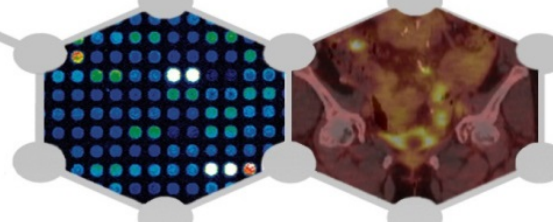

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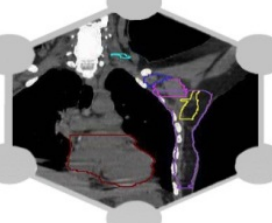
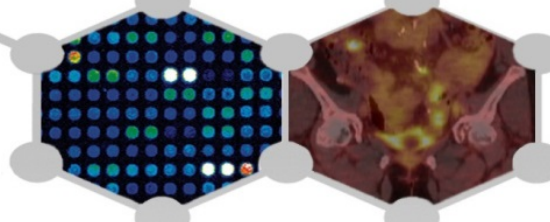


Proton SBRT/Hypofractionation for Lung



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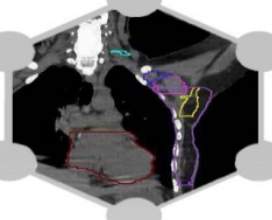

Goal: To develop a common lung SBRT procedural protocol using proton beam

Survey Results: Wide variability in the use of proton beam currently

Lung Survey Overview

- Survey designed by NRG Proton SBRT Working Group
- Sent to all US proton centers participating in NRG trials in Fall 2021
- 83 survey questions, covering 7 categories
  - Vendors, Delivery Techniques, and TPS (1-4)
  - Patient Selection (5-19)
  - Simulation and Motion Management (20-26)
  - Treatment Planning and QA (27-63)
  - Motion and IGRT (64-79)
  - Follow Up (80-81)
  - General (82-83)
- Focus today: questions that received wide variety of responses

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Response Overview

- Response Rate: 63%
- 9/19 centers treat lung SBRT and/or Hypofractionation with protons
- 1 center will implement in the near future (Beaumont)
- 1 center provided some info even though not treating SBRT/Hypofrac (Provision)
- 7/19 completed IROC lung credentialing

Institute	Response	Treat or Not
MCA	Y	Y
UHC	Y	N
Emory	Y	Y
Inova Schar	Y	N
John Hopkins	Y	N
MCR	Y	Y
MDA	Y	N
MGH	Y	N
Procure NJ	Y	N
UOHSC	Y	Y
UPenn	Y	N
Provision	Y	Y
Willis Knighton	Y	Y
Beaumont	Y	N
Cinncinatti	Y	N
NYPC	Y	Y
SCCA	Y	N
Maryland	Y	Y
Wash Univ	Y	Y

Proton SBRT/Hypo		
YES	9	47%
NO	10	53%
Total	**19**	

IROC lung		
YES	7	37%
NO	12	63%
Total	**19**	

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Vendors, Delivery Techniques, and TPSs

Vendors	Count #	%
IBA	8	40%
Mevion	3	15%
Varian	4	20%
Hitach	4	20%
Protom	1	5%
Total	**20**	

Techniques	Count #	%
PBS	16	80%
Passive Scatter	2	10%
Uniform scanning(SCCA)	1	5%
hyperscan	1	5%
Total	**20**	

TPS	Count #	%
Raystation	11	58%
Eclipse	6	32%
Pinnacle	1	5%
Astroid	1	5%
Total	**19**	

- MGH has two vendors (IBA and Protom)
- MDA has two delivery techniques (PBS and Passive Scattering)

Questions for Physician Discussion

1. Patient Selection
    I. What is the maximum tumor diameter allowed?
    II. What's the prescription for primary lung cancers?
2. Treatment Planning
    I. What are the dosimetry parameters for the following targets (PTV, CTV, and GTV)?
    II. Which target is used for coverage evaluation for the nominal plan?
    III. What is the inhomogeneity dose allowed in the target?
    IV. What is the allowable mean lung-GTV dose for 5 fx SBRT? (if applicable)
3. How can we increase the use of proton SBRT in lung cancer treatment (Volume Imaging CBCT vs. In-Room CT, Motion Management, Robust Plan Evaluation, Adaptive Plan Timing)?

Discussion Point: Patient Selection

Survey Question	Response	# Responses	% Responses
What is the maximum tumor diameter allowed?	No limit	4	44%
	4cm	1	11%
	5cm	2	22%
	6cm	1	11%
	Others	1	11%

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Discussion Point: Prescription

Survey Question	Response	# Responses	% Responses
What's the prescription for primary lung cancers?	48 Gy / 4 fx	2	17%
	50 Gy / 5 fx	6	50%
	60 Gy /15 fx	1	8%
	60 Gy / 5 fx	1	8%
	54 Gy / 3 fx	1	8%
	50-60 Gy in 15-20 fx	1	8%

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Discussion Point: Dose Constraints, Uninvolved Lung

What are the dose constraints for uninvolved ipsilateral and contralateral lung?	lung total V20Gy<10%	1	10%
	Per RTOG 0813, for both lungs, no more than 37% @ 13.5 Gy, no more than 1500cc@ 12.5 Gy, no more than 1000cc @ 13.5 Gy	1	10%
	Consider 15 Gy for SBRT per HyTEC, no real constraint for hypofrac	1	10%
	V13<35%/V7<40%/V<60%3 (Total Lung - CTV)	1	10%
	V15<1000cc, V12<1500cc	1	10%
	V13Gy<36%	1	10%
	1500 cc < 12.5 Gy, 1000 cc < 13.5 Gy, Avoid shooting toward/through to contralateral lung to maintain ALARA. Using multiple beams with smaller separation to reduce the dose spillage as much as possible to the ipsilateral lung.	1	10%
	Hypofrac per PCG LUN 005 study	1	10%
	No Answer	2	20%

Discussion Point: Planning Volumes & Target Coverage

PTV:
- D95 ≥ 95%Rx
- D99 ≥ 90%Rx
- V100≥ 95%
- Not used

CTV
- D95 ≥ 100%Rx
- D99 ≥ 90%Rx
- D99 ≥ 100%Rx
- D98 ≥ 100%Rx (G=C)
- V95 >95%(r)
- V110% <20%
- V100%> 95%

GTV
- D95 ≥ 100%Rx
- D95 ≥ 100%Rx
- D98 ≥ 100%Rx
- Not used

Discussion Point: What technology would make you more likely to treat lung with proton SBRT?

- Treatment planning capabilities?
- Motion management capabilities?
- IGRT technology?

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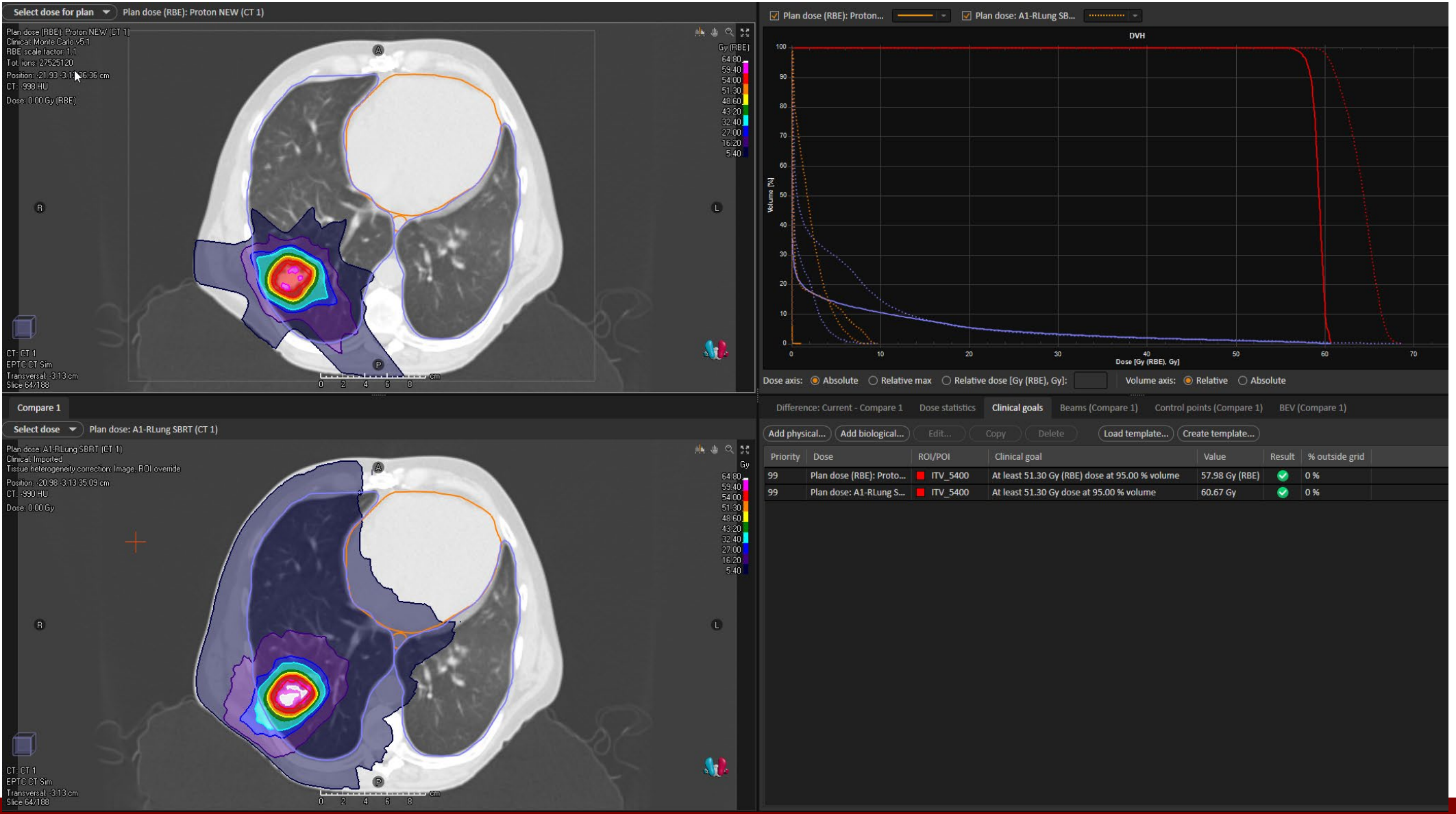
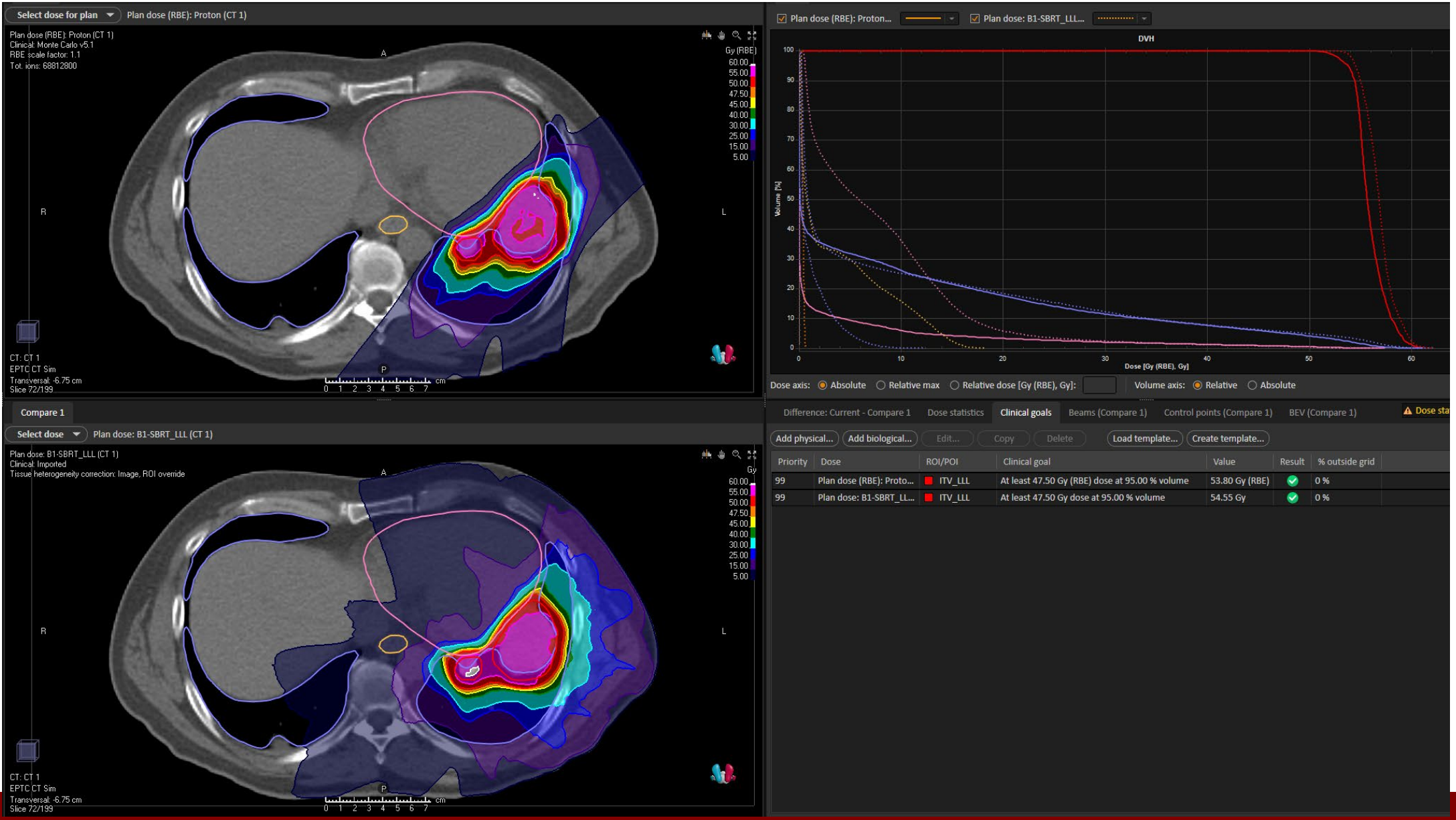
Upper Lobe Tumors

Lower Lobe Tumors



Reducing Heart Dose



Reducing Heart Dose