Oslo University Hospital

Customization Agreement

Treatment Planning for Radiation Therapy at Oslo University Hospital Trust (OUS)

Case # 2018/1216

Government Standard Terms and Conditions
for IT-procurement SSA – T

SSA-T Appendix 1a General Requirements Attachment 2 Existing environment

Version 1.0, July 2019

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1 Organization

Personell involved in radiation therapy at OUS is mainly organized in two departments.

Department of Oncology:

- Approximately 100 oncologists
- Approximaterly 120 radiaton therapists
    - 30 treatment planning
    - 80 treatment machines

Department of Medical Physics:

- Approximately 30 medical physicists

Both departments have employees at the two locations OUS Radiumhospitalet and OUS Ullevål hospital.

Diagosis groups are typically treated at one of the locations, but there will be of interest to have the ability to treat all diagnosis at both locations due to ongoing and future changes in organization, as well as the need to utilize treatment capasity at both hospitals.

2 Overview of IT systems in radiation therapy

2.1 Details of radiation therapy IT-solutions at OUS Radiumhospital

IT-system	Description	Short description of desired, future use if relevant
Elekta – Mosaiq v. 2.46 sp 11	Oncology information system. Verify&record system for ten linacs, one kV-treatment machine, and two HDR brachy machines. Booking functionality – currently not in use. Prescription functionality – currently not in use.	Currently no support for verify&record functionality against the three new Proton therapy gantries at OUS. One of two OIS at OUS.
Nexus – Medfolio	Information system for radiation therapy without verify&record-	One of three booking systems available for

	functionality. Resource scheduler (Booking). Electronic patient folder (prescription and document container). Dicom archive. Archive for most of the dicom series utilized in the treatment planning process.	radiation therapy. One of three prescription systems available for radiation therapy.
Elekta - Oncentra External Beam v. 4.5.3	Treatment planning system. Create plans for ten linacs at Radiumhospitalet.	End of life May 2020, *replacement of this system is the main goal for this tender*. One of four TPS at OUS for external beam treatments.
RaySearch – RayStation v. 7	Treatment planning system. Create plans for ten linacs at Radiumhospitalet and seven linacs at Ullevål.	One of four TPS at OUS for external beam treatments.
Brainlab – iPlan	Treatment planning system. Used for radiosurgery procedures for two linacs.	One of four TPS at OUS for external beam treatments.
Elekta – Oncentra Brachy v.4.5.3	Treatment planning system. Used for one gyn brachy therapy unit.	
Elekta – Oncentra Prostate	Treatment planning system. Used for one prostate brachy therapy unit.	
Vision RT – Align RT	Surface guided radiation threatment support. Includes gating functionality.	
Varian - RGSC	Respiratory gating system at CT scanners.	
Sun Nuclear – QA portfolio	Various solutions for machine QA and patient QA.	

2.2 Details of radiation therapy IT-solutions at OUS Ullevål Hospital

IT-system	Description	Short description of desired, future use if relevant
Varian – Aria v.15.6	Oncology information system. Verify&record system for seven linacs and eye brachy therapy. Booking. Prescription. Image handling.	One of two OIS at OUS.
Varian – Eclipse v.15.6	Treatment planning system. Create plans for seven linacs at Ullevål sykehus.	One of four TPS at OUS for external beam treatments.
BEBIG – EyePlaque	Treatment planning system. Used for treatment planning of eye brachy.	
Vision RT – Align RT	Surface guided radiation threatment support. Includes gating functionality.	
Varian - RGSC	Respiratory gating system at CT scanners.	
Sun Nuclear – QA portfolio	Various solutions for machine QA and patient QA.	

2.3 Details of other information systems relevant for the treatment planning system

IT-system	Description	Short description of desired, future use if relevant
DIPS AS – Dips	The Customer's electronic health record system at a hospital level	

Siemens - PACS	PACS at OUS Ullevål	
Sectra - PACS	PACS at OUS Radiumhospitalet	

Interfaces involved in patient demography flow in treatment planning process.

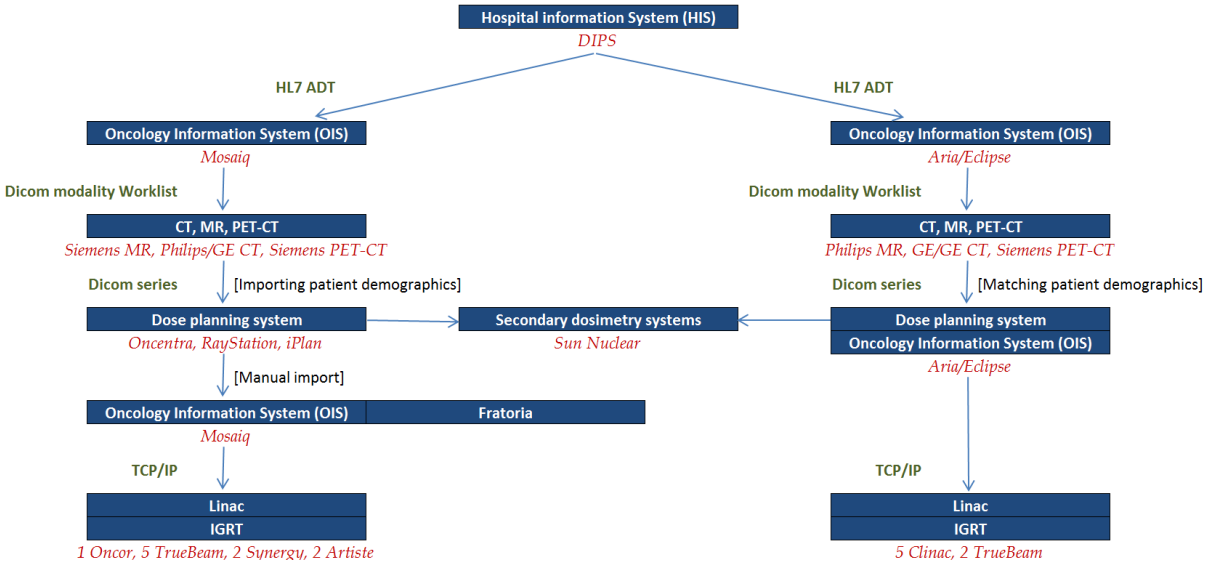

Figure 1 Interfaces patient demography

3 Existing lisences for treatment planning at OUS

Clinical treatment planning for external beam treatments at OUS Radiumhospitalet utilizes three TPS.

	Contriution
iPlan	4 %
Oncentra External Beam	57 %
RayStation	39 %

Table 1 Contribution of treatment plan production based on approved plans sent to Mosaiq OIS during 2018

OUS has invested in TPS systems according to TPS functionality demands. Now, the main TPS is to be replaced, and during the latest years, investment in this system has stopped. The current license portfolio in Oncentra External Beam does therefore not reflect the capasity demand at OUS Radiumhospitalet.

License type	Numbers
Dicom export/import	23
Contouring	23
Image fusion	11
Optimizing	7
Optimizing step-and-shoot	7
Optimizing angels	4
VMAT invers planning	3
Dose calc.	16
Dose calc. Collapsed cone	7
Dose calc. MonteCarlo	3
Plan evaluation	23+16

Table 2 *List of licenses in Oncentra External Beam. It is a mix of floating and fixed licenses.*

RayStation TPS has 5 licenses/work spaces with most of the functionality needed for treatment planning. Contouring by oncologists, however, is done in Oncentra External Beam and imported to RayStation because of a lack of contouring licenses to be used by oncologists.

iPlan TPS has 10 licenses/work spaces shared with neurosurgeants, with most of the functionality needed for intracraneal stereotactic radiosurgery.

OUS Ullevål hospital uses Eclipse as the main treatment planning system for external beam treatments. Eclipse is only used for treatment planning for treatments given at OUS Ullevål. Key figures for license numbers are 109 contouring licenses and 6 VMAT licenses.

In 2018, three linacs at OUS RAD were replaced and patients were sent to Ullevål Hospital on evening shifts, but treatment plans were made at OUS Radiumhsopitalet. In 2018, 9 % of all approved treatment plans for Ullevål hospital was made at Radiumhospitalet.

4 Existing lisences for education purposes at OUS

OUS has a traning system for education of health personell in radioation therapy. The main component of the education environment is a treatment planning lab consisting of 20 PCs with a two screen solution. The traning system runs on a separate virtual server solution.

In addition, the education environment consists of one auditorium, two rooms for lectures, and two rooms for groups. This education environment is attractive to educate health

personell in radiation therapy, and there are possibilities for external parties to make agreements on using the facilities.

The education is given by OsloMet university, and radiation therapists from all over Norway participate in the courses. A hotel is situated in the same builiding (Hotell Montebello).

The training system runs Oncentra External Beam v. 4.3, and has to be replaced.

License type	Numbers
Dicom export/import	20
Contouring	20
Image fusion	20
Optimizing	5
Optimizing step-and-shoot	5
Optimizing angels	5
VMAT invers planning	5
Dose calc.	20
Dose calc. Collapsed cone	20
Dose calc. MonteCarlo	20
Plan evaluation	5
Brachy planning	20

Table 3 *List of training licenses in Oncentra External Beam. It is a mix of floating and fixed licenses.*

5 Overview of medical equipment

The following table summarizes actual medical equipment at OUS Radiumhospitalet, and some indication of future use.

Medical equipment (manufacturer, model, version)	Description	Short description of desired, future use if relevant
SB5R: Varian – TrueBeam with high definition MLC (v.2.7) – 2014	One of two linacs with high definition MLC.	
SB6R: Varian – TrueBeam with high definition MLC (v.2.7) – 2014	One of two linacs with high definition MLC.	

SB8R: Varian – TrueBeam (v.2.7) – 2018	One of three dose matched linacs. Includes Align RT SGRT.	
SB9R: Varian – TrueBeam (v.2.7) – 2017	One of three dose matched linacs. Includes Align RT SGRT.	
SB10R: Varian – TrueBeam (v.2.7) – 2017	One of three dose matched linacs. Includes Align RT SGRT.	
SB12R: Elekta – Synergy with XVI – 2006	One of two dose matched linacs. Includes Align RT SGRT.	
SB13R: Elekta – Synergy with XVI – 2006	One of two dose matched linacs. Includes Align RT SGRT.	
SB14R: Siemens – Artiste – 2009	One of two dose matched linacs.	
SB15R: Siemens – Oncor – 2006		
SB16R: Siemens – Artiste – 2009	One of two dose matched linacs.	
SB2R: Elekta prostatabrachy Microselectron HDR3 - 2007		
SB7R: Elekta gynbrachy Microselectron HDR4 - 2012		
SB4R: kV-treatments Xstrahl 150 - 2019		First patient Q3 2019.
Varian - ProBeam	Three proton gantries	To be installed, first patient 2023

The following table summarizes actual medical equipment at OUS Ullevål, and some indication of future use.

Medical equipment (manufacturer, model, version)	Description	Short description of desired, future use if relevant
SB1U: Varian – Clinac with OBI – 2006	One of five beam energy matched linacs. Includes Align RT SGRT.	
SB2U: Varian – Clinac with OBI – 2006	One of five beam energy matched linacs. Includes Align RT SGRT.	
SB4U: Varian – Clinac with OBI – 2006	One of five beam energy matched linacs. Includes Align RT SGRT.	
SB5U: Varian – Clinac (v.) – 2006	One of five beam energy matched linacs.	
SB6U: Varian – Clinac – 2006	One of five beam energy matched linacs.	
SB3U: Varian – TrueBeam (v.2.7) – 2016	One of two dose matched linacs.	
SB7U: Varian – TrueBeam (v.2.7) – 2019	One of two dose matched linacs.	First patient September 2019.

The following table summarizes the most important imaging modalities for TPS at OUS Radiumhospitalet and OUS Ullevål.

Medical equipment	Description
Varian – TrueBeam	Seven linacs with ConeBeam CT. Five linacs at Radiumhospital send images to Mosaiq. Two linacs as Ullevål Hospital send images to Aria.
Elekta – Synergy / XVI	Two linacs with ConeBeam CT. Two linacs at Radiumhospitalet send images to Mosaiq.
Varian – ProBeam	Three ConeBeam CT proton gantries, not decided which OIS to use.
CT Radiumhospitalet	One CT Philips Brilliance - 2013

	One new CT to be installed Q1 2020.
CT Ullevål hospital	One GE Light Speed 16 – 2006 One GE Light Speed RT 16 - 2006
MR Radiumhospitalet	One Siemens Espree, to be replaced 2020.
MR Ullevål hospital	Philips open MR - 2006
PET/CT	Radiology department has several models.

6 Treatment plan production in 2018

In 2018, OUS Radiumhospitalet created approximately 5.200 approved treatment plans, and OUS Ullevål approximately 3.400. For each approved plan, there are often numerous plans made before one plan is chosen.

The variation in plan production during the week, indicates a huge difference in license needs at peak hours.

	Average	Maximum	Minimum
Monday	100 %	225 %	38 %
Tuesday	100 %	170 %	30 %
Wednesday	100 %	185 %	35 %
Thursday	100 %	247 %	29 %
Friday	100 %	157 %	19 %

Table 4 Variation in approved plans made per week day in 2018.

7 Treatmens in 2018

Overall, the distribution of treatmens given is normally 60% / 40% between OUS Radiumhospitalet and OUS Ullevål. In 2018, however, three linacs at OUS RAD were replaced and patients were sent to Ullevål Hospital on evening shifts during construction/installation phase .

	Patients	First Courses	Courses	Sessions
Radiumhospitalet	6 180	4 800	6 544	106 142
Ullevål hospital	5 841	4 906	6 138	88 584

7.1 Diagnosis distribution of treatments in 2018

		OUS Radiumhospitalet				OUS Ullevål Hospital			
ICD 10	Norwegian name	Patients	First Courses	Courses	Sessions	Patients	First Courses	Courses	Sessions
C 0-14, C30-32	ØNH All	335	269	345	9819	0	0	0	0
	ØNH Curative	255	239	255	8336	0	0	0	0
	ØNH Palliative	72	29	77	1183	0	0	0	0
	ØNH Unknown	12	1	13	300	0	0	0	0
C15	Spiserør All	4	3	4	99	104	79	112	1897
	Spiserør Curative	3	3	3	96	63	55	63	1413
	Spiserør Palliative	1	0	1	3	42	24	48	474
	Spiserør Unknown	0	0	0	0	1	0	1	10
C16-C17	GI_mage_tynntarm All	2	2	2	25	31	27	34	353
	GI_mage_tynntarm Curative	1	1	1	12	5	4	5	127
	GI_mage_tynntarm Palliative	1	1	1	13	25	22	28	216
	GI_mage_tynntarm Unknown	0	0	0	0	1	1	1	10
C18-C20	GI_tykktarm_rectum All	13	7	13	44	393	316	411	5373
	GI_tykktarm_rectum Curative	0	0	0	0	242	219	242	3991
	GI_tykktarm_rectum Palliative	11	7	11	40	144	90	161	1232
	GI_tykktarm_rectum Unknown	2	0	2	4	8	7	8	150

		OUS Radiumhospitalet				OUS Ullevål Hospital			
ICD 10	**Norwegian name**	**Patients**	**First Courses**	**Courses**	**Sessions**	**Patients**	**First Courses**	**Courses**	**Sessions**
C21	GI_anal All	0	0	0	0	63	59	64	1440
	GI_anal Curative	0	0	0	0	49	48	49	1233
	GI_anal Palliative	0	0	0	0	12	9	13	152
	GI_anal Unknown	0	0	0	0	2	2	2	55
C34	Lunge All	346	226	390	3035	607	484	690	6415
	Lunge Curative	121	100	122	1531	260	220	262	3440
	Lunge Palliative	218	121	259	1462	315	232	370	2416
	Lunge Unknown	9	5	9	42	58	32	58	559
C40-41, C45-49	Bein_Bløtdelsvulster All	89	66	96	1752	11	9	13	108
	Bein_Bløtdelsvulster Curative	45	43	45	1084	1	1	1	10
	Bein_Bløtdelsvulster Palliative	42	21	47	599	10	8	12	98
	Bein_Bløtdelsvulster Unknown	4	2	4	69	0	0	0	0
C43-C44	Mal_melanom_hud All	304	230	337	3879	3	3	3	22
	Mal_melanom_hud Curative	161	127	162	2437	0	0	0	0
	Mal_melanom_hud Palliative	142	99	164	1312	3	3	3	22
	Mal_melanom_hud Unknown	10	4	11	130	0	0	0	0

		OUS Radiumhospitalet				OUS Ullevål Hospital			
ICD 10	**Norwegian name**	**Patients**	**First Courses**	**Courses**	**Sessions**	**Patients**	**First Courses**	**Courses**	**Sessions**
C50	Mamma All	520	417	545	7455	921	849	936	14970
	Mamma Curative	399	376	399	6308	850	812	851	14202
	Mamma Palliative	102	34	124	893	59	25	72	581
	Mamma Unknown	22	7	22	254	13	12	13	187
C51-C57	Gyn All	226	196	233	4799	0	0	0	0
	Gyn Curative	143	136	143	3836	0	0	0	0
	Gyn Palliative	80	59	87	925	0	0	0	0
	Gyn Unknown	3	1	3	38	0	0	0	0
C61	Prostata All	415	330	433	9760	405	329	419	10688
	Prostata Curative	261	253	262	7648	307	293	307	9980
	Prostata Palliative	130	69	142	1620	98	36	111	703
	Prostata Unknown	28	8	29	492	1	0	1	5
	ProstataMamille All	3	2	3	70	0	0	0	0
	ProstataMamille Curative	2	2	2	68	0	0	0	0
	ProstataMamille Palliative	0	0	0	0	0	0	0	0
	ProstataMamille Unknown	1	0	1	2	0	0	0	0
C62	Testis All	0	0	0	0	6	5	6	81
	Testis Curative	0	0	0	0	2	2	2	35
	Testis Palliative	0	0	0	0	2	1	2	23
	Testis Unknown	0	0	0	0	2	2	2	23

		OUS Radiumhospitalet				OUS Ullevål Hospital			
ICD 10	**Norwegian name**	**Patients**	**First Courses**	**Courses**	**Sessions**	**Patients**	**First Courses**	**Courses**	**Sessions**
C64-C65	Nyre All	56	38	66	439	20	15	24	161
	Nyre Curative	1	1	1	6	0	0	0	0
	Nyre Palliative	53	36	61	399	19	14	23	160
	Nyre Unknown	4	1	4	34	1	1	1	1
C66-C67	Urinblære All	31	23	36	449	37	30	39	491
	Urinblære Curative	7	7	7	215	11	10	11	254
	Urinblære Palliative	24	16	29	234	26	20	28	237
	Urinblære Unknown	0	0	0	0	0	0	0	0
C69-C72	CNS_Øye All	200	184	202	4884	32	30	32	36
	CNS_Øye Curative	18	18	18	379	11	11	11	11
	CNS_Øye Palliative	182	166	184	4466	1	0	1	5
	CNS_Øye Unknown	0	0	0	39	20	19	20	20
C81-C85	Lymfom All	210	160	223	2786	0	0	0	0
	Lymfom Curative	131	120	132	1814	0	0	0	0
	Lymfom Palliative	75	37	81	876	0	0	0	0
	Lymfom Unknown	9	3	10	96	0	0	0	0
C90	Myelomatose All	64	38	78	566	0	0	0	0
	Myelomatose Curative	6	5	6	83	0	0	0	0
	Myelomatose Palliative	54	30	67	451	0	0	0	0
	Myelomatose Unknown	5	3	5	32	0	0	0	0

		OUS Radiumhospitalet				OUS Ullevål Hospital			
ICD 10	Norwegian name	Patients	First Courses	Courses	Sessions	Patients	First Courses	Courses	Sessions
C91-C96	Leukemi All	14	13	14	109	0	0	0	0
	Leukemi Curative	10	10	10	72	0	0	0	0
	Leukemi Palliative	2	2	2	28	0	0	0	0
	Leukemi Unknown	2	1	2	9	0	0	0	0
Others	Andre_maligne All	130	100	140	2282	110	92	125	938
	Andre_maligne Curative	45	43	45	1176	9	9	9	166
	Andre_maligne Palliative	79	52	88	1036	102	82	114	761
	Andre_maligne Unknown	6	5	7	70	2	1	2	11
Benign conditions	Mamille All	41	31	41	41	76	47	76	77
	Mamille Curative	2	2	2	2	1	1	1	1
	Mamille Palliative	1	1	1	1	0	0	0	0
	Mamille Unknown	38	28	38	38	75	46	75	76
	Carcinoma_in_situ All	40	37	40	583	80	76	80	1237
	Carcinoma_in_situ Curative	38	36	38	553	80	76	80	1237
	Carcinoma_in_situ Palliative	0	0	0	0	0	0	0	0
	Carcinoma_in_situ Unknown	2	1	2	30	0	0	0	0
	Andre_benigne All	31	28	31	195	4	3	5	5
	Andre_benigne Curative	4	4	4	28	2	2	2	2
	Andre_benigne Palliative	16	14	16	96	0	0	0	0
	Andre_benigne Unknown	11	10	11	71	3	1	3	3