

Therapist and
Dosimetrist
Perspectives on
Improving Treatment
Quality in Radiation
Oncology

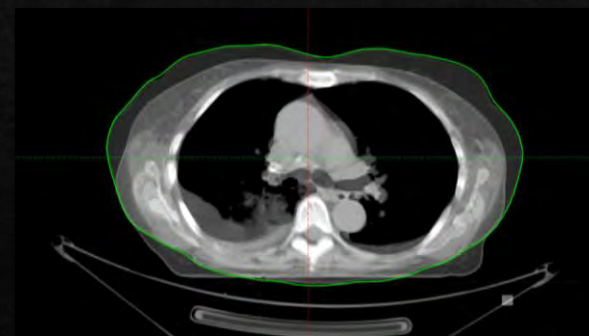
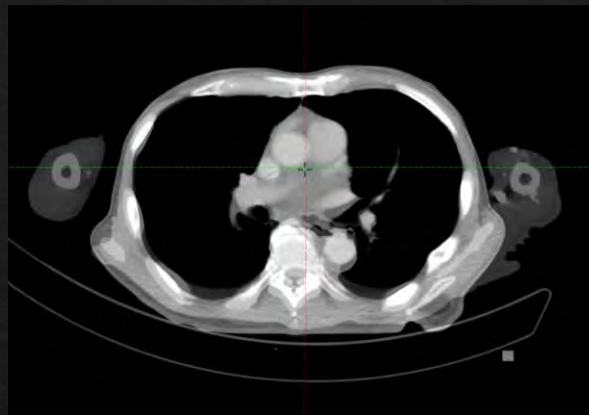
Charlene Rhodd



Image Fusion

PET/CT to CT Simulation

Image Fusions before



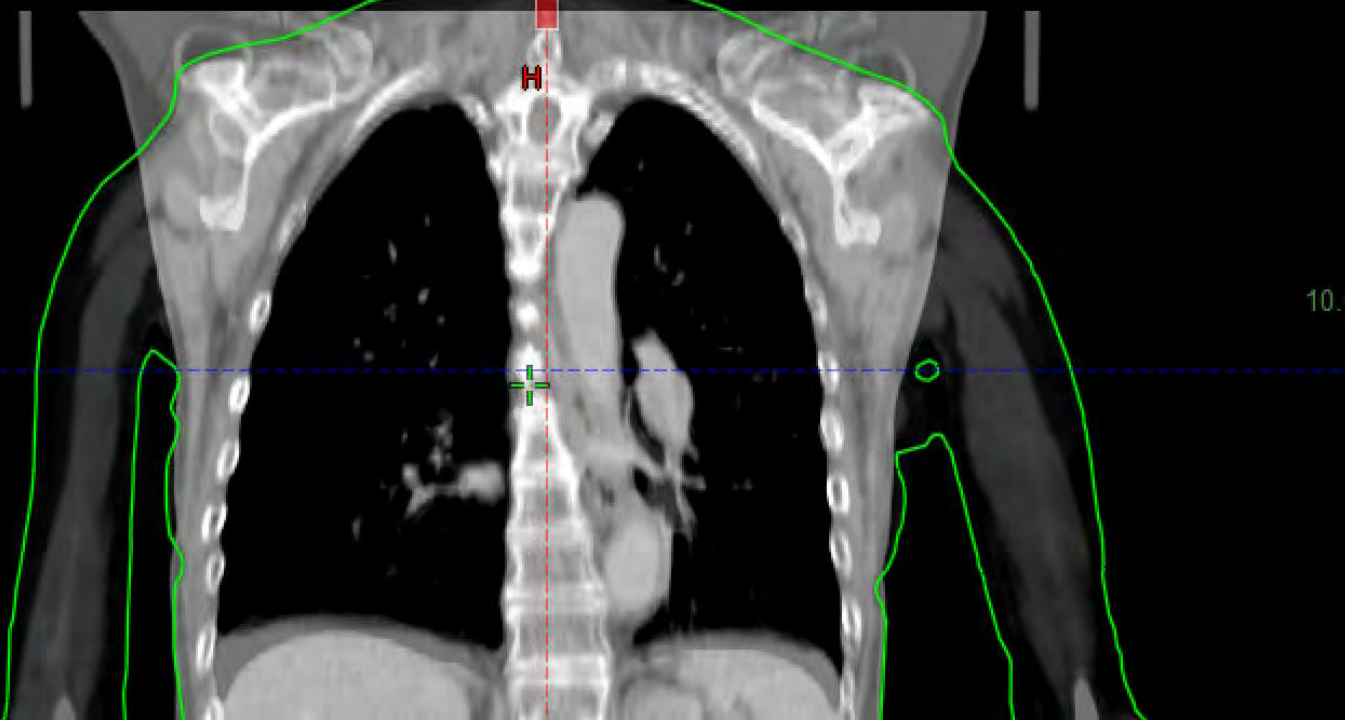
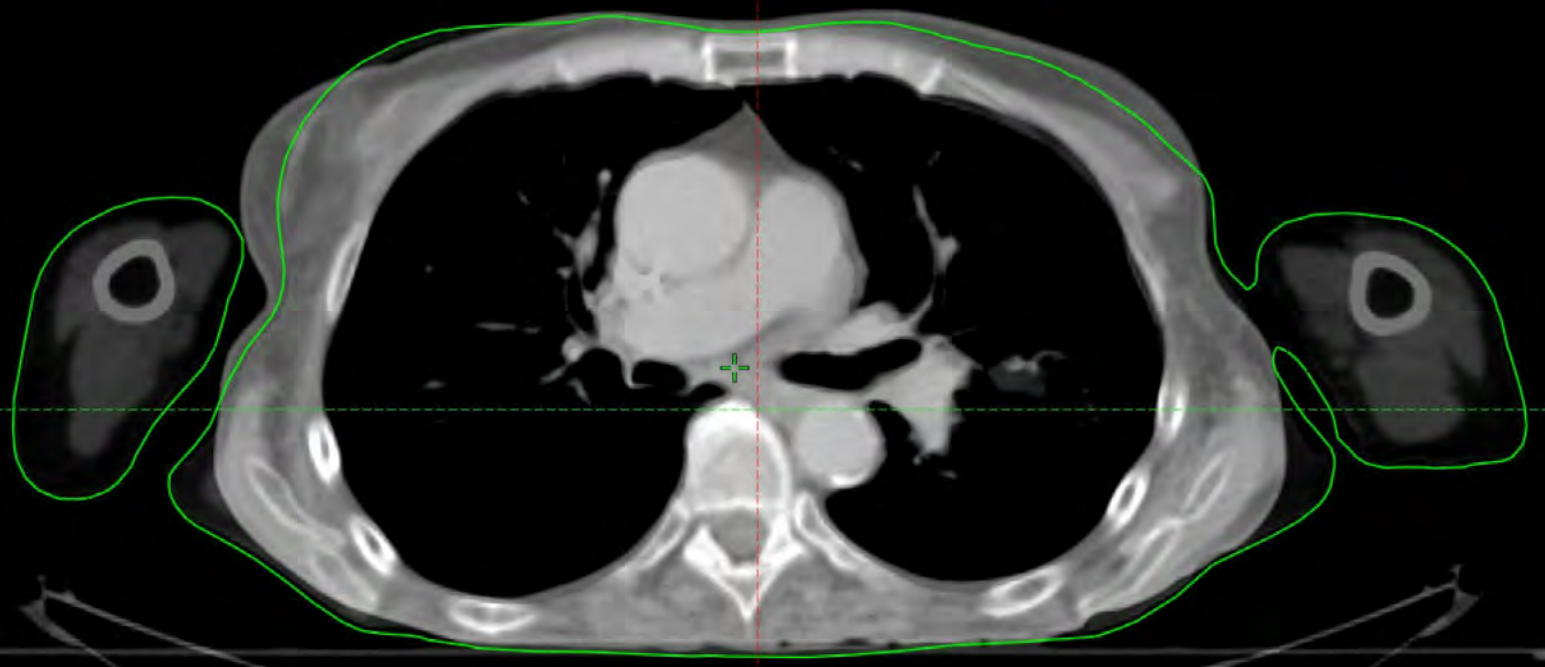


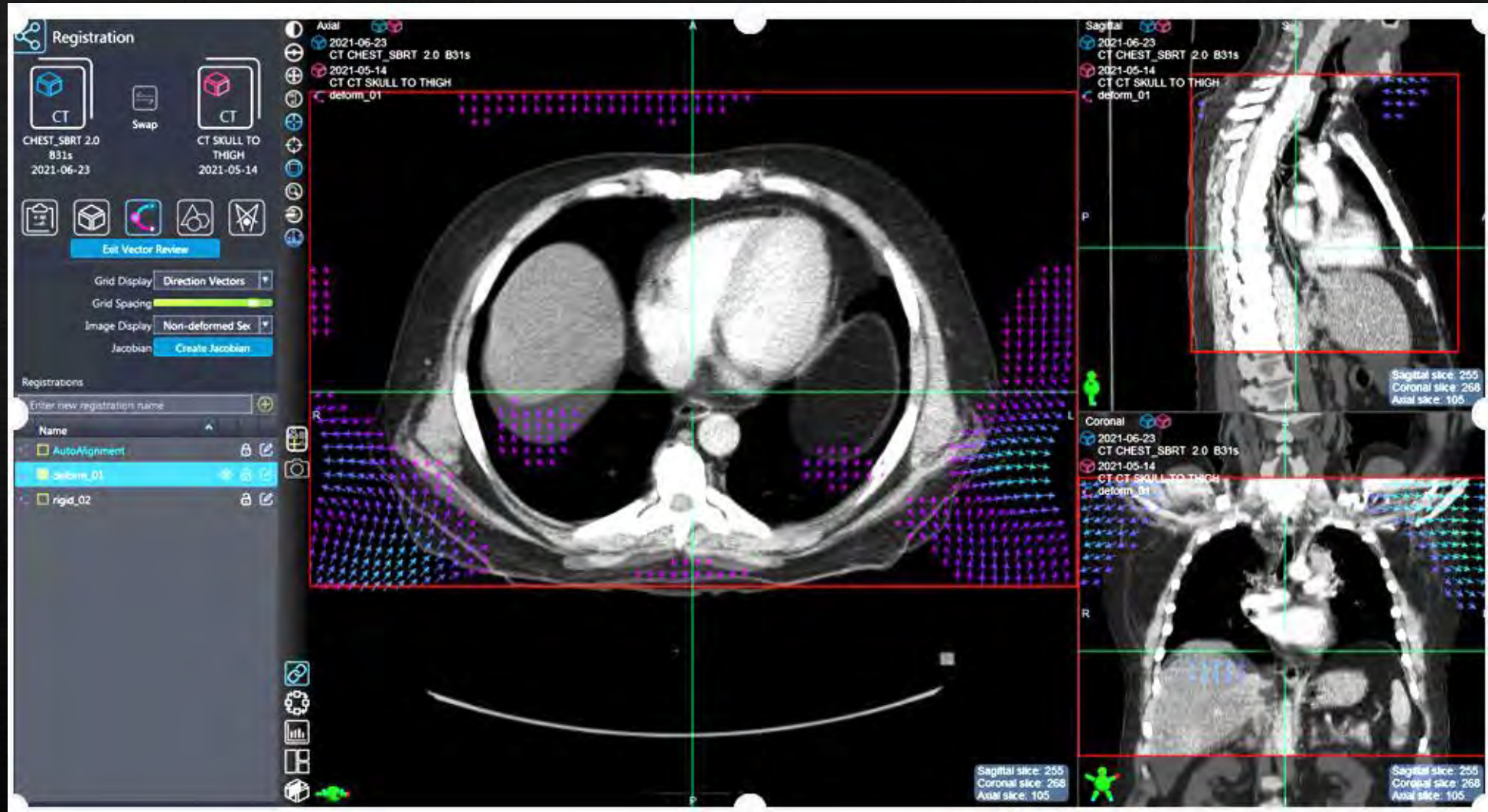
Image Fusions
before

PET/CT

- ◆ Flat Tabletop
- ◆ Thin pad on top
- ◆ Wing Board Arms up



How to



Patient #	Volume(cm ³)	Min (warp units: mm)	Mean (warp units: mm)	Max (warp units: mm)
1	3825.5	0.01	3.45	15.56
2	3517.1	0.03	3.79	19.91
3	3307.6	0.05	6.02	14.18
4	3098.9	0.00	4.16	10.31
5	2883.7	0.06	6.10	20.02
6	3841.1	0.06	7.87	19.16
7	3429.7	0.02	4.57	10.85
8	2338.6	0.34	9.17	25.42
9	3480.3	0.08	3.72	13.7
10	5309.7	0.02	3.50	11.73
Average		0.067	5.235	16.084

Table I. Total Lung

Patient #	Volume(cm ³)	Min (warp units: mm)	Mean (warp units: mm)	Max (warp units: mm)
1	26.8	0.41	2.33	4.37
2	18.7	1.62	2.52	4.37
3	22.0	3.97	4.65	5.14
4	7.2	4.06	5.58	7.75
5	36.6	0.38	3.04	7.61
6	35.4	1.10	5.85	10.73
7	13.0	0.45	1.66	3.42
8	48.6	0.00	6.92	9.15
9	36.4	0.00	4.16	6.94
10	46.9	0.00	1.05	2.46
Average		1.199	3.776	6.194

Table II. Spinal Cord

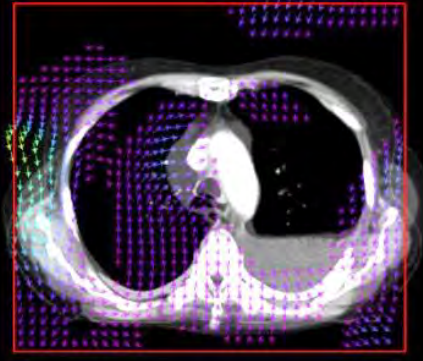
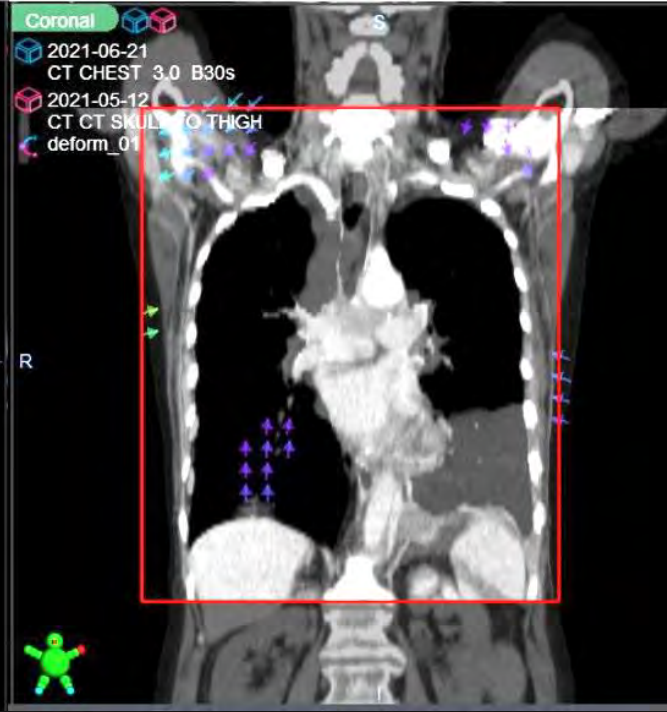
Patient #	Volume(cm ³)	Min (warp units: mm)	Mean (warp units: mm)	Max (warp units: mm)
1	26.4	0.77	3.19	5.46
2	27.5	2.62	6.36	9.81
3	47.1	4.05	5.13	6.62
4	34.7	1.02	4.69	9.16
5	30.7	1.78	4.79	9.68
6	11.1	4.32	8.55	10.54
7	17.7	1.66	2.85	4.66
8	28.6	1.34	5.28	8.93
9	36.0	0.52	3.02	6.69
10	27.7	0.04	1.92	4.69
Average		1.812	4.578	7.624

Table III. Trachea

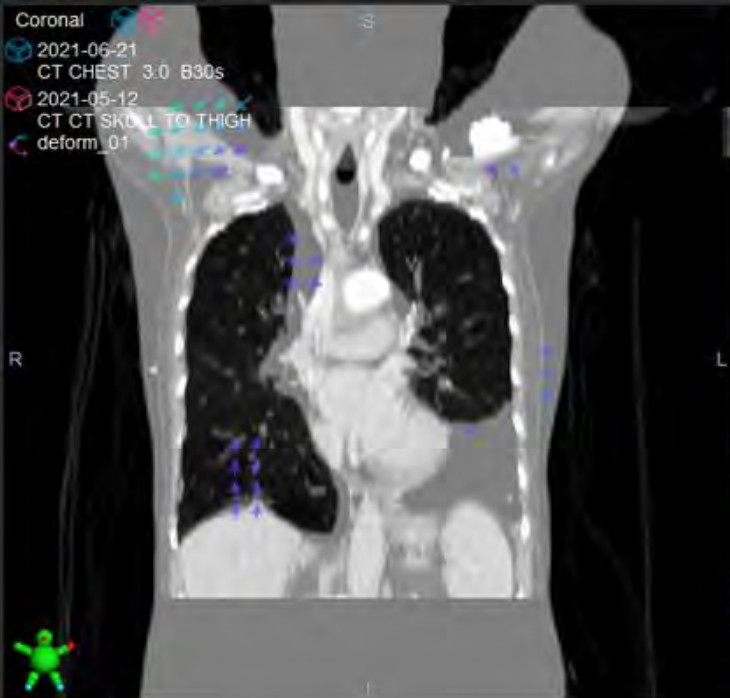
Results

Coronal

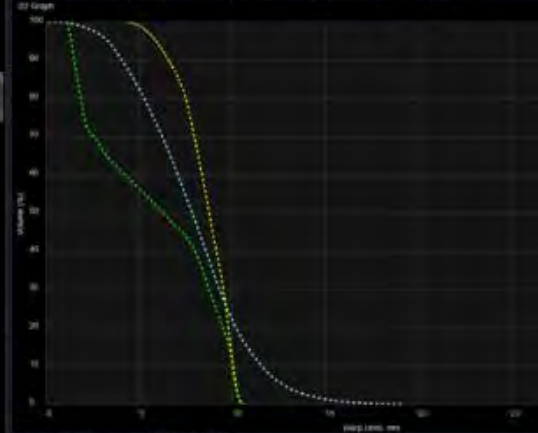
2021-06-21
CT CHEST 3.0 B30s
2021-05-12
CT CT SKULL TO THIGH
deform_01



Highest Warp Patient



Deformable Registration Warp Map Histogram - deform_01



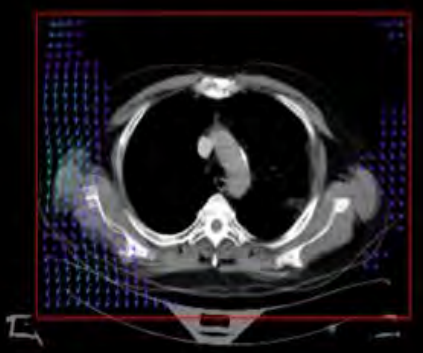
Primary Volume: CHEST 3.0 B30s
Secondary Volume: CT SKULL TO THIGH

Name	# Bins	Volume (cm ³)	Min / Mean / Max	Warp Units
Heart	1024	614.6 cm ³	2.29 Warp Units: mm	10.25 Warp Units
Region of Interest	1024	23917.3 cm ³	0.00 Warp Units: mm	8.85 Warp Units
Spiral Cord	1024	35.4 cm ³	1.10 Warp Units: mm	5.85 Warp Units
TBT	1024	11.1 cm ³	4.32 Warp Units: mm	8.55 Warp Units
Total Lung	1024	3841.1 cm ³	0.06 Warp Units: mm	7.87 Warp Units
Heart	1024	614.6 cm ³	2.29 Warp Units: mm	10.25 Warp Units
Region of Interest	1024	23917.3 cm ³	0.00 Warp Units: mm	8.85 Warp Units



2021-11-05
 CT CHEST_SBRT 2.0 HD_FoV
 2021-10-04
 CT 2.85 x 2.85 MAC_CT ATTEN COR
 deform_01

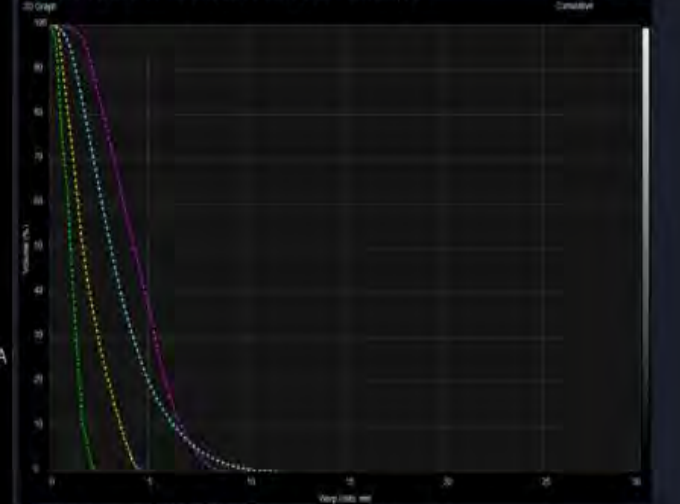
Coronal
 2021-11-05
 CT CHEST_SBRT 2.0 HD_FoV
 2021-10-04
 CT 2.85 x 2.85 MAC_CT ATTEN COR
 deform_01



Lowest Warp Patient

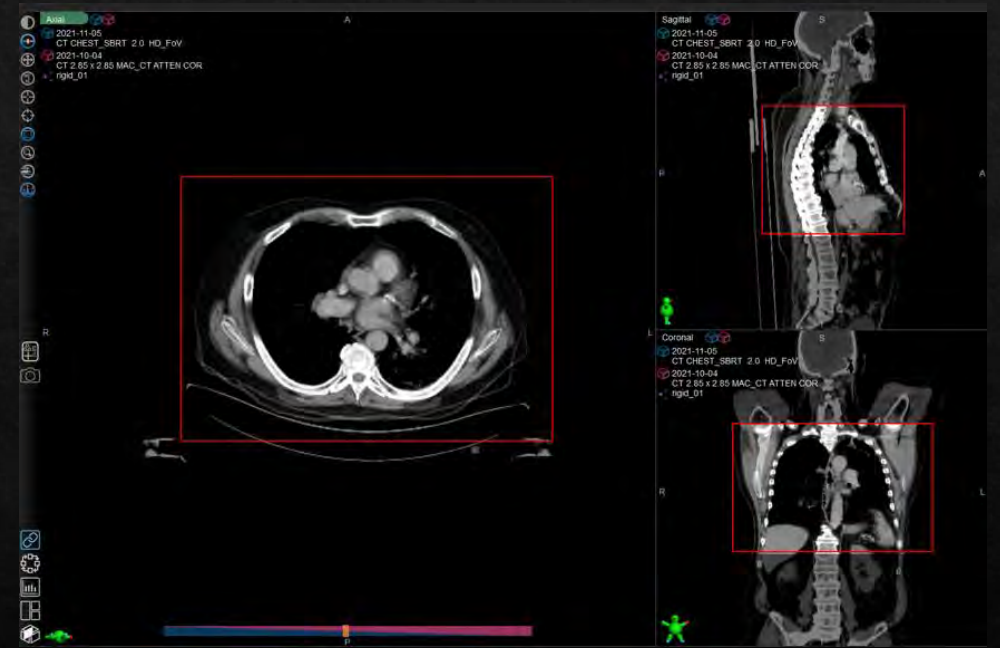


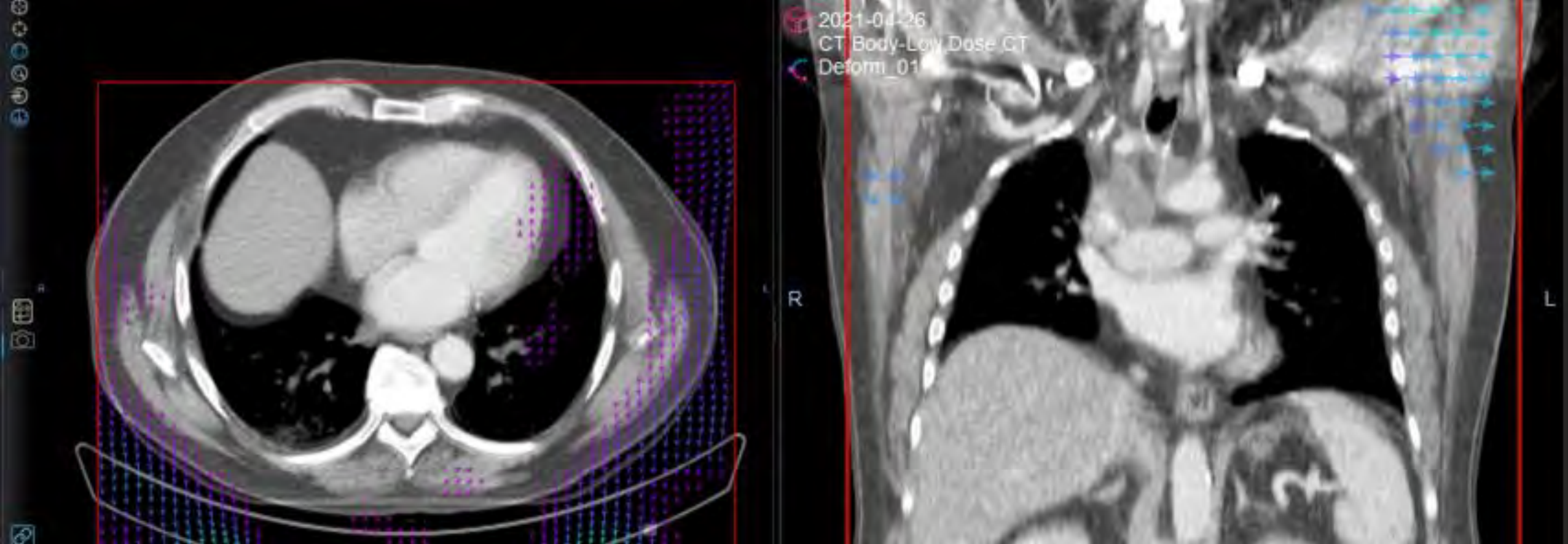
Deformable Registration Warp Map Histogram - deform_01 2021-11-17 13:26:59



Primary Volume: CHEST_SBRT 2.0 HD_FoV
 Secondary Volume: 2.85 x 2.85 MAC_CT ATTEN COR

Name	# Bins	Volume (cm ³)	Min / Mean / Max
Total Lung	1024	5309.7 cm ³	0.02 Warp Units: mm / 3.50 Warp Units: mm / 11.73 Warp Units: mm
TBT	1024	27.7 cm ³	0.04 Warp Units: mm / 1.92 Warp Units: mm / 4.69 Warp Units: mm
Spinal Cord	1024	46.9 cm ³	0.00 Warp Units: mm / 1.05 Warp Units: mm / 2.46 Warp Units: mm
Heart	1024	844.8 cm ³	0.08 Warp Units: mm / 4.36 Warp Units: mm / 9.07 Warp Units: mm
Region of Interest	4096	50948.1 cm ³	0.00 Warp Units: mm / 6.23 Warp Units: mm / 28.77 Warp Units: mm





Average Warp Patient

Discussion

- ◇ Patients with minimal anatomical changes between their PET/CT and CT simulation have the best quality RR.
- ◇ Better fusions and more accurate target delineation may help improve treatment outcomes for lung patients.



Image to
Treatment
Delay



◇ What is Intrafraction motion and why is it bad?

Response Times


Jan-April 2020

Minutes	<5	5-8	8-10	10-15	15<
Total	169	122	35	24	3

May-July 2021

Minutes	<5	5-8	8-10	10-15	15<
Total	165	82	37	9	7

* 5 patients
waited over 20
minutes for
imaging to be
approved

- 
- ◇ A pre-page system- failed due to miscommunication
 - ◇ Getting full cooperation
 - ◇ Imaging takes 1 minute would you be willing to give your patient the most accurate treatment by waiting 1 minute
 - ◇ Possible research using OSMS

Additional Areas of Interest

- ◇ Surface Guided Radiation Therapy- Appropriate way to perform
- ◇ Imaging Breast Dose
- ◇ Contouring Immobilization Devices
- ◇ Could showing patients their treatment plans and explaining the importance of holding still help with patient cooperation

Thank you!
Questions?