AAPM SPRING CLINICAL MEETING 2018

AAPM TG-275: Live Demonstration of Chart Checks

EBRT Plan Review: RayStation and Mosaiq

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Conflicts of Interest

- None

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Systems

MOSAIQ

Version 2.64
UDI: (01)00858164002091(10)2.64.152
Multi-Departmental Oncology Management System
IMPAC Medical Systems, Inc.
Sunnyvale, California, U.S.A.

RayStation

Product name: RayStation
Product version: 6
Software build no: 6.1.1.2

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Acknowledgements

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Manufacturing Quality Management

Shigeo Shingo

http://www.shingoprize.org/about

- 1960's – Japanese Industrial Engineer
- Zero Quality Control (ZQC)
  - Stop Errors at or Very Close to Source
  - Simple & Inexpensive Processes
    - Successive Checking
      - Checking prior work before continuing
    - Self Checking
      - Operators assess own work

Plan Check Quality Management

- From TG275 Draft Report:
  - *For the initial review this is typically performed at the end of treatment planning. It may be possible to perform some of this review earlier in the workflow.*
  - *There are several advantages to reviewing early in the workflow, including:*
    - *1) issues may be more easily identified,*
    - *2) changes may be more easily executed if the work is not yet complete,*
    - *3) wasted effort and rework may be avoided (which translates into time and cost savings)*
    - *4) early review may allow for several shorter, more focused checklists rather than one very long checklist late in the workflow.*

Plan Check Quality Management

- Need to pay attention to location of safety barriers
  - Design safety into the process
  - Put barrier within or immediately following error prone process step
  - Put safety into the hands of the planner
  - Reduce “scrap” or re-work

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Plan Check Quality Management

- DosCheck Script
  - Run by CMD's for All Plans
  - Examples of Items Checked
    - Isocenter coincides with that set in CT-sim
    - High energy beam with pacemaker?
    - Same beam number used in multiple datasets?
    - Beam segment MU>5 MU and<999 MU
    - VMAT collimator angles non-zero

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Plan Check Quality Management

Id	Check	RS VMAT Collimator Angle in Plan: *1 Prostate Bed*	
B7	beamSet:1 Prostate Bed beam #1, *1*	15.0 degrees	✔ Should be non-zero
B7	beamSet:1 Prostate Bed beam #2, *2*	345.0 degrees	✔ Should be non-zero

Key

- ✔ Passed test
- Safety Check
- ? Missing something?
- ✘ Failed test
- NA Not Appropriate
- i Informational

✔ DRRs & Setup Beams

Id	Check	RS BeamSet: *1 Prostate Bed* for current plan	
S1	BeamSet #	1	i
S2	DRR: Highlight Markers	Off	i

✔ Optimization

Id	Check	RS BeamSet Optimization: *1 Prostate Bed|VMAT*	
O2	Constrain Leaf Motion	checkbox enabled	✔
O3	Constrain Leaf Motion: distance per degree	0.48	✔

✔ ROI

Id	Check	RS ROI	
R1	Excess Empty ROIs		i All existing ROIs have geometry
R3	External ROI Color	Green	✔

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Plan Check Quality Management

- Physics Reviews Prior to MD Reviews
  - IMRT/VMAT Plans
  - SBRT Plans
- Checklists
  - Mosaiq Assessments
  - QCL's using IQ Scripts

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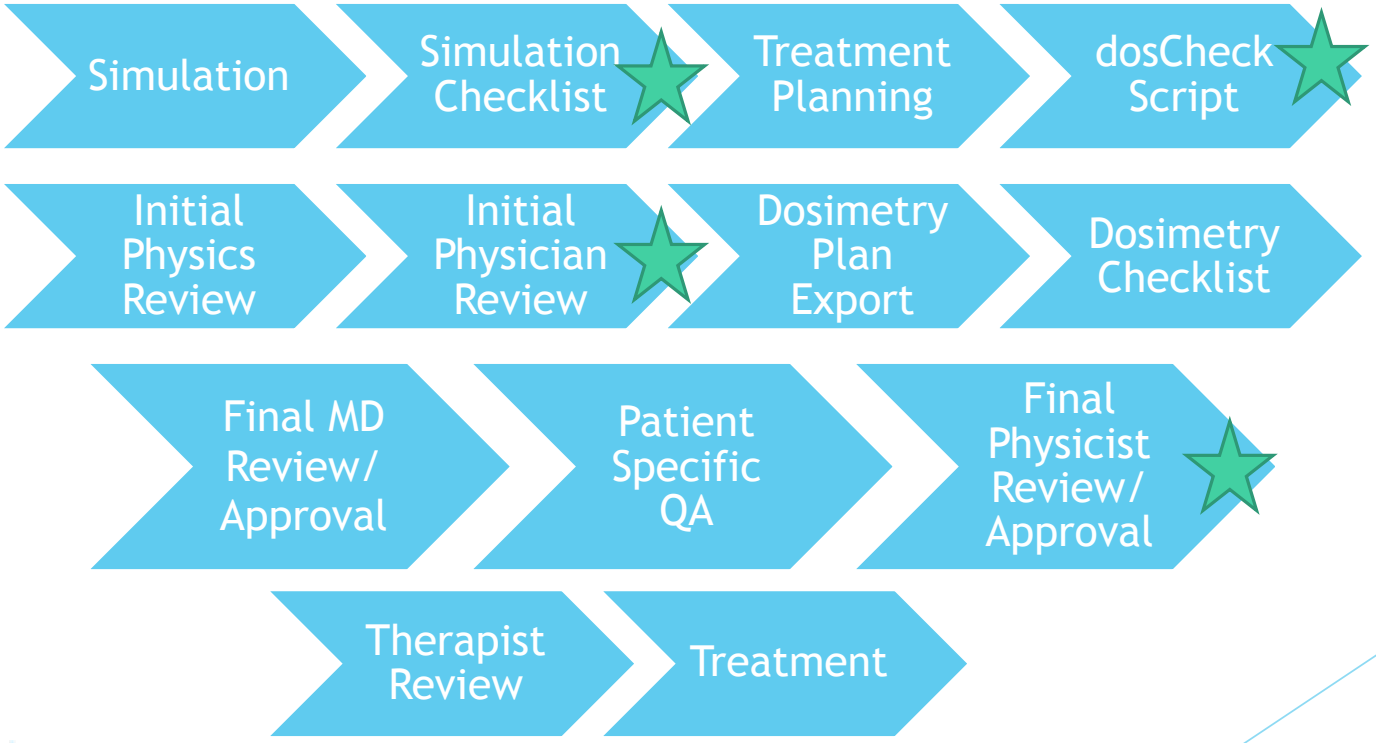
Treatment Planning Workflow



Check List Modification

Patient Assessment and Intent	
☐	Special Considerations for radiotherapy (e.g. pacemakers, ICDs, pumps, etc.)*
☐	Previous radiotherapy treatments*

Done?	New Start Checks
	Review 3P Assessment for Pregnancy, ICD, Prior Tx
	Prior Tx?
	Prior tx taken into account, Overlap, IGRT appropriate, Special Physics Consult Necessary?
	Skip QCL if not action needed, Complete QCL if action/Special Physic Consult needed
	ICD?
	Card uploaded into Mosaiq?
	Manufacturer's Guidelines Uploaded into Mosaiq?
	Escribe Document Completed?
	MOSFETs on Patient Schedule
	Noted in Sim Order?
	All fields <= 10 MV

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Live Plan Check Demo

- Prostate Bed

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Clinical Examples

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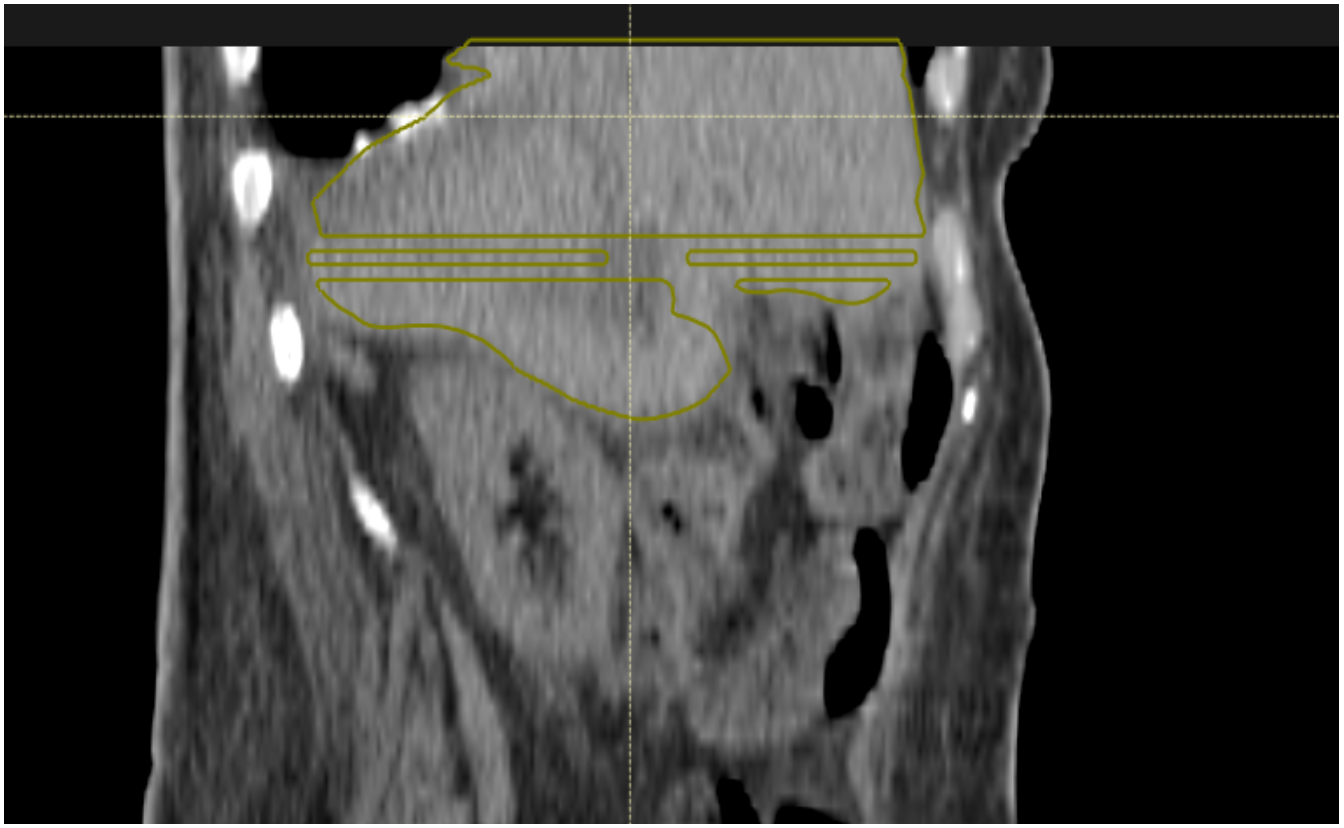
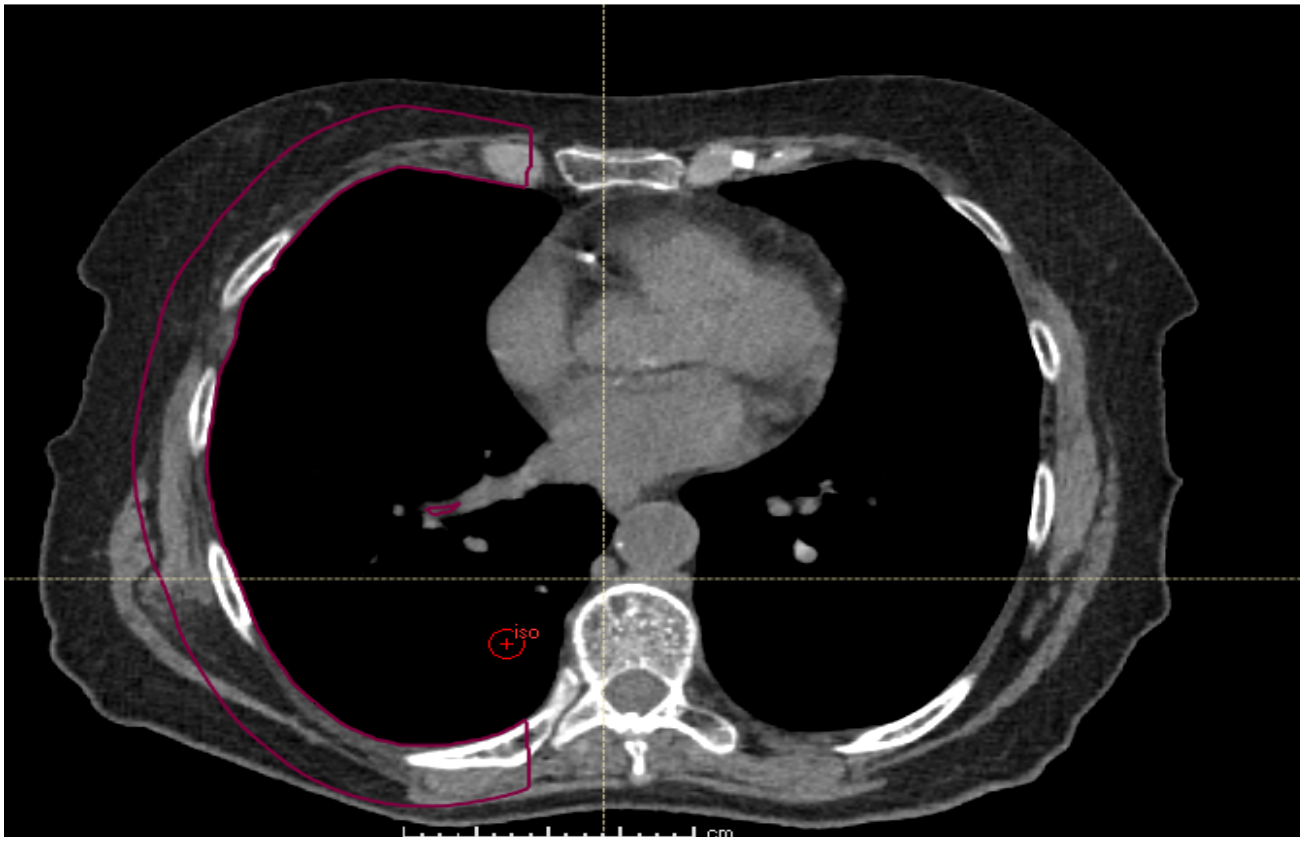
Missing Slices on Liver ROI

Missing Slices on Liver ROI



Chestwall Contour Extending into GTV



Incorrectly Labeled Setup Photo

ns (B)	Comments	Number Of Imag
	SIM - AP CTiso = blue/tattoo + INF straightening t...	
	SIM - LLat CTiso = blue/tattoo	
	SIM Setup - Full	
	SIM Setup - head/arm position	
	SIM - RLat CT0 = blue/tattoo	
	SIM Setup - arm/hand position	

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Laterality

CLINICAL TREATMENT PLANNING:

[redacted] has metastatic rectal cancer. Refer to the consult for full clinical details.

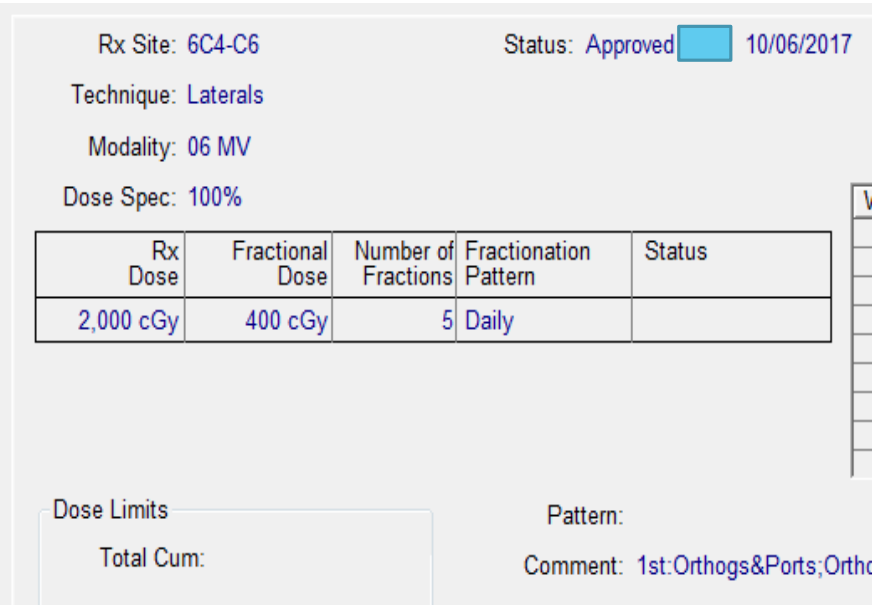
I plan to treat with photons utilizing 3D CRT technique.

The radiation target area/treatment site will be left ilium

I will attempt to minimize the dose to bowel.

The total radiation dose will be 2000 cGy at 400 cGy/fraction for a total of 5 fractions, treated once a day. Chemotherapy not administered.

Dose Per Fraction



Rx Site: 6C4-C6 Status: Approved 10/06/2017

Technique: Laterals

Modality: 06 MV

Dose Spec: 100%

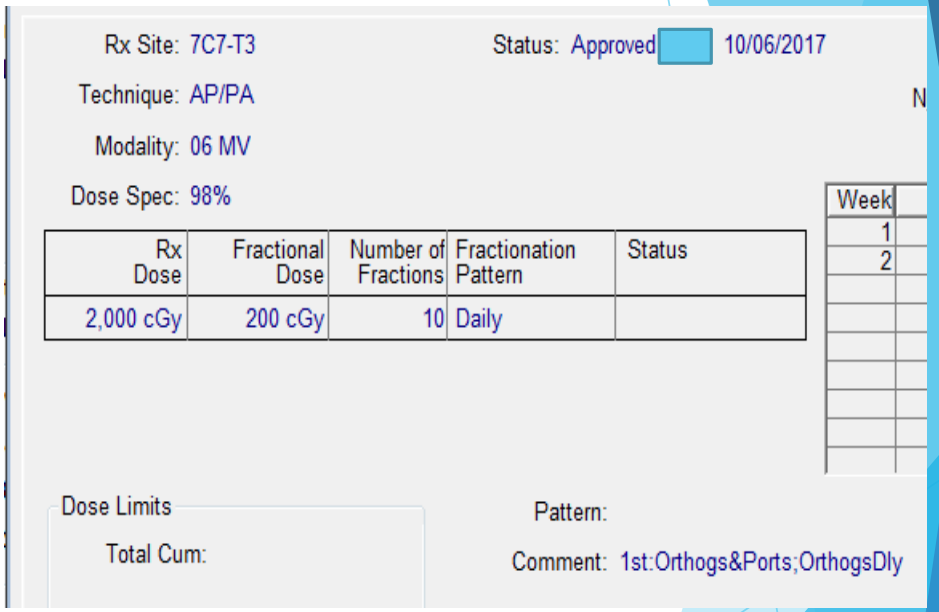
Rx Dose	Fractional Dose	Number of Fractions	Fractionation Pattern	Status
2,000 cGy	400 cGy	5	Daily	

Dose Limits

Total Cum:

Pattern:

Comment: 1st:Orthogs&Ports;Ortho



Rx Site: 7C7-T3 Status: Approved 10/06/2017

Technique: AP/PA

Modality: 06 MV

Dose Spec: 98%

Rx Dose	Fractional Dose	Number of Fractions	Fractionation Pattern	Status
2,000 cGy	200 cGy	10	Daily	

Week
1
2

Dose Limits

Total Cum:

Pattern:

Comment: 1st:Orthogs&Ports;OrthogsDly

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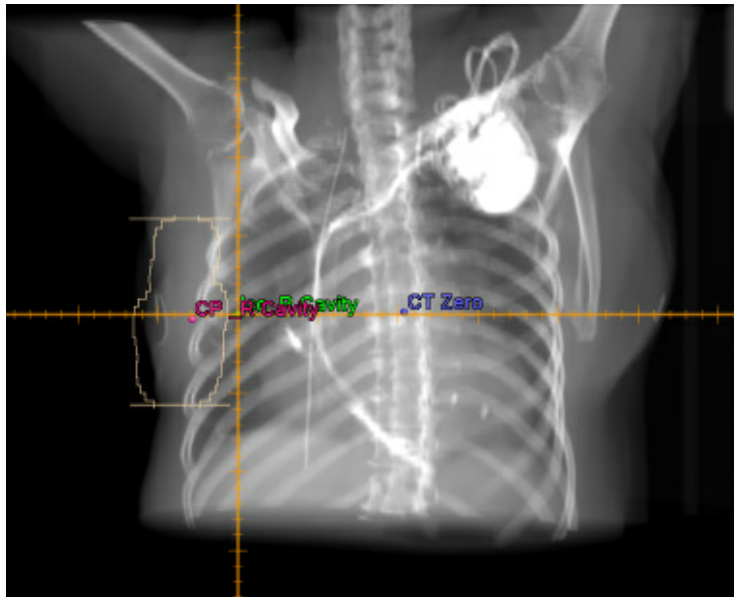
High Energy Beam for Pacemaker Patient



ROI Dose statistics [Beam Set

Name
Breast
Cavity
Clips
Cord
Cord+5mm
Defibrillator
External

Id	Check	RS Name Lengths, Pacemaker, Angles	
B9	Pacemaker	No Pacemaker ROI	✓
B10	BeamSet name length	2 R Cavity has 10 characters	i

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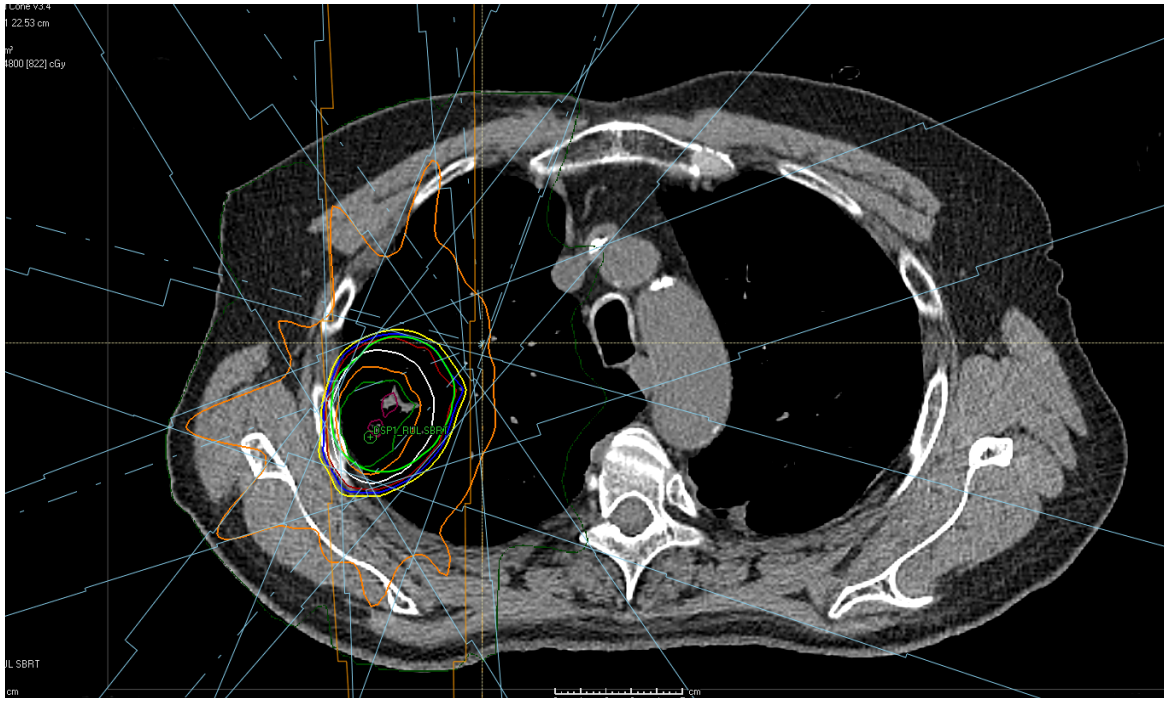
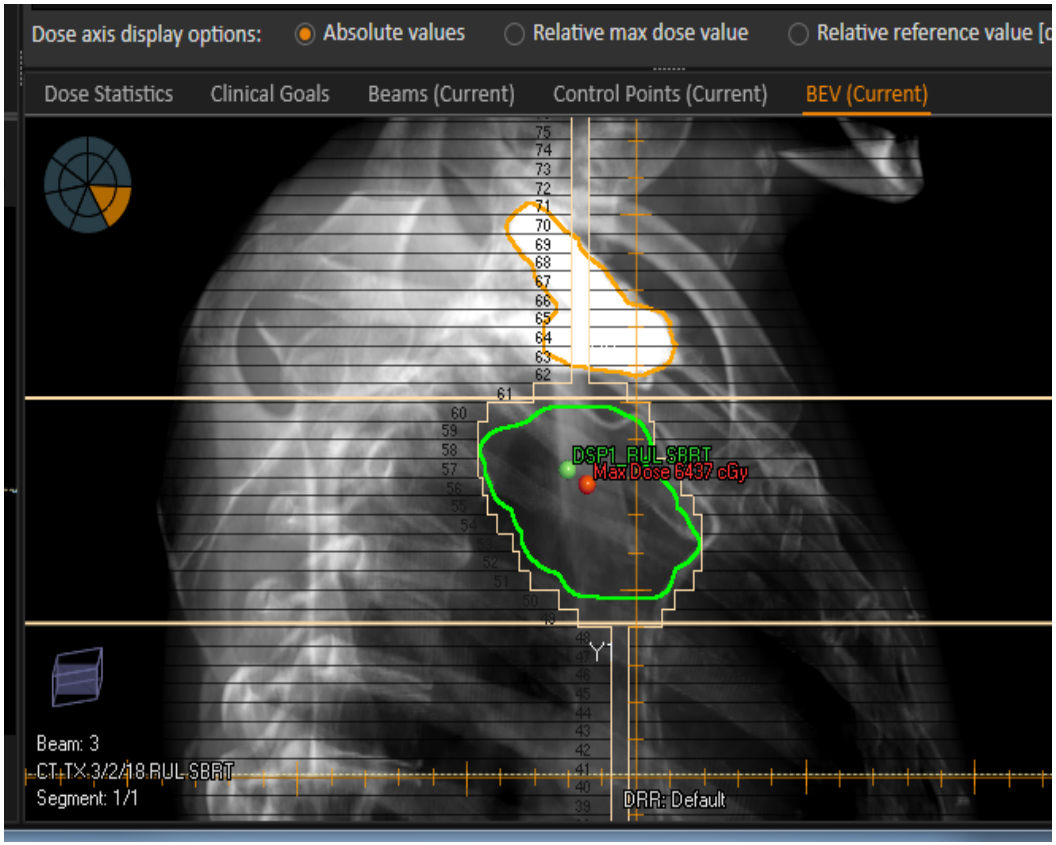
Field Edge Close to Pacemaker



ICD	At most 200 cGy dose at 0.0 cm^3 volume	42 cGy

Field Edge Close to Pacemaker



Recommendations

- Adapt TG275 Checklist to Own Practice
- Insert Safety Barriers Throughout Planning Process
  - Self Checking & Successive Checking
- Document Plan Review Findings
  - Valuable Learning Opportunity

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Thank You!

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Physics Chart Checks at RS/Mosaiq

Done?	New Start Checks	Notes
	Review 3P Assessment for Pregnancy, ICD, Prior Tx	
	Prior Tx?	
	Prior tx taken into account, Overlap, IGRT appropriate, Special Physics Consult Necessary?	
	Skip QCL if not action needed, Complete QCL if action/Special Physic Consult needed	
	ICD?	
	Card uploaded into Mosaiq?	
	Manufacturer's Guidelines Uploaded into Mosaiq?	
	Escribe Document Completed?	
	MOSFET's on Patient Schedule	
	Noted in Sim Order?	
	All fields <= 10 MV	
	Review Simulation Order Assessment	
	Tx site matches Rx	
	Special Tx Procedure Order?	
	Imaging technique, setup and immobilization, contrast, etc.	
	Motion management? (4DCT, DIBH, etc.)	
	Special Physics Consult Order?	
	Fusion?	
	Is a fusion report in documents?	
	Bolus?	
	Pacemaker monitoring?	
	Review Simulation Summary Assessment	
	Bolus?	
	Orientation matches photos and CT Header Info	
	Setup Photos	
	Clearly document setup info	
	Tattoos and and marks documented and labeled appropriately	
	Evaluate CT Scan	
	Correct scan chosen for plan	
	Artifacts/ Use of Contrast	
	Scan FOV and Sup/Inf range Includes enough Data	
	Contouring Checks	
	Target(s) - discernible errors, missing slices, mis-labeling, gross anatomical deviations	
	PTV and OAR Margin	
	Organs-at-Risk (OAR's)	
	Body/External contour	
	Density overrides applied as needed (ex. High-Z material, contrast, artifacts, etc.)	
	Consideration of Supporting Structures (i.e. couch, immobilization and ancillary devices, etc.)	
	Raystation Plan Review	
	Target coverage and target planning objectives	
	Sparing of OARs and OAR planning objectives	
	Plan conforms to clinical trial (as applicable)	
	Dose Distribution	
	Hot Spots	
	Reference Points and Plan Normalization	
	Review plan normalization and/or norm point location	
	Calculation Algorithm and Calculation Grid Size	
	Prior Radiation accounted for in plan	
	Plan Sum (e.g. Original plus boost plans)	
	Review beam aperatures	
	Field Size reasonable for site/beam energy	
	SOP's Followed for Correctly Used	
	- Energy	
	-Beam Arrangement	
	-MU	
	- Plan ID	
	- Field ID and Name	

	Beam Deliverability	
	- <1000 MU/static field or segment	
	- Potential for Collision	
	Review Rx	
	Approved?	
	Review note if one added	
	Note Imaging in Comment	
	Changes Recommended?	
	Rx Matches Plan	
	Rx Standard of Care	
	Bolus?	
	Site and laterality (incl. medical chart to confirm laterality)	
	Technique Standard for Sight	
	Additional Shielding (eye block, testicular shield, etc.)	
	MOSFET's ordered?	
	-If yes, on schedule?	
	Plan and Rx Match Tx Planning Worksheet & Consult Note	
	Plan in Mosaiq	
	Approved by MD	
	Matches Rx - Dose, Dose/Fx, Number of Fx's, Energy, Modality, Technique	
	- Bolus	
	Site Setup	
	Set to Exclude	
	Correct patient orientation?	
	Iso Coordinates Match Plan	
	Shifts agree with plan	
	Approved?	
	Mosaiq Fields Match RS Fields	
	- Energy	
	-Beam Arrangement	
	-MU	
	-Setup instructions match tx fields?	
	- Plan ID	
	- Field ID and Name	
	IMRT?	
	If yes, was QA completed and approved?	
	Is Clinical Goal Sheet Acceptable?	
	6 MV?	
	If prostate, check seed localization	
	Setup DRR's at Correct Iso?	
	DRR's associated with correct fields	
	DRR image quality adequate	
	Shifts needed?	
	Verify IGRT for applicability	
	Rad Calc Agreement?	
	New Patient? If yes, ensure 0 entered for vrt, lat, lng for Versa	
	Boost? If yes, enter couch parameters if iso unchanged.	
	Check orders and verify items are completed or scheduled	
	OSLD's, Fusion, IGRT, Vision RT, etc.	
	Dosimetry button clicked	
	Do field doses add up to daily Rx dose?	
	Review RO Treat and ensure calendar appropriate	
	Complete QCL	
	Approve Physics Assessment	
	If MD has not approved plan yet, don't complete QCL, add "SAP - Needs MD Approval" to QCL	
	SBRT? If yes, create form for clip board	
	1st Weekly Phyiscs Check QCL on Tx Day 4? (If BID, it needs to be on Tx #4)	
	Change EOT QCL to Last Day of Tx	
	Enter Rx Site in RTT QCL	