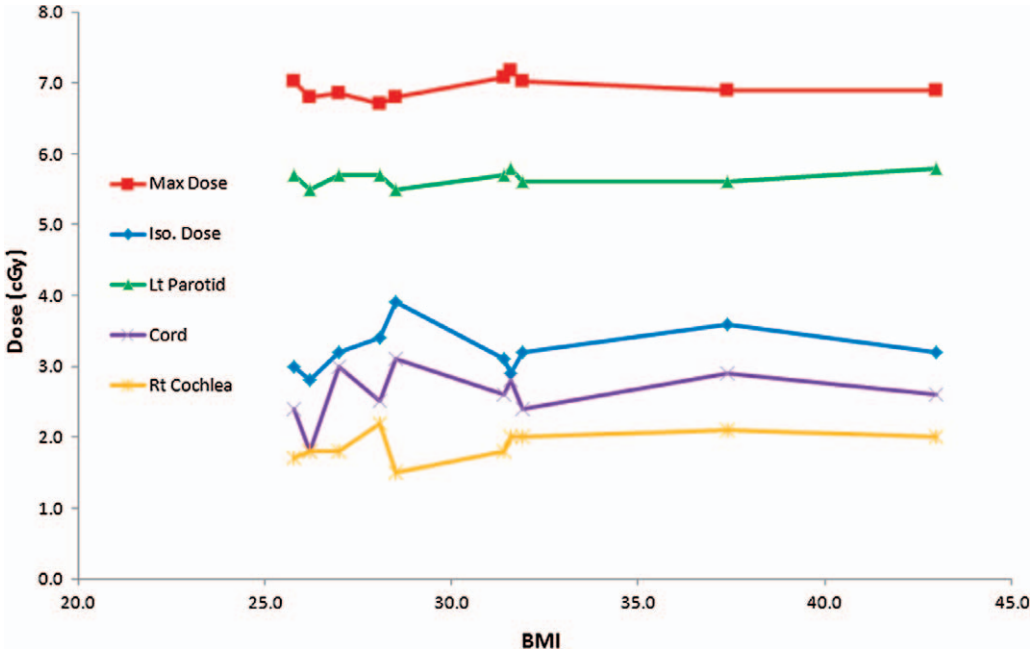
Supplementary material for Alaei P, et al. Dose calculation and treatment plan optimization including imaging dose from kilovoltage cone beam computed tomography. Acta Oncol 2014;53:839–44.



Supplementary Figure 1. Correlation of isocenter, maximum, and several organ doses with body mass index (BMI) for 35 fractions of head and neck imaging for 10 patients. Organ doses are mean dose values. The BMI was calculated on the day of simulation.

Supplementary Table I. Patient-specific data and dose delivered to patients and various organs from daily CBCT of the head and neck cases (35 fractions) and pelvis cases (25 fractions). The values reported for bony structures (femurs and pelvis) are under-estimated by a factor of 2–3 due to inability of the system to compute the dose to the bones accurately.

Head and neck cases		Separation at iso. (cm)			Dose from CBCT (cGy)			Mean dose to select organs from CBCT (cGy)						
Patient	Location of isocentre	Lateral	Ant/post	BMI	Max Dose	Location of max dose	Iso dose	Rt eye	Lt eye	Rt parotid	Lt parotid	Cord	Rt cochlea	Lt cochlea
1	Ant to C1	12.5	17.5	31.9	7.0	behind left ear	3.2	3.0	4.7	2.2	5.6	2.4	2.0	3.9
2	Ant to C1	13.0	19.0	25.8	7.0	left of left eye	3.0	3.0	4.7	1.7	5.7	2.4	1.7	3.9
3	Ant to C1	14.0	18.0	31.6	7.2	behind left ear	2.9	3.0	4.7	1.9	5.8	2.8	2.0	3.8
4	Ant to C4	10.0	14.0	28.5	6.8	left lower neck	3.9	0.8	1.2	1.7	5.5	3.1	1.5	3.4
5	Ant to C2	13.5	15.5	37.4	6.9	behind left ear	3.6	2.9	4.5	2.0	5.6	2.9	2.1	3.9
6	Ant to C2	15.0	18.0	27.0	6.9	behind left ear	3.2	2.8	4.6	1.8	5.7	3.0	1.8	3.8
7	Ant to C2	15.0	18.0	31.4	7.1	left of mouth	3.1	2.8	4.7	1.8	5.7	2.6	1.8	3.6
8	Ant to C1	14.0	18.0	28.1	6.7	left lower neck	3.4	2.8	4.6	2.0	5.7	2.5	2.2	4.1
9	Ant to base of skull	14.0	22.0	26.2	6.8	behind left ear	2.8	2.8	4.7	1.7	5.5	1.8	1.8	3.7
10	Ant to C1	14.0	16.5	43.0	6.9	left of left eye	3.2	3.1	4.8	2.0	5.8	2.6	2.0	3.7

Pelvis cases		Separation at iso. (cm)			Dose from CBCT (cGy)			Mean dose to select organs from CBCT (cGy)							
Patient	Location of isocentre	Lateral	Ant/post	BMI	Max dose	Location of max dose	Iso dose	Rt kidney	Lt kidney	Bladder	Rectum	Sm bowel	Rt femur	Lt femur	Pelvis
1	2 cm sup to coccyx	39.5	27.5	38.8	77.5	left post pelvis	28.5	4.1	4.4	26.7	38.9	29.6	28.7	32.9	31.2
2	11 cm sup to coccyx	35.3	21.7	27.6	78.4	right post pelvis	38.0	26.2	31.1	41.8	38.8	42.4	27.3	32.2	41.9
3	3 cm sup to coccyx	44.8	30.2	41.0	76.2	left post pelvis	22.7	3.8	3.7	23.4	27.2	27.2	26.3	27.7	24.5
4	5 cm sup to coccyx	38.7	26.4	36.8	74.7	left post pelvis	29.8	11.8	6.8	30.9	35.1	33.6	39.3	32.4	33.5
5	3 cm sup to coccyx	39.5	24.0	32.5	77.0	left post pelvis	33.3	2.7	3.8	37.2	37.2	37.2	39.6	33.8	35.2
6	2 cm sup to coccyx	37.0	23.0	29.3	77.7	left post pelvis	37.7	3.7	3.3	39.3	44.5	25.6	40.7	39.8	39.8
7	1 cm sup to coccyx	34.5	22.0	27.6	77.5	left post pelvis	38.4	4.8	5.2	41.0	46.2	38.8	46.5	42.5	42.0
8	5 cm sup to coccyx	34.0	18.0	21.9	80.0	left post pelvis	46.7	4.8	5.4	52.4	48.5	46.3	47.0	43.0	50.0
9	5 cm sup to coccyx	37.5	22.0	26.4	79.8	left post pelvis	38.8	14.1	7.7	42.2	40.8	42.7	41.3	36.4	42.1
10	2 cm sup to coccyx	33.0	23.5	24.5	81.1	left post pelvis	41.5	17.5	19.3	40.6	48.6	39.7	44.7	45.8	44.9

Supplementary Table II. Comparison of monitor units and control points for the pelvis plans optimized without and with the addition of CBCT beam prior to optimization. Percentage differences compare the plans optimized accounting for the CBCT dose after optimization to those adding the CBCT dose before optimization. Percent differences demonstrate reduction of monitor units and control points if the imaging dose is accounted for in the beginning.

	CBCT added after optimization		CBCT added before optimization		Monitor units %	Control points %
Patient	Monitor units	Control points	Monitor units	Control points	Difference	Difference
1	376	44	371	44	−1.33	0.00
2	247	27	229	26	−7.29	−3.70
3	293	40	281	37	−4.10	−7.50
4	308	33	304	33	−1.30	0.00
5	348	42	328	39	−5.75	−7.14
6	286	32	280	31	−2.10	−3.13
7	415	52	405	49	−2.41	−5.77
8	329	40	306	36	−6.99	−10.00
9	329	34	312	31	−5.17	−8.82
10	334	37	322	34	−3.59	−8.11