

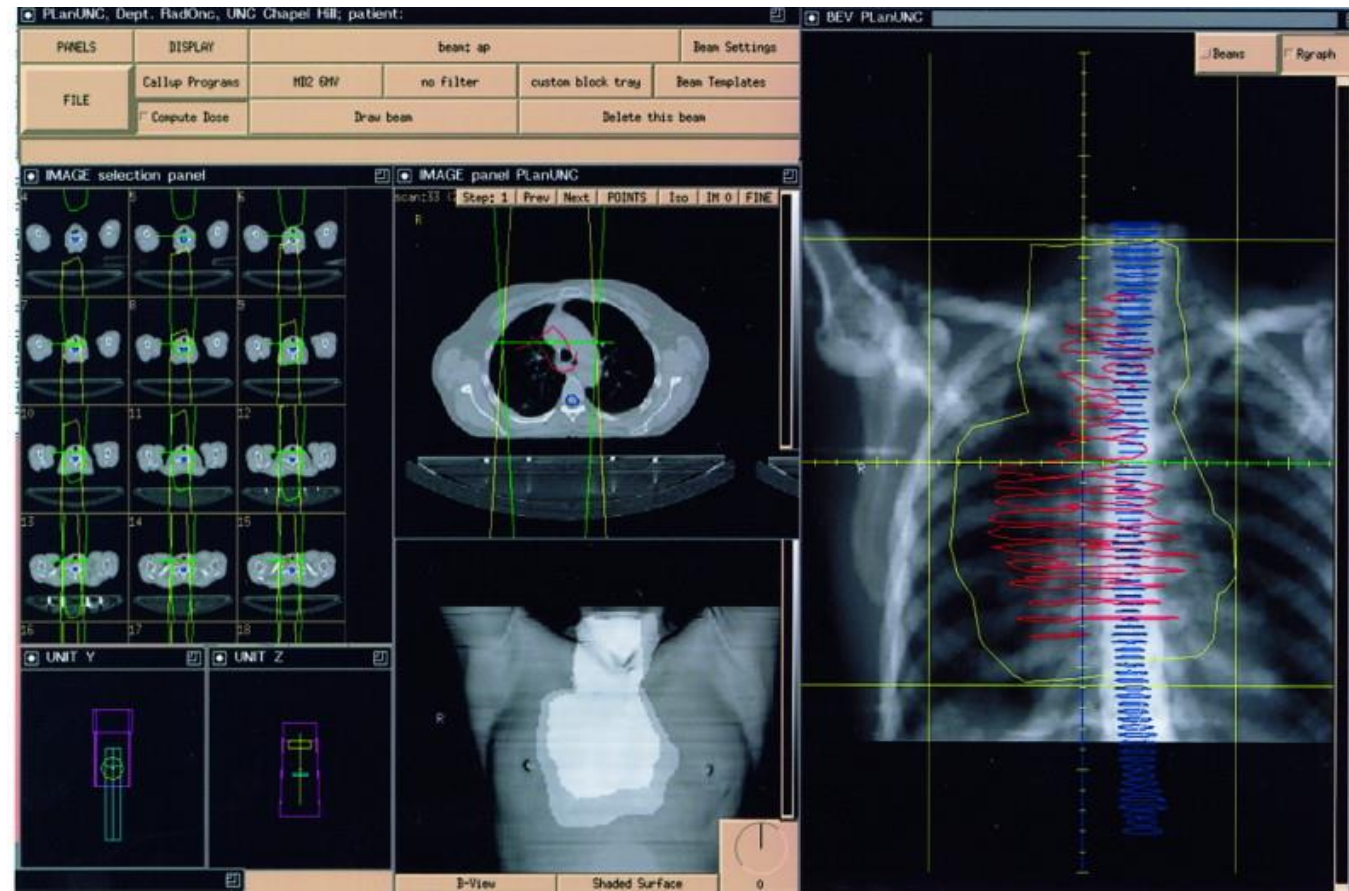
Automating plan review checklists in a RayStation-Mosaiq environment

Leith Rankine, DABR

UNC has a long history of developing 3D-CRT planning software

- The University of North Carolina (UNC) developed one of the first modern 3D-CRT planning systems
 - PlanUNC → “PLUNC”
- PLUNC used clinically for in-house planning until 2015
 - 3D-CRT
 - IMRT (SMLC)
 - Pencil Beam Algorithm (w- heterogeneity corrections)

Rosenman, J., et al (1998). Image Registration: An Essential Part of Radiation Therapy Treatment Planning. *IJROBP*, 40(1):197-205



Multi-vendor institutions may require additional checks

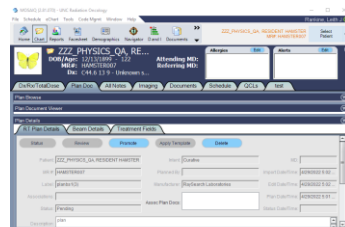
- In 2015, UNC switched to Elekta linacs & RayStation TPS
 - Steep learning curve for therapy, dosimetry, physics, & physicians
- Per TG-100, and our Incident Learning System (ILS) experience:
 - Transitions in technology = temporary increase in likelihood of errors
 - Multi-vendor institution = increased number of data transfer events per patient and increase in required manual data entries



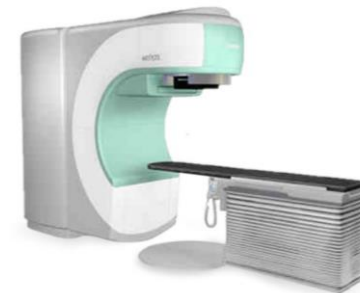
Philips Simulator



RayStation TPS



Mosaiq TMS/R&V



Elekta & Siemens Linacs, and Accuray Tomotherapy



UNC

SCHOOL OF
MEDICINE

Pre-MD check

Additional upstream physics plan review

“dosCheck”

Automated plan check script

TG 275: physics plan review as early as possible

- TG 275 recommends a physics plan review as early in the radiation oncology workflow as possible
- UNC has 7+ years experience with “pre-MD” plan reviews
 - Physics review *before* the MD reviews/approves a treatment plan
- Advantages of reviewing a plan *before* MD approval:
 - Willingness to address “minor” systematic errors
 - Encourages learning/discussion-based feedback → collaborative treatment planning
 - More time for dosimetrist to experiment with plan quality improvement suggestions
 - Physicians are happier due to lower incidence of plan re-review and re-approval

The pre-MD focusses on all aspects of plan quality *before* transfer to Mosaic

- Pre-MD check focus:
 - Prior Tx, Pacemaker, Pregnant (3 P's)
 - Treatment site/laterality/Rx vs. written directive
 - Patient simulation: immobilization, imaging, iso
 - CT & isocenter transfer to TPS
 - Secondary image fusions
 - Contours (OARs, target volumes & expansions)
 - Density overrides, artifacts, bolus, couch model
 - Technical plan aspects (dose grids, beam gantry/collimator angles, energy selection)
 - Optimization parameters & objectives
 - Digital clearance check
 - Plan quality – isodose lines, conformity, DVHs, hotspot, OAR dose vs. predictive-DVH software
 - Clinical goals appropriate and passing
 - BEV review for all segments
- Provide constructive planning feedback to dosimetrist
 1. Required changes, vs.
 2. Suggested improvements
- Completed *before* the MD formally reviews or approves the plan in TPS

The pre-treatment check has additional items covering transfer from TPS to the TMS and linac

- Pre-treatment check focus:
 - Repeat (2nd-check) examination of all items from the pre-MD checklist
 - Additional key items:
 - TPS (RayStation) to TMS (Mosiaq) transfer
 - TMS setup (Rx, calendar, schedule, IGRT)
 - Secondary MU check & IMRT QA
 - Linac or ancillary setup items (CBCT, SGRT)
 - Appropriate QCL items completed or in-place
 - Billing & documentation
- Performed by a 2nd, independent physicist
- Completed *after* the MD formally reviews/approves the tx plan

The 1st weekly chart-check at UNC has some additional items, too

- 1st weekly chart check focus:
 - Repeat (2nd-check) examination of “key items” from the pre-treatment checklist
 - Plus, standard weekly chart check items (TG-315: MPPG)



Image retrieved from <https://www.healthline.com/nutrition/is-swiss-cheese-healthy>

Checklist items (from Sim → Tx):

- | | | |
|--|---|---|
| <div style="color: red; font-weight: bold;">2. Pre-treatment Check</div> | <div style="color: blue; font-weight: bold;">1. Pre-MD Check</div> | <ul style="list-style-type: none"> • Treatment site/laterality/Rx vs. written directive • Patient simulation: immobilization, imaging, iso • Prior Tx, Pacemaker, Pregnant (3 P's) • CT & isocenter transfer to TPS • Secondary image fusions • Contours (OARs, target volumes & expansions) • Density overrides, artifacts, bolus, couch model • Technical plan aspects (dose grids, beam gantry/collimator angles, energy selection) • Optimization parameters & objectives • Digital clearance check • Plan quality (isodose lines, conformity, DVHs, hotspot, etc) • OAR dose versus predictive-DVH software • Clinical goals appropriate and meeting • BEV review for all segments |
| | MD reviews/approves plan | |
| | <div style="color: green; font-weight: bold;">3. First weekly check</div> | <ul style="list-style-type: none"> • TPS (RayStation) to TMS (Mosiaq) transfer • TMS setup (Rx, calendar, schedule, IGRT) • Secondary MU check & IMRT QA • Linac or ancillary setup items (CBCT, SGRT) • Appropriate QCL items completed or in-place • Billing & documentation |

Patient receives 1-2 tx fractions

- Standard weekly chart check items (TG-315: MMPG)
- ...

We unfortunately added to our physics workload

- Pre-MD checks reduced # of plan re-approvals, but...
- Increase in physics workload by ~30 minutes per patient
- **Many checklist items can (and should) be automated**
- Automation of simple checklist items allows physics to focus on complex, non-automatable items of plan quality and safety





UNC

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MEDICINE

Pre-MD check

Additional upstream physics plan review

“dosCheck”

Automated plan check script

“dosCheck” – an automated plan check script

- In 2016, UNC began development of “dosCheck”
 - Collaboration: Division of Healthcare Engineering; Division of Physics
 - Automated plan check script written in Python
 - Queries RayStation ‘state tree’ and Mosaiq SQL database
 - Test results: green (passed) / orange (caution) / red (hard stop)
 - Interactive output using HTML/JavaScript/JSON
 - Physicist can accept/override/N.A. each test result
 - Physicist may add comments to each result
 - Dosimetrists run script (self-check) during planning
 - Physicists run script during pre-MD & pre-tx checks

Automated scripting improves check efficiency

- Efficacy study by UNC Division of Healthcare Engineering in 2018
- N=10 physicists, realistic plan check scenarios embedded with artificial errors, w/wo dosCheck
- Use of automated plan check script was associated with:
 - decreased time to check completion ($P < .01$)
 - increases in documentation of additional patient safety and plan quality concerns ($P = .04$)

Practical Radiation Oncology (2018) 8, 458-467

Basic Original Report

Developing and assessing electronic checklists for safety mindfulness, workload, and performance



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^aDivision of Healthcare Engineering, Department of Radiation Oncology, School of Medicine, University of North Carolina, Chapel Hill, North Carolina

^bCarolina Health Informatics Program, School of Information and Library Science, University of North Carolina, Chapel Hill, North Carolina

Focus the report

Pat: [REDACTED]
Id: [REDACTED]
(dosCheckV310)

Mq Sites:

☒ MENINGIOMA

RS Plan-Beamsets:

☒ MENINGIOMA_IMRT|MENINGIOMA

Triggers:

About Triggers

- ☐ 3D-CRT Photon (includes CBCT, visionRT)
- ☐ 3D-CRT Electron
- ☒ IMRT/VMAT (includes CBCT, visionRT)
- ☐ Tomo
- ☐ SBRT (includes HypoFx, CBCT, visionRT)
- ☐ HypoFx
- ☐ All tests

Misc:

Changes

- ☐ Extend date ranges for post-MD Approval
- ☐ Bailout on error
- ☐ Anonymize patient

Use SELECTED
sites & beamsets

Use ALL
sites & beamsets

Cancel
Report

Pre-plan
ResetIn-plan
17 Reset

Pre-MD Approval

Attn 0 ? 9 AOK 0 NA 0

Post-MD Approval

Attn 0 ? 17 AOK 0 NA 0

About

One Page



Patient/Plan Info

Id		Check	RS	
P1	[RS]	Pt Name	[REDACTED]	i
P2	[RS]	MRN	[REDACTED]	i
P3	[RS]	Gender	Female	i
P4	[RS]	MD for case	Shen, C. MD	i
P5	[RS]	Planned By	DSC	i
P6	[RS]	Body Site	Brn	i
P7	[RS]	Selected: MQ Sites	MENINGIOMA	i
P8	[RS]	Selected: RS Plan, Beamsets	MENINGIOMA_COPY MENINGIOMA_COPY	i



Rx

Id		Check	MQ	
M2	[RS]	Planning Notes	Clinical-TxPlan Notes 06/21/2022 (20 days ago) Morse, Ryan Clinical-TxPlan 54 y.o. female with residual from WHO grade I anterior skull base meningioma s/p right pterional craniotomy for resection (5/22/2019) with interval growth. Plan: IMRT PTV 180cGy x 30 = 5400cGy Please limit optic nerve + 3mm and hotspot within PTV to 55 Gy (ok to undercover) Hippocampi as low as possible while maintaining coverage (D100<5Gy goal may be able to be met)	i
M3	[RS]	Sim Setup Notes	07/06/2022 BRAIN SUP HEADCAST FLEX HH ANGLE 10 BLACKSPG ARMS BY SIDE RKS FEET BANDED	i
M9	[RS]	Prior Tx Documents	None	i
M10	[RS]	Beam Sites	07/07/2022 (4 days ago) MENINGIOMA	i

Id		Check	MQ	
M11	[RS]	SIMULATION DIRECTIVE Assessment [showing only 3P observations]		
		Observation	06/21/2022 RTM	06/22/2022 LGJ



UNC DosCheck V311 Pt [REDACTED] Id [REDACTED] Gender [REDACTED]
Plans: MENINGIOMA_COPY [REDACTED]
Sites: MENINGIOMA
Options: IMRT/VMAT (includes CBCT, visionRT)
Date: Mon Jul 11, 2022 @ 22:11, run by: Leith Rankine [u166333]

Pre-plan
Reset

In-plan
1 **7** Reset

Pre-MD Approval

Attn 0 ? 9 AOK 0 NA 0

Post-MD Approval

Attn 0 ? 17 AOK 0 NA 0

About

One Page



Prescription

Id	Check	RS BeamSet: MENINGIOMA_COPY	
D1	BeamSet #	1	i
D2	beamSet Type	DynamicArc + Imrt -> VMAT	i delivery + generation -> beamSet type
D7	Rx (cGy)	5400	i
D12	Arcs: Prescribe SBRT to D2%, or IMRT to DoseAtVolume	DoseAtVolume	✓
D13	VMAT/SMLC Rx ROI Target Name	PTV_CS	i Target ROI found
D9	Fx	30	i
D10	cGy/Fx	180	i



CT Scan Params and Pt Setup

Id	Check	CT Scan	
C2	Planning CT name	CTsim Brn 6/22/2022	✓
C4	CT Date/Time	6/22/2022 11:53:25 AM	i verify CT date
C4	CT Date/Time is fresh	scanned 19 days ago	more than 13 days old; verify CT age
C5	CT Density Table	HOST-76087	✓
C6	Image: slice count within range	300	✓
C7	Image: Pt Position	HFS	i

Id	Check	RS Beam MU in BeamSet: MENINGIOMA_COPY	
B6	All beams > 5 MU		✓
B6	All beams below MU limits		✓

Id	Check	RS Collimator, Dose settings	
B7	beamSet:MENINGIOMA_COPY beam #1, 1	50.0 degrees	✓ Should be non-zero
B7	beamSet:MENINGIOMA_COPY beam #2, 2	85.0 degrees	✓ Should be non-zero

✓ DRRs & Setup Beams

Id	Check	RS	
S6	RS Setup Beam Count	4	i
S7	RS Setup Beam Size	S1-1: 20.0x20.0	✓
S7		S1-2: 20.0x20.0	✓
S7		S1-3: 20.0x20.0	✓
S7		S1-4: 20.0x20.0	✓



✗ Optimization

Id	Check	RS Optimization MENINGIOMA_COPY MENINGIOMA_COPY	
O2	VMAT: Constrain Leaf Motion: enabled	checkbox enabled	✓
O3	VMAT: Constrain Leaf Motion: distance per degree	1.2	✗ should be between 0.1 and 0.48
O11	EUD "A" value < 1		✓

CP1	AOK ☐ Attn ☐ N/A ☐	Name: last^first^middle	Mq [REDACTED]								
CP2	AOK ☐ Attn ☐ N/A ☐	MRN	Mq [REDACTED]								
CP3	AOK ☐ Attn ☐ N/A ☐	Birth date, age	Mq [REDACTED] 54 years old RS [REDACTED] 54 years old								
CP4	AOK ☐ Attn ☐ N/A ☐	Pacemaker	Is Pacemaker Assessed as Present? Is Pacemaker ROI contoured? Mq 06/21/2022 Assessed as No RS No Pacemaker ROI, or contours								
CP5	AOK ☐ Attn ☐ N/A ☐	Rx vs. Planning Note	Mq ? None in last 14 days Hide 1 older 06/24/2022 (20 days ago) Morse, Ryan 54 y.o. female with residual from WHO grade I anterior skull base meningioma s/p right pterional craniotomy for resection (5/22/2019) with interval growth. Plan: IMRT PTV 180cGy x 30 = 5400cGy Please limit optic nerve + 3mm and hotspot within PTV to 55 Gy (ok to undercover) Hippocampi as low as possible while maintaining coverage (D100<5Gy goal may be able to be met) RS <table> <tr> <th>Plan BeamSet</th> <th>ROI/POI</th> <th>Dose</th> <th>Energy, Modality</th> </tr> <tr> <td>MENINGIOMA_COPY MENINGIOMA_COPY</td> <td>ROI:PTV_CS</td> <td>180 cGy x 30 Fx = 5400 cGy</td> <td>6MV Photons</td> </tr> </table>	Plan BeamSet	ROI/POI	Dose	Energy, Modality	MENINGIOMA_COPY MENINGIOMA_COPY	ROI:PTV_CS	180 cGy x 30 Fx = 5400 cGy	6MV Photons
Plan BeamSet	ROI/POI	Dose	Energy, Modality								
MENINGIOMA_COPY MENINGIOMA_COPY	ROI:PTV_CS	180 cGy x 30 Fx = 5400 cGy	6MV Photons								
A4	AOK ☐ Attn ☐ N/A ☐	Target ROIs Underived	RS 8 target ROIs Underived								

CP1	AOK ☐ Attn ☐ N/A ☐	Name: last^first^middle	Mq RS								
CP2	AOK ☐ Attn ☐ N/A ☐	MRN	Mq RS								
CP3	AOK ☐ Attn ☐ N/A ☐	Birth date, age	Mq 54 years old RS 54 years old								
CP4	AOK ☐ Attn ☐ N/A ☐	Pacemaker	Is Pacemaker Assessed as Present? Is Pacemaker ROI contoured? Mq 06/21/2022 Assessed as No RS No Pacemaker ROI, or contours								
CP5	AOK ☐ Attn ☐ N/A ☐ Plan name should contain laterality	Rx vs. Planning Note	Mq ? None in last 14 days Hide 1 older 06/24/2022 (20 days ago) Morse, Ryan 54 y.o. female with residual from WHO grade I anterior skull base meningioma s/p right pterional craniotomy for resection (5/22/2019) with interval growth. Plan: IMRT PTV 180cGy x 30 = 5400cGy Please limit optic nerve + 3mm and hotspot within PTV to 55 Gy (ok to undercover) Hippocampi as low as possible while maintaining coverage (D100<5Gy goal may be able to be met) RS <table> <tr> <th>Plan BeamSet</th> <th>ROI/POI</th> <th>Dose</th> <th>Energy, Modality</th> </tr> <tr> <td>MENINGIOMA_COPY MENINGIOMA_COPY</td> <td>ROI:PTV_CS</td> <td>180 cGy x 30 Fx = 5400 cGy</td> <td>6MV Photons</td> </tr> </table>	Plan BeamSet	ROI/POI	Dose	Energy, Modality	MENINGIOMA_COPY MENINGIOMA_COPY	ROI:PTV_CS	180 cGy x 30 Fx = 5400 cGy	6MV Photons
Plan BeamSet	ROI/POI	Dose	Energy, Modality								
MENINGIOMA_COPY MENINGIOMA_COPY	ROI:PTV_CS	180 cGy x 30 Fx = 5400 cGy	6MV Photons								
A4	AOK ☐ Attn ☐ N/A ☐	Target ROIs Underived	RS 8 target ROIs UNderived								

X
Approvals

CP26	AOK Attn N/A	Assessed 5 Planning Timeout	Mq [not checked] RS No approved plans An approved plan enables this check	?												
CA6	AOK Attn N/A Test plan.	Compare MD-Approved Plan BeamSets to Sites	Mq Sites: <table><tr><th>Rx</th><th>Rx Note</th><th>Pattern</th><th>Approval</th></tr><tr><td>MENINGIOMA: 180 cGy * 30 = 5400 cGy</td><td>CBCT DAILY ALIGN TO SKULL BASE/PTV</td><td>Uniform Fx dose, pattern = 1x/day, daily</td><td>07/06/2022 CJS</td></tr></table> RS Beamset Approvals <table><tr><th>Plan beamset</th><th>Approval</th></tr><tr><td>MENINGIOMA_COPY MENINGIOMA_COPY</td><td>Unapproved</td></tr></table> A beamset is unapproved.	Rx	Rx Note	Pattern	Approval	MENINGIOMA: 180 cGy * 30 = 5400 cGy	CBCT DAILY ALIGN TO SKULL BASE/PTV	Uniform Fx dose, pattern = 1x/day, daily	07/06/2022 CJS	Plan beamset	Approval	MENINGIOMA_COPY MENINGIOMA_COPY	Unapproved	X
Rx	Rx Note	Pattern	Approval													
MENINGIOMA: 180 cGy * 30 = 5400 cGy	CBCT DAILY ALIGN TO SKULL BASE/PTV	Uniform Fx dose, pattern = 1x/day, daily	07/06/2022 CJS													
Plan beamset	Approval															
MENINGIOMA_COPY MENINGIOMA_COPY	Unapproved															

X
Final Setup

CP13 	AOK Attn N/A	Dosimetry notes	Mq Dosimetry notes Subj: meningioma Created: <u>07/06/2022</u> (5 days ahead) per CJS, unable to differentiate optics vs tumor, OK if dmax <5550cGy away from optics July 6, 2022 8:32:27 AM Chang, David S. CMD:						
A5 	AOK Attn N/A	Setup Beams	Mq site <i>MENINGIOMA</i> - VMAT - 06 Photons field:S1-1 - AP_ISO - en:kV Setup - XVI:Head/Extremity Angle 0 field:S1-2 - PA_ISO - en:kV Setup - XVI:Head/Extremity Angle 180 field:S1-3 - RLAT_ISO - en:kV Setup - XVI:Head/Extremity Angle 270 field:S1-4 - LLAT_ISO - en:kV Setup - XVI:Head/Extremity Angle 90						
CP7 	AOK Attn N/A	Check linacs	Mq Linacs: <i>UNCVersa1</i> <table><tr><th>Site</th><th>Linac</th><th>Pt Schedule</th></tr><tr><td>MENINGIOMA</td><td>UNCVersa1</td><td>Fi:08/17/2022</td></tr></table> RS Linacs: <i>UNCVersa1</i>	Site	Linac	Pt Schedule	MENINGIOMA	UNCVersa1	Fi:08/17/2022
Site	Linac	Pt Schedule							
MENINGIOMA	UNCVersa1	Fi:08/17/2022							
CF4 	AOK Attn N/A	Sim Field Note (per field) vs Site Setup Instructions (per site)	Mq <u>07/06/2022</u> setup field <i>BRAIN</i>: SUP HEADCAST FLEX HH ANGLE 10 BLACKSPG ARMS BY SIDE RKS FEET BANDED <u>07/06/2022</u> setup instruction <i>MENINGIOMA</i>: SUP HEADCAST FLEX HH ANGLE 10 BLACKSPG ARMS BY SIDE RKS FEET BANDED CBCT DAILY ALIGN TO SKULL BASE/PTV Notes do not match						

CF5

AOK

Attn

N/A

Field Bolus matches; if bolused, check if SSDs match

CF7

AOK

Attn

N/A

Dose tracking

CF8

AOK

Attn

N/A

Tx Calendar per Site

Mq

No Bolus beams

RS

No Bolus ROIs

Mq

Tracked Dose:

Field ID, Name	Meterset	Dose	Rx: MENINGIOMA
1 1ARC CW MENINGIOMA	231.5 MU	68 cGy	1.000
2 2ARC CCW VERTEX	179.5 MU	113 cGy	0.991

Sum of Planned Field Doses:

Rx	Dose in Tx fields: sum(fx * dose * coeff)	Diff
MENINGIOMA: 180 cGy * 30 = 5400 cGy	(patterned) 5400 cGy	0 cGy

RS

[From DoseCoefficients script]

BeamSet	Field Name, Description	Dose	Coeff
MENINGIOMA_COPY	1 1ARC CW MENINGIOMA	78	0.936 Matches no Mq coeff
	2 2ARC CCW VERTEX	114	0.939 Matches no Mq coeff

Mq

Scheduled Fx, Events, Clinic Closings:

Toggle

☒ A: MENINGIOMA/UNCVersa1

☒ @UNCVersa1: Scheduled Appt for UNCVersa1

☒ @St/UNCVersa1 : Start Tx

☒ @Fi/UNCVersa1 : Final Tx

☒ *WCC: Weekly Chart Check

☒ *PECC: PHY - EOT Chart Check

☒ *PIQM: PHY - IMRT QA MLC

☒ *PCp: PHY - CBCT prep

Year	Su	Mo	Tu	We	Th	Fr	Sa
2022				07/06 *PIQM *PCp	07/07 A#1 @UNCVersa1 @St/UNCVersa1	07/08 A#2 @UNCVersa1 *WCC	
		07/11 A#3 @UNCVersa1	07/12 A#4 @UNCVersa1	07/13 A#5 @UNCVersa1	07/14 A#6 @UNCVersa1	07/15 A#7 @UNCVersa1 *WCC	
		07/18 A#8 @UNCVersa1	07/19 A#9 @UNCVersa1	07/20 A#10 @UNCVersa1	07/21 A#11 @UNCVersa1	07/22 A#12 @UNCVersa1 *WCC	
		07/25 A#13 @UNCVersa1	07/26 A#14 @UNCVersa1	07/27 A#15 @UNCVersa1	07/28 A#16 @UNCVersa1	07/29 A#17 @UNCVersa1 *WCC	
		08/01 A#18 @UNCVersa1	08/02 A#19 @UNCVersa1	08/03 A#20 @UNCVersa1	08/04 A#21 @UNCVersa1	08/05 A#22 @UNCVersa1 *WCC	

CF9	AOK ☐ Attn ☐ N/A ☐	Each Rx has a Plan Document	Mq Rx: MENINGIOMA Status: APPROVED Create: 07/06/2022 (5 days ago) Docu: TREATMENT PLAN REPORT, MENINGIOMA_IMRT, Sites: 1, Associated Docs (non-Void): 1																																							
CF13	AOK ☐ Attn ☐ N/A ☐	IMRTQA form exists?	Mq Type: IMRT QA results Created: 07/06/2022 (5 days ago) Chang																																							
CF21	AOK ☐ Attn ☐ N/A ☐	Bill Pt	Mq Linac Per Site: <table><tr><th>Site</th><th>Linacs (from Tx fields)</th></tr><tr><td>MENINGIOMA</td><td>UNCVersal</td></tr></table> Dosimetry-related charges <table><tr><th>Procedure Date</th><th>Description</th><th>CPT Code</th><th>Qty</th><th>Note</th></tr><tr><td>4 days ago</td><td></td><td></td><td></td><td></td></tr><tr><td>07/07/2022</td><td>HC DOSIMETRY-BASIC</td><td>77300</td><td>2</td><td>start 7/7</td></tr><tr><td>07/06/2022</td><td>HC IMRT PLANNING</td><td>77301</td><td>1</td><td></td></tr><tr><td>07/06/2022</td><td>HC MLC DESIGN PER IMRT PLAN</td><td>77338</td><td>1</td><td></td></tr><tr><td>19 days ago</td><td></td><td></td><td></td><td></td></tr><tr><td>06/22/2022</td><td>HC TREATMENT DEVICES COMPLEX</td><td>77334</td><td>1</td><td></td></tr></table> RS No approved beamsets	Site	Linacs (from Tx fields)	MENINGIOMA	UNCVersal	Procedure Date	Description	CPT Code	Qty	Note	4 days ago					07/07/2022	HC DOSIMETRY-BASIC	77300	2	start 7/7	07/06/2022	HC IMRT PLANNING	77301	1		07/06/2022	HC MLC DESIGN PER IMRT PLAN	77338	1		19 days ago					06/22/2022	HC TREATMENT DEVICES COMPLEX	77334	1	
Site	Linacs (from Tx fields)																																									
MENINGIOMA	UNCVersal																																									
Procedure Date	Description	CPT Code	Qty	Note																																						
4 days ago																																										
07/07/2022	HC DOSIMETRY-BASIC	77300	2	start 7/7																																						
07/06/2022	HC IMRT PLANNING	77301	1																																							
07/06/2022	HC MLC DESIGN PER IMRT PLAN	77338	1																																							
19 days ago																																										
06/22/2022	HC TREATMENT DEVICES COMPLEX	77334	1																																							

Final QCL

CF14	AOK ☐ Attn ☐ N/A ☐	Prepared CBCT QCLs	Mq Stale QCLs: Desc: PHY - CBCT prep Status: Complete Due: 07/06/2022 Physics (5 days ago) Edited: 07/06/2022 Rankine (5 days ago) CBCT in Rx note, but no PHY - CBCT prep QCL; (searched QCLs 3 days back and 3 days ahead)											
CF15	AOK ☐ Attn ☐ N/A ☐	Prepared VisionRT QCLs	Mq <table><thead><tr><th>Source</th><th>Mentions DIBH?</th></tr></thead><tbody><tr><td>Planning Note</td><td>No</td></tr><tr><td>Sim Field Name</td><td>No</td></tr><tr><td>QCL Tx Planning Comment</td><td>No</td></tr><tr><td>Anywhere?</td><td>No</td></tr></tbody></table> No DIBH mentioned and no QCL exists	Source	Mentions DIBH?	Planning Note	No	Sim Field Name	No	QCL Tx Planning Comment	No	Anywhere?	No	
Source	Mentions DIBH?													
Planning Note	No													
Sim Field Name	No													
QCL Tx Planning Comment	No													
Anywhere?	No													
CF16	AOK ☐ Attn ☐ N/A ☐	SIM REVIEW (plan review) QCL exists	QCL is not needed.											
CF11	AOK ☐ Attn ☐ N/A ☐	IMRT QA QCL	Mq QCLs Desc: PHY - IMRT QA MLC Due: 07/06/2022 Physics (5 days ago) Comment: CJS MENINGIOMA V1 ST 07/07 QA Passed -LJR/RH Show Tasks											
CF22	AOK ☐ Attn ☐ N/A ☐	QCL DOS for Boost	Mq No QCLs found											

An active departmental Incident Learning System (ILS) acts as a feedback loop

- Incidents submitted to the Incident Learning System (ILS) are analyzed by a multi-disciplinary team
- When applicable, dosCheck is modified to catch/prevent similar incidents in the future.

Quality Assurance of automated check scripts

- Use test “modules” that can be added/updated individually
- Modules are tested by treatment planning physicists
 - Use dummy treatment plans with artificial, test-dependent errors
- Dedicated Quality Assurance (QA) testing is necessary when:
 - A new module is added
 - An existing module is edited
 - Your TPS or TMS is upgraded
- Strict version control (script “approval” in RayStation)
- Newly released script versions are treated as “trust, but verify”

Thank you!

Anonymous Session Survey (<5 minutes)

<https://bit.ly/TxPlan1>

Please take a short survey to help us
gather information about current practices
in the medical physics community

Thank you!!



Help/support from vendors?

- We query the Mosaiq database (Microsoft SQL database)
- Mosaiq gave a data dictionary, which is “somewhat” helpful
- RayStation provides a scripting manual, which details some of the function calls and an explanation of the state tree. But the state tree actually provides all of this information.
- We use Python to create an HTML output with JAVAscript/Jason (similar to XML) making it interactive, opens in MS Edge. Results of user input (accept/reject/comment on test results) are stored in a Jason file.