Day 1 Couch Coordinates: Providing a Starting Point Using a Novel Technique

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Carl Horsfield BSc MSc DipIPEM MIPEM
Lead for Imaging - carl.horsfield1@nhs.net

Radiation Physics Department | The Queen's Centre |
Castle Hill Hospital | Castle Road | Cottingham | HU16 5JQ

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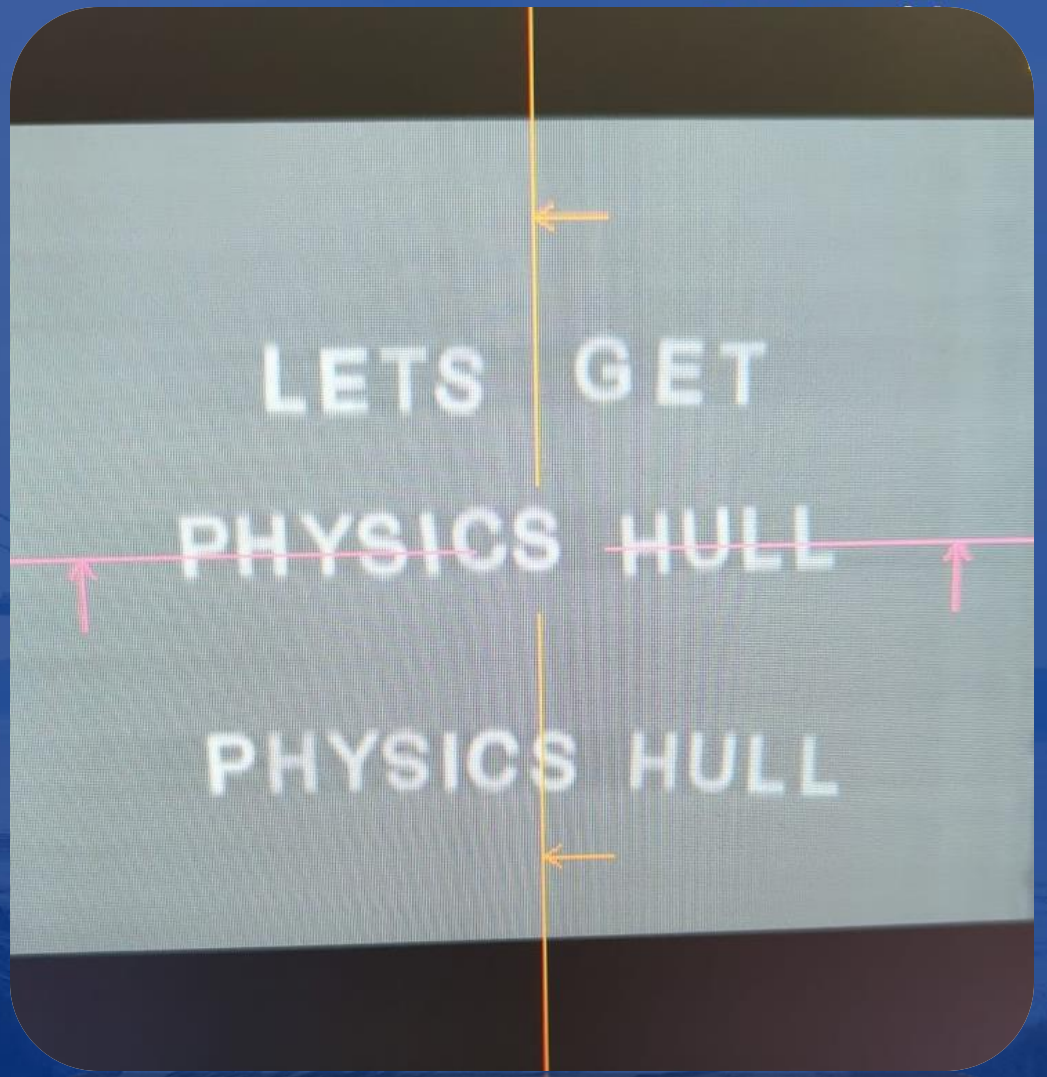
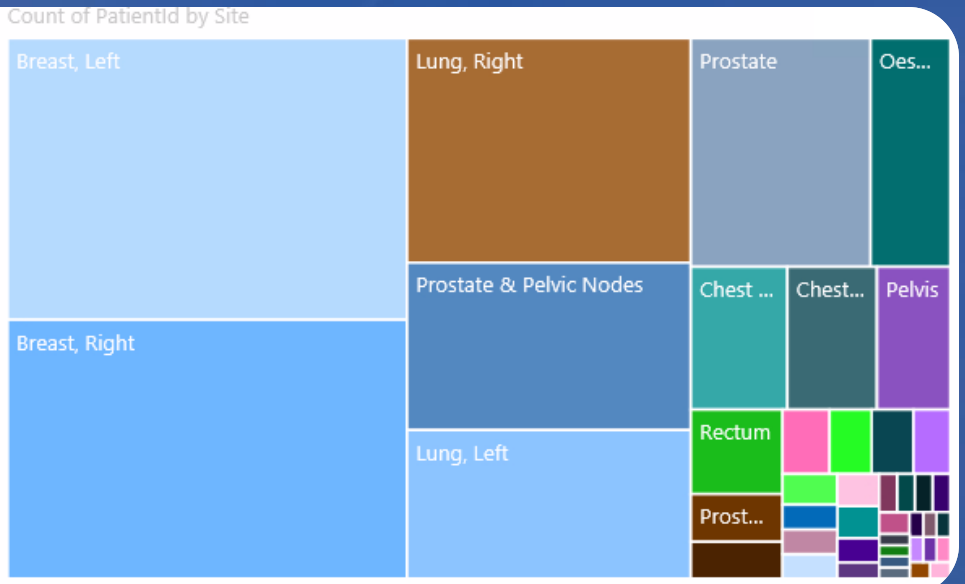


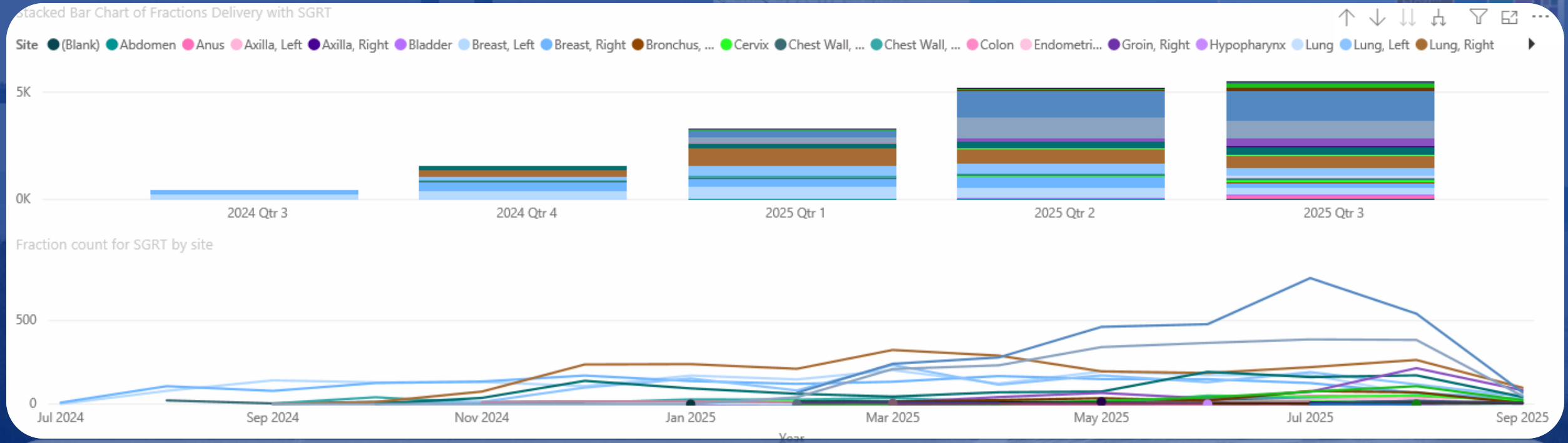
Our SGRT journey so far

1469
Count of Unique Patients

42
Count of Unique Sites

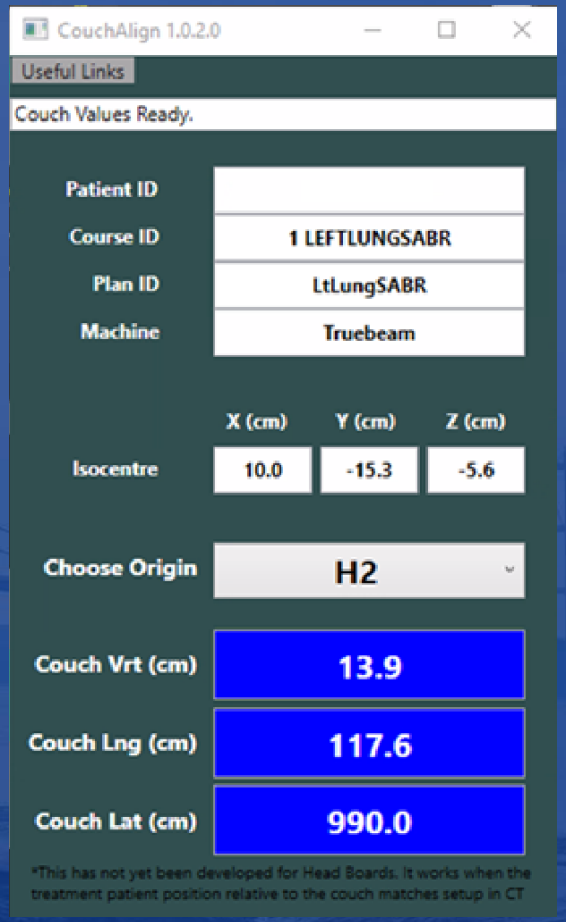
16.01K
Count of SGRT fractions





Objectives of the work

- *The objectives of this work were to:*
- *Provide a quick and accurate method for positioning patients as a starting point consistent with SGRT expectations.*
- *Minimize the need to "hunt" for a usable surface for SGRT recognition.*
- *Rapidly identify cases with incorrect indexing or immobilisation.*
- *Achieve positioning within 5 cm of the required surface for most setups. This would be used every day to maintain consistency. This means we are aiming to ignore fraction 1 "inconsistencies".*
- *To ensure we had a system that worked as contingency incase SGRT did not work.*



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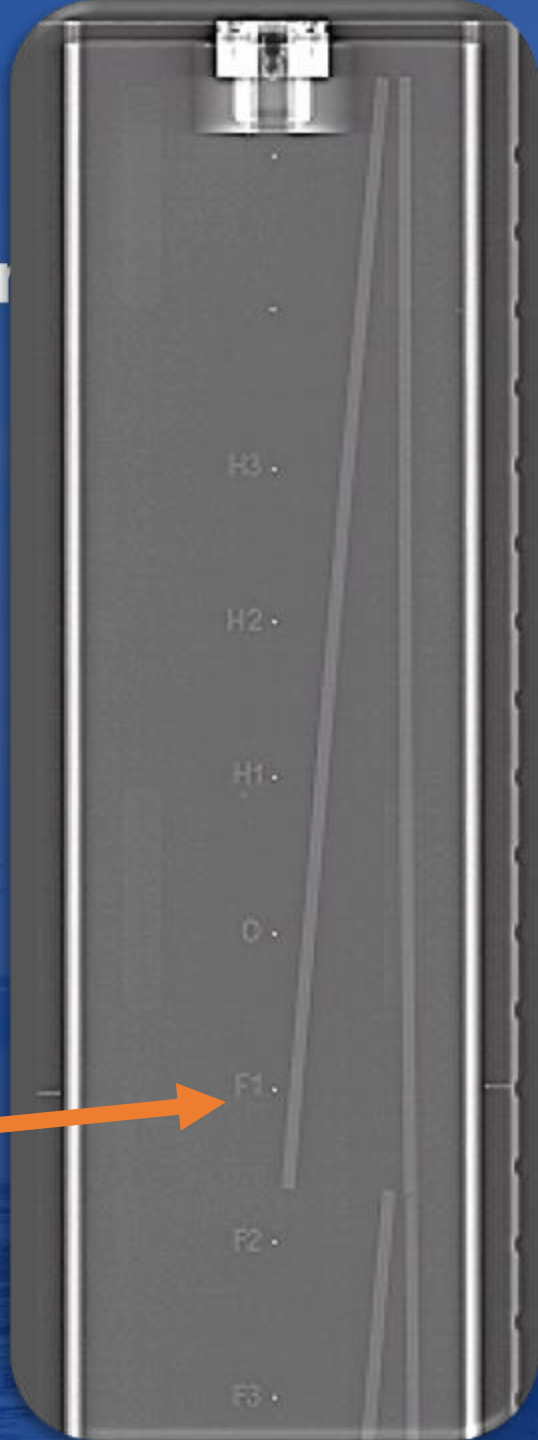
Method- Pretreat

Letters align with Varian Indexing attached to the underside of our couches

No Isocentres past here on Halcyon



Getting a match

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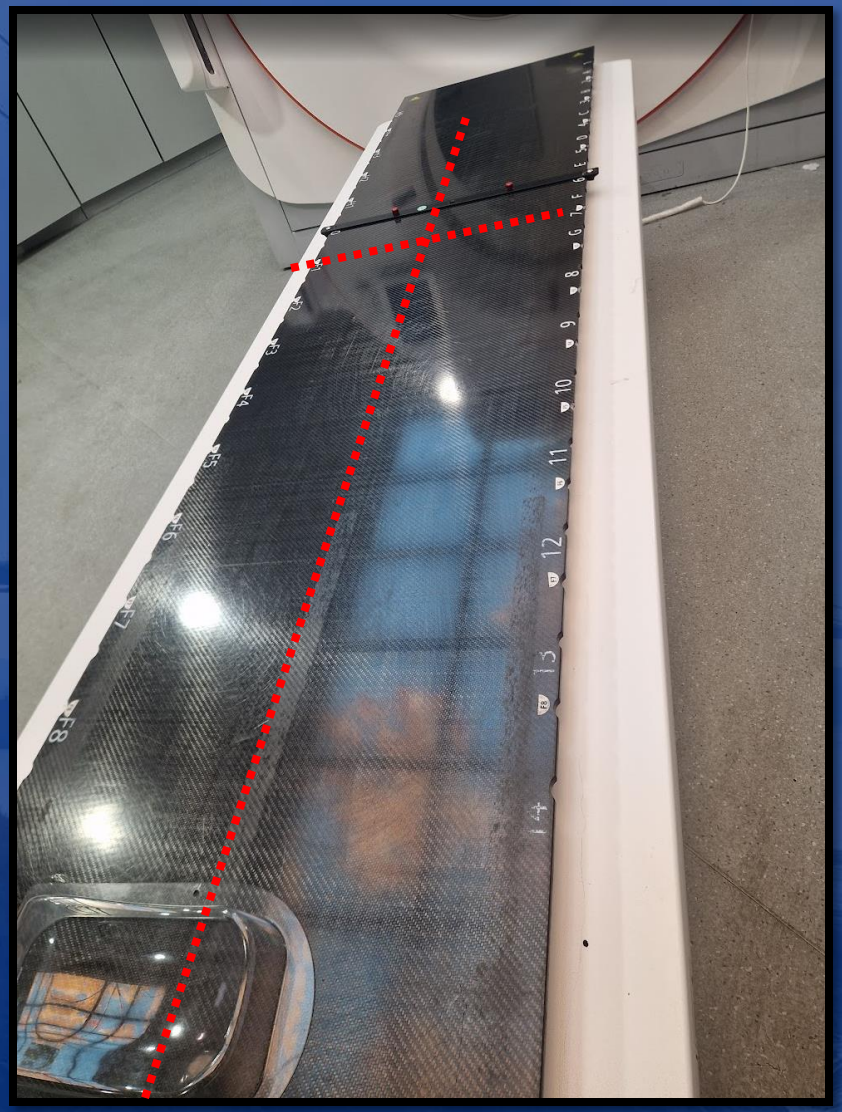
Basic Method-

- Found the coordinate of the Varian couch “O” marker and matched this with the same marker on the CT couch.
  - This was necessary for both Halcyon and Truebeams

- I have an offset table for each index mark that is used within Eclipse Scripting Code.



Method- Treatment Planning

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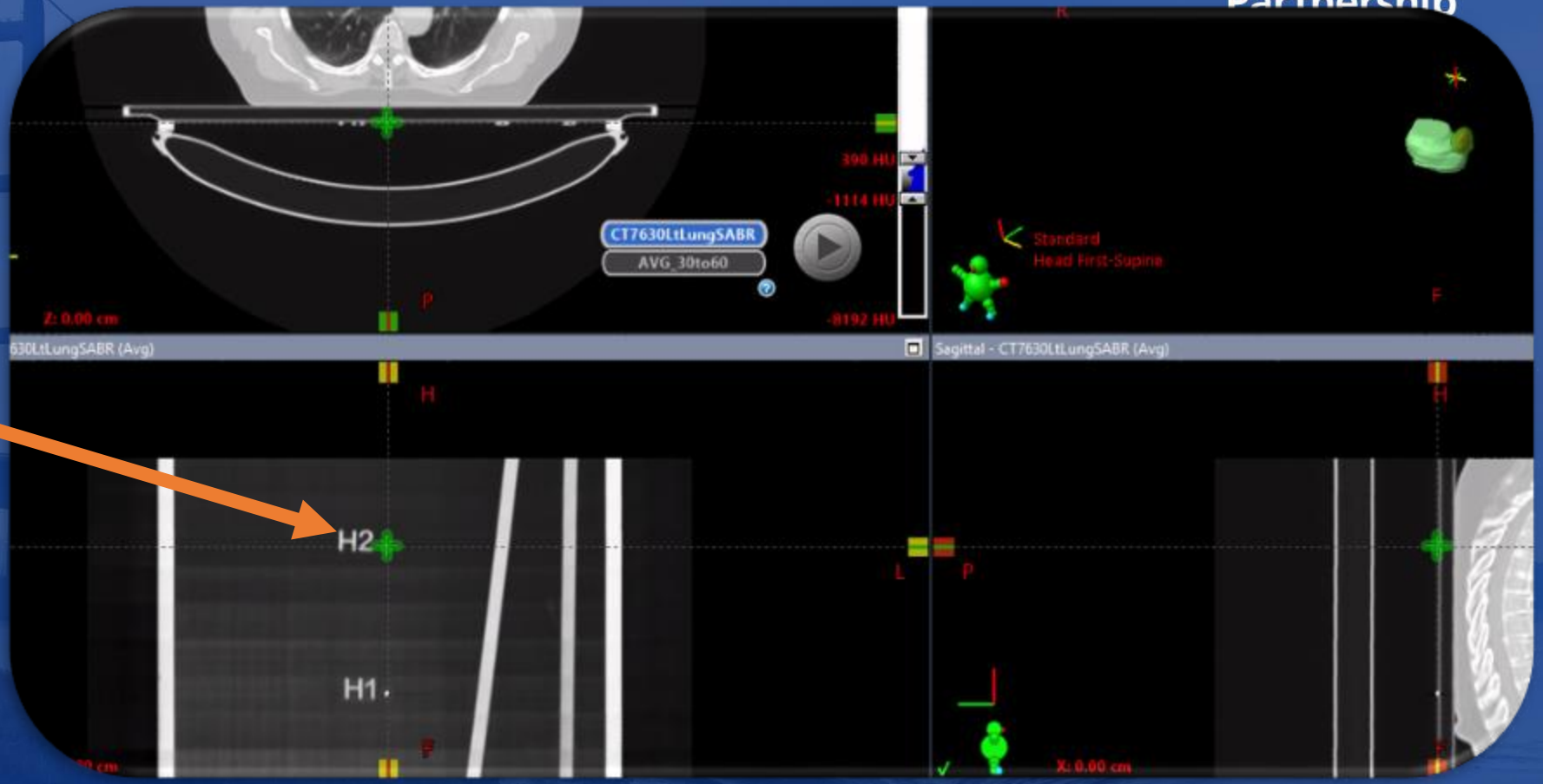
The planner selects the origin that they want to use- Usually just the closest to the Isocentre. The TPS user Origin is placed here. All isocentre selection remain as they were.



Method-
Couch Align Application

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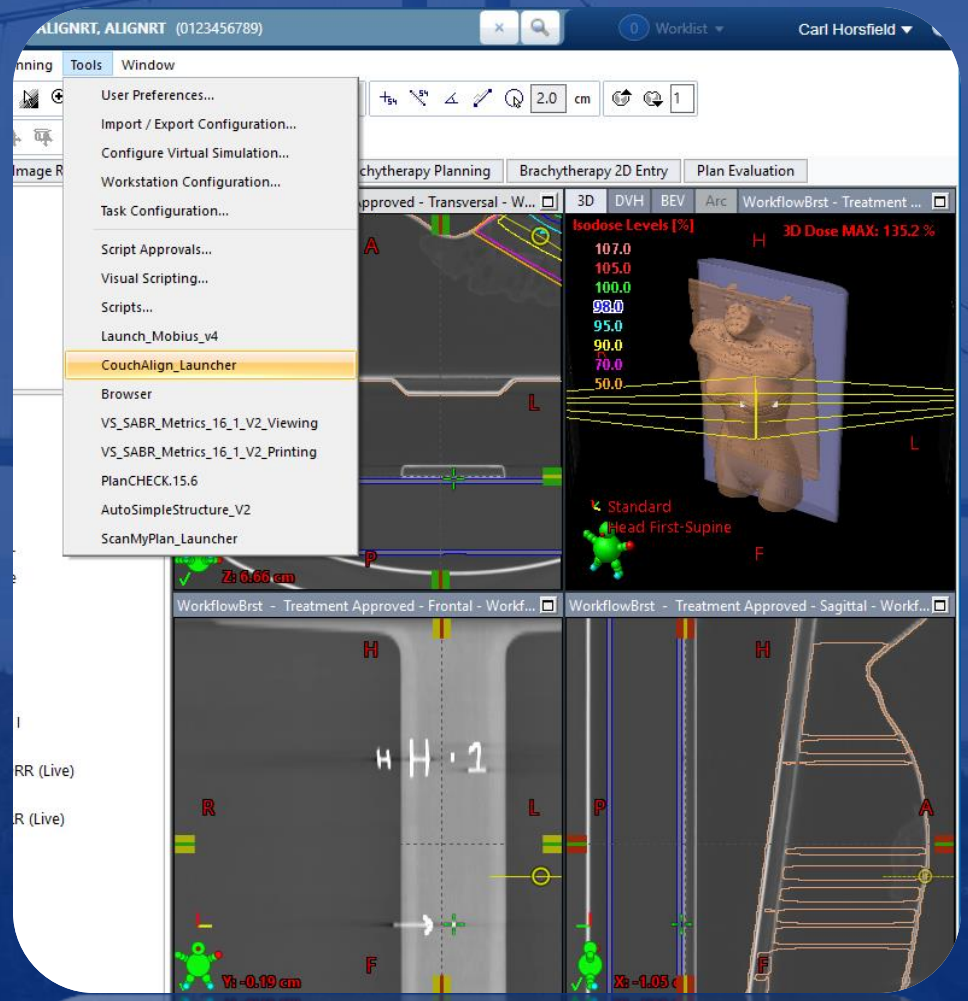
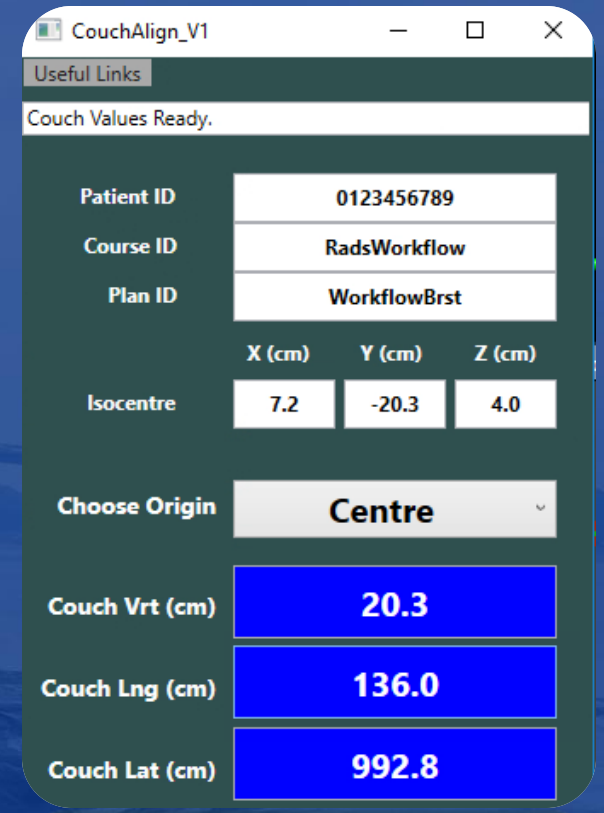
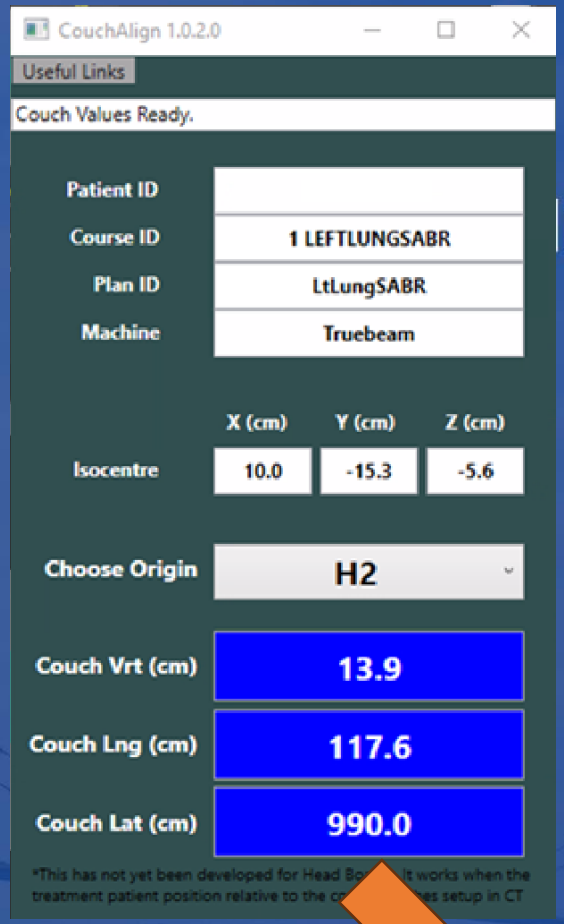
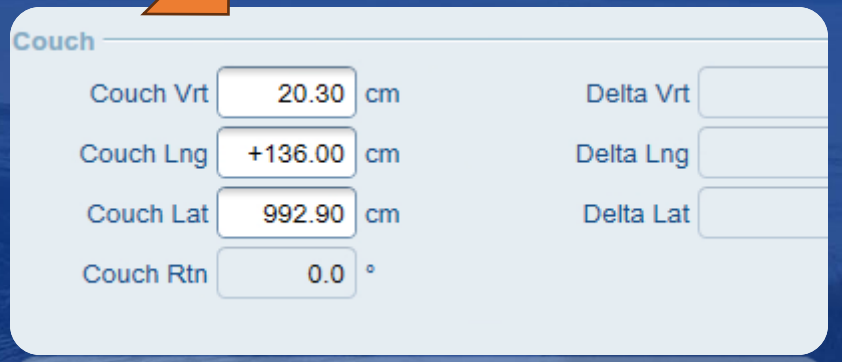




Method-
Couch Align Application

- The application knows the coordinate for the Origin on the Truebeams and the Halcyon based on our data.
  - The app then corrects to find the couch coordinate based on the user selection using a lookup table.
  - The intention was to get within 5cm so AlignRT could do the rest.





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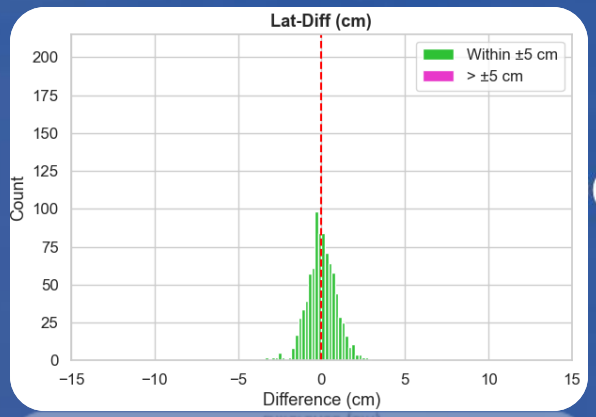
Phantom Tests

- How close we got?
  - On all phantom tests the results were within 0.5cm giving us confidence in the methodology.
  - This was for a none moving, plastic phantom on a breast board.

Effectiveness Review

To determine how effective the strategy was, a review was started after 6 months of use. The results will be shown here.



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Log from Code collected every use over 15 months

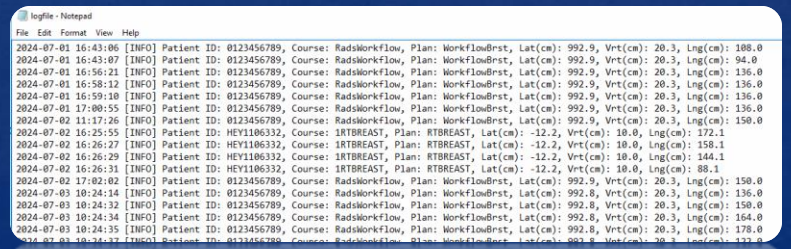
Used code (Entity framework written in C#) to access the database for every entry. Determined first fraction couch values for the plan.

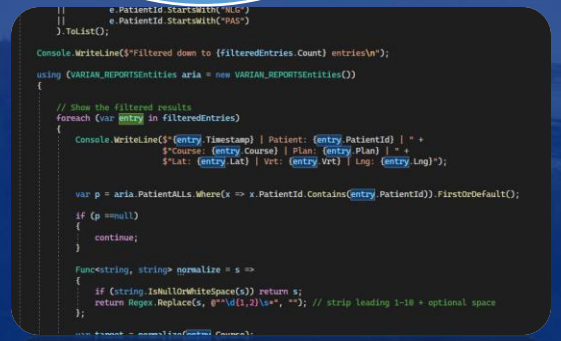
Calculated the offset:
871 usable results.

115 outside 2cm

10 outside 5cm

Used Python to analyse the results and present the data.





Agreement with Treatment Values

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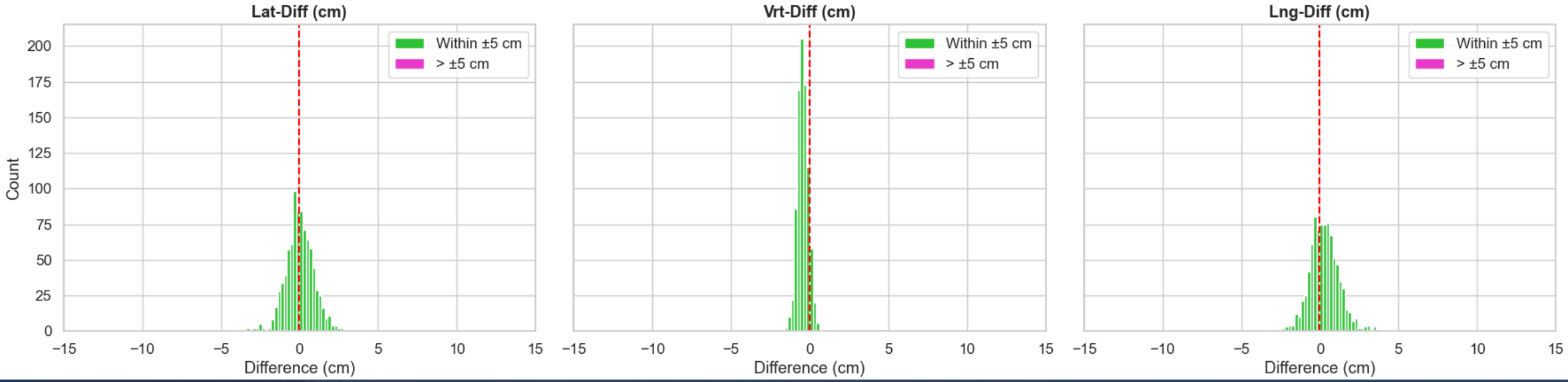

Systematic shift present on Vertical and Longitudinal axis, but Lateral is in good agreement. The vast majority of results are within the target of 5cm and largely within 2cm.

Metric	# Mean (cm)	# ±2 SD (cm)
Lat-Diff (cm)	-0.007	1.881
Vrt-Diff (cm)	-0.432	1.191
Lng-Diff (cm)	0.32	3.131

Disagreements

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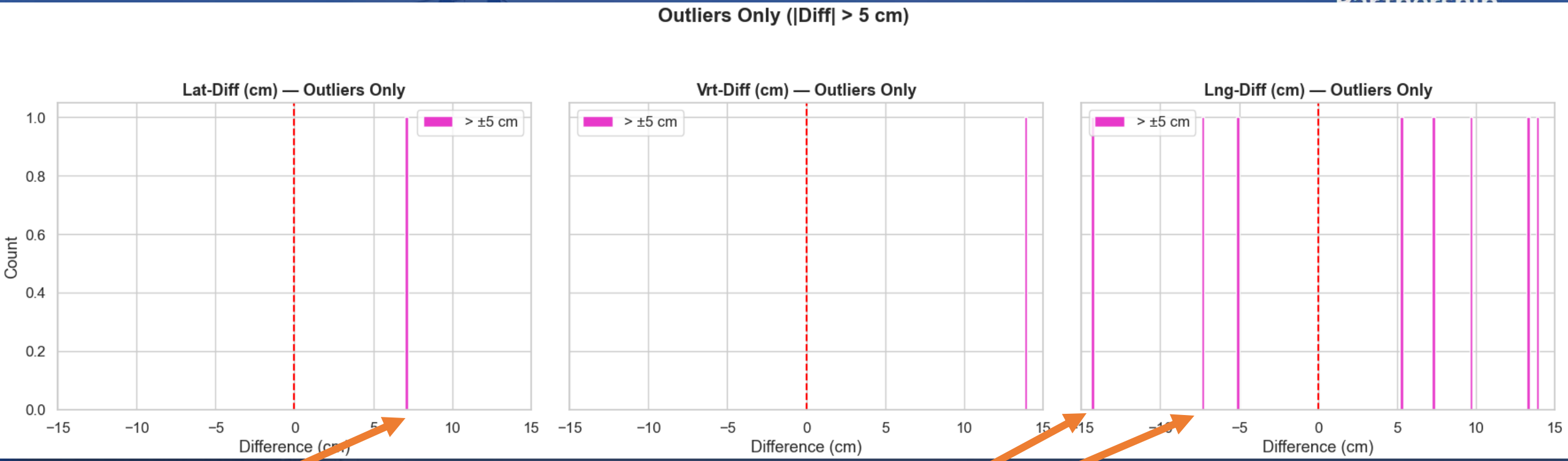

- 14cm Offset by 1 Varian Couch Index due to an incorrect reading at CT.
- 7cm Offset by 1 Elekta Couch Index due to our multi index couch top.
- 7cm Lat offset was a breast patient that needed to be offset to avoid couch incident beams or collisions.
- Other various long offsets.

Distribution of Couch Values

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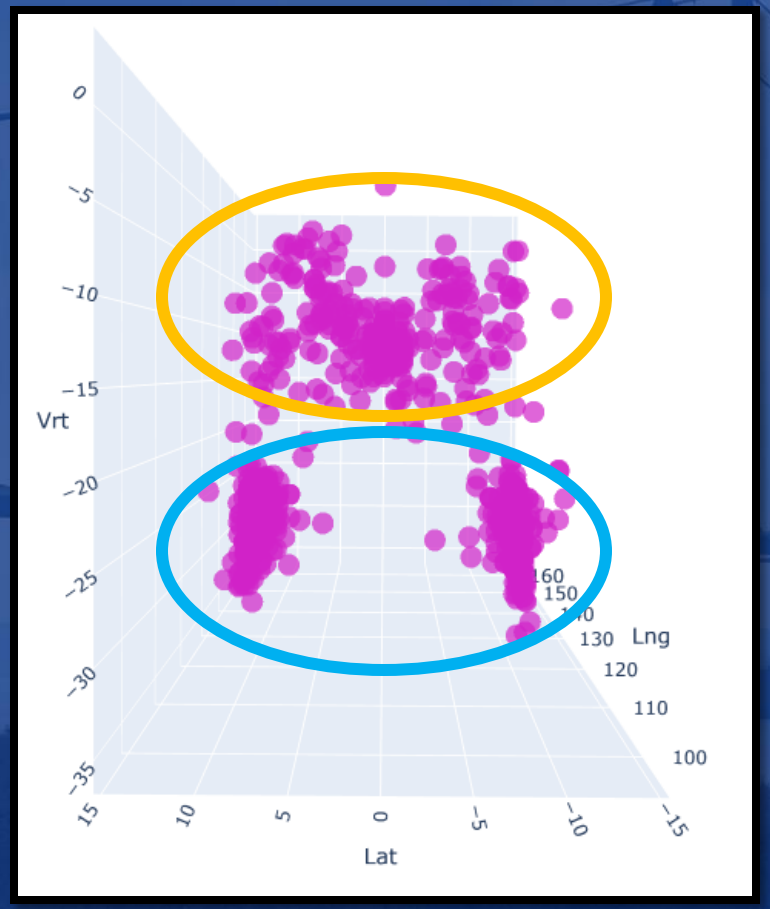

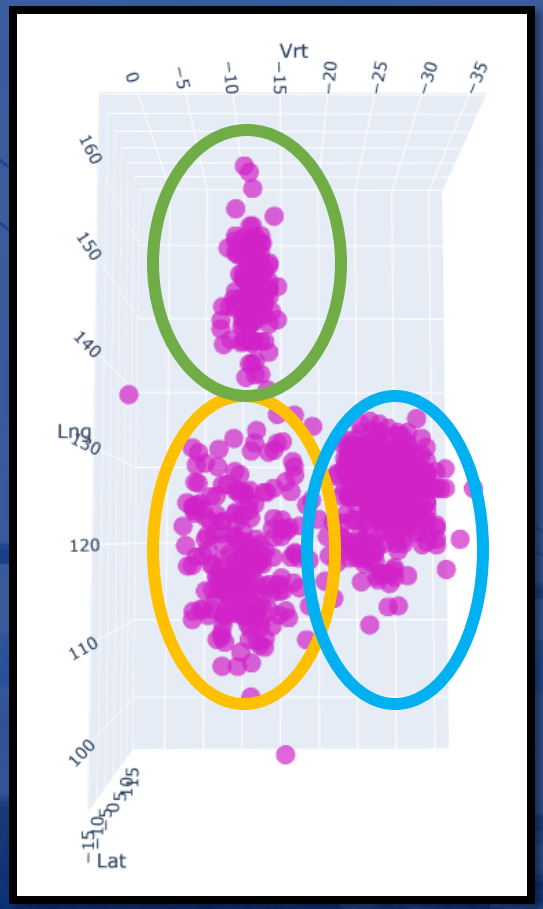

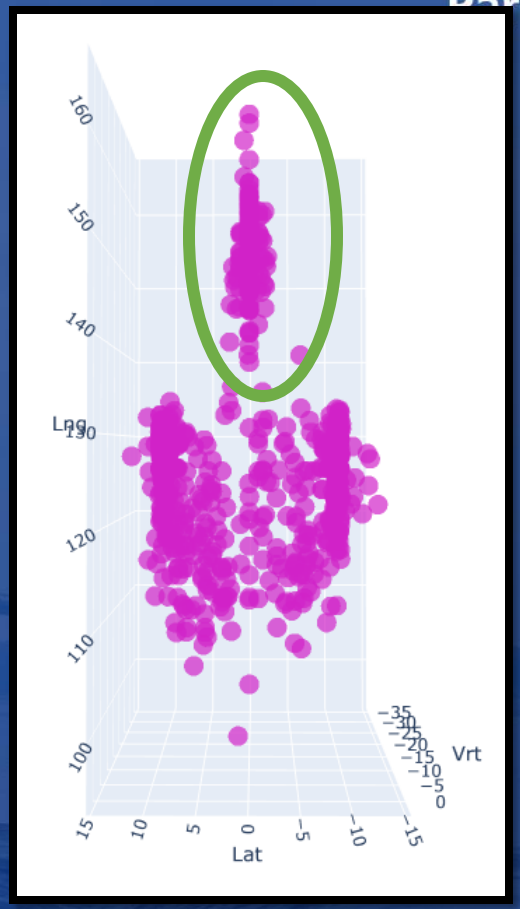

Breast Pelvis Thorax

Incidental findings

- **Inferior Isocentres:** This gave us a means to flag when an isocentre was set too inferior longitudinally at planning that the linac couldn't deliver.
- **Transcription errors:** These are often now found fraction one and corrected.
- **Clearance testing:** The couch values seem accurate so we can load these on treatment before the patient arrives to confirm clearance.
- **Incorrect index marks from CT:** Either 1 full Varian index or an Elekta index (7cm).
- **Reduced Documentation:** We needed to record less at CT as we didn't need to describe a reference anatomical structure.
- **Forgetting to Capture Couch Actuals:** This hasn't been a problem as the preference has been to use the planning couch values rather than actuals.

Contingency Planning

- **What if AlignRT breaks:** For a while we discussed how we would handle breakdowns and the need to setup without AlignRT. This has proved a robust method to get us close to the correct setup most of the time, allowing an image to be taken to confirm position. We would then mark the patient and use tegaderm until the issue was resolved.

Conclusion

- *We have demonstrated a simple, reproducible method that has been successfully integrated with SGRT for over one year.*
- *This method is transferable and could be readily implemented in other departments using similar resources and workflows.*

Thanks for your time, Any Questions?

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