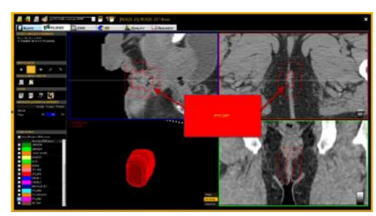
2014 AAPM Spring Clinical Meeting

TIPS AND PLANNING STRATEGIES FOR BEST PRACTICES

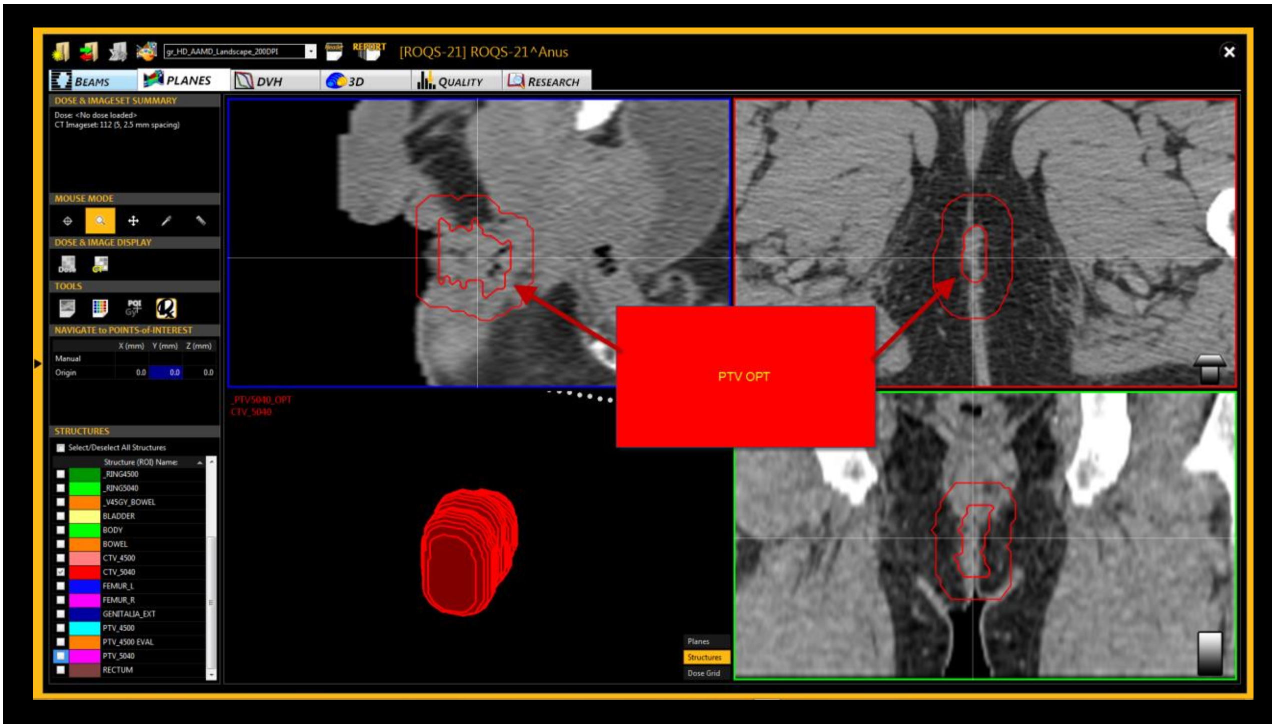
GREG ROBINSON, MS, CMD, RT(T)

What special techniques were used to ensure target coverage?

Target Coverage



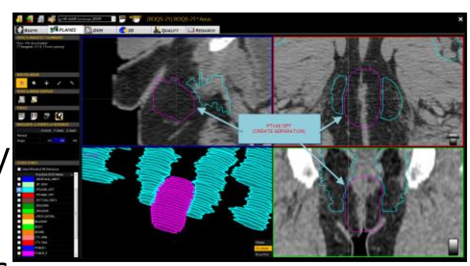
- Highest priority in optimization
- Clean the contours (clean ROI/ post process, etc.)
- Optimization contours – separate or add gradients// back from skin at least 3-5mm
- Evaluate overlap areas of OAR and opt Targets
- VMAT (cheater PTV ~ 1mm)
- Rings (separated or gradient) to “squeeze” dose in
- “Double down” on optimization structures
- Beam arrangement (circumferential vs. hemisphere)// PA beam
- Inner rind of 3mm to “boost” edge for coverage


[ROQS-21] ROQS-21^Anus
BEAMS
PLANES
DVH
3D
QUALITY
RESEARCH
DOSE & IMAGESET SUMMARY
MOUSE MODE
DOSE & IMAGE DISPLAY
TOOLS
NAVIGATE to POINTS-of-INTEREST
STRUCTURES
Select/Deselect All Structures
_RING4500
_RING5040
_V45GY_BOWEL
BLADDER
BODY
BOWEL
CTV_4500
CTV_5040
FEMUR_L
FEMUR_R
GENITALIA_EXT
PTV_4500
PTV_4500 EVAL
PTV_5040
RECTUM
_PTV5040_OPT
CTV_5040
PTV OPT

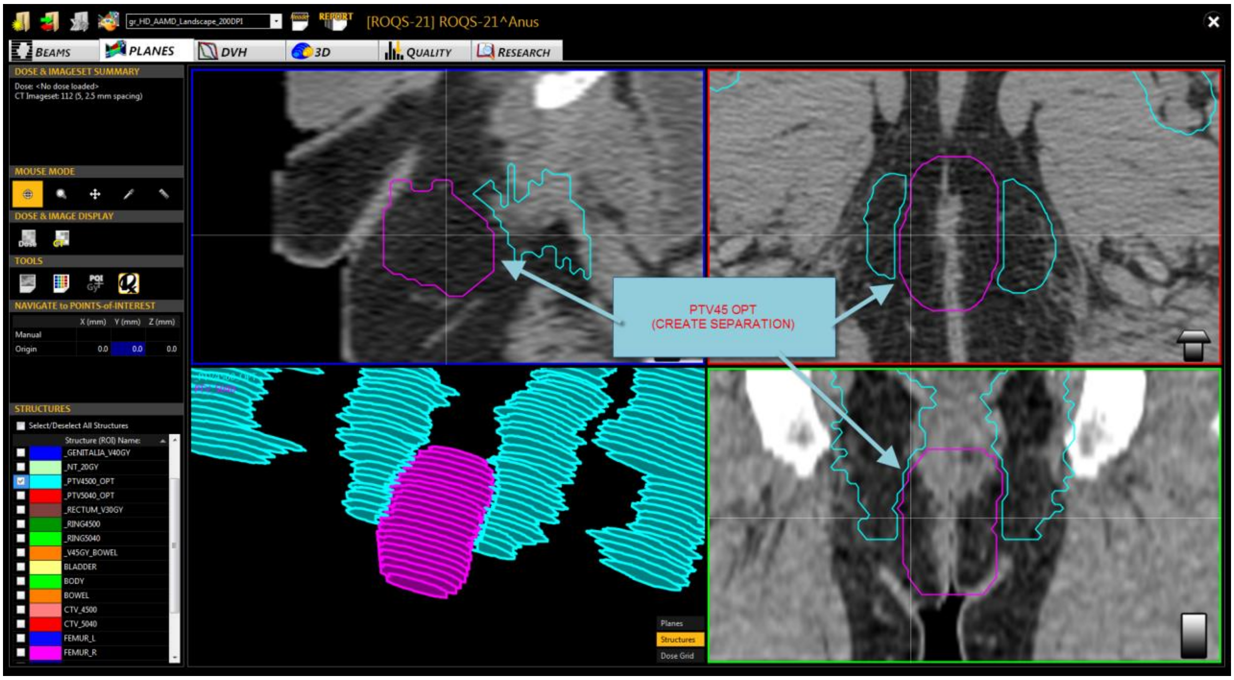

[ROQS-21] ROQS-21^Anus
BEAMS
PLANES
DVH
3D
QUALITY
RESEARCH
DOSE & IMAGESET SUMMARY
MOUSE MODE
DOSE & IMAGE DISPLAY
TOOLS
NAVIGATE to POINTS-of-INTEREST
STRUCTURES
Select/Deselect All Structures
_RING4500
_RING5040
_V45GY_BOWEL
BLADDER
BODY
BOWEL
CTV_4500
CTV_5040
FEMUR_L
FEMUR_R
GENITALIA_EXT
PTV_4500
PTV_4500 EVAL
PTV_5040
RECTUM
_RING5040
PTV_4500
PTV_5040
RINGS
(GRADIENT MARGIN)

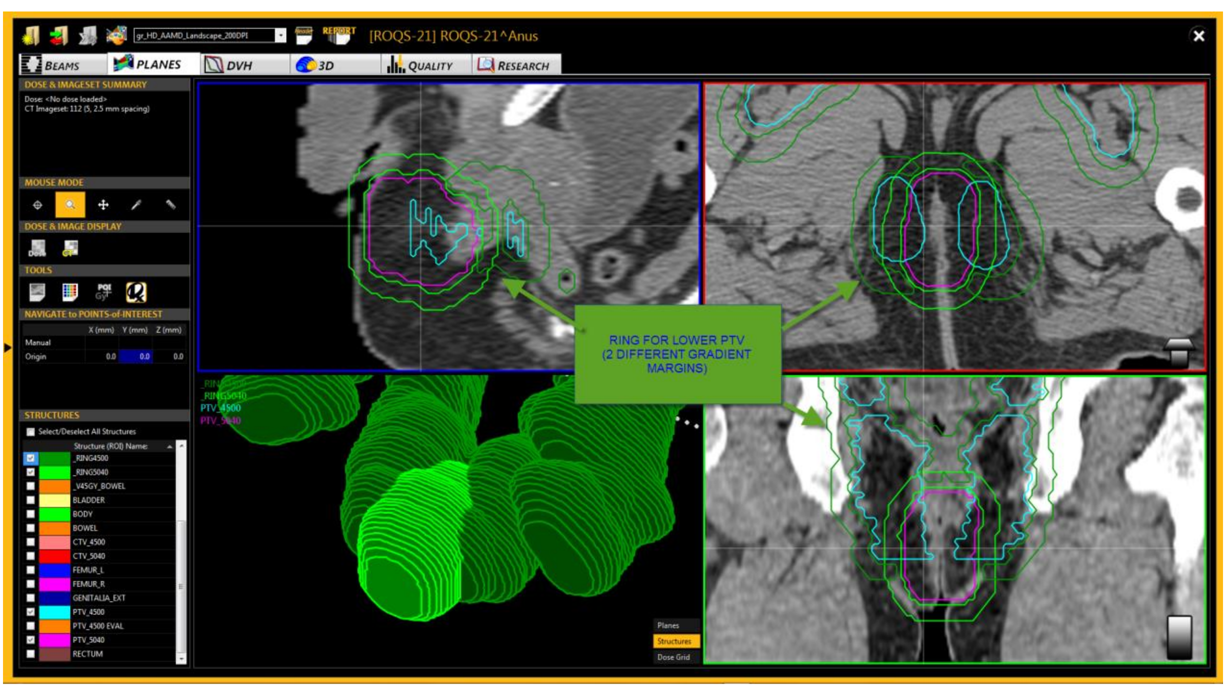
What special techniques were used when approaching a multiple PTV case?

Multiple PTVs



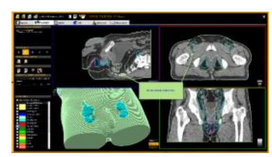
- Isocenter location close to high dose PTV
- Separate targets
- Ensure there are no conflicting objectives
- Gradient margins
- Rings follow same gradient approach (1mm, 5mm, etc.)


[ROQS-21] ROQS-21^Anus
BEAMS
PLANES
DVH
3D
QUALITY
RESEARCH
DOSE & IMAGESET SUMMARY
MOUSE MODE
DOSE & IMAGE DISPLAY
TOOLS
NAVIGATE to POINTS-of-INTEREST
STRUCTURES
PTV45 OPT
(CREATE SEPARATION)

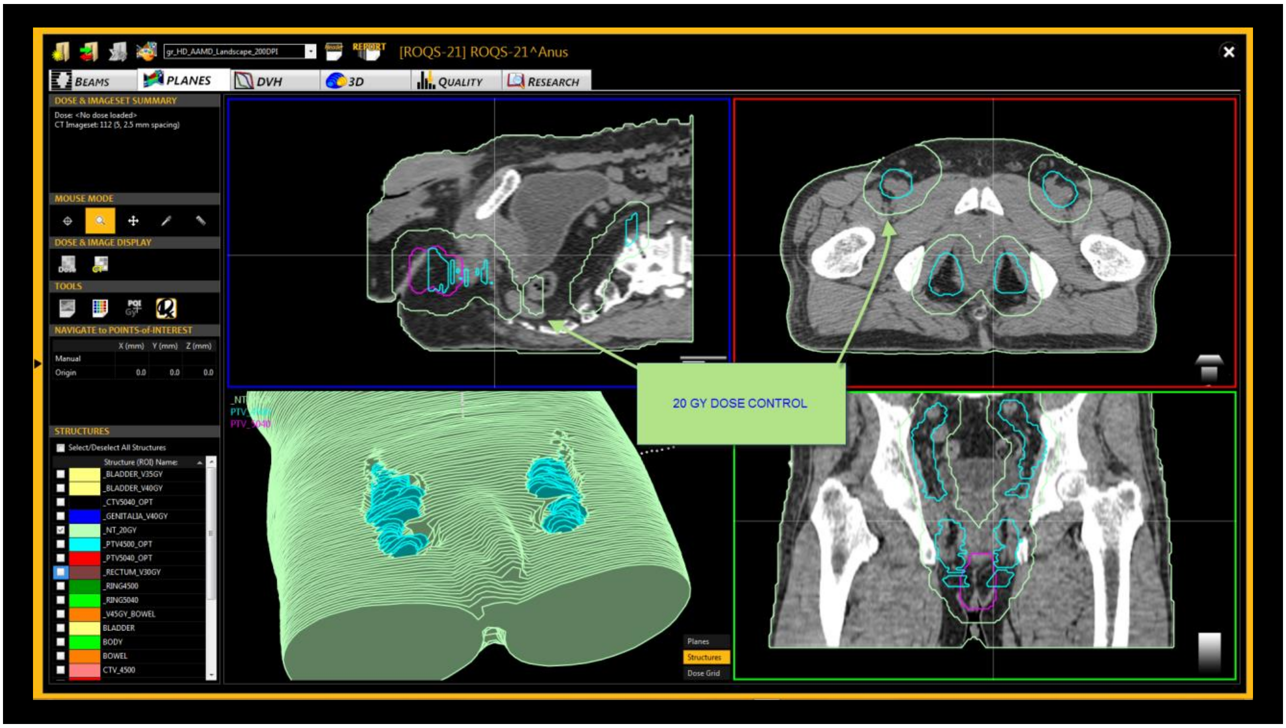

[ROQS-21] ROQS-21^Anus
BEAMS
PLANES
DVH
3D
QUALITY
RESEARCH
DOSE & IMAGESET SUMMARY
MOUSE MODE
DOSE & IMAGE DISPLAY
TOOLS
NAVIGATE to POINTS-of-INTEREST
STRUCTURES
RING FOR LOWER PTV
(2 DIFFERENT GRADIENT
MARGINS)

What special techniques were used when trying to make your plan as conformal as possible?

Conformality



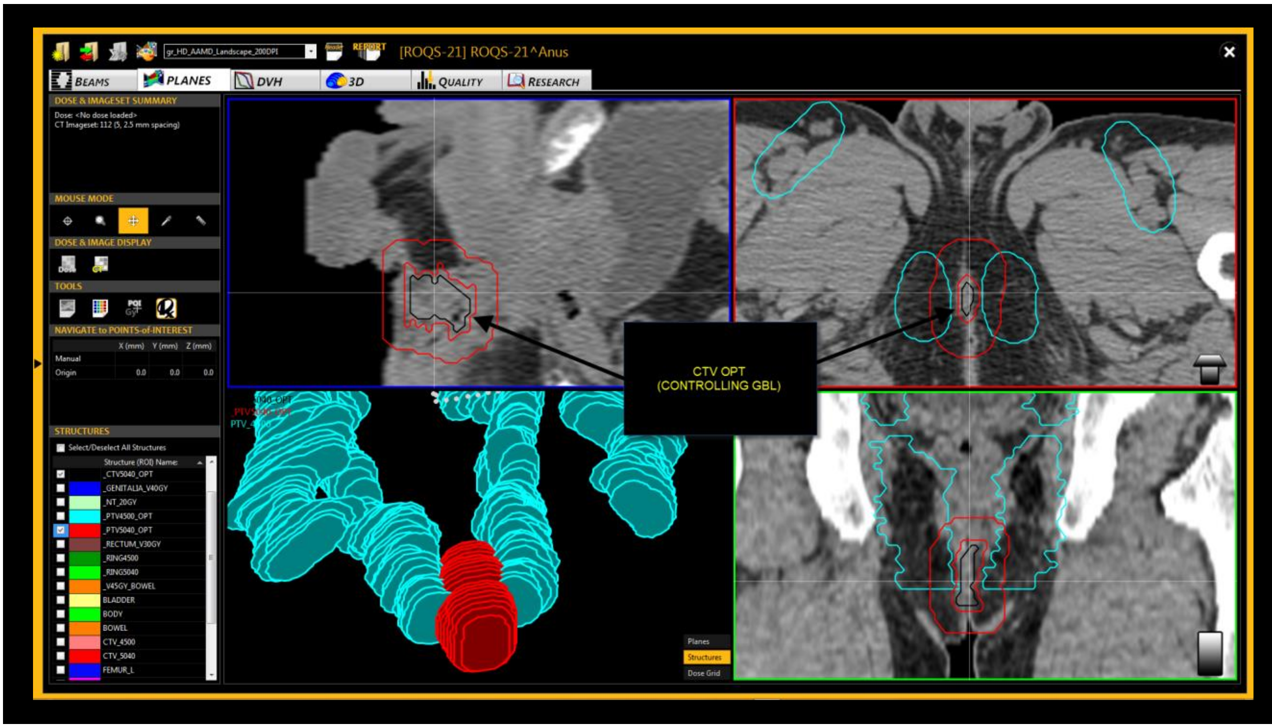
- Push the rings until target coverage budges … then stop!!!
- 2 normal tissue contours with margin
- Non-overlapping rings
- Overlap areas with bowel/ bladder (treat as a target)
- VMAT (lock jaw width <15cm)
- Fluence editing
- Respect the point of diminishing returns for conformality
- Multiple DVH objectives on the rings (not just a max dose)


[ROQS-21] ROQS-21^Anus
BEAMS
PLANES
DVH
3D
QUALITY
RESEARCH
DOSE & IMAGESET SUMMARY
MOUSE MODE
DOSE & IMAGE DISPLAY
TOOLS
NAVIGATE to POINTS-of-INTEREST
STRUCTURES
Select/Deselect All Structures
_BLADDER_V35GY
_BLADDER_V40GY
_CTV5040_OPT
_GENITALIA_V40GY
_NT_20GY
_PTV4500_OPT
_PTV5040_OPT
_RECTUM_V30GY
_RING4500
_RING5040
_V45GY_BOWEL
BLADDER
BODY
BOWEL
CTV_4500
20 GY DOSE CONTROL
Planes
Structures
Dose Grid

What special techniques were used when trying to keep your plan from getting too “hot”?

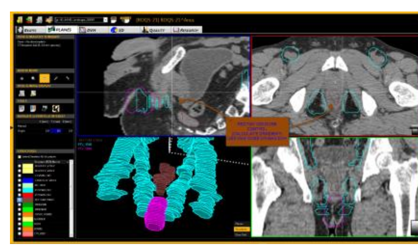
Controlling “hotness”

- Small, incremental steps
- Special smaller structures – isodose to contour
- Each time take away something off OAR, raise priority on targets
- Extreme high priority on max dose
- “wash plan” after final optimization one last time
- VMAT – adding a 3rd partial arc// TOMO (pinhole in middle of target)
- Optimization numbers very close together
- Separate GTV from PTV run hotter with loose constraints
- Use body as constraint for extra emphasis
- Fluence editing


[ROQS-21] ROQS-21^Anus
BEAMS
PLANES
DVH
3D
QUALITY
RESEARCH
DOSE & IMAGESET SUMMARY
MOUSE MODE
DOSE & IMAGE DISPLAY
TOOLS
NAVIGATE to POINTS-of-INTEREST
STRUCTURES
Select/Deselect All Structures
_CTV5040_OPT
_GENITALIA_V40GY
_NT_20GY
_PTV4500_OPT
_PTV5040_OPT
_RECTUM_V30GY
_RING4500
_RING5040
_V45GY_BOWEL
BLADDER
BODY
BOWEL
CTV_4500
CTV_5040
FEMUR_L
CTV OPT
(CONTROLLING GBL)
Planes
Structures
Dose Grid

What special techniques were used when sparing OAR's (organs at risk), without sacrificing target coverage or conformity?

Sparing OAR's



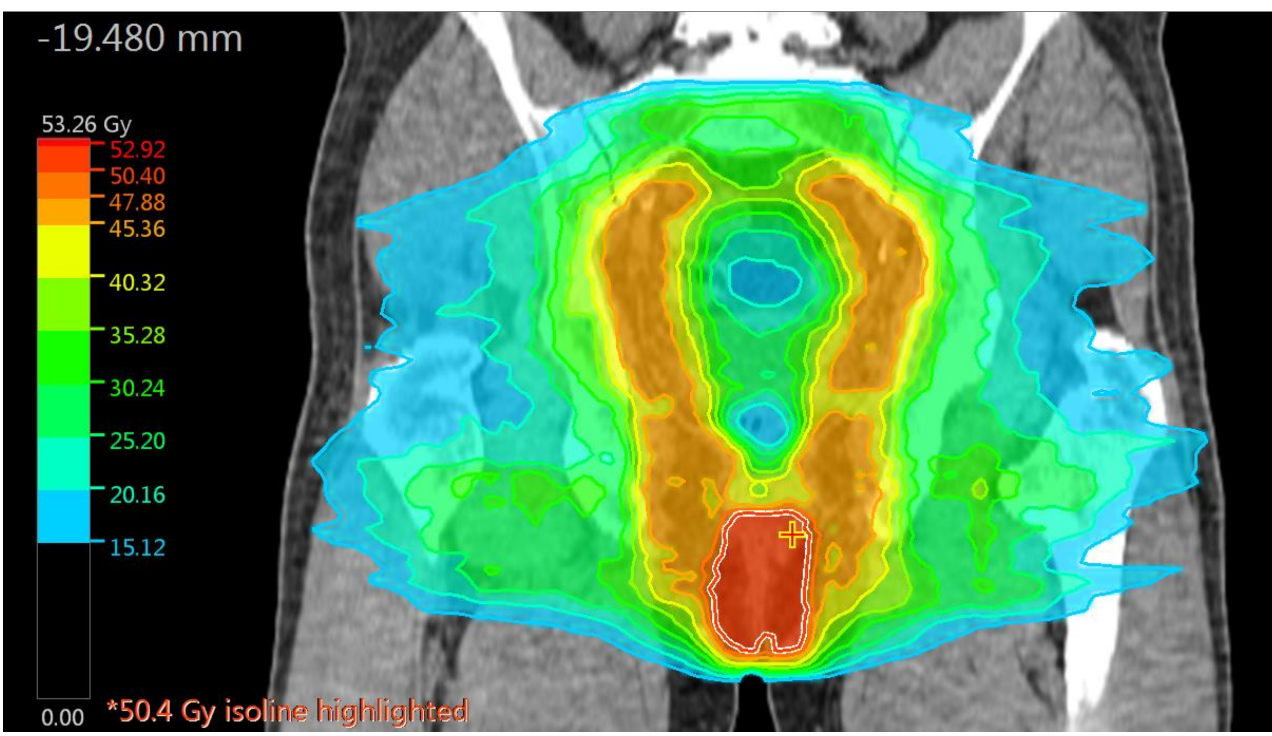
- Address overlap areas prior to optimizing
- Clone OAR - separate
- Separate opti structures from targets – mean dose
- EUD, Biological, etc.
- Never take OAR higher than target
- Hardly had to do anything for this plan
- Multiple optimizations to pause and wait
- Mean dose in optimization, in addition to max
- Beam arrangement – evaluating
- Step into them gently

Top 10

List for IMRT/ VMAT Best Practices

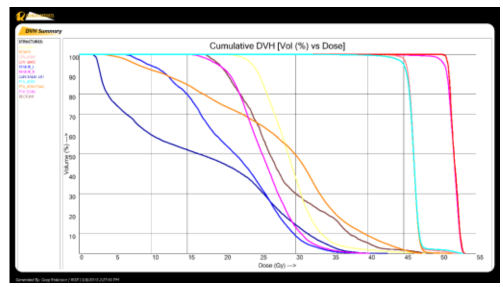
#10 – Consistent Plan Evaluation

- Clear, reasonable goals from the physician
- Rx prior to planning
- Dose grid settings
- Algorithm used
- Consistent field labels/ plan labels
- DVH/ metric analysis of every goal
- Consider using advanced metrics (conformation number)
- The "Smell Test" (isodose lines vs. color wash)
- How is "hotness" defined? (consider absolute volumes)
- USE ABSOLUTE DOSE!!!



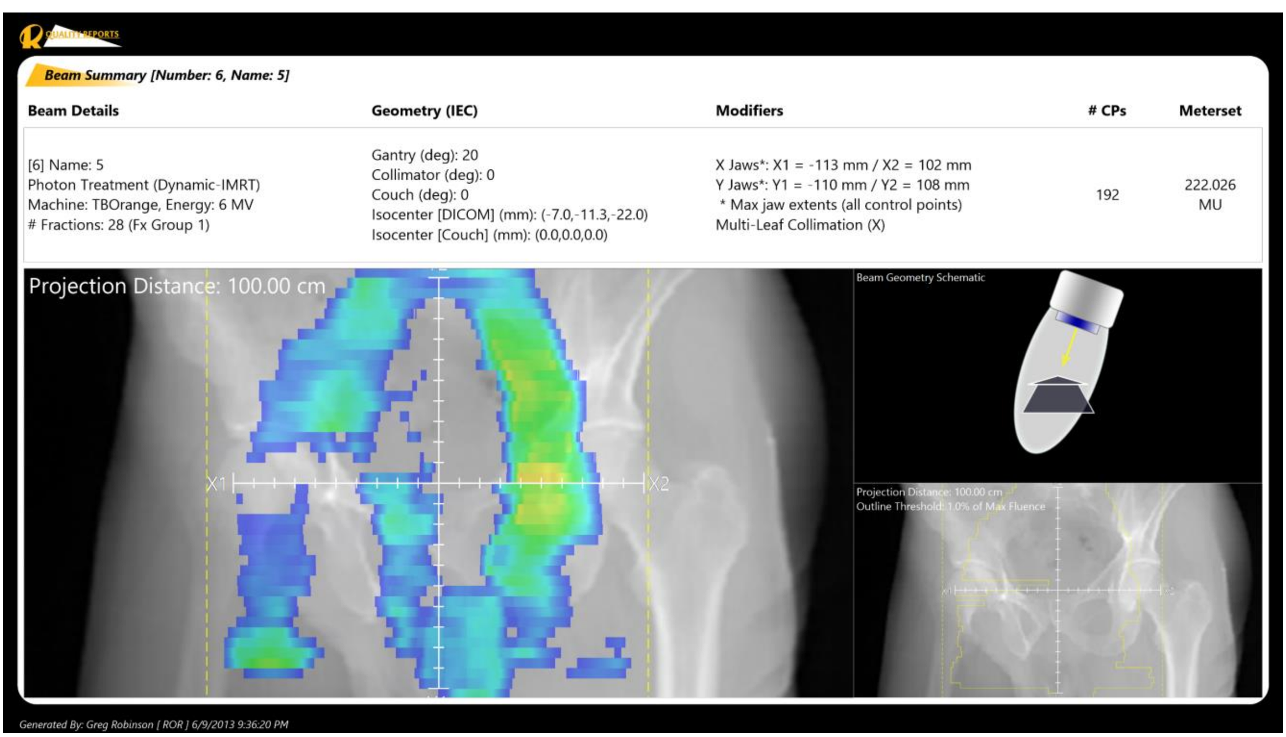
#9 – "Where is the normalization handbook?"

- Every TPS has different normalization settings
- Seems to be a lot of confusion
- Physicians normalizing to DVH (not an isodose line)
- Print plans with actual dose being delivered
- USE ABSOLUTE DOSE!!!



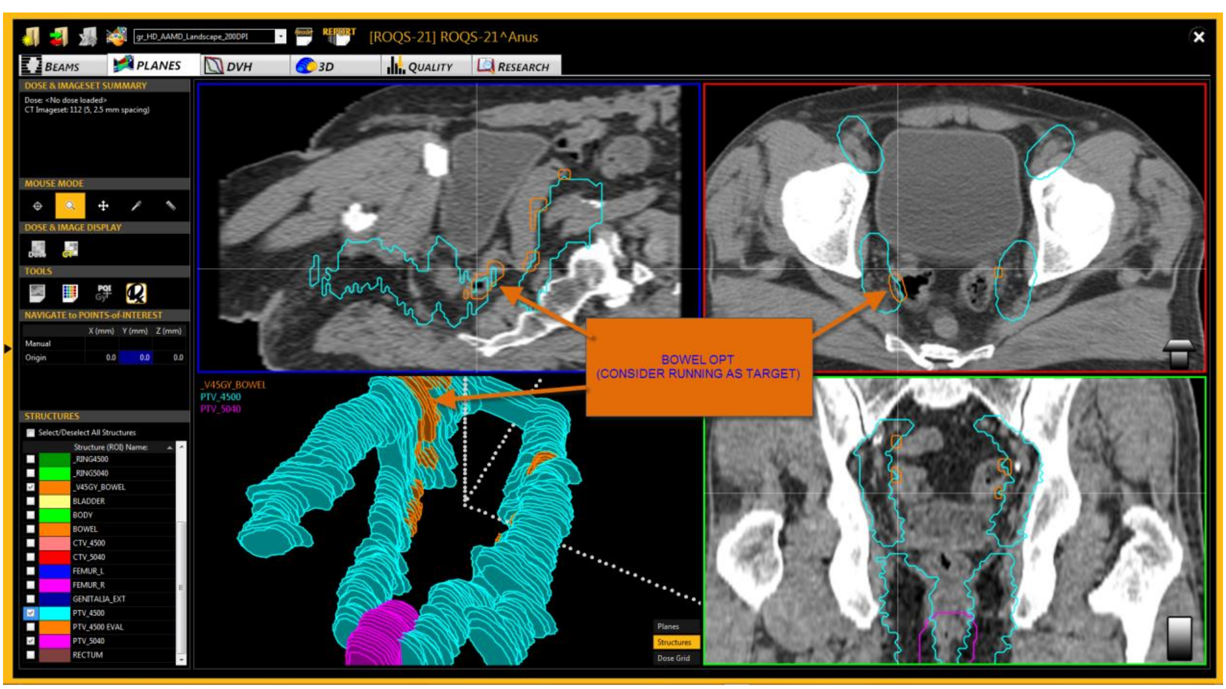
#8 – "Isn't that special!"

- Prove concept of special TPS-specific tools
- Make the heavy service contracts worth the expense!
- Advanced features can save time
- Efficiency of planning and delivery
- Increase consistency inter-planner
- Examples (biological, NTO, fluence editing)



#7 – "Dip your toes in the water"

- Small incremental steps
- Optimize to targets only
- Do not try to overload the optimizer at the start
- See what is possible
- If there is an issue, check contours
- Re-evaluate approach if targets are being compromised

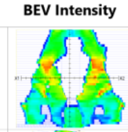
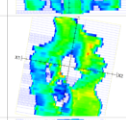
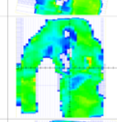
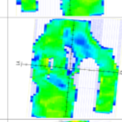
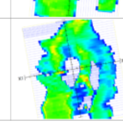


#6 – "Build a good foundation first"

- Beam arrangement can make or break a plan
- More is not always better
- Not enough can lead to headaches
- Consider varying beam arrangements
- Fixing jaws to improve delivery (VMAT)
- Isocenter placement
- Energy selection (mixed; 10x if available)

QUALITY REPORTS

Beam Summary

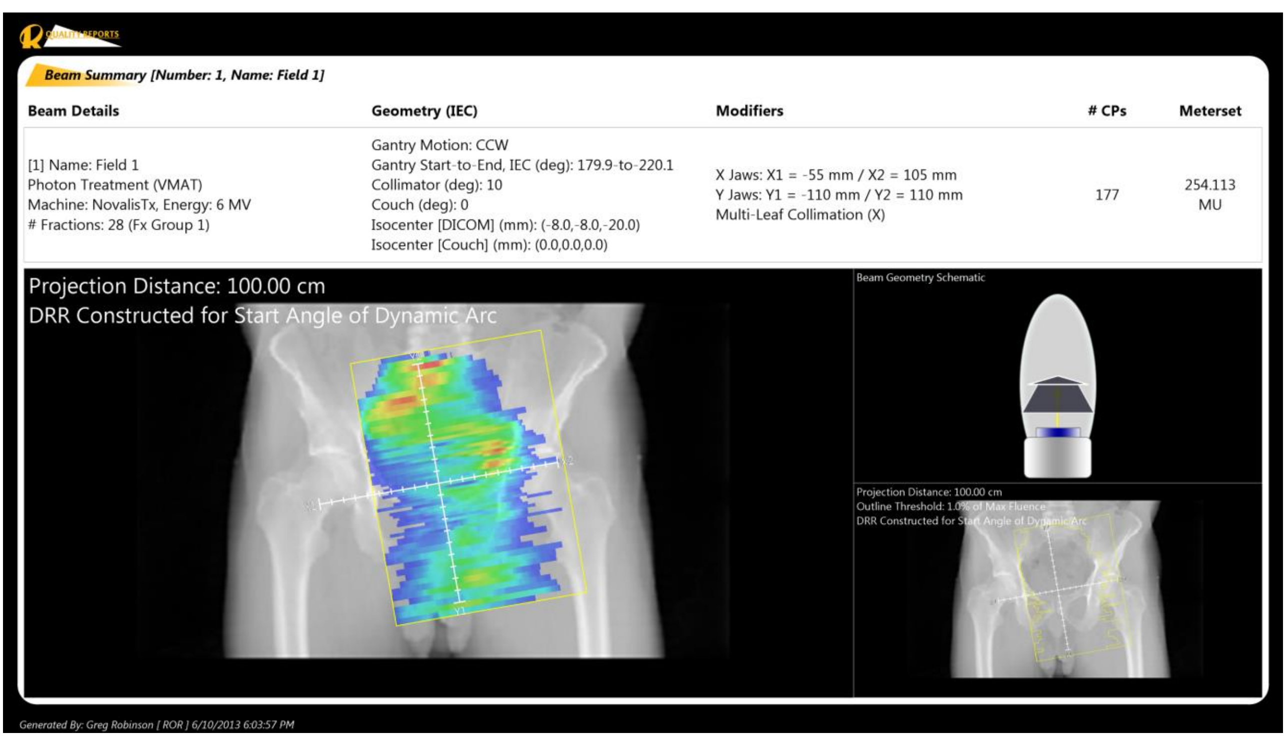
Beam Details	Geometry (IEC)	Modifiers	BEV Intensity	# CPs	Meterset
[1] Name: 1 Photon Treatment (Dynamic-IMRT) Machine: 21 IX, Energy: 6 MV # Fractions: 28 (Fx Group 1)	Gantry (deg): 180 Collimator (deg): 0 Couch (deg): 0 Isocenter [DICOM] (mm): (-0.5,-10.9,-18.0) Isocenter [Couch] (mm): (0.0,0.0,0.0)	X Jaws*: X1 = -110 mm / X2 = 123 mm Y Jaws*: Y1 = -125 mm / Y2 = 100 mm * Max jaw extents (all control points) Multi-Leaf Collimation (X)		289	378 MU
[5] Name: 2 Photon Treatment (Dynamic-IMRT) Machine: 21 IX, Energy: 6 MV # Fractions: 28 (Fx Group 1)	Gantry (deg): 105 Collimator (deg): 350 Couch (deg): 0 Isocenter [DICOM] (mm): (-0.5,-10.9,-18.0) Isocenter [Couch] (mm): (0.0,0.0,0.0)	X Jaws*: X1 = -93 mm / X2 = 90 mm Y Jaws*: Y1 = -115 mm / Y2 = 103 mm * Max jaw extents (all control points) Multi-Leaf Collimation (X)		263	360 MU
[4] Name: 3 Photon Treatment (Dynamic-IMRT) Machine: 21 IX, Energy: 6 MV # Fractions: 28 (Fx Group 1)	Gantry (deg): 40 Collimator (deg): 270 Couch (deg): 0 Isocenter [DICOM] (mm): (-0.5,-10.9,-18.0) Isocenter [Couch] (mm): (0.0,0.0,0.0)	X Jaws*: X1 = -113 mm / X2 = 125 mm Y Jaws*: Y1 = -110 mm / Y2 = 75 mm * Max jaw extents (all control points) Multi-Leaf Collimation (X)		313	381 MU
[3] Name: 4 Photon Treatment (Dynamic-IMRT) Machine: 21 IX, Energy: 6 MV # Fractions: 28 (Fx Group 1)	Gantry (deg): 320 Collimator (deg): 265 Couch (deg): 0 Isocenter [DICOM] (mm): (-0.5,-10.9,-18.0) Isocenter [Couch] (mm): (0.0,0.0,0.0)	X Jaws*: X1 = -110 mm / X2 = 128 mm Y Jaws*: Y1 = -80 mm / Y2 = 103 mm * Max jaw extents (all control points) Multi-Leaf Collimation (X)		318	366 MU
[2] Name: 5 Photon Treatment (Dynamic-IMRT) Machine: 21 IX, Energy: 6 MV # Fractions: 28 (Fx Group 1)	Gantry (deg): 255 Collimator (deg): 10 Couch (deg): 0 Isocenter [DICOM] (mm): (-0.5,-10.9,-18.0) Isocenter [Couch] (mm): (0.0,0.0,0.0)	X Jaws*: X1 = -88 mm / X2 = 100 mm Y Jaws*: Y1 = -115 mm / Y2 = 103 mm * Max jaw extents (all control points) Multi-Leaf Collimation (X)		260	321 MU
			Totals:	***1443 CPs***	***1806 MU***

NOTE: "IMRT" label(s) derived from: 1) usage of MLC and 2) multiple segments.

Generated By: Greg Robinson [ROR] 6/9/2013 10:03:13 PM

#5 – "As the collimator turns…"

- Collimate when possible
- Static beams – look at Beams Eye View with targets turned on
- VMAT – turn varying degrees for each arc
- Obtain coverage easier
- Plans more homogenous



#4 – "Garbage in, garbage out."

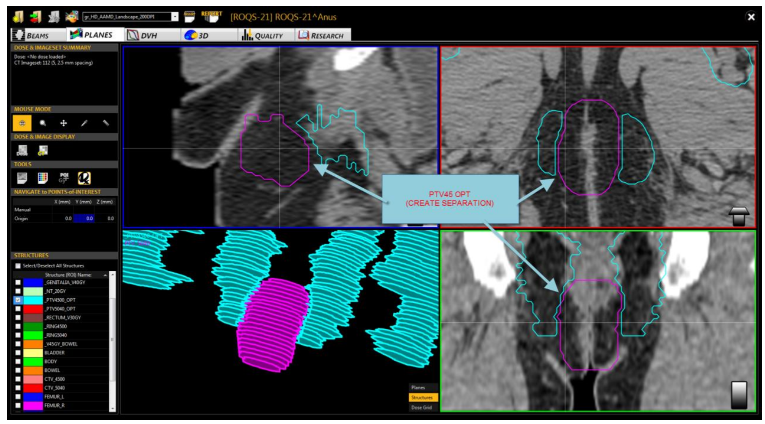
- Don't confuse the optimizer!
  - Abutting/ overlapping contours
  - Poor priority weighting
  - Keep it simple and practical

#3 – "Go the extra mile with contours"

- Even with special, efficiency tools in TPS extra contours are still VERY valuable
  - Rings
  - Normal Tissue
  - Specific dose control structures
- Convert isodose lines to contours to "wash the plan"

#2 – "Don't forget the physical limits"

- Gradient margins - they are important!
- 5-10%/mm dose fall-off is a good rule of thumb
- Use for targets
- Use for rings
- Use for OAR's



#1 – "The more things change, the more they stay the same."

- **CONTOURS, CONTOURS, CONTOURS**
- Optimization Contours
- Cleaning targets
- Standardization of names, colors, etc.
- Smoothing contours