The Christie NHS
NHS Foundation Trust

Postural Video Service Evaluation

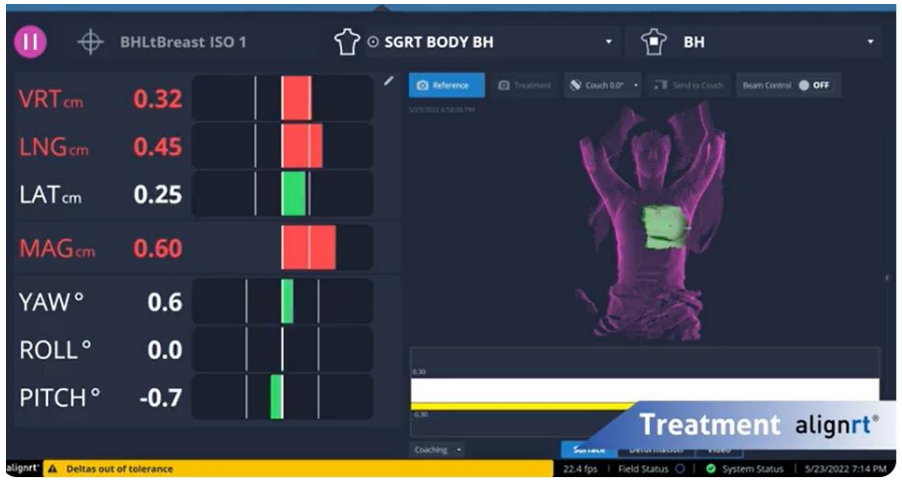
(QICA 3953)

AlignRT

- SGRT has been used at the Christie NHS Foundation Trust since 2022.
- The intention was primarily to facilitate a voluntary breath-hold technique for breast patients
- All breast patients are now treated using SGRT and are tattooless

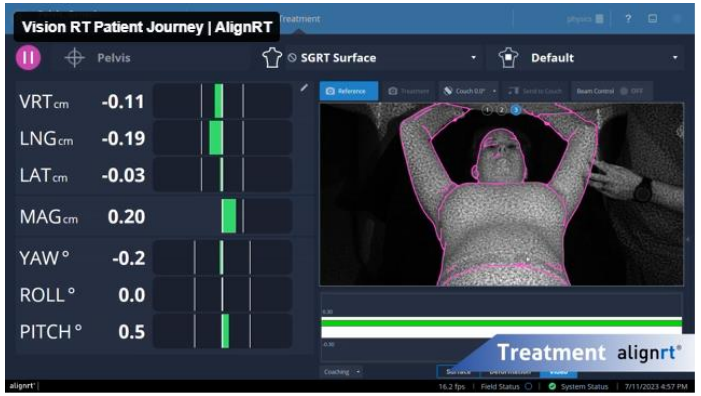
AlignRT without postural video

- Information on the patient's position is displayed in real time in the form of numbers and a 3D representation.
- Static "treatment captures" generate a snapshot of the patient's position and are instructive to the setup of the patient.
- Movement of the patient during treatment delivery automatically interrupts the treatment beam



AlignRT with postural video

- Postural video provides a traced outline (purple) indicating the position the patient needs to be in and a real-time CCTV-like view of the patient on the treatment couch.
- The radiographer can adjust the patient quickly in accordance with the traced outline and visually monitor for any changes during treatment delivery



AlignRT with Postural Video

Potential advantages may include:

- Reduction in physical interaction required with the software
- Avoiding the need for multiple static Surface Captures
- Aiding set-up accuracy by providing continuous visualisation and correction of the neck, shoulder and arm position which are relevant to SCF and axillary node treatments but are excluded from evidence-based regions of interest (ROIs) (3).
- Ability to maintain visualisation of the patient position during camera occlusion.

AlignRT with Postural Video

- Postural video was available as an optional extra at the time SGRT was introduced but, Postural Video was not purchased.
- Vision RT claimed Postural Video improved efficiency and this was backed by a number of (at the time) unpublished studies (1,2).
- VisionRT provided Postural Video to the department on a trial period and a comparison study was conducted.

Aims and Objectives

Aim:

To compare radiotherapy workflow efficiency and set-up accuracy using AlignRT with postural video (**Group B**) versus AlignRT alone (**Group A**).

Objectives:

Amalgamate postural video workflow into the existing standardised training and competency framework for breast treatments.

Compare AlignRT with Postural video against AlignRT alone in respect to:

- Efficiency of setup and treatment delivery
- Set-up accuracy

Method: Efficiency for setup and treatment delivery

- Data was acquired prospectively from 8 SGRT LINACs across all 4 radiotherapy departments, enabling the sampling of a large dataset in a short period of time.
- Postural video was introduced to the workflow from 20th May 2024. **Group A** data was acquired in the month before this date. **Group B** data was acquired 4 months after this date
- **Included sub-groups** were; Tangent Pair +/-DIBH, Tangent Pair and Peripheral field +/-DIBH and Photon Boost. Each sub-group was stratified further into imaging/no-imaging to control for the impact on treatment delivery time.
- Certain groups were **excluded** to limit confounders.
- Each site worked to a sample size target based on projected activity at the time and the number required to inform statistical significance (318 fractions for Combined Group A and 288 for Combined Group B).

Method: Efficiency of setup and treatment delivery

- Treatment duration was defined by the time taken from when the patient got onto the treatment couch, to the delivery of the final treatment beam- This isolated treatment workflow and limited confounders.
- For each fraction, radiographers were instructed to record issues encountered and particularly factors that negatively impacted efficiency.

Method: Thematic Analysis

- A uni-variate analysis using a Welch two sample t-test was employed to compare the timing data and a null hypothesis of “The duration for group A is significantly greater than duration for group B” was applied.
- Sub-groups were analysed individually and as a combined breast group. The free-text issues were analysed and grouped into themes.

Method: set-up accuracy

- A total of 1800 fractions were retrospectively analysed using image notes and beam offset values stored within Mosaiq.
- All verification images were 2D MV portal images.
- Setup accuracy was measured using "Out Of Tolerance" (OOT) rate, re-setup rate (due to setup error identified on image) and setup error using beam offset values.
- Beam offset values were analysed and presented as mean setup error and random setup error.
- A Welch two sample t-test was employed (confidence interval 95%) and a null hypothesis of “The mean setup error for Group A is significantly greater than the mean setup error for Group B” was applied to the 3F DIBH sub-group.

Results: Efficiency of set-up and treatment delivery

- The mean difference of the combined breast group was 2 minutes 35 seconds and statistically significant
- Sampling a week of activity around the same time period, it is estimated that Postural Video Module could have saved approximately **15 hours and 45 minutes across all sites over the course of a week.**
- **This equates to 3 hours and 9 minutes per day**.

Group/Sub-group	Statistic	Value	Null hypothesis proven?
Combined Breast	P-Value	0.0001	Yes
	Mean Difference	2:35 mins	
TP DIBH without imaging	P-Value	0.06	No
	Mean Difference	2:21 mins	
TP DIBH with imaging	P-Value	0.0035	Yes
	Mean Difference	4:49 mins	
TP FB without imaging	P-Value	0.143	No
	Mean Difference	0:56 mins	
TP FB with imaging	P-Value	0.12	No
	Mean Difference	0:59 mins	
3F FB without imaging	P-Value	0.34	No*
	Mean Difference	1:25 mins	
3F FB with imaging	P-Value	0.208	No*
	Mean Difference	3:17 mins	
3F DIBH	P-Value	0.492	No
	Mean Difference	0:02 mins	
Boost	P-Value	0.279	No
	Mean Difference	0:49 mins	

*Table 1. Details the mean difference and p value for the combined breast group as well for each individual sub-group. *Caution should be applied to the 3F FB sub-groups as the sample size was too small.*

Results: Thematic Analysis

- Thematic analysis demonstrated **9 themes** not relating to Postural Video that **negatively impacted** on treatment duration.
- These themes occurred at consistent mean rates between Groups A and B and were prevalent at a rate of ~44%. This means **nearly 1 in 2 fractions delivered encounter an/more than one issue impacting on efficiency**, ranging from machine breakdowns to pain management.

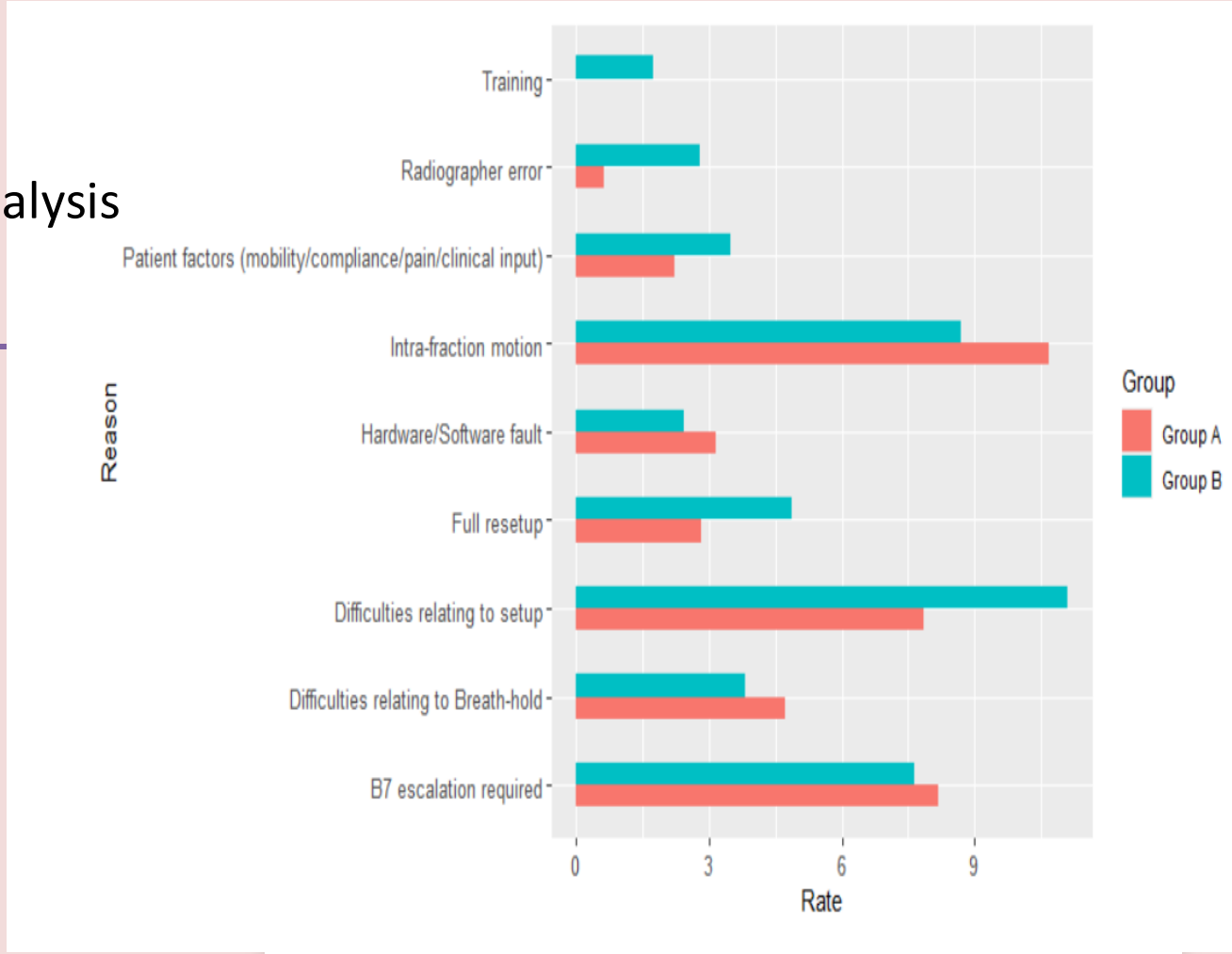


Figure 1. Demonstrates the themes that impacted negatively on efficiency of set-up and treatment delivery and the mean rate (%) at which they occur

Results set-up accuracy

- Due to daily image verification and therefore large, uniformed samples between Groups A and B, inferential statistics were applied to the beam offset data for the 3F DIBH group.
- No statistical significance between Group A and B Mean Setup Error was found for the left-right displacement
- The superior-inferior direction the P-Value was 0.002 and therefore proved the null hypothesis

	Superior-Inferior		Left-Right	
	Group A	Group B	Group A	Group B
Mean Setup Error	0.13	0.042	-0.081	-0.026
P-Value (mean setup error)	**0.002**		0.045	
Random Setup Error	0.294	0.309	0.288	0.293

Table 2: Details the Mean Setup Error and the Random Setup Error between Groups A and B for each beam offset direction. The Mean Setup Error values were compared for statistical significance.

Discussion: efficiency of set-up and treatment delivery

- Despite the large sample size, the short period of data collection meant limited representation for smaller sub-groups such as 3-field. Individual problematic patients created potential to skew the results.

- The timing data isolated the treatment delivery workflow from the rest of the appointment time and so **cannot be used to inform alterations to the current appointment slots for breast patients.**

- The use of Postural Video Module **reduced treatment duration by a statistically significant amount which equates to several hours of activity saved per day**

- Patient experience must be considered. SGRT requires exposure of the thorax and positioning with arms abducted on a hard surface, with potential to compromise both dignity and comfort respectively. **Any tool that reduces the time a patient spends in this position holds significant value.**

Discussion: thematic analysis

- The thematic analysis highlights the challenges that radiographers must navigate daily and **emphasises the value of a tool such as Postural Video that helps regain efficiency in workflow.**
- The mean rate of themes negatively impacting efficiency was consistent between combined breast Groups A and B. This provides reassurance that the combined breast group mean difference is **attributable to Postural Video** and not the other confounding factors identified.
- 3-Field group appeared to not benefit from postural video but demonstrated a considerably higher mean rate of other issues that negatively impacted on efficiency. This, coupled with limited sample size may have distorted the impact of the Postural Video Module on efficiency and requires more work.

Discussion: set-up accuracy

- AlignRT alone already produces good setup accuracy leaving **limited scope to improve upon.**
- Some sub-groups did experience modest reduction in the rate of online correction.
- Despite making treatments quicker, **Postural Video did not compromise setup accuracy** and, a **modest improvement** in online correction frequency and setup error was observed in some breast sub-groups.

Conclusion

- The introduction of Postural video has reduced the duration of setup and treatment delivery by a statistically significant amount.
- This should result in reduced delays and time saving in the magnitude of several hours each day across all departments.
- This improved efficiency has not been at any cost to setup accuracy and in some areas reduced setup error was observed.
- Postural Video Module is of value to patients, the radiotherapy service and its staff. It is therefore recommended that the Postural Video Module licences are purchased on a permanent basis and that it remains integrated in the departmental workflow.

Thanks!!!

- Jessica Powell – Senior Radiographer
  - Collation of data
  - Presentation design
- Okezie Ucheikonne- Senior data scientist
  - Statistical support
- Radiographer teams at Macclesfield, Oldham, Withington and Salford
  - Data collection

Any Questions?

References

1- Efficiency, Standardisation and Clinical Excellence: One Goal Across a Large Network. SGRT Community Meeting 2022. Presentation by Kira-Lee Oliver, Genesis Care Florida, June 2022

2- Using Postural Video to reduce positioning errors. SGRT Community Meeting 2023. Presentation by Carmen E Parsels, Wehner Medical Centre , Ohio, May 2023

3- Sauer, T-O, Ott, OJ, Lahmer, G, Fietkau, R, Bert, C. Region of interest optimization for surface guided radiation therapy of breast cancer. J Appl Clin Med Phys. (2021); 22(10): 152–160. https://doi.org/10.1002/acm2.13410