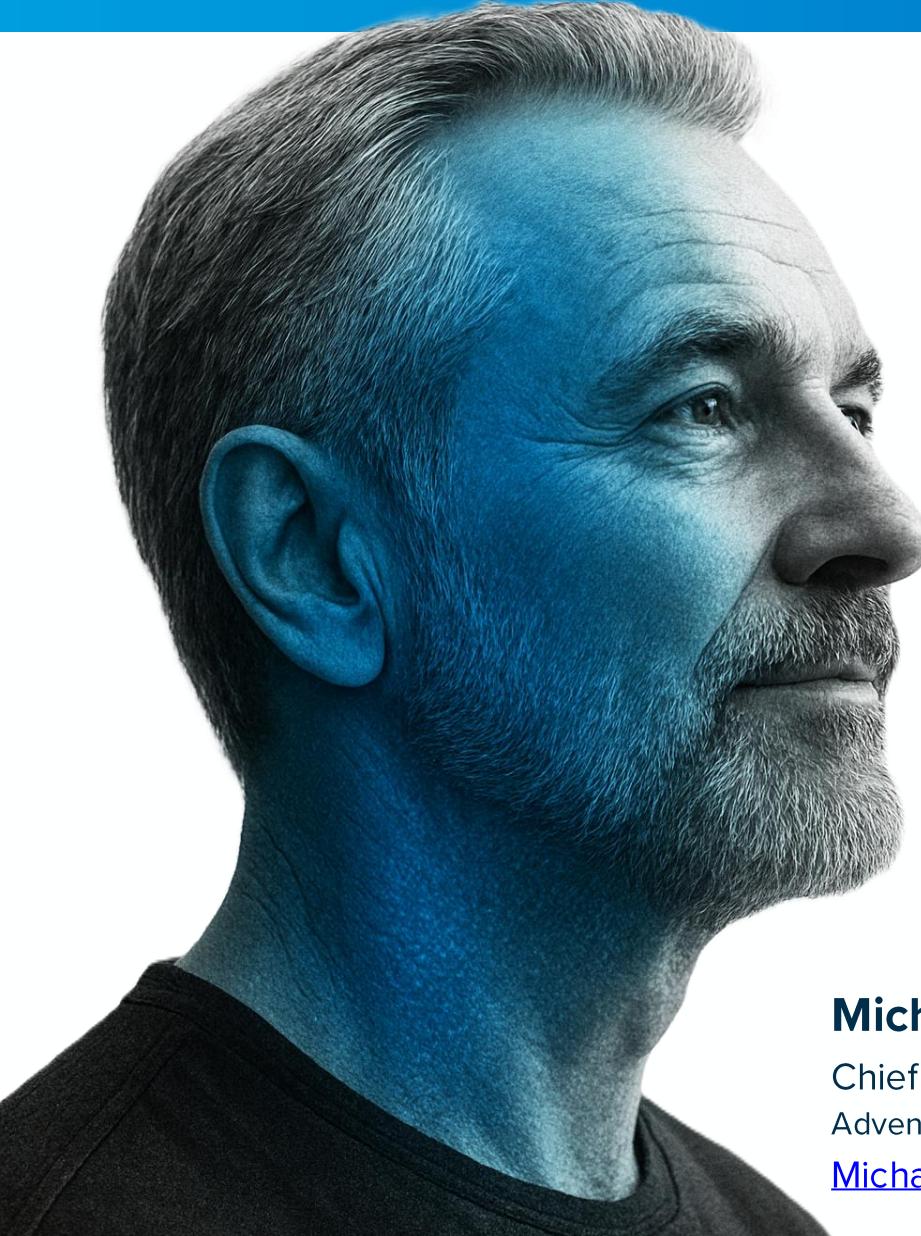


Pushing the Boundaries of SGRT

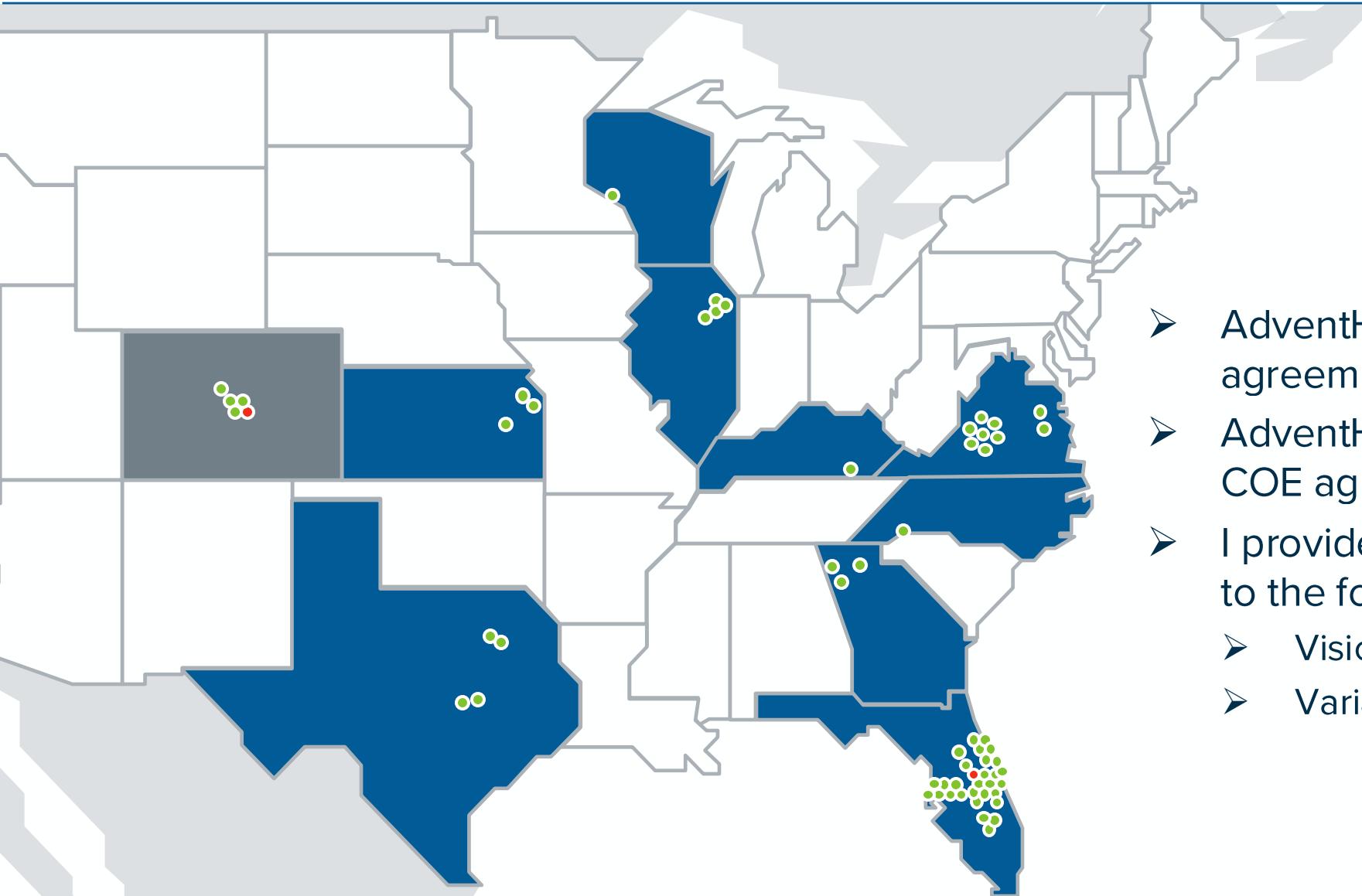
Exploring Current and Future Uses of SGRT Throughout the Radiation Oncology Workflow



Michael J Tallhamer MSc DABR

Chief of Radiation Physics
AdventHealth Rocky Mountain Region
Michael.Tallhamer@AdventHealth.com

Disclosures

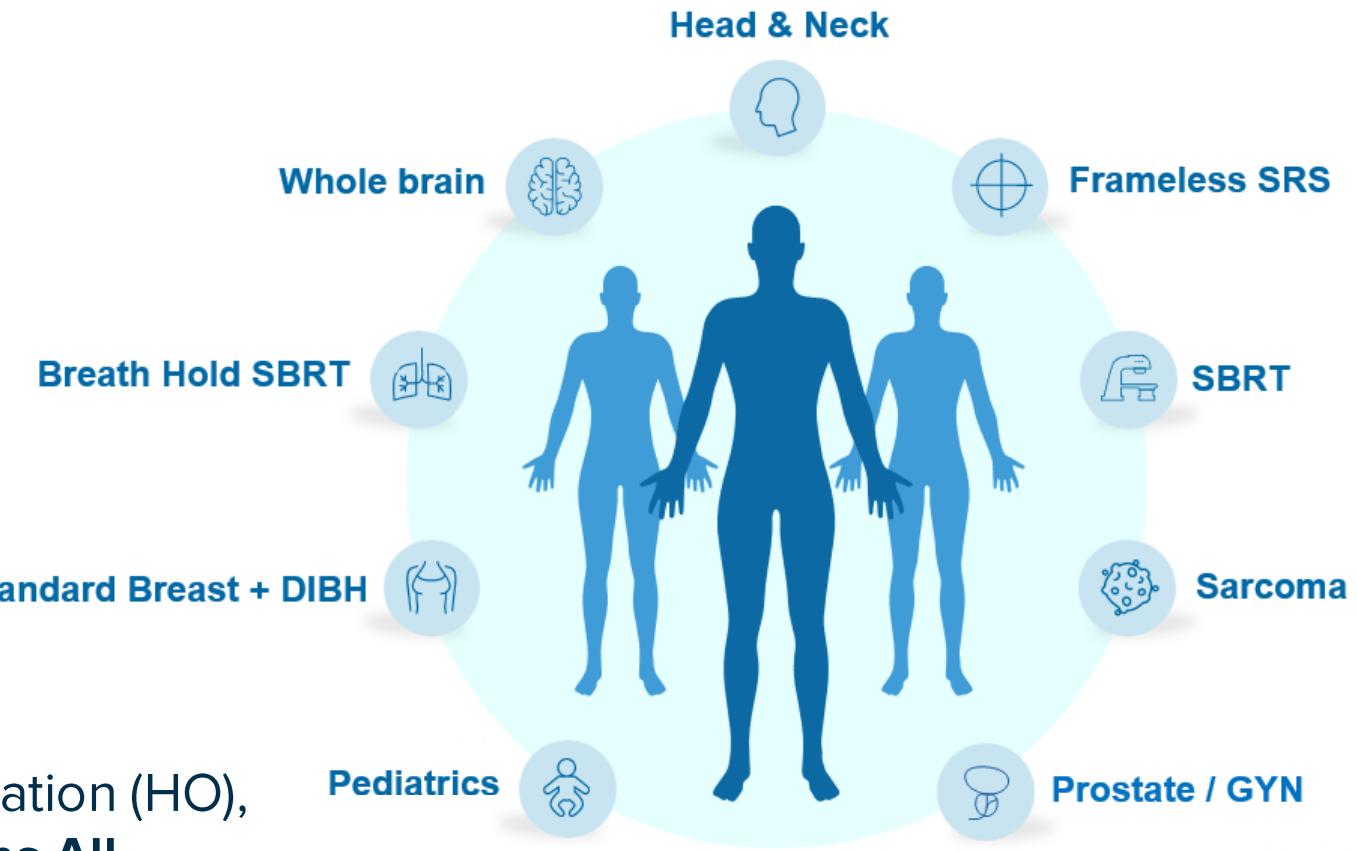


- AdventHealth – Parker has a PSA agreement with Vision RT.
- AdventHealth – Celebration has a COE agreement with Vision RT.
- I provide physics consultation services to the following vendors
 - Vision RT
 - Varian Medical Systems

Rocky Mountain Region



- SGRT is standard of care
- 100% of patients treated with SGRT.
- All indications including Heterotopic Ossification (HO), Electrons, and Osteoarthritis (OA)...**All means All**
- SGRT used for Simulation, Planning, Patient Identification, Patient Setup, Motion Management (Respiratory), Treatment Delivery and Dose Visualization

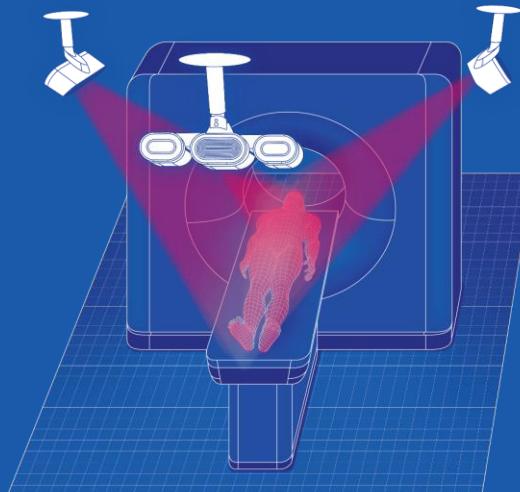


AdventHealth's SGRT Portfolio

SGRT

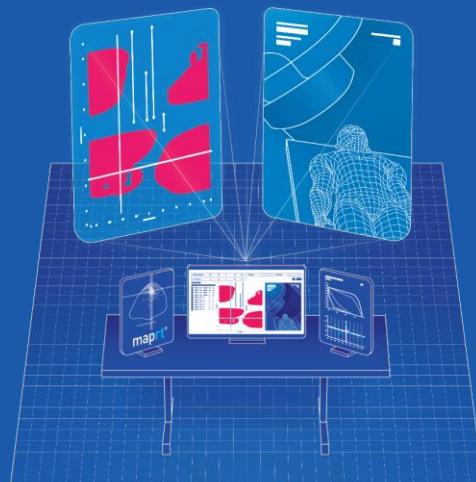
Use of surface guidance to help improve the safety, effectiveness and efficiency of the *entire* radiation therapy workflow

SIM



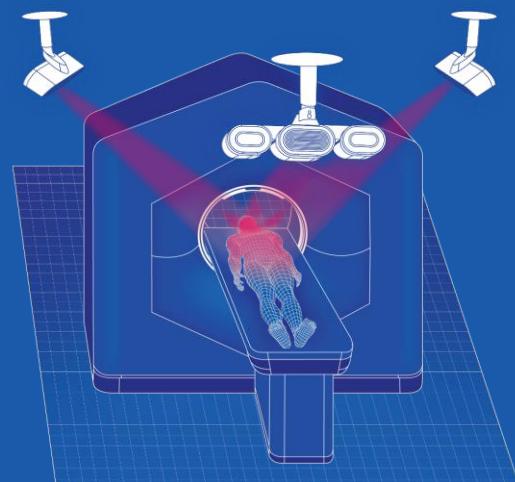
4D AND BREATH HOLD CT

PLAN



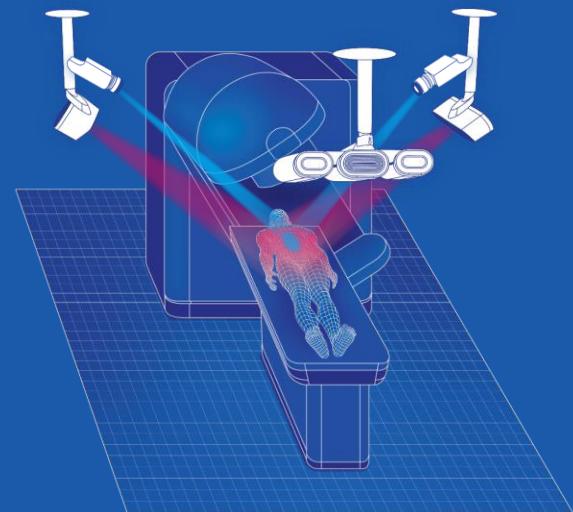
CLEARANCE MAPPING

TREAT



MOTION MANAGEMENT

DOSE



DOSE VISUALIZATION

simrtTM

maprt[®]

alignrt[®] *InBore*[™]

alignrt[®] **dosert**[™]
Powered by BeamSite[®]

DO NOT CROSS

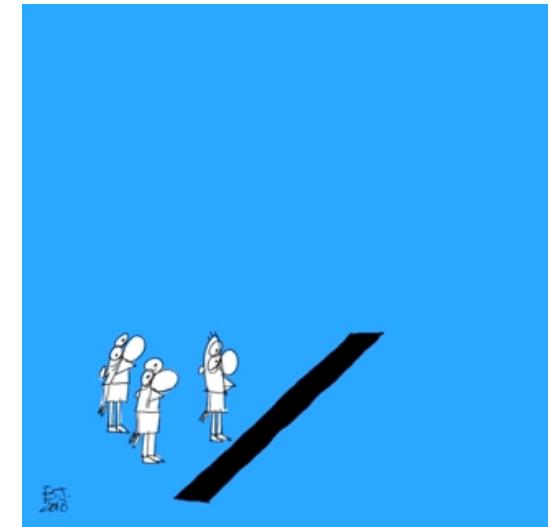


Pushing Boundaries Doesn't Mean Crossing “The Line”



This is a safe space

- SGRT as the standard of care was once thought of as one of those “**out-there**” ideas.
 - Generally refers to unconventional, extreme, or unusual ideas. It can be used to describe a person's thinking, their creative output, or even a situation that deviates significantly from the norm.
- Treating 100% of patients with SGRT is still, to some degree, seen as pushing some sort of boundary.
 - Tattooless treatments are still considered pushing the limits by some
 - “*Even Electrons*”, “*Even Osteoarthritis*”, “*Even Trigeminal Neuralgia*” ...etc.
 - Treating SRS cases is still considered “risky” by some, even with the body of literature out there related to accuracy and clinical outcomes .
- Apply the principles of SGRT and SGRT technologies to
 - Simulation
 - Planning
 - Treatment
 - Exploring the utility of Direct Visualization of the Dose Delivery is often seen as “**ill advised**” or even “**unnecessary**”.

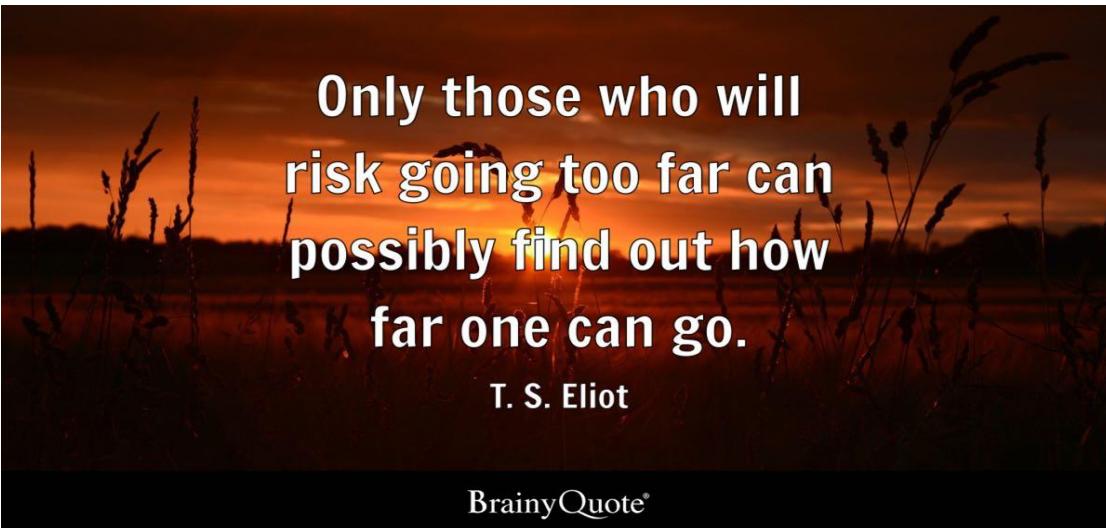


My philosophy tends to be “slightly” different



Goals

- Review a couple quick historical cases where boundaries may have been pushed and see where we are today.
- Look at some present “opportunities” to expand the utility of existing SGRT technologies by “nudging” a boundary or two.
- Peek over the fence and speculate on future opportunities.



Back to the Future of SGRT



SGRT is a Timeline of Pushing Boundaries...



2019

Maskless H&N enters
clinical discussion

Postural Correction and
IGRT Augmentation
Promoted

Importing of SGRT
images and reports into
OIS was first reported

- First 10 H&N patients presented

- 7 Chinstrap mask only



From: [REDACTED]
Sent: Thursday, June 27, 2019 12:45 PM

To: Tallhamer, Michael <MichaelTallhamer@Centura.org>
Subject: [EXTERNAL] Re: Vision RT Maskless Head & Neck Treatments

➤ IGRT
Immobilization
Correction
pres

Understood. Your presentation, while interesting, concerns me because I feel it promotes an unsafe technique for treatment. I don't believe that SGRT is capable of aligning a patient for H&N treatment without a mask. While I see some are using open face H&N masks, even this can lead to less-than-ideal setups and larger than normal shifts. I'm not sure posterior immobilization with SGRT alone will ever be a viable option.

I would encourage you to rethink this approach.

> J Med Rad

Explor
anxiety
underg

Jodie L Nixon

Laurelie R Wall ^{2 4}, Elizabeth C Ward ^{2 4}, Sandro V Porceddu ^{5 6}

Affiliations + expand

PMID: 30378282 PMCID: PMC6275267 DOI: 10.1002/jmrs.308

Affiliations + expand

PMID: 31343118 PMCID: PMC6745384 DOI: 10.1002/jmrs.346

PMID: 31883285 DOI: 10.1111/ecc.13215



What has happened while we were gone?

Postural Video Released
allowing for real-time
video based postural
correction prior to IGRT

2020



2019

Maskless H&N enters
clinical discussion

Postural Correction and
IGRT Augmentation
Promoted

Importing of SGRT
images and reports into
OIS was first reported



"The future of SGRT" presented at
meeting

The future of SGRT's status
and the future of IGRT

Ma



**WHERE
ARE WE
NOW?**



Studies on “mask anxiety” in Head and Neck Cancer (HNC) Patients

Journal of Radiotherapy in Practice

cambridge.org/jrp

Original Article

Cite this article: Daniels J, Kyei KA, and Asomani BA. (2025) Thermoplastic mask-induced anxiety among head and neck cancer patients undergoing radiotherapy in a limited-resource setting: a cross-sectional study. *Journal of Radiotherapy in Practice*. 24(e22), 1-6. doi: 10.1017/S1460396925000184

Received: 22 December 2024
Revised: 10 April 2025
Accepted: 17 April 2025

Keywords:
Anxiety; coping mechanisms; head and neck cancers; patient immobilization; quality of life; radiotherapy; thermoplastic mask

Corresponding author:
Kofi Adesi Kyei;
Email: kakyei@ug.edu.gh

Thermoplastic mask-induced anxiety among head and neck cancer patients undergoing radiotherapy in a limited-resource setting: a cross-sectional study

Joseph Daniels¹ , Kofi Adesi Kyei^{1,2}  and Baron Agyei Asomani^{1,2}

¹National Centre for Radiotherapy, Oncology and Nuclear Medicine, Korle-Bu Teaching Hospital, Accra, Ghana and ²Department of Radiography, University of Ghana, Accra, Ghana

Abstract

Introduction: Radiotherapy is a critical component of head and neck cancer (HNC) management that requires reliable patient immobilization. Using thermoplastic masks helps to ensure reproducible patient positioning during radiotherapy, thus reducing the risk of a geographical miss. However, the use of these masks can also induce anxiety and distress, which can negatively impact treatment adherence and quality of life outcomes.

Methods: The research was a quantitative cross-sectional study that determined the prevalence and severity of thermoplastic mask-induced anxiety and assessed the scope of coping mechanisms used by HNC patients. Data were collected using a structured questionnaire from recruited participants and analysed with the Statistical Package for Social Sciences software, version 26.0. Relevant clinical and treatment-related data were retrieved from patients' hospital-based medical records. Descriptive and inferential statistical analyses such as chi-square tests and likelihood ratios were conducted, with *p*-values < 0.05 considered statistically significant.

Results: In all, there were 145 HNC patients with a male to female ratio of 1.9:1 and a median age of 52.8 years (IQR 20.7), ranging from 18 to 82 years. There was a high prevalence of thermoplastic mask-induced anxiety both during mask moulding (93.8%) and radiation therapy sessions (94.5%). Most participants (95.2%) adopted coping mechanisms including distraction (58%) and visualization techniques (46%).

Conclusions: Even though there was a high level of awareness and utilization of coping mechanisms, the high prevalence of thermoplastic mask-induced anxiety highlights a critical aspect of HNC patient care that may be overlooked in resource-limited settings.

Introduction

The curative management of head and neck cancer (HNC) requires a multidisciplinary approach that includes multimodality therapy with surgery and/or radiation therapy alone or in combination with chemotherapy, targeted or immunotherapy. Radiotherapy is a critical component of HNC management, requiring precise tumour-targeting to maximize radiation dose to the target volume. Immobilization devices, such as thermoplastic masks, help ensure that the patient's head and neck region remains in the same position throughout each treatment session, reducing the risk of a geographical miss caused by inadvertent patient motion during treatment. Thermoplastic masks are custom-moulded for each patient, ensuring a comfortably tight fit for reproducible treatment setup, thus minimizing both inter- and intrafraction variation in patient positioning.

However, the use of thermoplastic masks can induce anxiety, discomfort, claustrophobia and psychological distress. Several studies have identified strategies that may be effective for managing thermoplastic mask-induced anxiety such as mindfulness-based stress reduction techniques, cognitive-behavioural therapy and patient education.¹ The use of effective coping mechanisms can improve treatment compliance, alleviate psychological stress and mitigate the overall emotional impact of wearing thermoplastic masks for radiation treatment. In high-resource settings, various interventions, including pharmacological and non-pharmacological strategies, have been successfully employed to mitigate the impact of thermoplastic mask-induced anxiety.² However, in limited-resource settings, where healthcare infrastructure and support systems are often underdeveloped, effectively addressing anxiety in HNC patients poses a significant challenge.

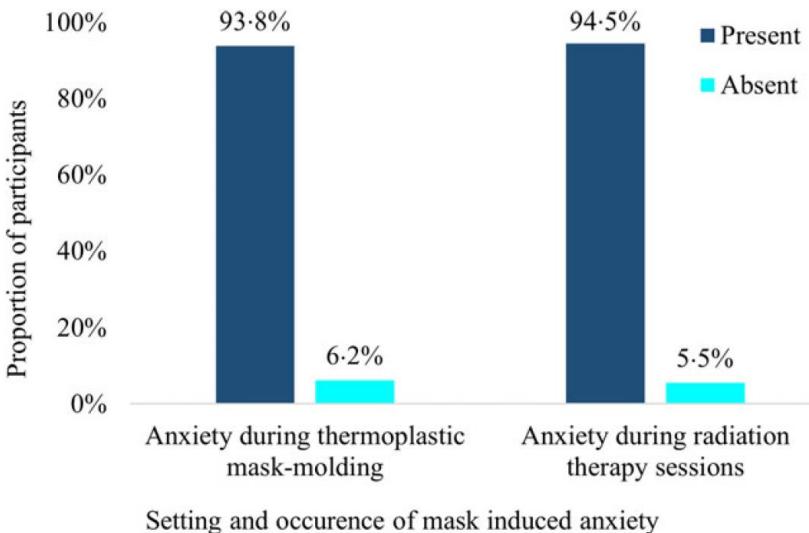
Despite the significant impact of thermoplastic mask-induced anxiety, little is known about the extent and scope of this challenge among HNC patients managed with radiotherapy in limited-resource settings. Reliable data on effective coping mechanisms used by HNC patients in

© The Author(s), 2025. Published by Cambridge University Press. This is an Open Access article, distributed under the terms of the Creative Commons Attribution license (<https://creativecommons.org/licenses/by/4.0/>), which permits unrestricted re-use, distribution and reproduction, provided the original article is properly cited.

CAMBRIDGE
UNIVERSITY PRESS



- Quantitative cross-sectional study of 145 patients that determined the prevalence and severity of thermoplastic mask-induced anxiety.
- There was a high prevalence of anxiety during the mask-making process as well as during radiation treatment, 93.8% (n = 136) and 94.5% (n = 137), respectively.
- The high prevalence of thermoplastic mask-induced anxiety highlights a critical aspect of HNC patient care



Meta Analysis of Comparisons Between Full, Open-Face, and No Mask

Journal of Radiotherapy in Practice

cambridge.org/jrp

Literature Review

Cite this article: Sharkey M and Bridge P. (2025) A systematic review of open face versus mask less surface guided radiotherapy for patients undergoing radiotherapy for head, neck and brain tumours. *Journal of Radiotherapy in Practice*. 24(e15), 1-8. doi: 10.1017/S146039692500111

Received: 14 October 2024
Revised: 20 January 2025
Accepted: 6 March 2025

Keywords:
head and neck; maskless; open masks;
radiotherapy; SGRT; systematic review

Corresponding author:
Pete Bridge;
Email: pete.bridge@liverpool.ac.uk

A systematic review of open face versus mask less surface guided radiotherapy for patients undergoing radiotherapy for head, neck and brain tumours

Megan Sharkey and Pete Bridge 

School of Allied Health Professions and Nursing, University of Liverpool, Liverpool, UK

Abstract

Introduction: Accurate delivery of radiotherapy to head, neck and brain cancer relies on the use of sophisticated immobilisation devices, usually using a restrictive thermoplastic mask. These masks can cause anxiety and can make treatment difficult for many patients. Open-face or maskless techniques are alternatives which can improve the patient experience. This systematic review aimed to compare the effectiveness of open-face (OF) masks and maskless surface guided radiotherapy (SGRT) with conventional masks.

Method: Primary research papers from the last 10 years were gathered from Scopus, PUBMED, Web of Science and OVID databases. Quantitative data reporting interfractional set-up errors and intrafractional patient motion were extracted from included studies and subjected to descriptive statistical analysis. Additional qualitative data relating to patient tolerance were also extracted to inform discussion.

Results: Ten studies were identified for inclusion. The data identified that OF masks can reproduce patient set-up with an accuracy of <2 mm and $<1^\circ$ and can restrict movement to <1 mm and 0.4° , while maskless SGRT can achieve accuracy to within 0.05 mm and 0.1° .

Conclusion: This review indicates comparable reduction of interfractional motion between conventional masks, Open-Face masks and maskless SGRT techniques. More research is needed into the impact of maskless SGRT techniques on translational and rotational motions compared to traditional masks.

Introduction

The proximity of target volumes to critical structures is often a dose limiting factor for head, neck and brain cancer (HNBC) radiotherapy¹⁻⁷ with several severe toxicities including brainstem necrosis or loss of vision, reported.^{8,9-12} The need to increase dose conformity to limit dose to surrounding non-target tissues for these patient groups is well recognised.^{1-6,9} A key factor underpinning conformal radiotherapy is the need for reproducibility of internal structure positions.¹³⁻¹⁷ Successful treatment delivery therefore relies on the use of sophisticated immobilisation devices with patient-specific thermoplastic masks covering the head, face and shoulders being the current standard of care (SoC) in most radiotherapy departments.¹⁸

While these devices do reproduce set-up position and reduce interfractional motion, many patients suffer with anxiety and distress related to their use, particularly those with past trauma, mental health struggles, or claustrophobia.^{19,20} Nixon et al. report that approximately one quarter of patients experience moderate to severe anxiety attributed to the use of thermoplastic masks.¹⁹ Fu evidence suggests that while mask anxiety significantly reduces throughout the course of radiotherapy for the majority of patients, it remains consistent, or worsens, for 22% and 6% of patients, respectively, and is a significant cause of disruption to HN and brain radiotherapy treatments.^{21,22} Patients report the fear of having the face covered and movement restricted as major factors contributing to anxiety.²³

Recent developments in HNBC immobilisation have explored open-face (OF) masks and maskless surface guided radiotherapy (SGRT) techniques as ways to immobilise patients while reducing anxiety and feelings of claustrophobia.²⁴ A search of the literature has failed to identify any large scale randomised controlled trials (RCTs) that compared the effectiveness of these novel immobilisation techniques to that of the current SoC. The aim of this study, therefore, was to review the existing evidence within this field to compare the reported effectiveness of the immobilisation tools at reducing translational and rotational errors.

➤ Meta analysis of primary research papers published in the last 10 years were gathered from Scopus, PUBMED, Web of Science and OVID databases.

➤ Ten studies were identified for inclusion

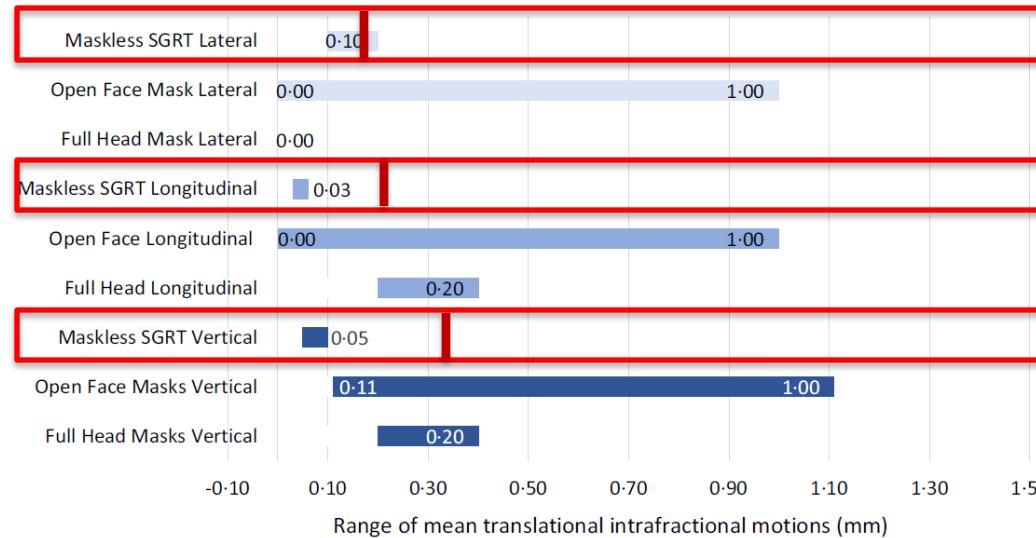
➤ The review indicated comparable reduction of interfraction motion between conventional masks, Open-Face masks and maskless SGRT techniques.



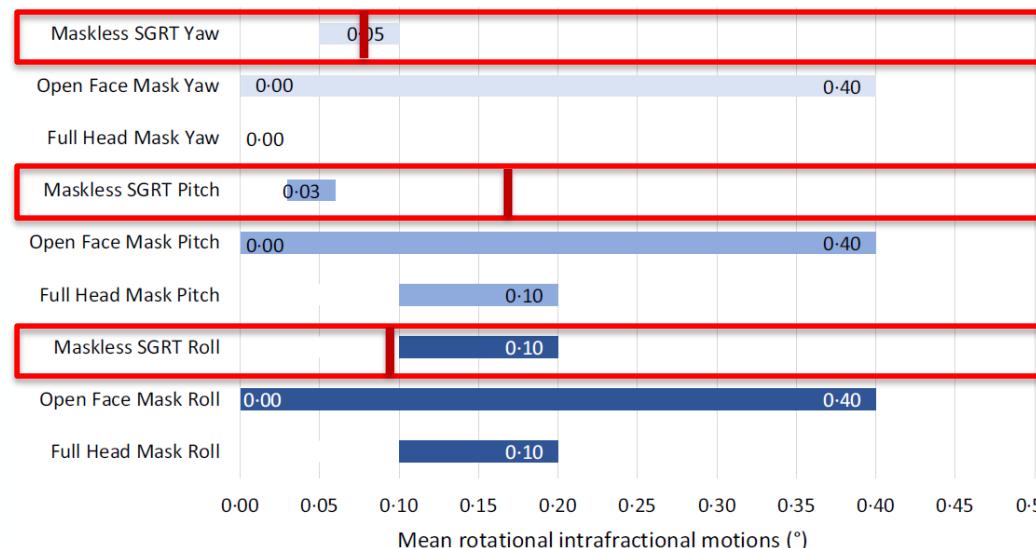
© The Author(s), 2025. Published by Cambridge University Press. This is an Open Access article, distributed under the terms of the Creative Commons Attribution licence (<https://creativecommons.org/licenses/by/4.0/>), which permits unrestricted re-use, distribution and reproduction, provided the original article is properly cited.

CAMBRIDGE
UNIVERSITY PRESS

Meta Analysis of Comparisons Between Full, Open-Face, and No Mask



2019 AdventHealth – Parker (n=326)



- Comparing Full Mask (FM), Open-Face (OF) Masks, and Maskless setups.
- Findings suggested the current Standard of Care (SoC) Full Head (FH) masks, Open Face (OF) masks, and maskless SGRT can allow for comparable set-up accuracy and intrafraction motion restriction.
- Radiotherapy centers may consider transitioning towards the use of novel immobilization methods to improve patient comfort.
- Evidence is currently limited regarding maskless SGRT, but early reports show positive results and suggest it may be a safe and effective method of immobilization.
- **Additional studies are needed**

Additional Institutional Studies



About Cancer ▾ Cancer Types ▾ Research ▾ Grants & Training ▾ News & Events ▾ About NCI ▾

[Home](#) > [Research](#) > [Participate in Cancer Research](#) > [Find Cancer Clinical Trials](#)

Head: From: [REDACTED]
Can: Sent: Thursday, June 27, 2019 12:45 PM
Setup: To: Tallhamer, Michael <MichaelTallhamer@Centura.org>
in head: Subject: [EXTERNAL] Re: Vision RT Maskless Head & Neck Treatments

Understood. Your presentation, while interesting, concerns me because I feel it promotes an unsafe technique for treatment. I do not feel that SGRT is capable of aligning a patient for H&N treatment without a mask. While I see some are using open face H&N masks, even this can lead to significant patient movement during treatment. I am not sure posterior immobilization with SGRT alone will ever be a viable option.

I would encourage you to rethink this approach.

Highlights

- Maskless:
- SGRT an
- SGRT ca
- The CTV

• Patient Cohort: 4 patients unable to tolerate standard immobilization.
• Facilities: Varian TrueBeam 4 linear accelerator + real-time surface monitoring using AlignRT (Vision RT)
• Technical parameters
• Repositioning Tolerances: 1.5 mm (translations) / 1.5°(rotations)
• Imaging: CBCT before and after treatment session to assess intra fraction movement.
• Analysis: Comparison of intrafraction motion with PTV margins (4mm in all directions).

RESULTS

- Mean positional deviations:
 - 0.86 mm (lateral) ($\sigma = 0.52$) – 0.81 mm (longitudinal) ($\sigma = 0.78$) – 1.46 mm (vertical) ($\sigma = 1.08$)
 - Mean Rotational shifts < 1°

All positional deviations remained within the 4 mm PTV margins.

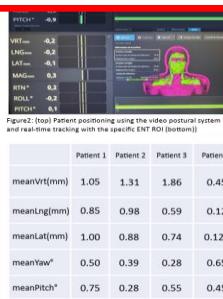
After medical assessment, on CBCT post treatment 100% of targets volumes remained covered by the prescription isodose. Coverage was confirmed across all sessions.

CONCLUSION

The DSPS-Prominent® system combined with Vision RT enables precise and reproducible immobilization for head and neck radiotherapy.

Next step: A clinical trial to extend inclusion to all H&N patients and assess patients comfort improvement.

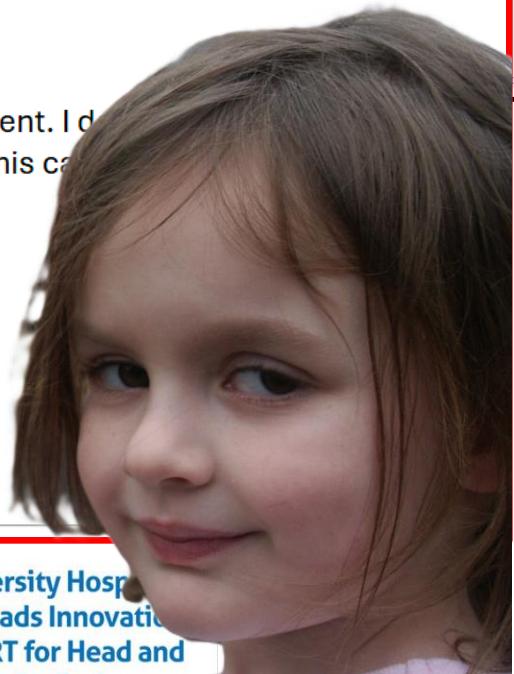
Ultimate goal: Consider the maskless strategy as a new standard of care.



Lessons Learned

Maskless treatment works, patients do hold still due to being less anxious, CBCT allows accurate alignment, and vision provides confidence and intrafraction motion is minimal.

Cleveland Clinic is rethinking its approach to head and neck cancer.

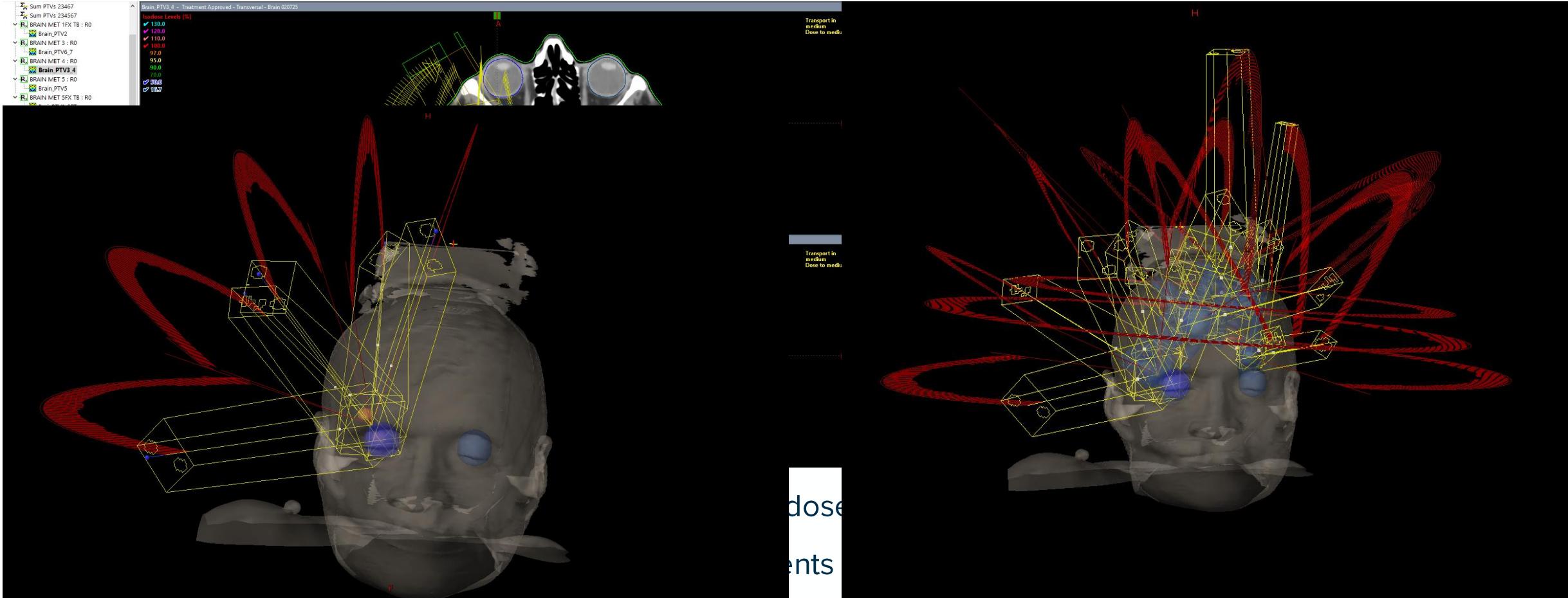


University Hospital Dorset Leads Innovation in SGRT for Head and Neck Radiotherapy

You and 49 others

2 comments • 3 reposts

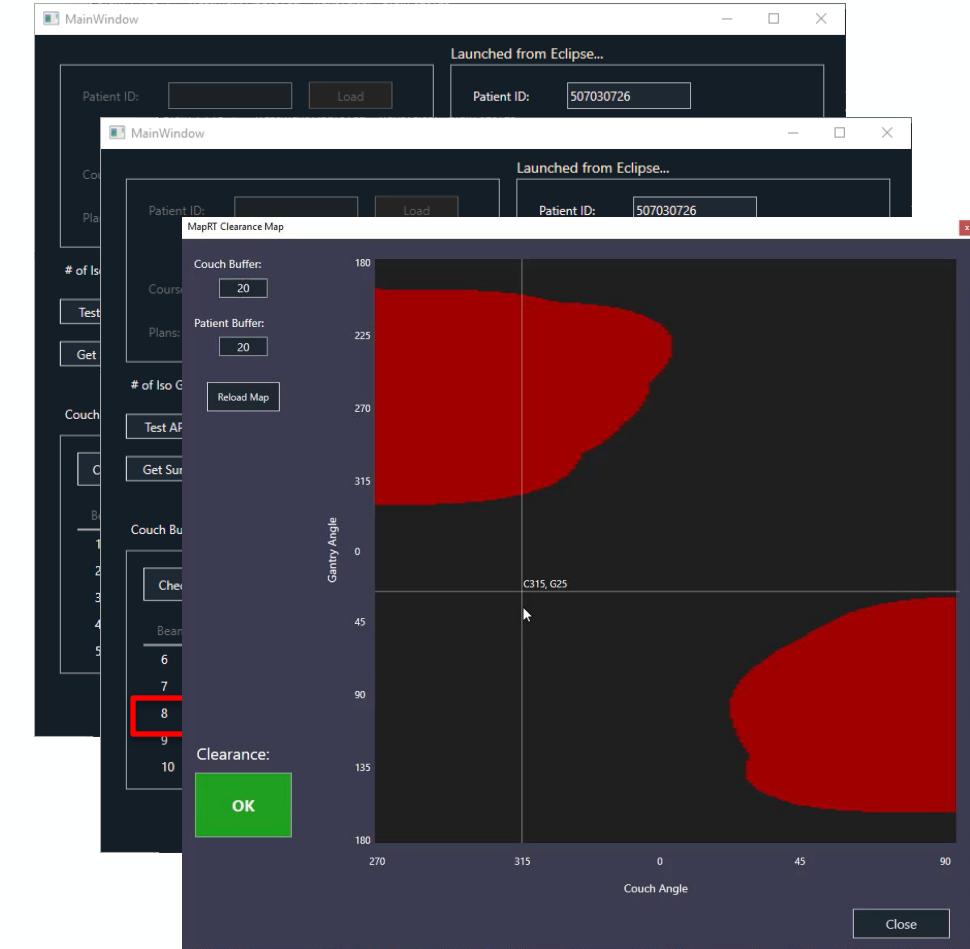
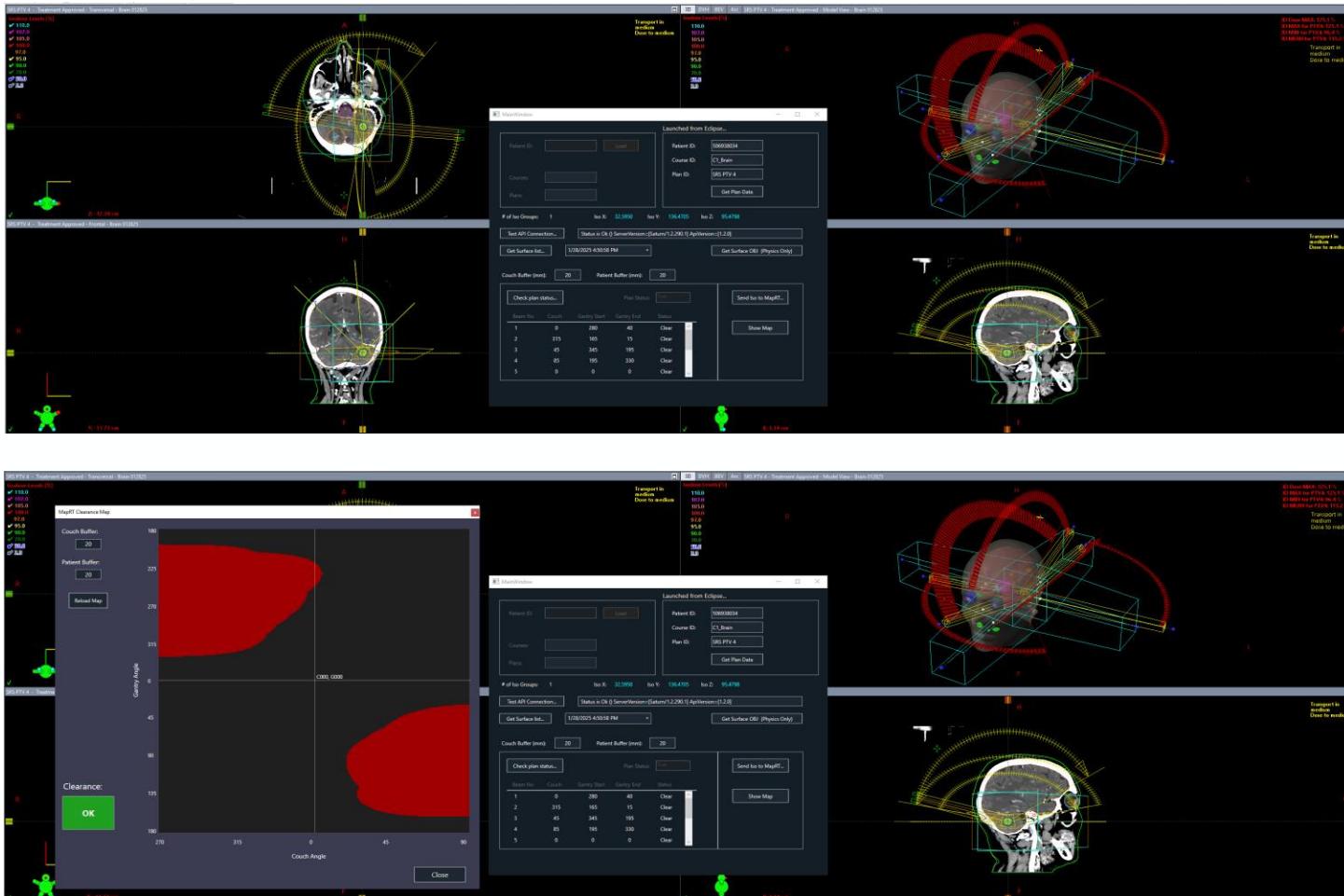
MapRT for Efficient Exploration of Non-Coplanar Solutions



- While risk of collision can be high, developments like Varian's HyperArc artificially reduce the risk by **Single SMT SRS Plan** limiting the available solution space explored during the planning process **4 grouped SMT SRS Plans to avoid previous treated areas**
- MapRT allows planers to explore the full possibility of the solution space with confidence even for highly complex single isocenter multiple target (SMT) SRS cases with previous irradiation that need to be avoided

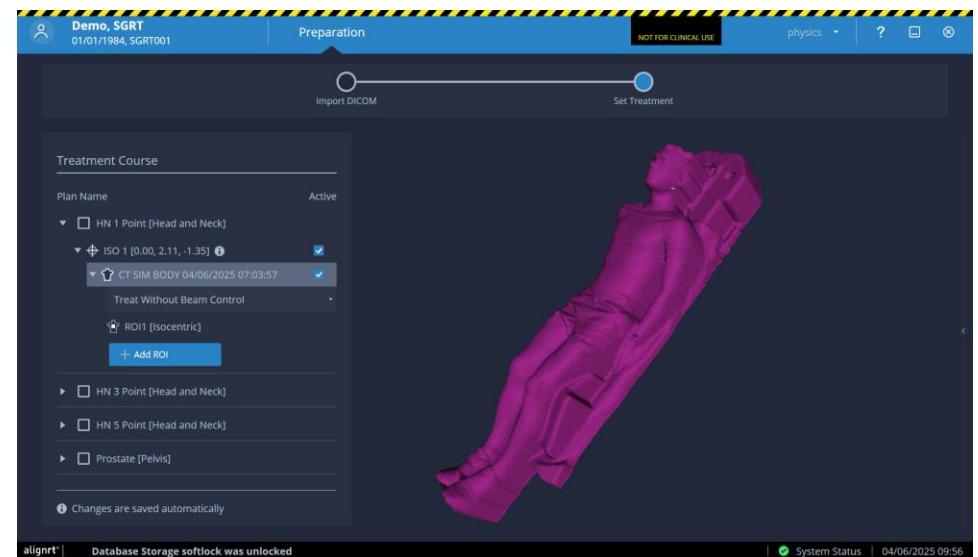
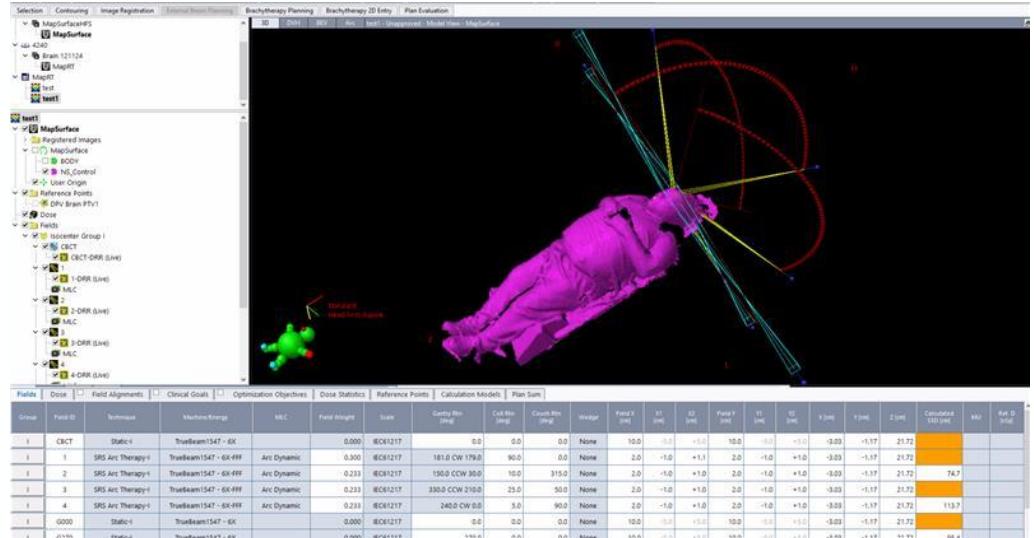
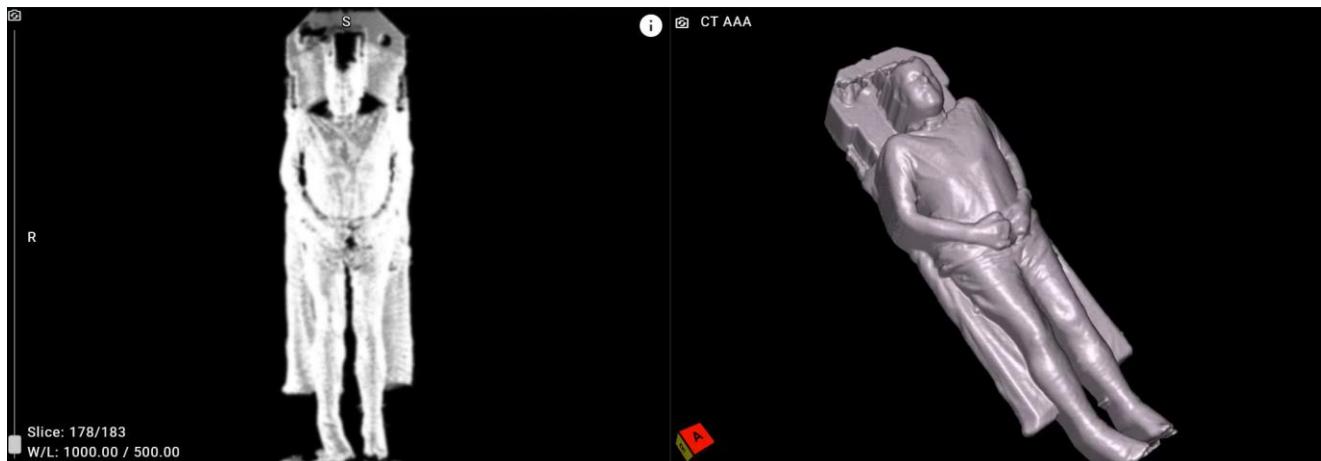
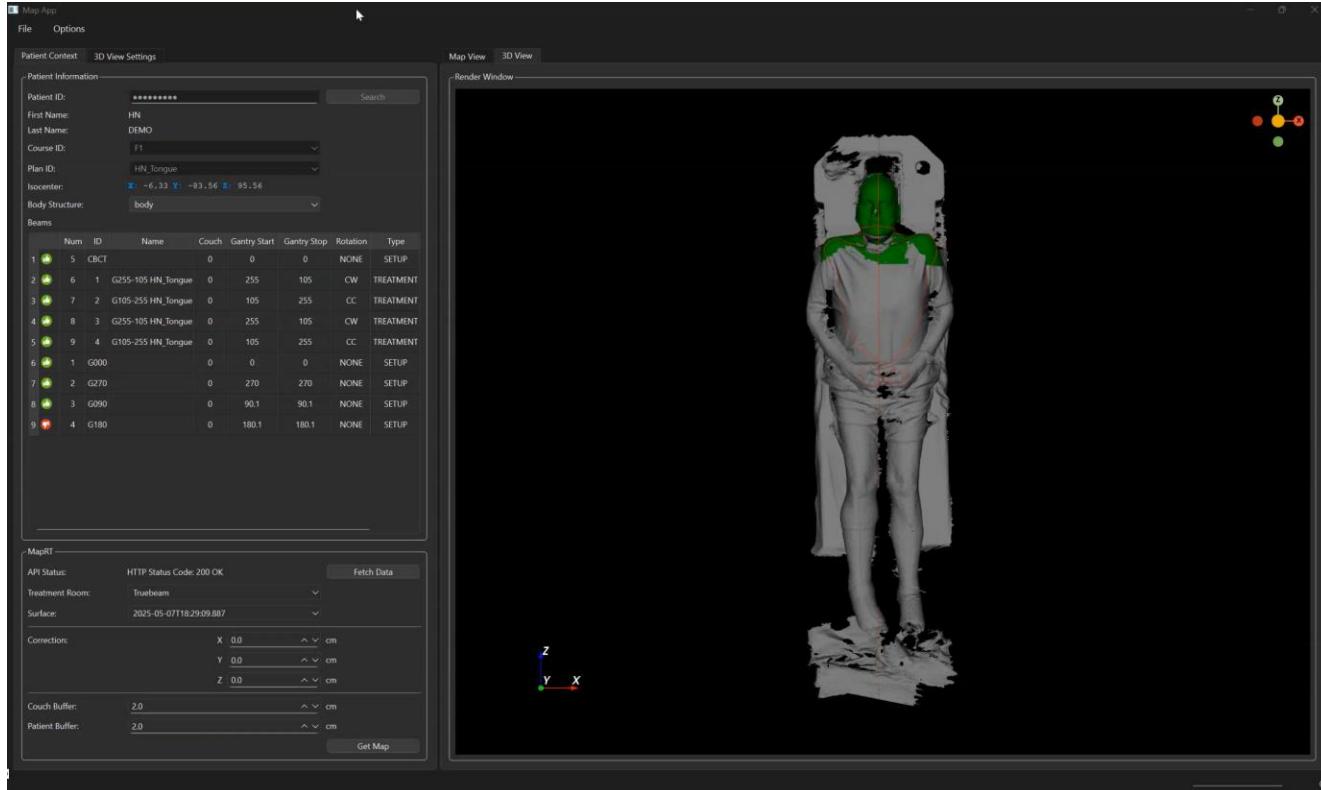


MapRT for Rapid Non-Coplanar Plan Validation Through ESAPI Integration



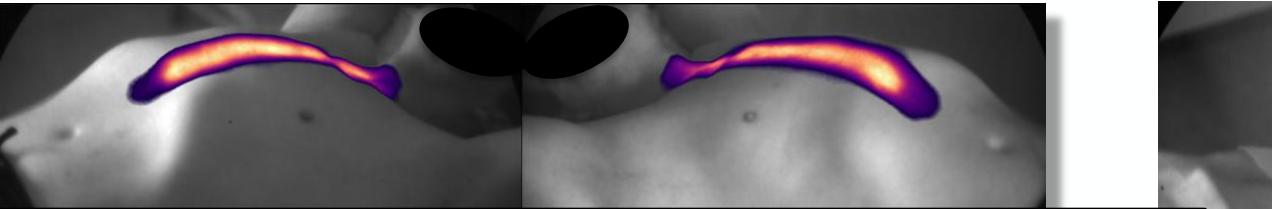
- Leveraging the API allows the user to rapidly evaluate the plan context being worked on while planning.
- The API also allow the user to generate a collision map that can be dynamically explored for alternate solutions for failing fields reducing planning time by more than 30 minutes.

Advanced Script Assisted Techniques



Dose Visualization During Delivery

How cool is that!!



> Pract Radiat Oncol. 2025 Nov 4:S1879-8500(25)00259-0. doi: 10.1016/j.prro.2025.09.004.

Online ahead of print.

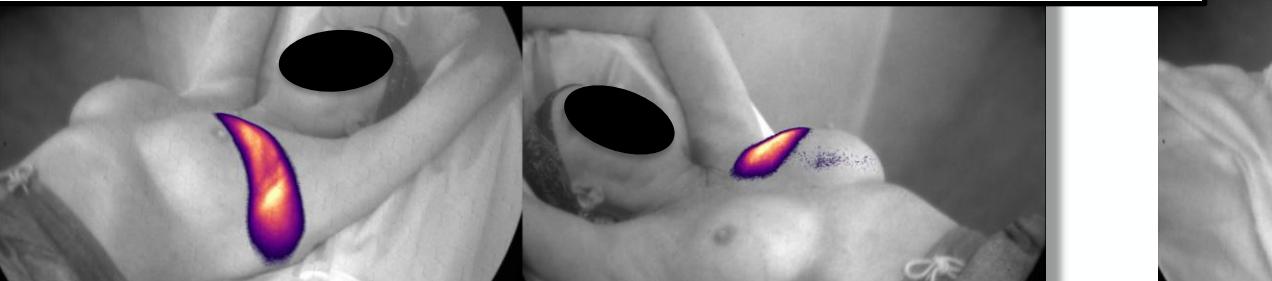
A Review of Cherenkov Imaging for Real-Time Verification in Radiation Therapy

Adi Robinson ¹, Michael Tallhamer ², Florian Stieler ³

Affiliations + expand

PMID: 41197798 DOI: 10.1016/j.prro.2025.09.004

Free article



Advances in Radiation Oncology (2025) 10, 101798

advances
in radiation oncology
www.advancesradonc.org



Teaching Case

Optimizing Breast Cancer Radiation therapy With Volumetric Modulated Arc Therapy and Skin Flash: A Case Study Using Deep Inspiration Breath Hold and Cherenkov Imaging

Adi Robinson, PhD, ^{a,*} Michael Tallhamer, MS, ^b and Amber Orman, MD ^a

^aDepartment of Radiation Oncology, AdventHealth Celebration, Celebration, Florida; and ^bDepartment of Radiation Oncology, AdventHealth Parker, Parker, Colorado

Received 10 February 2025; accepted 21 April 2025

Introduction

Radiation therapy is integral to the management of breast cancer, particularly in cases involving the chest wall and regional lymph nodes. Modern techniques, such as volumetric modulated arc therapy (VMAT), have revolutionized treatment by delivering highly conformal dose distributions while minimizing exposure to critical organs such as the heart and lungs. Studies have shown that VMAT provides superior dose homogeneity and target coverage, especially in complex scenarios requiring chest wall or nodal irradiation.^{1,2}

Deep inspiration breath hold (DIBH) further enhances the safety and precision of VMAT by increasing the distance between the heart and chest wall, significantly reducing cardiac dose. This approach is particularly beneficial for patients with left-sided breast cancer, because it mitigates long-term risks of radiation-induced heart and lung toxicity.^{3,4} Surface-guided radiation therapy (SGRT) has been shown to accurately reproduce the DIBH position, providing a valuable technique for setup verification.^{4,5}

Despite these advancements, VMAT can underdose the skin and superficial areas of the chest wall without specific modifications. This shortfall poses a risk to

treatment efficacy, especially in cases where skin and surface structures are part of the clinical target volume. Although locoregional skin recurrence is rare, recurrence at the skin margin in these patients can be related to the under dosing of the skin and should be monitored and/or augmented when found to be inadequate.⁶ The "skin flash" technique, which extends the dose distribution beyond the target's surface, addresses this challenge by ensuring better superficial coverage.⁷⁻⁹

Cherenkov imaging has emerged as a valuable tool for real-time dose visualization, enabling clinicians to assess dose coverage directly during treatment. By capturing Cherenkov light emitted during radiation delivery, this technology can identify underdosed areas with precision, facilitating timely adjustments.¹⁰⁻¹²

This case study demonstrates the integration of VMAT, DIBH, and Cherenkov imaging to ensure optimal dose delivery to the skin and chest wall of a patient with left-sided breast cancer. The implementation of SGRT and Cherenkov imaging in this case study highlights the potential of these technologies to improve the safety and precision of radiation therapy for breast cancer.



Sources of support: This work had no specific funding.

Research data are stored in an institutional repository and will be shared upon request to the corresponding author.

*Corresponding author: Adi Robinson, PhD; Email: adi.robinson@adventhealth.com

<https://doi.org/10.1016/j.adro.2025.101798>

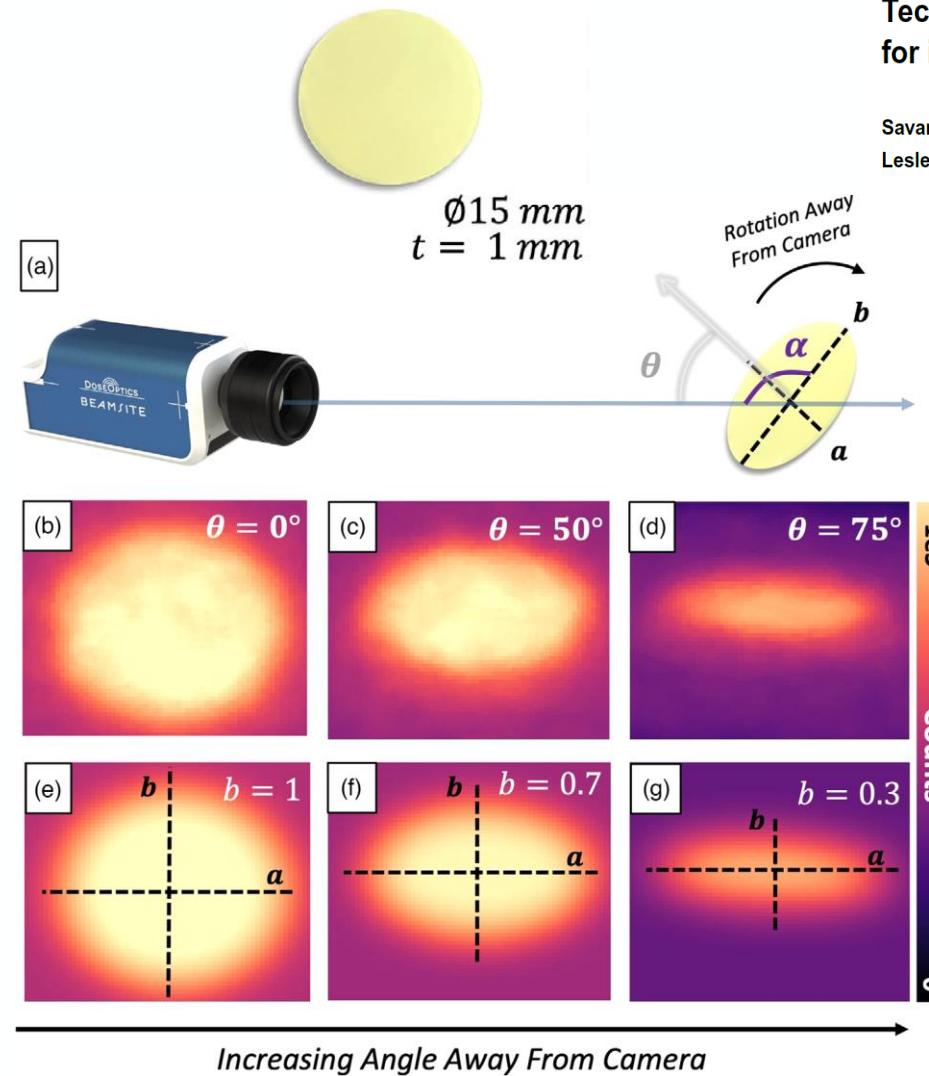
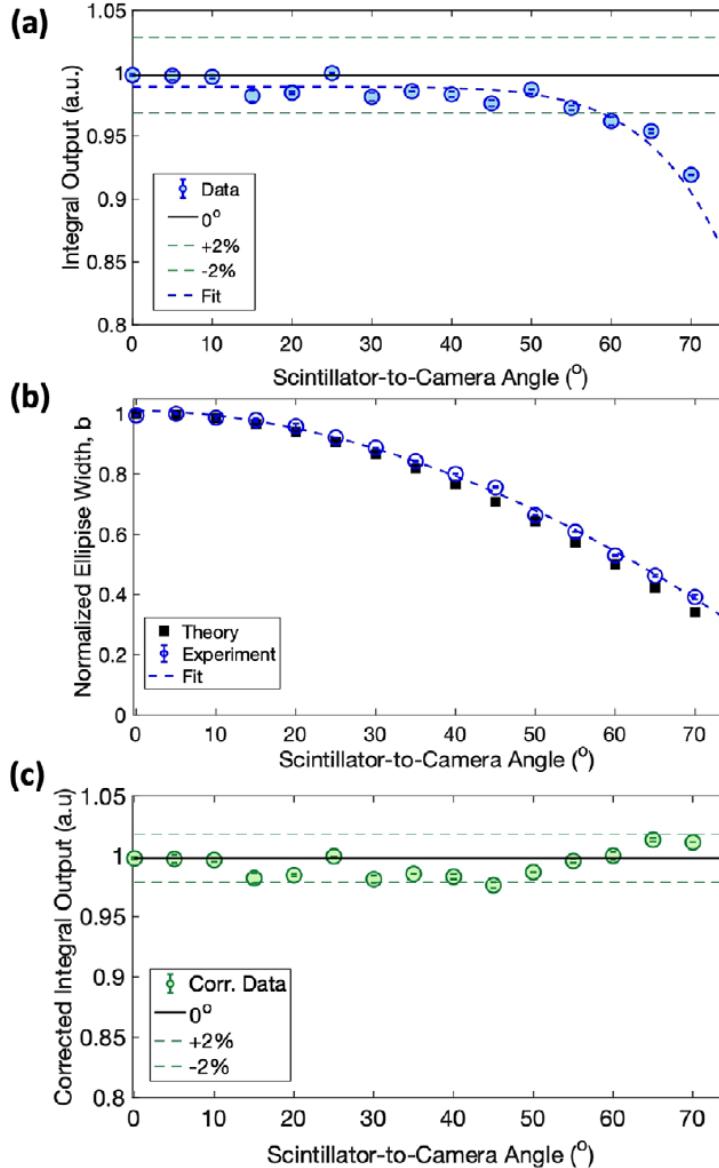
2452-1094/© 2025 The Authors. Published by Elsevier Inc. on behalf of American Society for Radiation Oncology. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Method

Patient

A patient with left-sided breast cancer

Potential Quantitative Applications

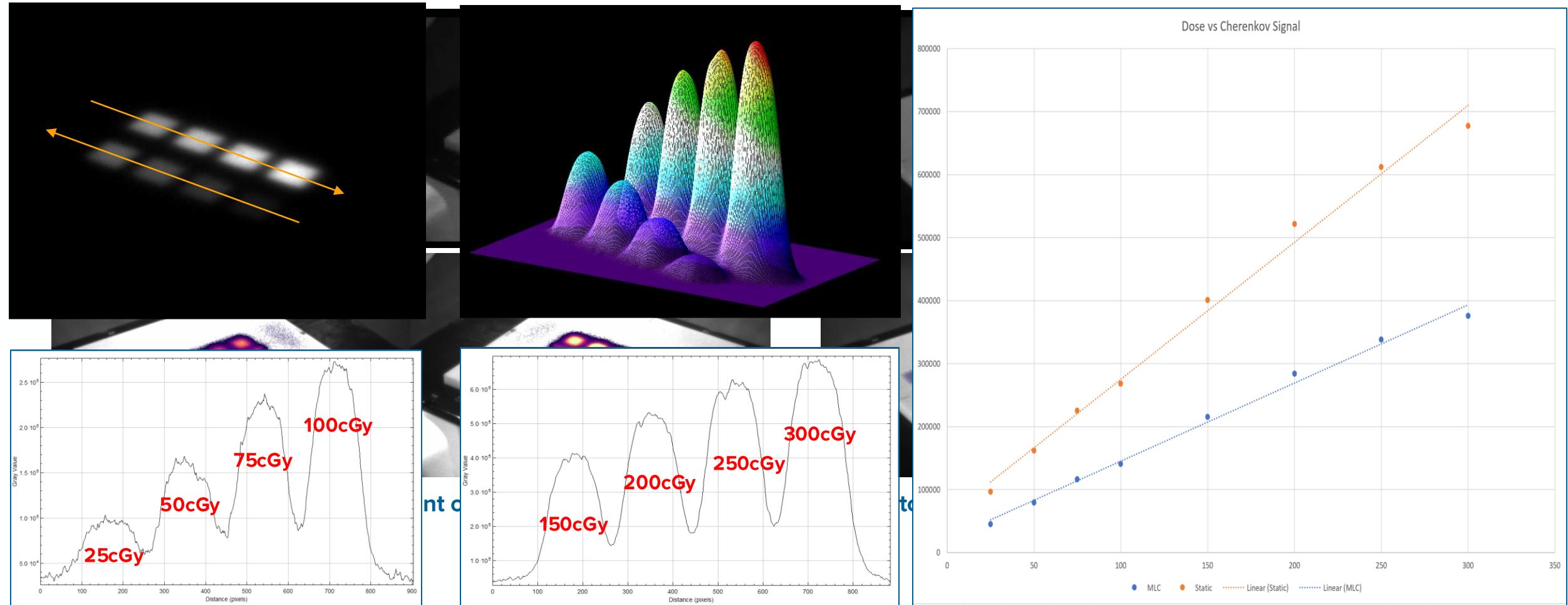


Technical note: Visual, rapid, scintillation point dosimetry for in vivo MV photon beam radiotherapy treatments

Savannah M. Decker¹ | Petr Bruza¹ | Rongxiao Zhang² | Benjamin B. Williams³ |
Lesley A. Jarvis^{2,3} | Brian W. Pogue¹ | David J. Gladstone^{1,2,3}



Clinical Validation of Potential Quantitative Applications



❖ Ilya Frank and Igor Tamm worked out the mathematics for this and shared the 1958 Nobel Prize with Cherenkov

CASE STUDY: Identifying the Impact of Daily Positional Variance

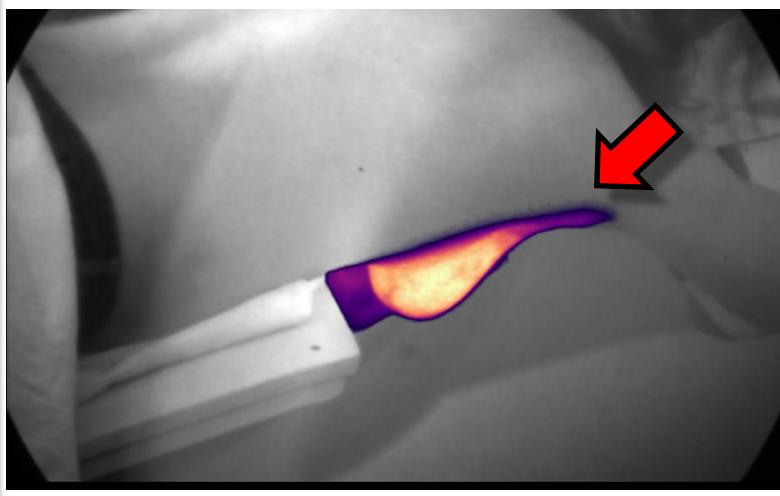
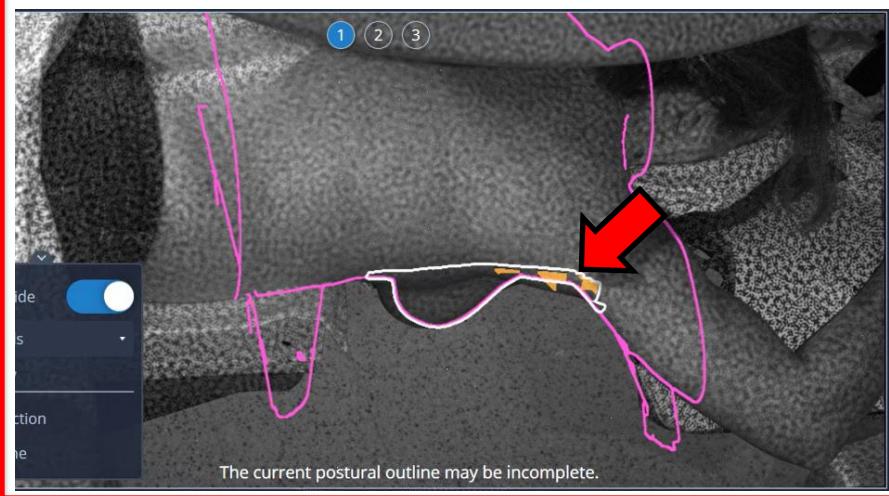
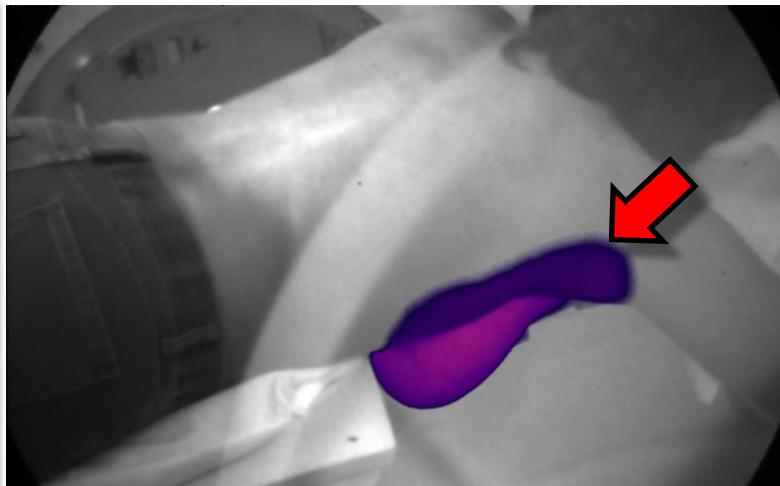
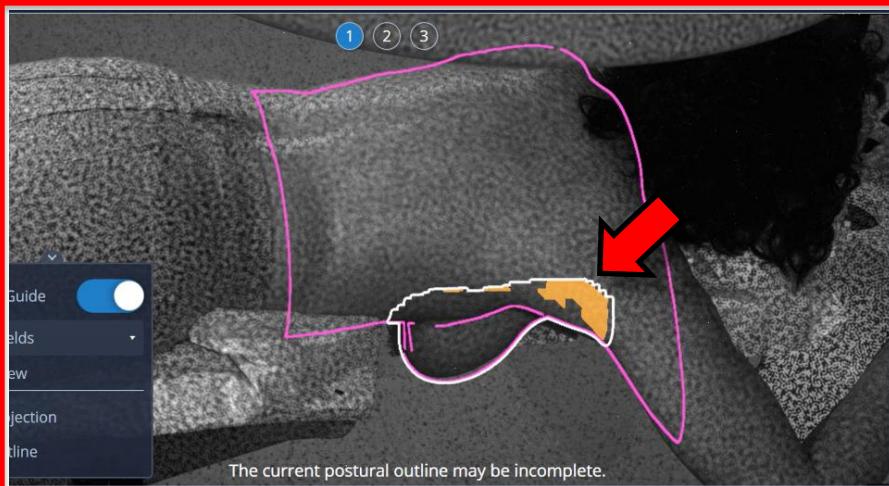
Identify interfraction changes in both patient position and immobilization...



- 67 Year Old Female undergoing 3DCRT for Prone Breast
- Visual verification of treatment dose initiated from fraction 1 of treatment
- Fraction 3 - Exit dose through arm noted by physics team during daily review
 - Investigation showed prone pad indexing places slightly inferior resulting in wrong elbow position
 - Decreased arm extension resulted in beam exiting through upper arm.

CASE STUDY: Beam Guide for Identifying the Impact of Positional Variance

Identify the impact of patient position on expected dose delivery...



➤ Planned Exposure?

- Does the patient have entrance and exit dose exposure to posterior lateral chest wall and upper arm to address coverage concerns on breast and nodal regions or is this a setup error?

➤ Planned Exposure?

- Are we limiting the entrance and exit dose exposure to posterior lateral chest wall and upper arm or is this a setup issue?

Beam Guide™

Beam Guide™ is 510K Pending

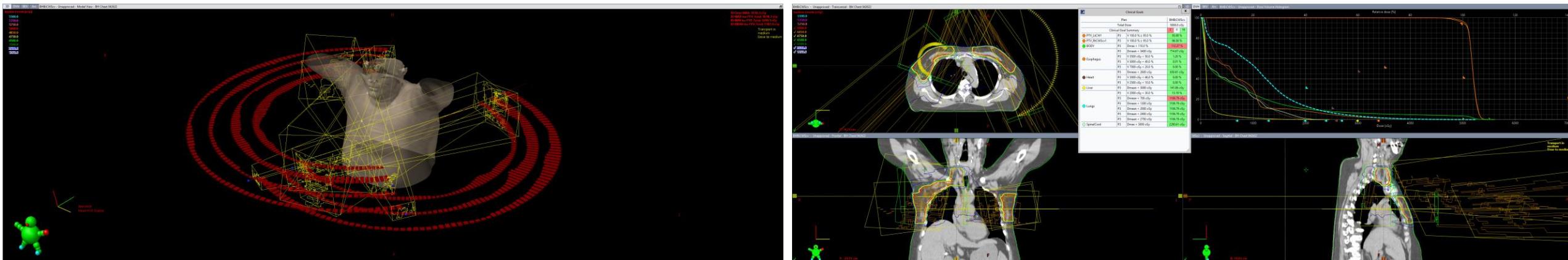
dosert™
Powered by BeamSite®

 **AdventHealth**

Complete documentation of complex cases within the OIS

Planning Challenges

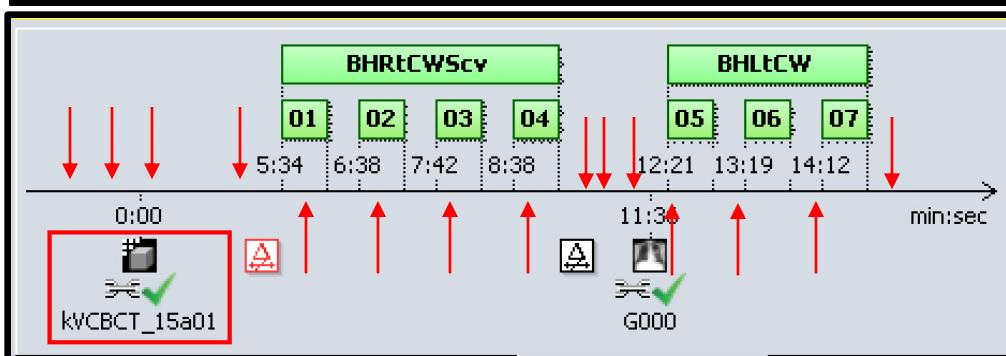
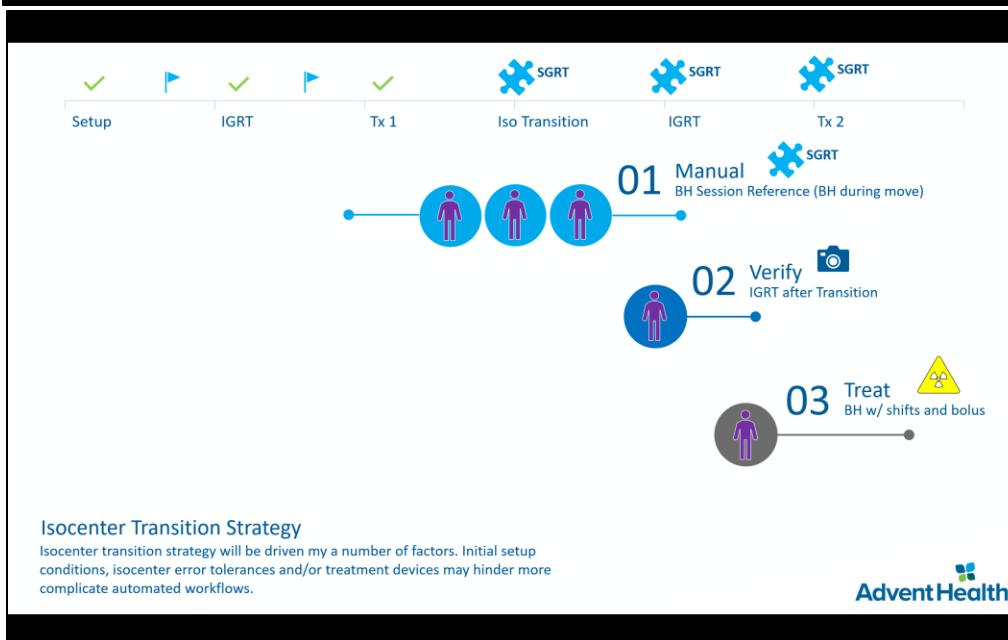
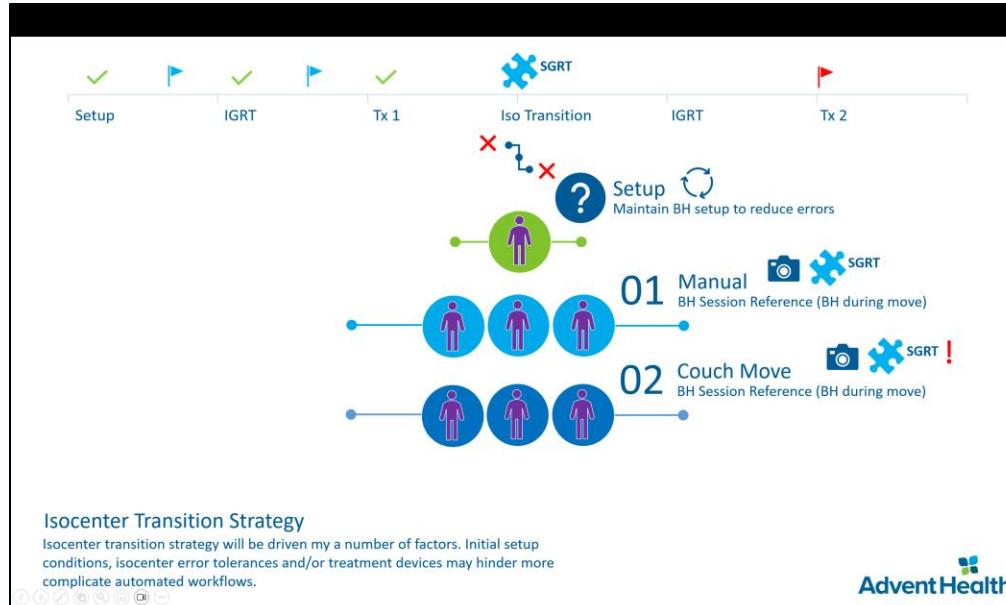
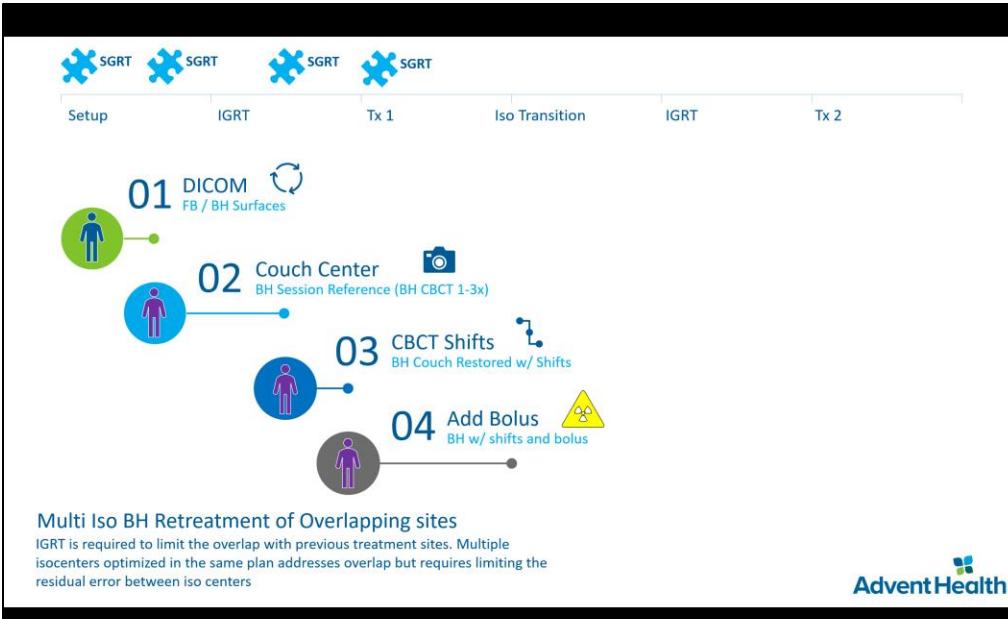
- Overlapping dose volumes resulting in 110Gy regions of dose
 - Required optimization of plan around previous dose and strategy to account for dose from both sides (1 iso vs 2 iso)
- Limited ability to travel requiring treatment locally on Varian Edge linac (SGRT, HDMLC, PerfectPitch couch...etc.)
 - Limited MLC field sizes



Treatment Challenges

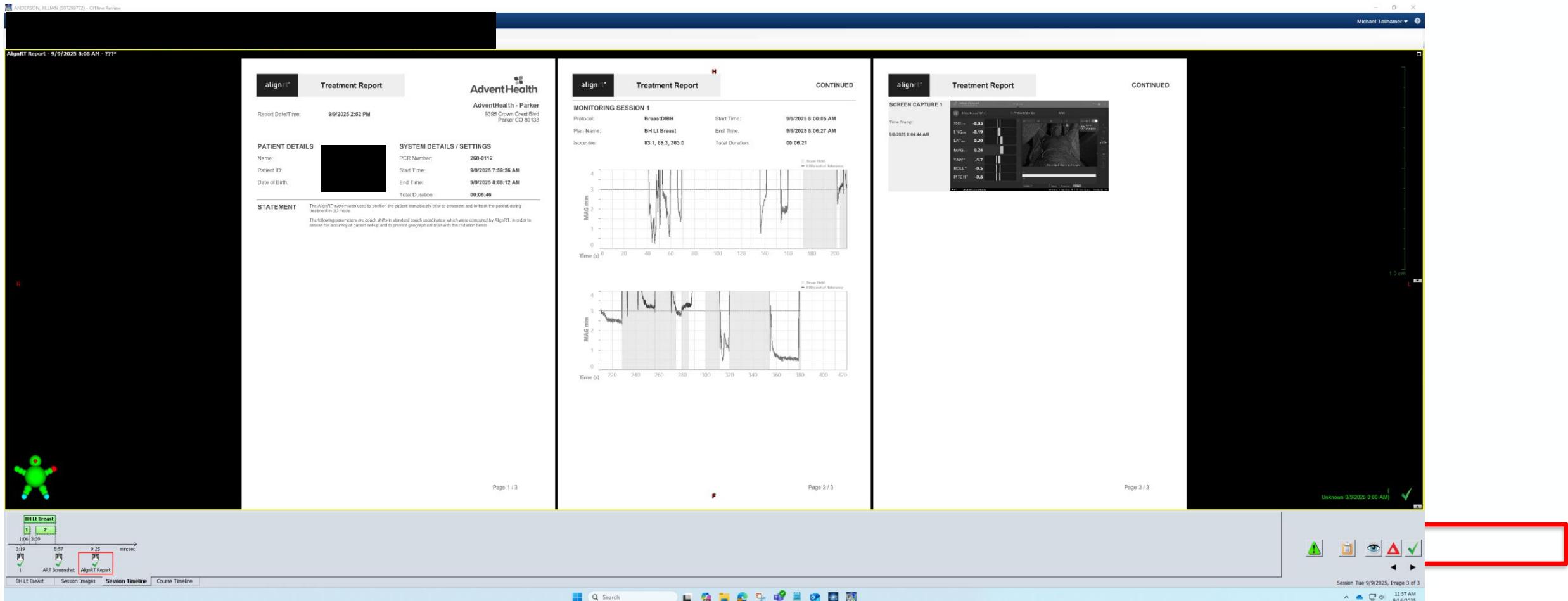
- Varian Edge won't treat 2 isocenters in the same plan (**2 isocenter synchronously optimized plan gives best result**)
 - **Uniformity of dose is dependent on both isocenter deliveries**
- Uncertainty needed for dose uniformity and overlap avoidance is approx. 3mm and 1.5 degrees in all directions (**need DIBH CBCT**)
- 6DoF setups are non-transferable between isocenters with Varian PerfectPitch couch.
- Reference surfaces are non-transferable between treatment plans
- Bolus required over bilateral chest walls obstructs the surface of the patient

Complete documentation of complex cases within the OIS



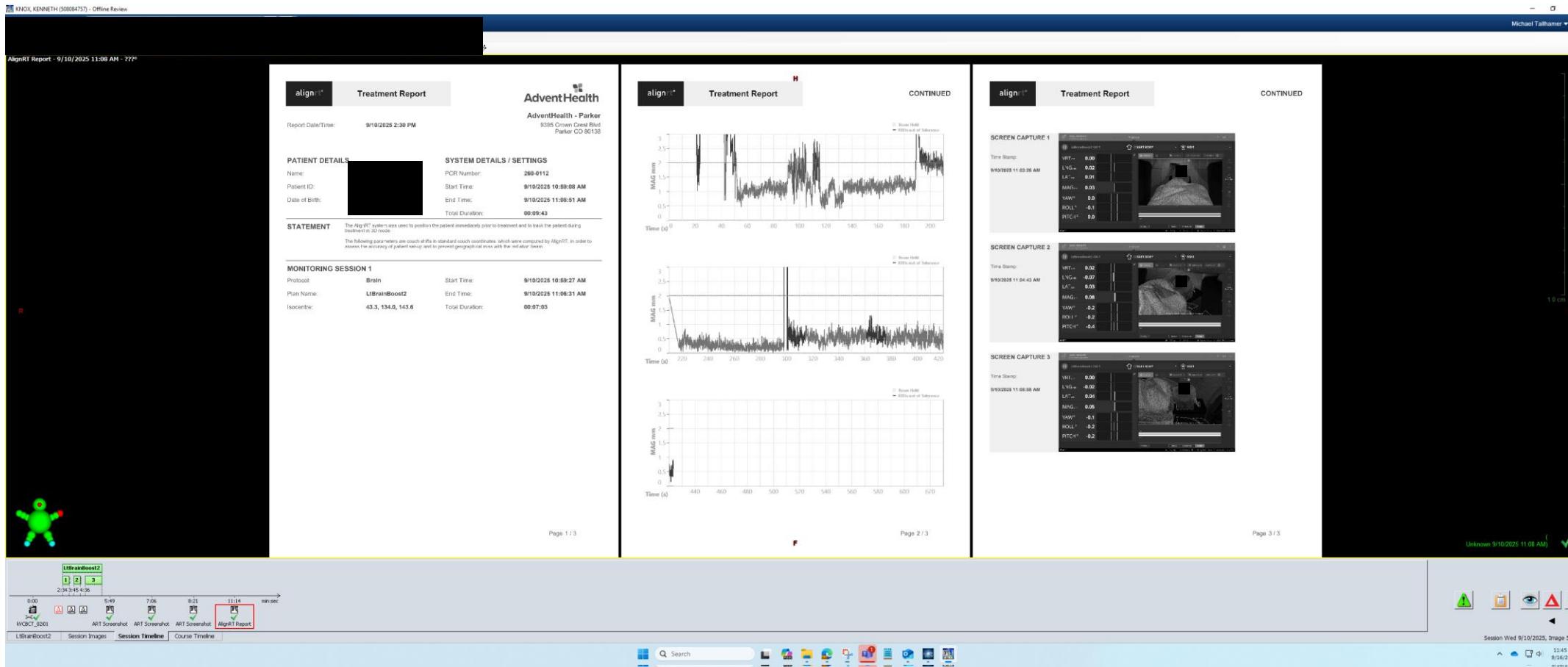
OIS Module: Standardize Your Documentation and Approach

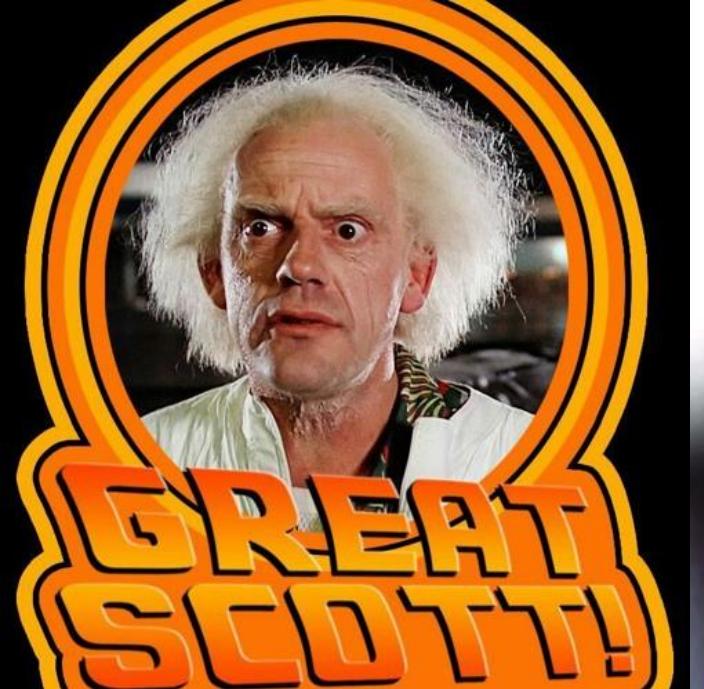
The OIS Module allows clinicians to keep their standard, well established, IGRT process and promotes SGRT documentation so that the supervision requirements for SGRT fall within those same standard workflows.



OIS Module: Standardize Your Documentation and Approach

The OIS Module allows clinicians to keep their standard, well established, IGRT process and promotes SGRT documentation so that the supervision requirements for SGRT fall within those same standard workflows.



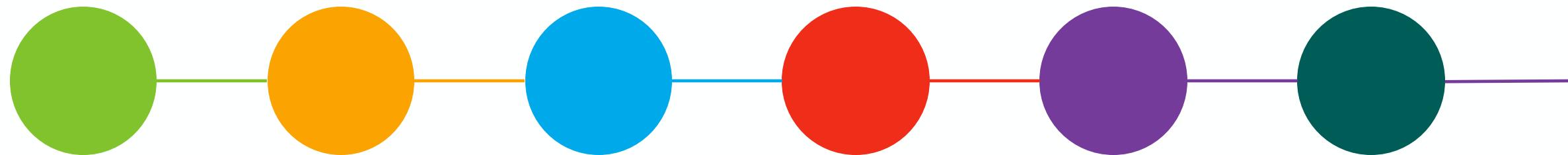






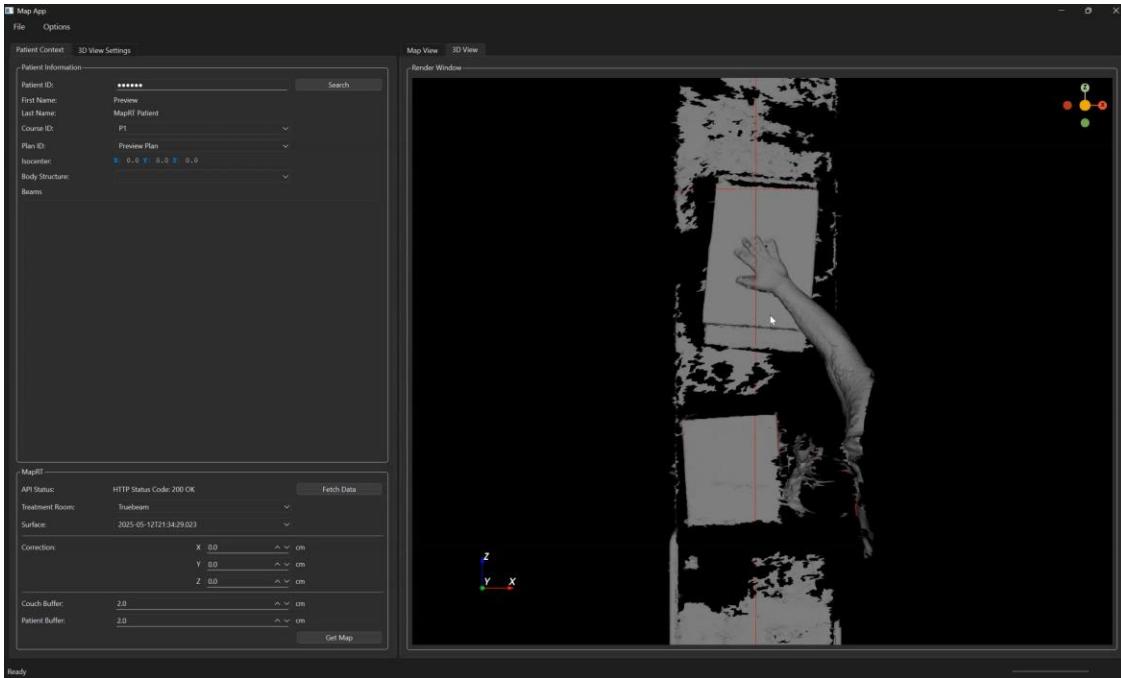
Osteoarthritis Workflows Reimagined

ALAR for non-malignant disease sites

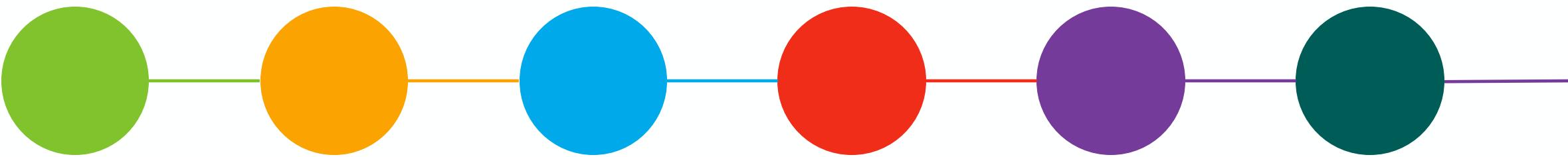


What could a future Sim – Plan – Treat – Dose process look like?

Osteoarthritis Workflows Reimagined

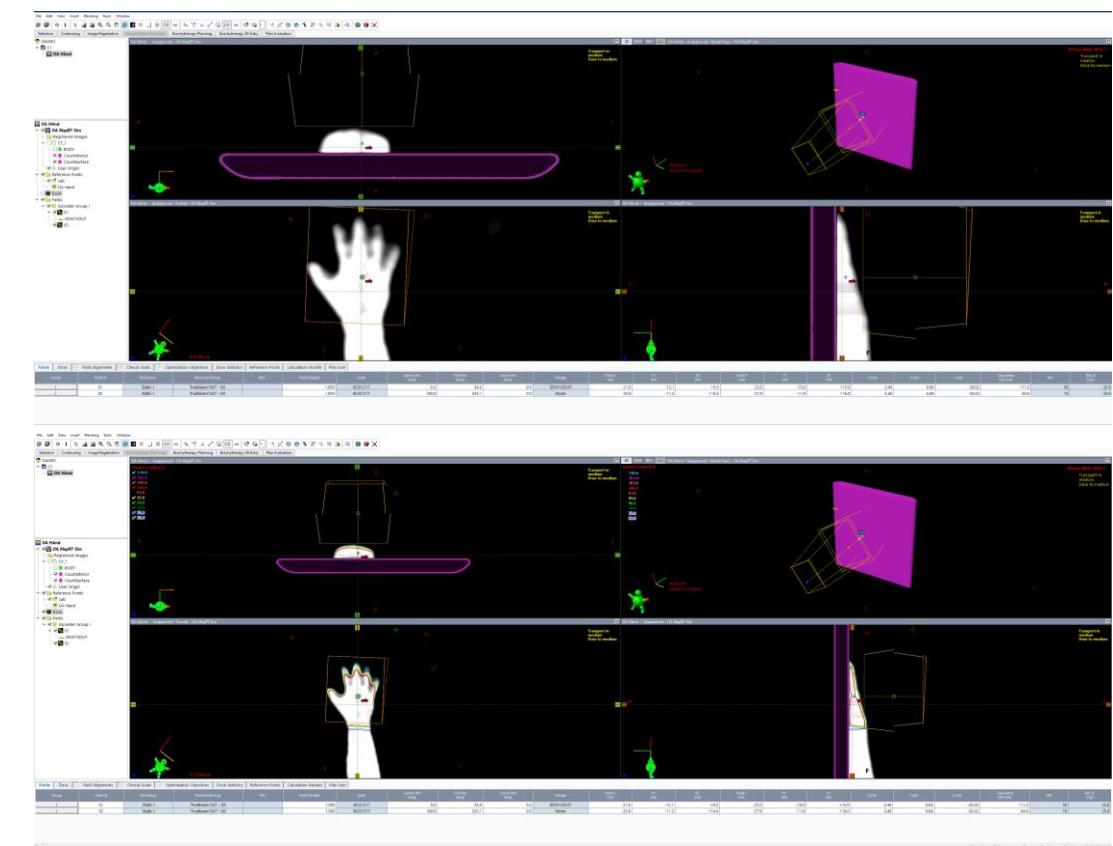


<https://github.com/tallhamer/MapApp>



We can replace a standard CT sim with a completely optical sim for some indications.

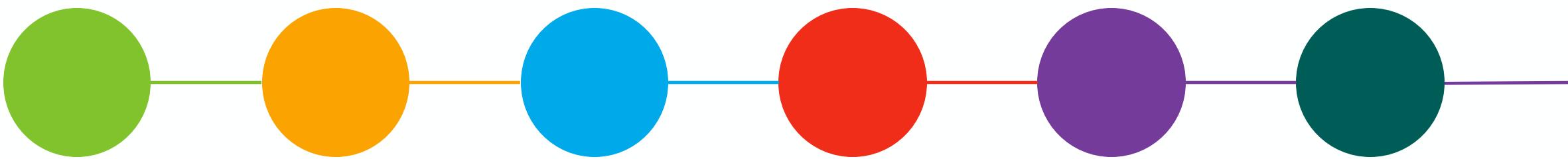
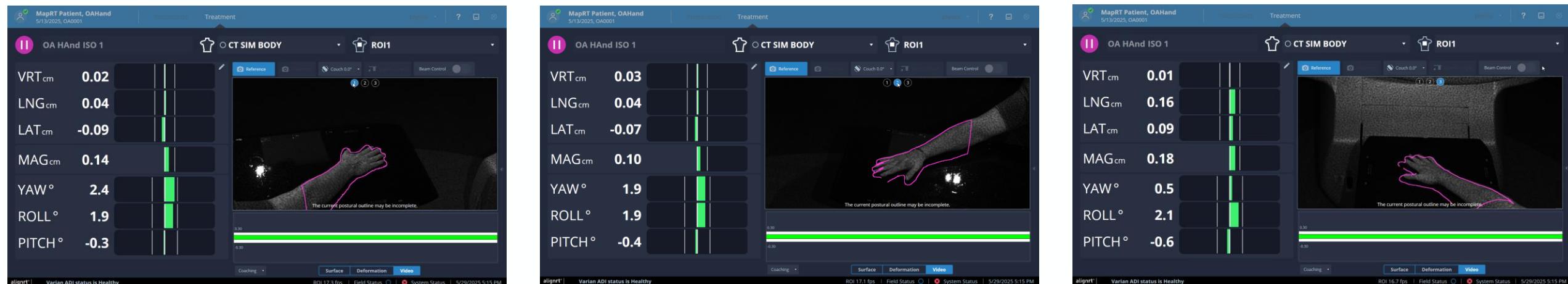
Osteoarthritis Workflows Reimagined



We can then convert an optical sim surface to a synthetic planning CT.



Osteoarthritis Workflows Reimagined



The sim surface then becomes the treatment setup surface.

Osteoarthritis Workflows Reimagined

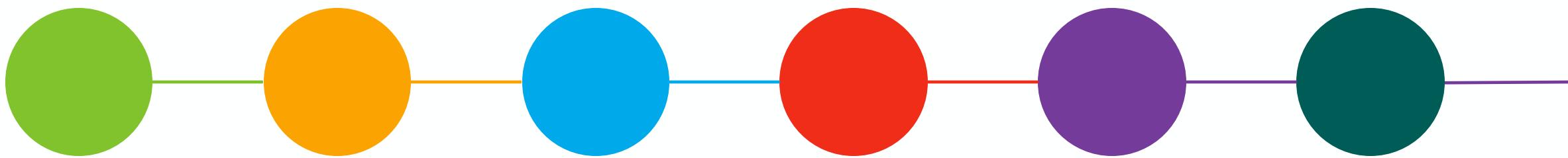
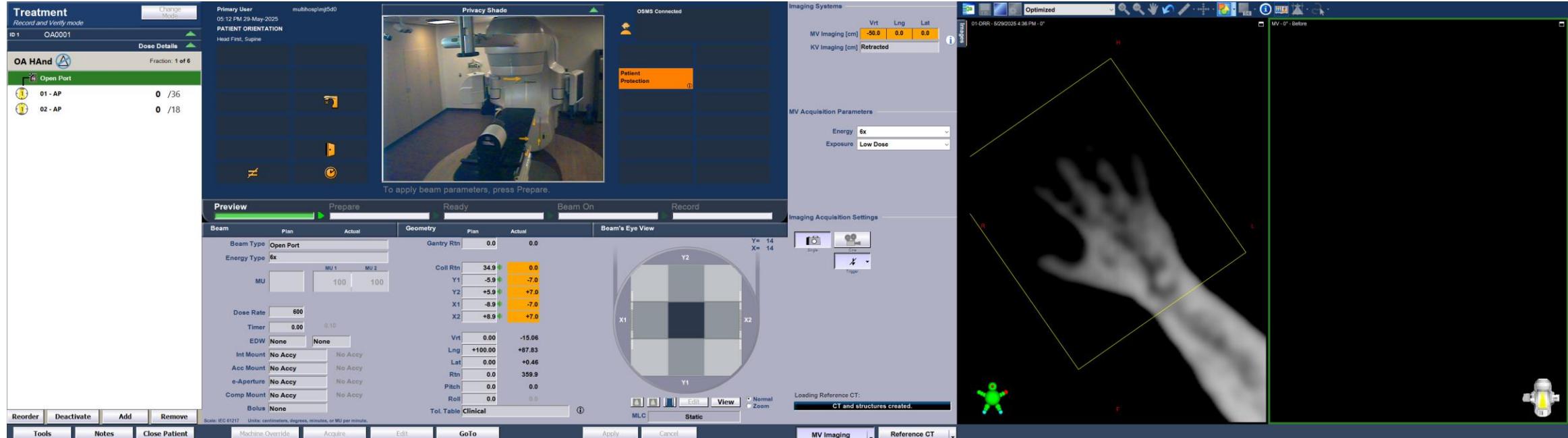
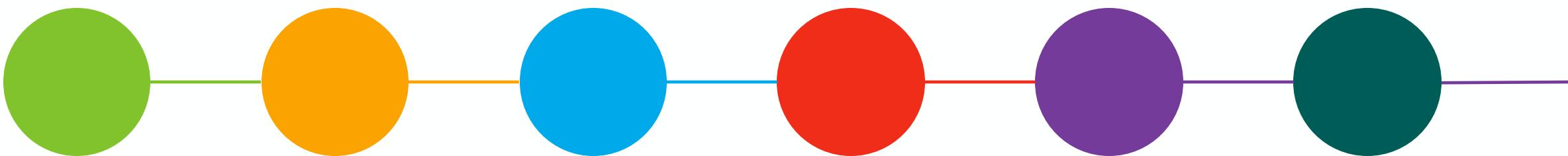


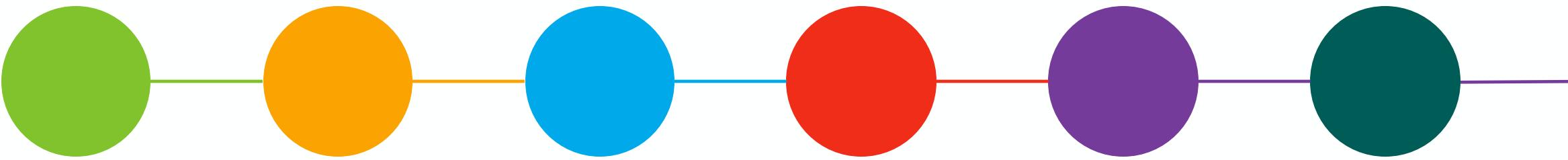
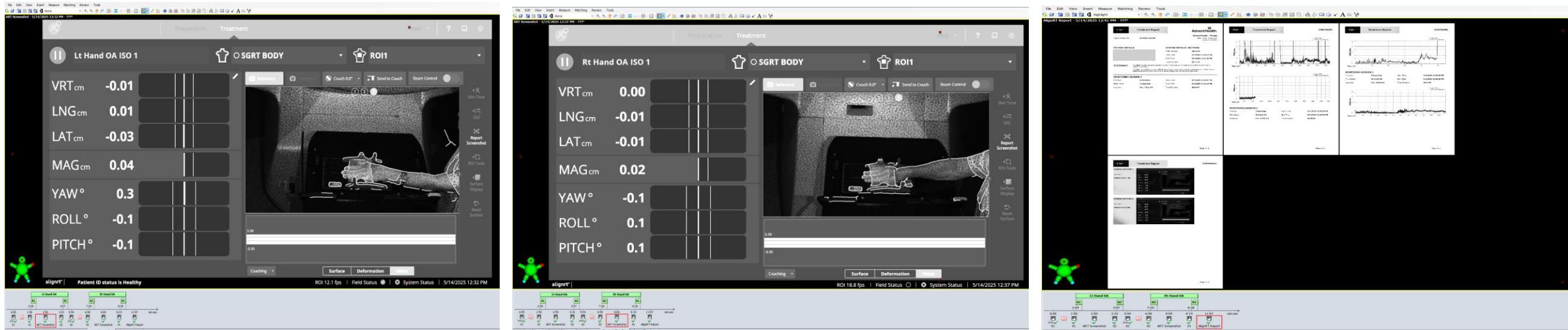
Image and deliver the treatment as planned using the synthetic CT.

Osteoarthritis Workflows Reimagined



Visualize the dose delivery using Cherenkov imaging.

Osteoarthritis Workflows Reimagined



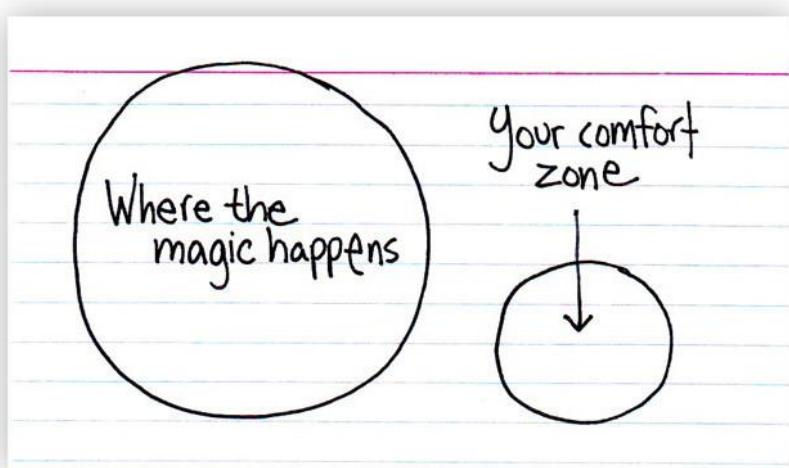
Document and review the treatment in the OIS (Offline Review) just like any other treatment.

Summary

- We have reviewed historical cases where boundaries may have been pushed with maskless H&N cases and where we are now.

“Good company in a journey makes the way seem shorter.” – Izaak Walton

- We looked at some present “opportunities” to expand the utility of existing SGRT technologies by “nudging” a boundary or two.



Thank You!

- Special Thanks to the AdventHealth Physics team.



Adi Robinson PhD
AdventHealth - Celebration

- Special Thanks to to all of you who push the boundaries and bring hope to so many patients.

Extending the Healing Ministry of Christ