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Peter Mac Fellowship 2008



Visit to Melbourne 2022



Melbourne 2026



Oisín Mullin's 'supreme athleticism' hailed as 14 Irish players look to new AFL season



Colm Keys

March 4 2026 5:30 AM

Oisín Mullin's athleticism has been hailed by his Geelong Cats' coach Chris Scott as he prepares for a fourth season in the AFL which gets underway this weekend.

The former Mayo defender is one of 14 Irish players – one more than last year as Kerry's Ben Murphy

OPEN Trial

Optimising Patient Experience in head and Neck radiotherapy

Phase 3 RCT comparing Closed versus Open face masks

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Director of Research

St Luke's Radiation Oncology Network, Dublin



MASK ANXIETY

26% of HNC
patients

Distress prognostic factor for poorer survival

‘Having the mask on didn't worry me until
... they clamped my head down so I wouldn't move’

Clover et al, 2011
Forbes et al, 2023



SCAN ME

Unmasking anxiety: a head-to-head comparison of open and closed masks in head and neck cancer radiotherapy

Aisling M. Glynn, Rachel Harwood, Bill Garrett, Dean Harper, Mary Dunne, Jill Nicholson, Guhan Rangaswamy, Fran Duane, John Armstrong, Orla McArdle, Sinead Brennan

ABSTRACT

Background: Facemasks accurately immobilise patients with head and neck cancer (HNC) receiving radiotherapy (RT). However, such masks are associated with treatment related distress, a prognostic factor for poorer survival. Open masks offer increased comfort and patient satisfaction. We investigated whether open masks could immobilise patients without affecting treatment accuracy.



Surface Guided Radiotherapy (SGRT):

3D SGRT Systems

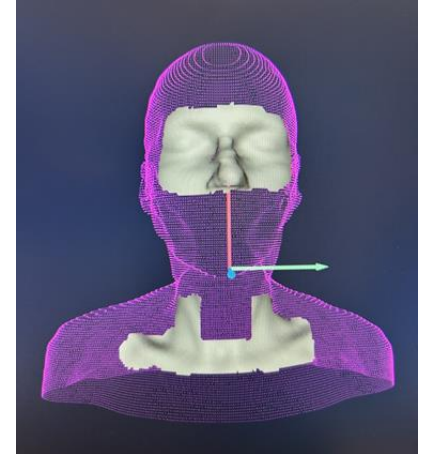
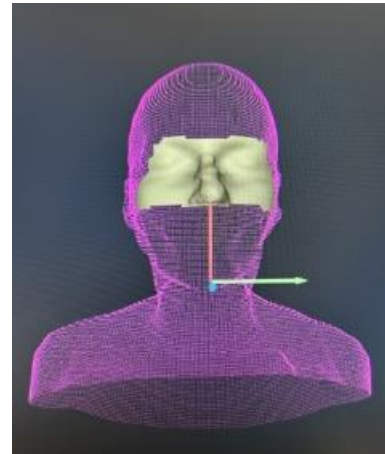
AlignRT:

- reduce the complexity of treatment setup
- track patient motion with < 1mm accuracy
- reduce need for immobilisation

Leverage these new technologies:

- maximise patient comfort
- maintain treatment accuracy

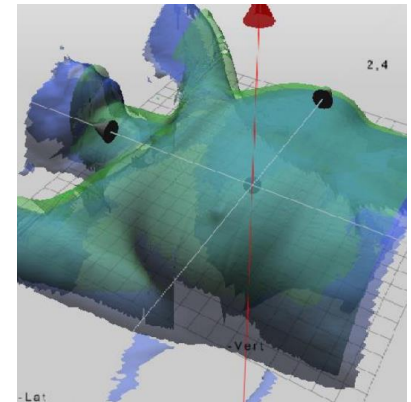
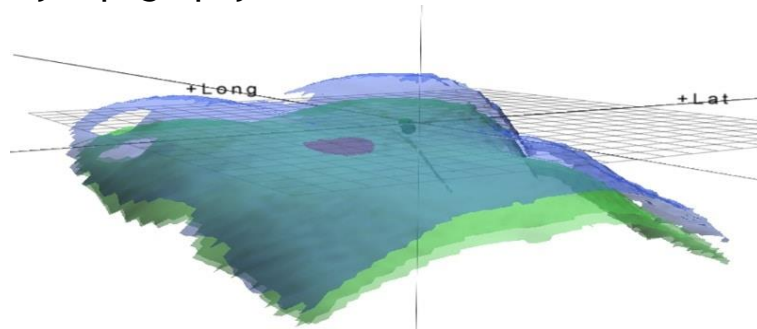
Importance of Ph 3 RCT in evaluating new technology



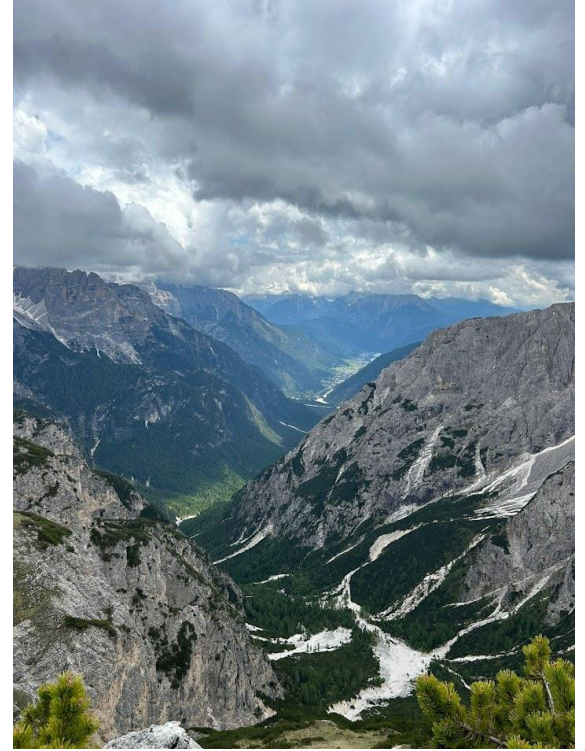
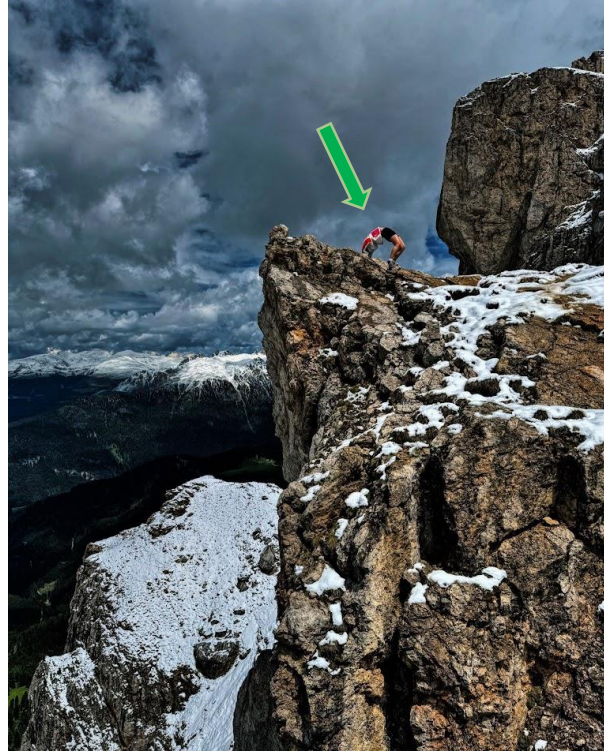
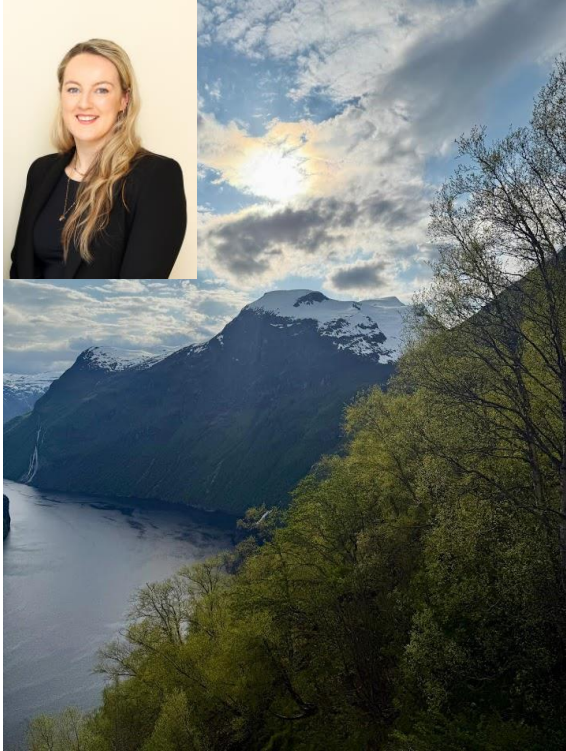
OPEN face ROIs are quite small.... Did we capture “Good” topography?



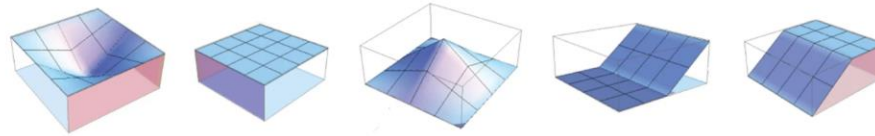
- ROI: a defined area on patient's body surface that used to monitor and guide treatment delivery
- The ROI should include suitable topography for accurate SGRT surface registration
- Head & neck ROIs much smaller than breast
- How do we measure good quality topography?



Can Geographical Topographical metrics help us define “Surface topography”?

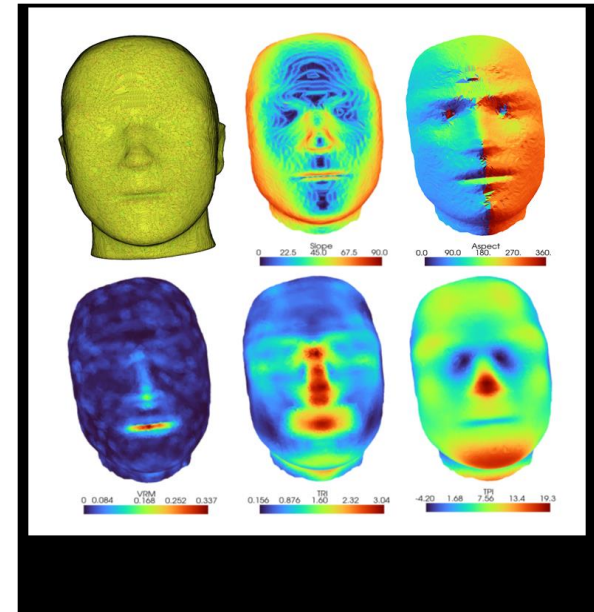
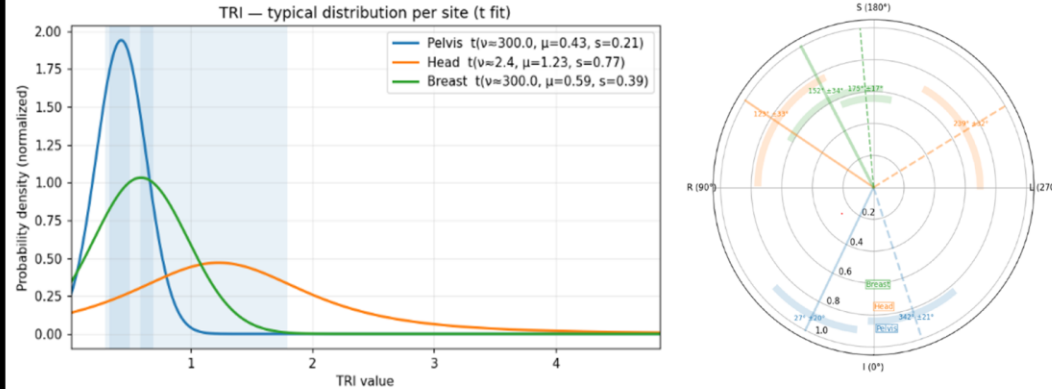


SGRT – what is “Good Topography”?



Slope (0-90)
Aspect (0-360)

Vector Ruggedness Measure (VRM) - fine structure
Terrain Ruggedness Index (TRI) - local structure
Topographic Position Index (TPI) - regional structure



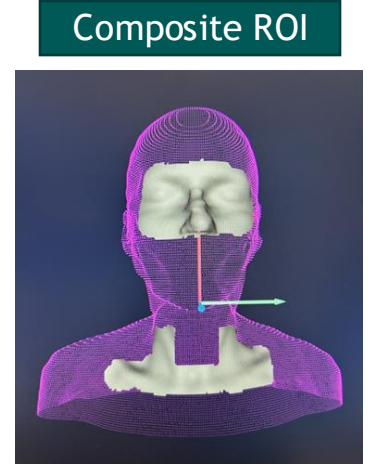
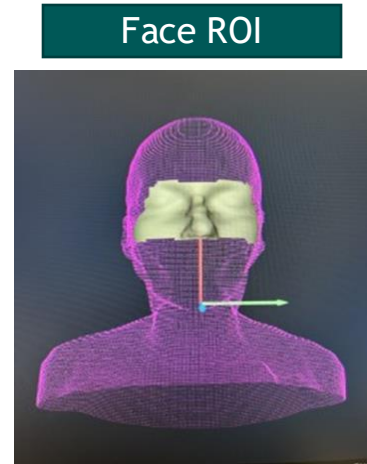
Result: Even small ROIs in the facial region give good surface topography. Nasal bridge = important

SGRT: Region of Interest (ROI) Design Strategy

Focused Staff training on ROI - based tracking strategies

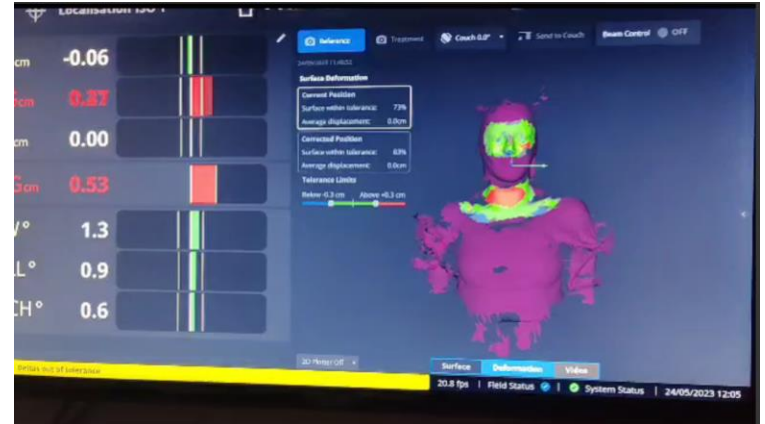
Introduction and standardisation of a dual ROI workflow:

- Face ROI for initial set up
- Composite ROI for real time tracking during RT delivery



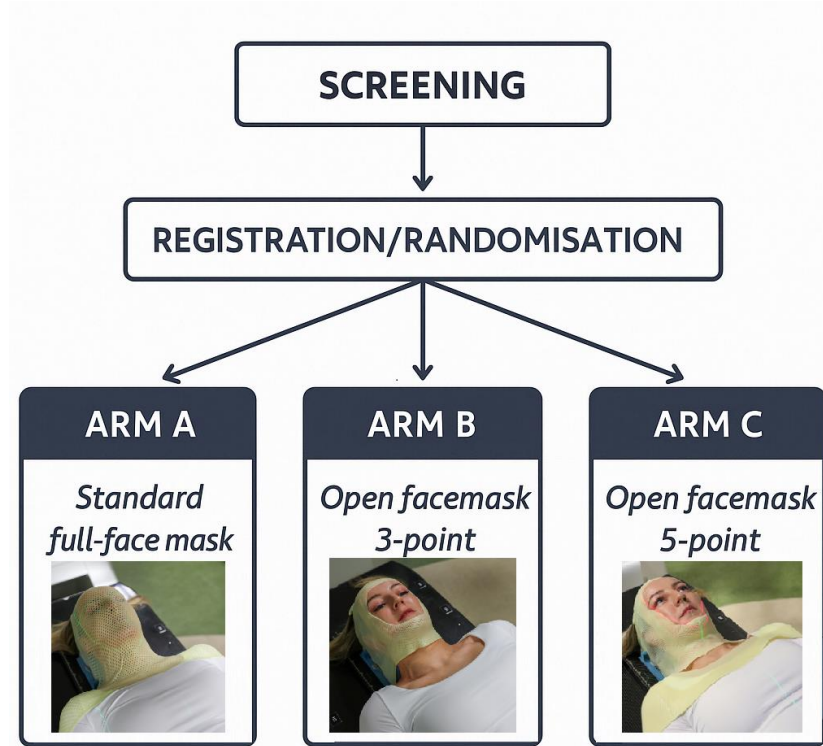
Non Invasive
Real time motion
Monitoring

Real Time Deltas
Set up and Monitoring
2mm and 2deg



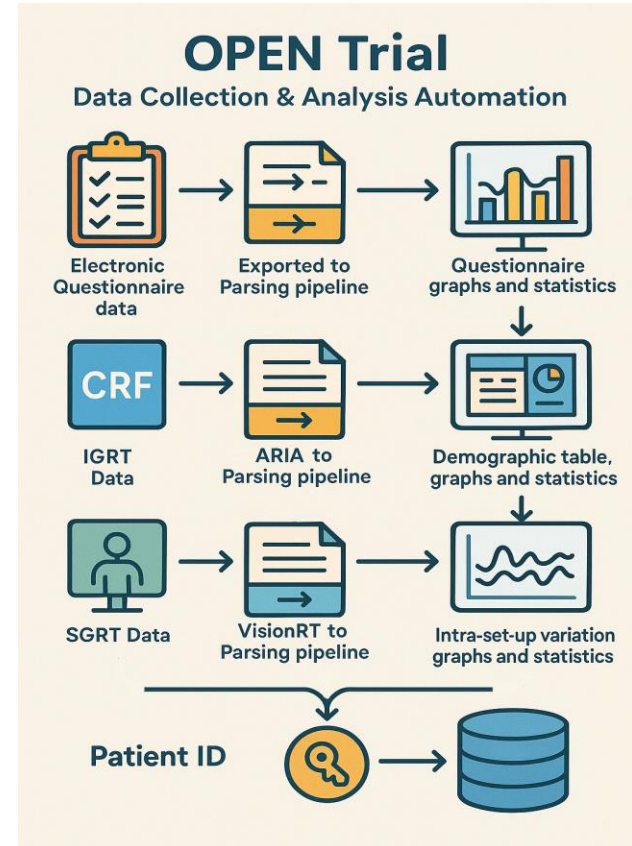
OPEN TRIAL: Methods

- Largest RCT of Open faced masks: N= 231
- Included radical RT for head & neck cancer pts
- Excluded pts with known claustrophobia
- Randomised 1:1:1
- Combination of frequentist & Bayesian statistics
- Automated data parsing pipelines & analysis scripts using Python



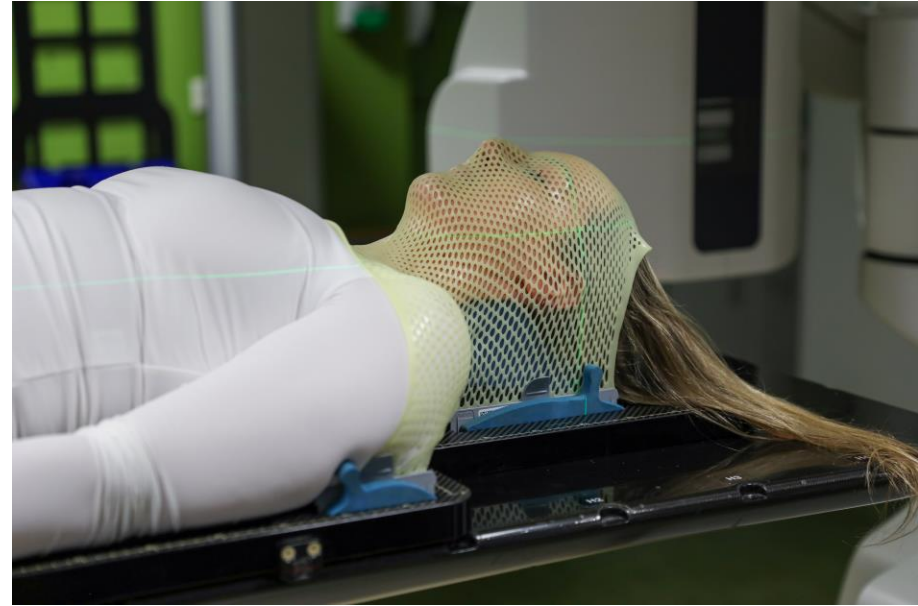
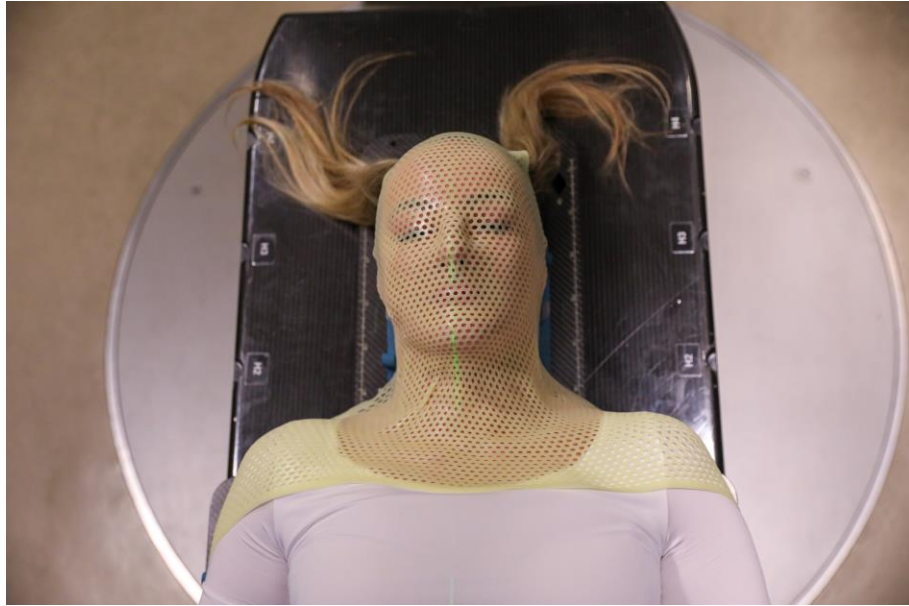
OPEN TRIAL: Methods

- Largest RCT of Open faced masks: N= 201
- Included radical RT for head & neck cancer pts
- Excluded pts with known claustrophobia
- Randomised 1:1:1
- Combination of frequentist & Bayesian statistics
- Automated data parsing pipelines & analysis scripts using Python



ClinicalTrials.gov: NCT06327139
Publication: HRB Open Access Journal

ARM A: 5 point CLOSED mask



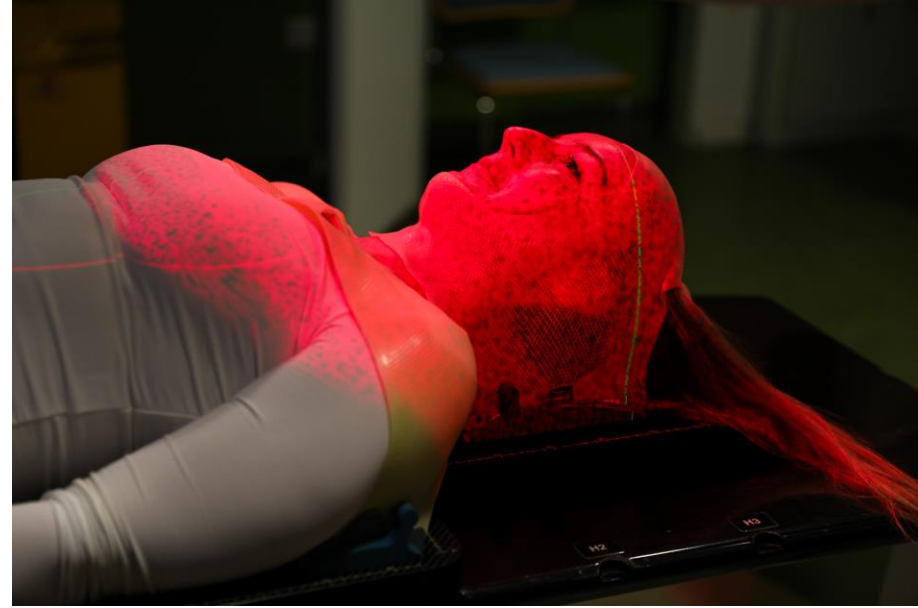
DOI CBCT, No SGRT

ARM B: 3 point OPEN Face mask



DOI CBCT + SGRT

ARM C: 5 point OPEN Face mask



DOI CBCT + SGRT

OPEN Trial Endpoints:

Primary Objectives:

1. Compare the setup accuracy of three different types of masks

Secondary Objectives:

1. Compare patients' distress levels at beginning and end of RT using the psychological measure General Health Questionnaire-12 (GHQ-12) & additional questions on comfort, tolerability & overall experience
2. Evaluate potential advantages of Surface Guided Radiotherapy (SGRT) as a tool for intra-fraction motion monitoring in combination with CBCT imaging
3. Assess impact on treatment set up time and use of resources on the treatment unit

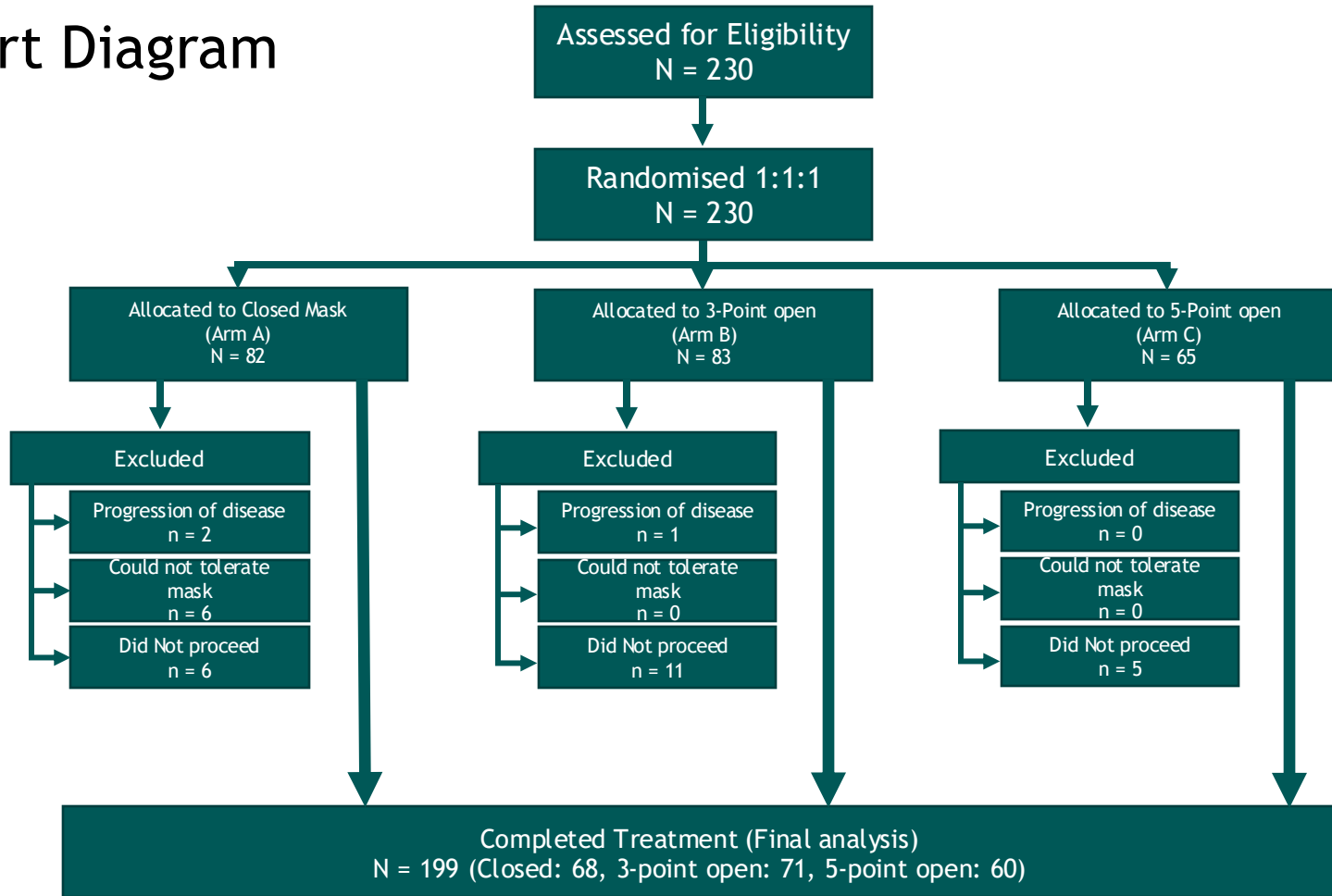
Q14: How would you rate the comfort level of your mask during treatment?	<input type="checkbox"/> Very uncomfortable <input type="checkbox"/> Uncomfortable <input type="checkbox"/> Neutral <input type="checkbox"/> Comfortable <input type="checkbox"/> Very Comfortable
Q15: How would you rate your ability to tolerate the mask during your treatment?	<input type="checkbox"/> Very hard to tolerate <input type="checkbox"/> Hard to tolerate <input type="checkbox"/> Neutral <input type="checkbox"/> Easy to tolerate <input type="checkbox"/> Very easy to tolerate
Q16: How would you describe your overall experience with the mask during setup and treatment?	<input type="checkbox"/> Very negative <input type="checkbox"/> Negative <input type="checkbox"/> Neutral <input type="checkbox"/> Positive <input type="checkbox"/> Very positive

Results Demographics

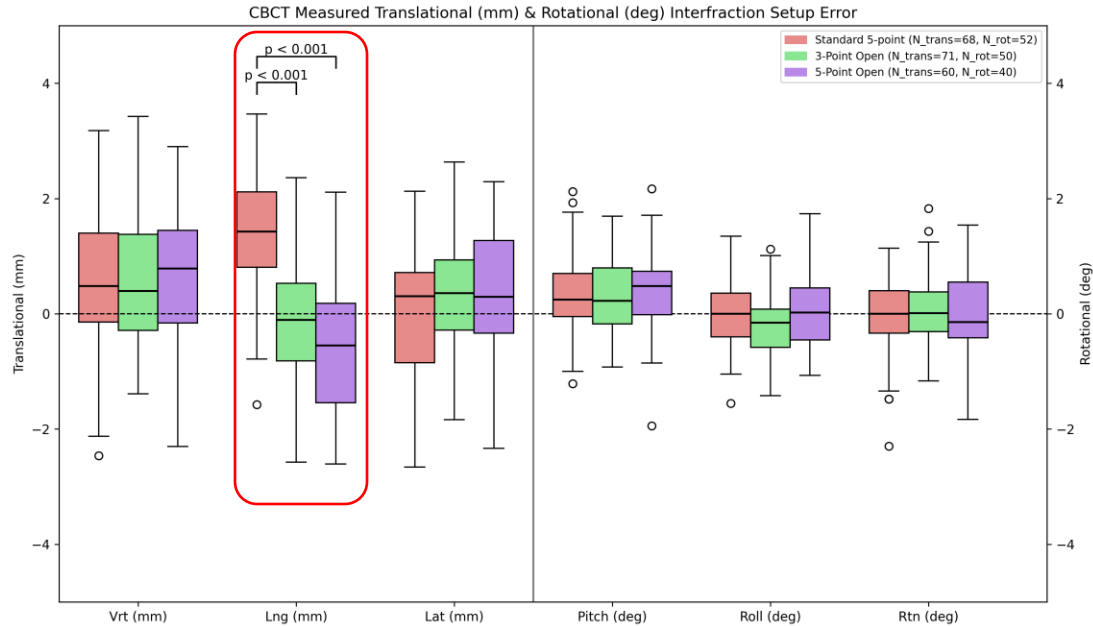
- Trial accrual: 230 -Jan 2024 to April 2025
- TC/RTT led consent process
- Wide inclusion criteria
- Radical RT 30-35#

Demographic Data		
Number of patients		199
Type of mask	Arm A - Standard	68 (34.2%)
	Arm B - 3 point open	71 (35.7%)
	Arm C - 5 point open	60 (30.2%)
Sex	Male:	147 (73.9%)
	Female:	52 (26.1%)
Height		165.7 cm \pm 36.2 cm
Weight		74.1 kg \pm 15.1 kg
Age		62.0 yrs \pm 10.9 yrs
Site	Oropharynx:	95 (47.7%)
	Oral Cavity:	33 (16.6%)
	Larynx:	18 (9.0%)
	Skin:	14 (7.0%)
	Hypopharynx:	13 (6.5%)
	Unknown Primary:	8 (4.0%)
	Sinonasal:	8 (4.0%)
	Nasopharynx:	4 (2.0%)
	Other:	3 (1.5%)
	Salivary Gland:	3 (1.5%)
T - stage	T0	7 (3.5%)
	T1	27 (3.5%)
	T2	56 (13.6%)
	T3	53 (28.1%)
	T4	48 (26.6%)
	Tx	8 (24.1%)
N - Stage	N0	52 (26.1%)
	N1	62 (31.2%)
	N2	50 (25.1%)
	N3	35 (17.6%)
M - Stage	M0:	199 (100.0%)
Treatment Purpose	Definitive Radical:	142 (71.4%)
	Adjuvant:	57 (28.6%)
Chemotherapy	Yes:	132 (66.3%)
	No:	67 (33.7%)

Consort Diagram



Primary Endpoint: Interfraction Motion



- No significantly significant differences across Vert, Lat and rotational dimensions btw 3 arms, median set up errors <1 mm
- Except in long dimension, closed masks had significantly larger motion than either open face mask ($p < 0.001$)
- Difference did not translate into differing PTV margins btw arms

Intrafraction motion: A synergistic approach



- Pre-planned interim safety analysis
- First 56 patients
- **Intrafraction motion assessed using both weekly pre + post CBCT, & daily SGRT synergistically**
- CBCT - deviations in translational + rotational dimensions based on bony alignment
- SGRT - continuous monitoring of surface motion
- Bayesian analysis to determine the equivalence across mask types and measurement techniques



Start position



During Treatment



End position

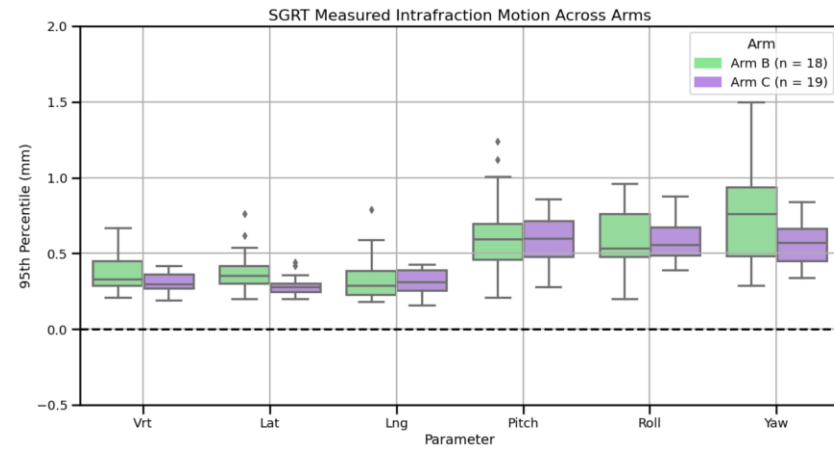
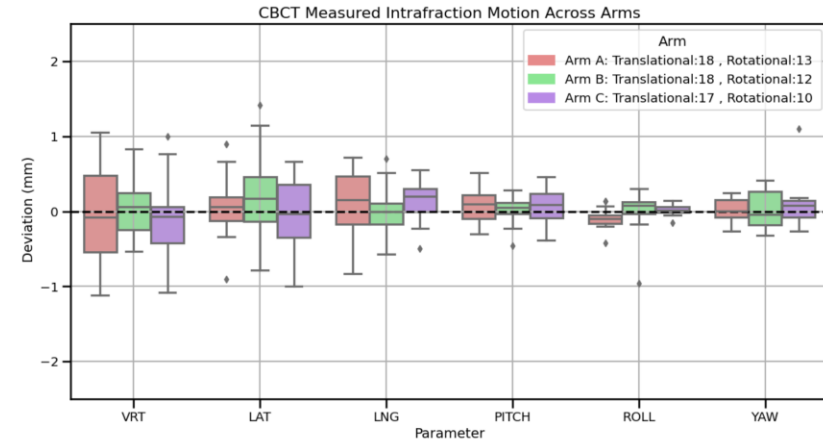


Intrafraction motion stability of open vs. closed facemasks in head and neck radiotherapy: Insights from the OPEN phase III trial

[Claran Malone](#) ^a [Samantha Ryan](#) ^a [Jill Nicholson](#) ^{a,b} [Ruth Woods](#) ^a [Brendan McClean](#) ^{a,d} [Sinead Brennan](#) ^{a,b} [Show more](#)

Secondary Endpoint: Intrafraction Motion

- Open-face masks show intrafractional stability comparable to closed masks.
- Mean CBCT deviations <0.4 mm; 0.2 deg
- SGRT 95th percentile deviations: 0.4 mm; 0.8 deg
- Bayesian analysis: no clinically significant differences
- CBCT intrafraction margins: 1.8, 1.7 and 1.3 (mm)
- Margins consistent across masks, validated by SGRT
- SGRT revealed transient deviations missed by CBCT



SCAN ME

Confidence that SGRT was allowing us to capture patient positional variation when it mattered most: during treatment

Patient Experience: GHQ 12

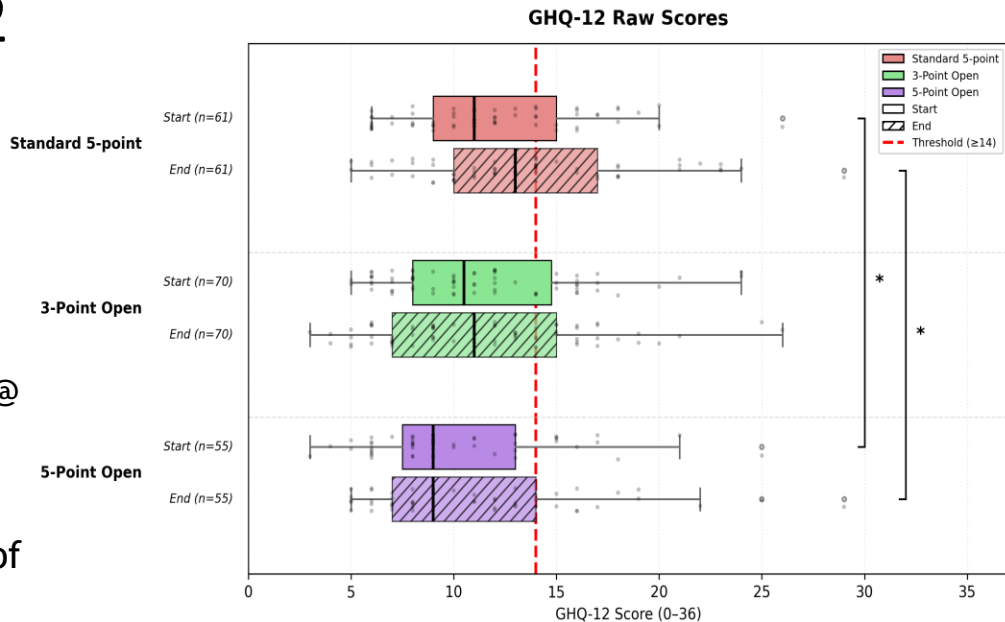
GHQ 12 Distress levels: Start & End of RT:

Open masks: lowest levels of distress >14

5 pt open: significantly lower levels of distress @ start & end of RT vs closed masks ($p < 0.05$)

Both OPEN arms significant less distress @ end of RT using independent Bayesian testing

Closed masks highest levels of distress >14 both @ start & end RT, largest increase from start to end



Threshold of GHQ-12 distress: 14*

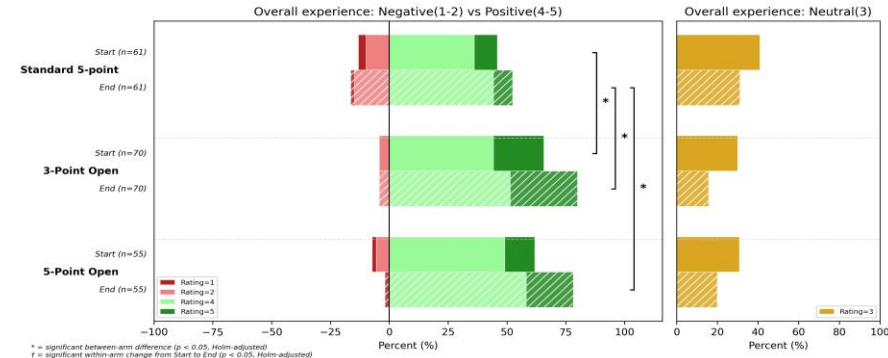
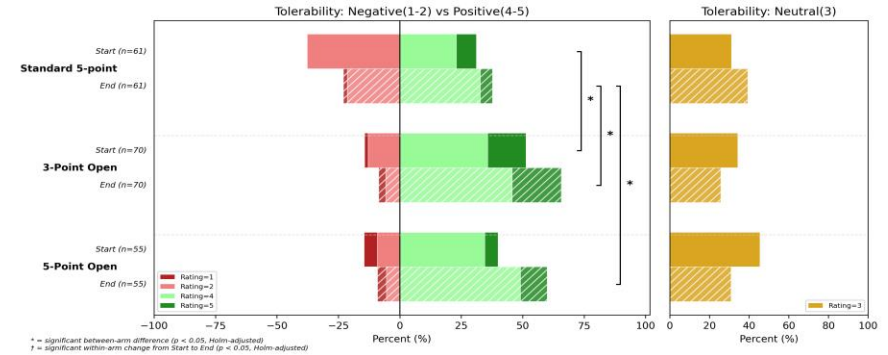
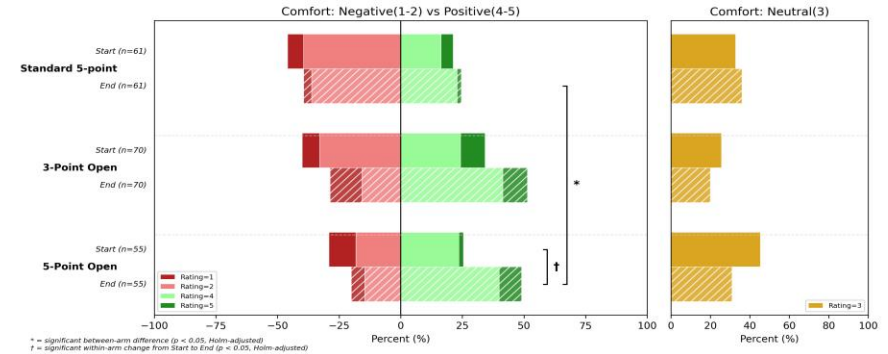
91% questionnaire completion rate

Patient Experience Questions: Comparing Start vs End RT

- All ratings improved during RT

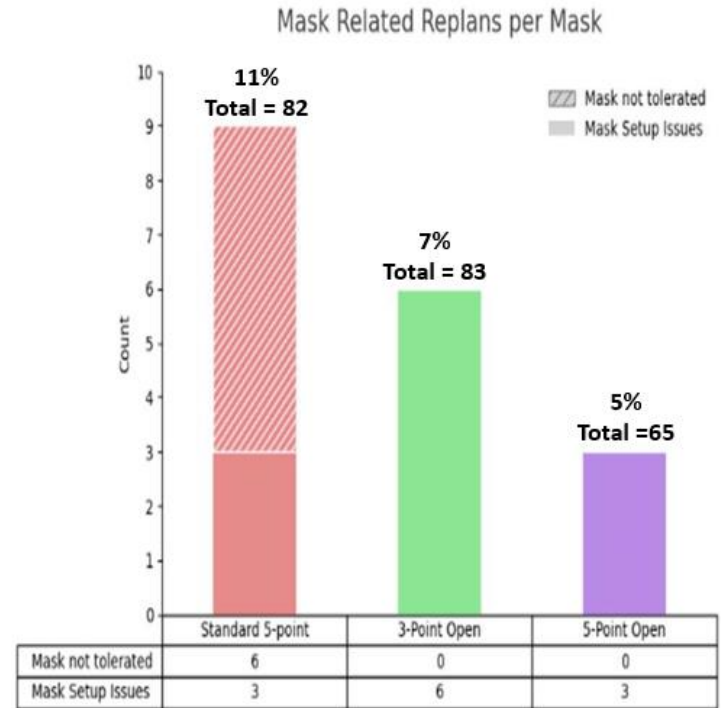
Tolerability/comfort/Overall experience:

- **Closed mask:**
 - worst ratings @ start & end, and no improvement
- **3 point open mask:**
 - Better Tolerability and Overall Experience @ both start & end RT vs. closed masks (<0.05)
- **5 point open mask:**
 - Improved from start to end RT ($p < 0.05$)
 - Better Comfort, Tolerability and Overall Experience @ end RT vs closed masks (<0.05)



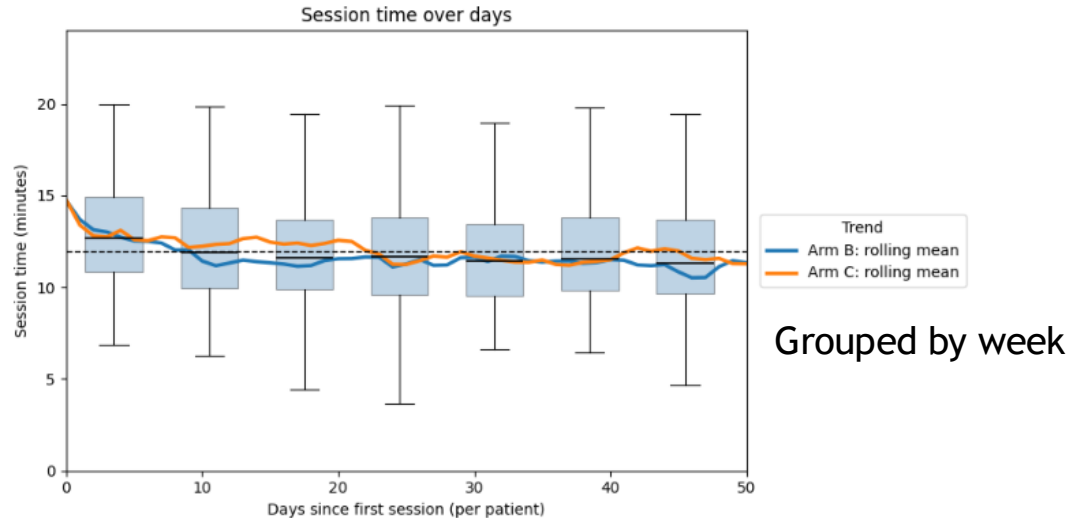
Resource Utilisation: CBCT + Replan Rates

- Average no. of CBCTs per patient per arm: 1.1 +/- 0.1 CBCTs
- No differences demonstrating that re-setup rate due to mask type was comparable
- No. of mask related replans highest in closed mask and lowest in 5 point open mask: 11% in closed mask vs 5% 5 point open
- Change in Mask required due to mask intolerance:
 - 6/82 (7%) closed masks changed to open masks
 - No open masks not tolerated.
- Note this is a non claustrophobic population !



Resource Utilisation: Treatment duration impact

Was there a learning curve over treatment course:



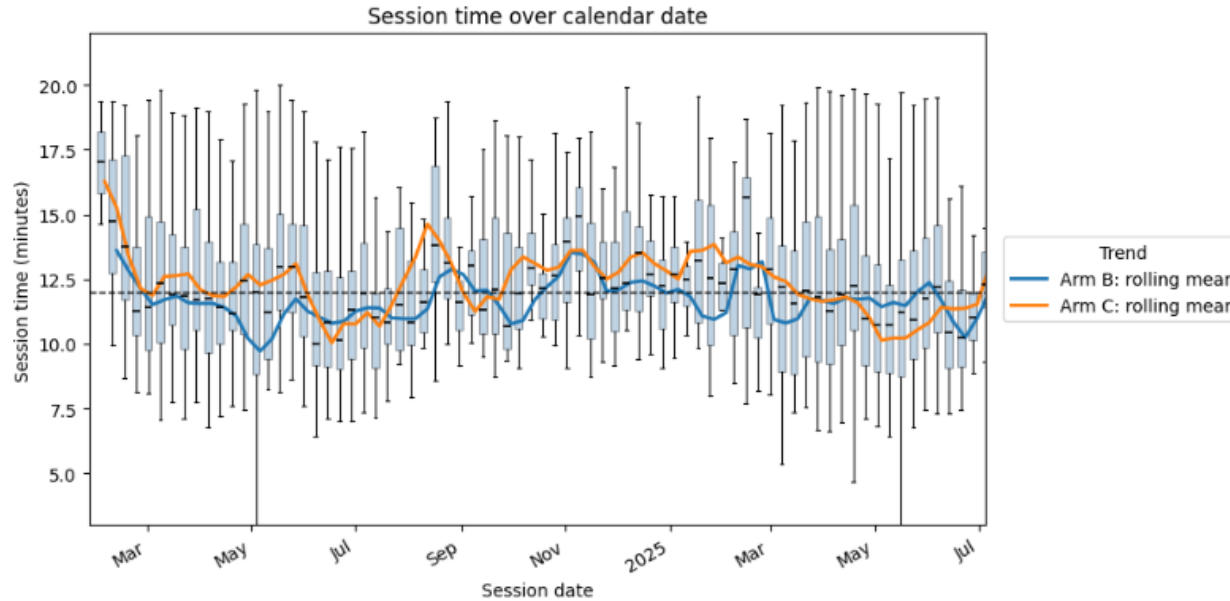
SGRT timings for treatment duration for each patient, day 1 - final day, grouped by week

First few fractions took longer, personalisation of ROIs, but settled quickly, dotted line mean 12.5 mins

No obvious difference between 3 point and 5 point masks

Resource Utilisation: Treatment duration

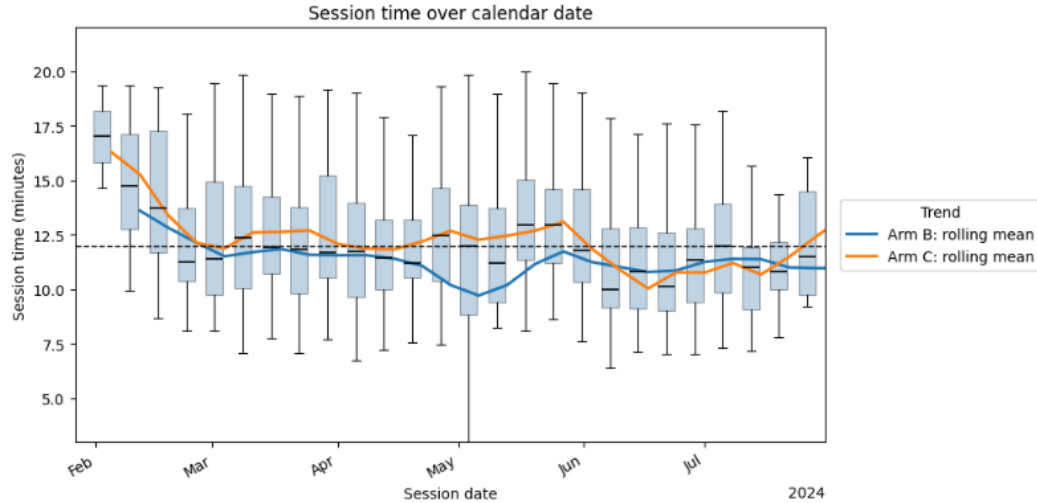
Was there a change in treatment time: - over the course of the OPEN trial?



- Graph shows mean treatment time for all open mask pts, using SGRT timings from start to end of trial

Resource Utilisation: Treatment duration

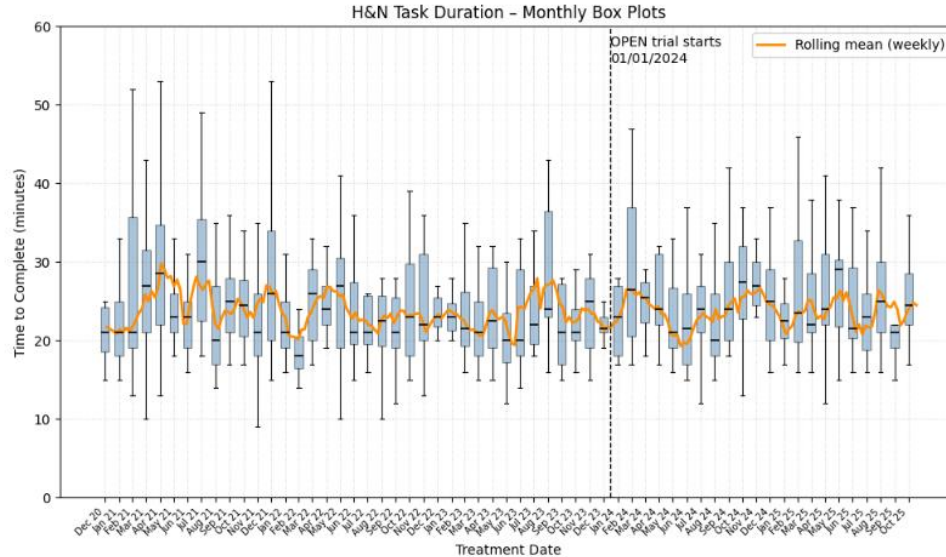
Was there a change in treatment time: - first 7 months of the OPEN trial?



- Quick Drop In first month; had SGRT in Dept but had never used in H&N Cohort
- Staff training facilitated by pilot, QART approved protocols, RTT fellow delivered training on linac
- Collaboration with SGRT Community

Resource Utilisation: Treatment duration

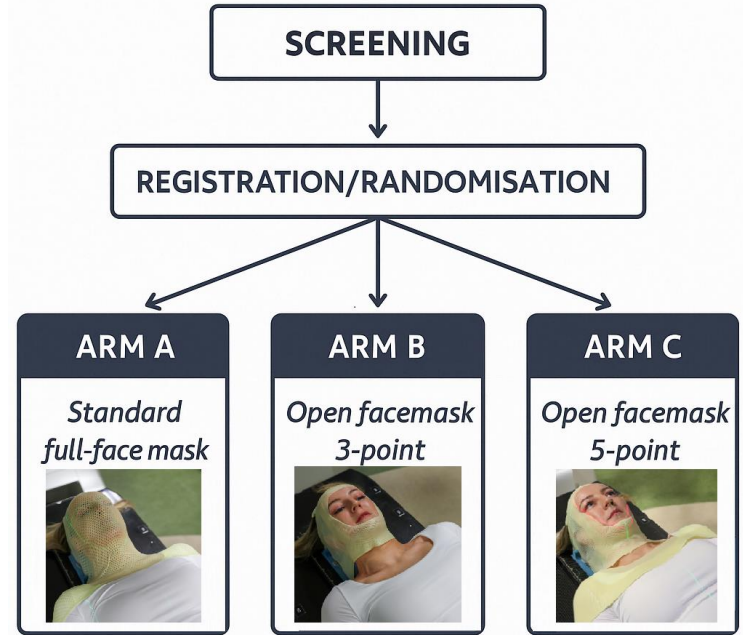
Was there a change in time for ARIA task duration – from 2020 pre open to 2025 post open



- No step change in Aria task duration from 3 years before SGRT/ Open mask implemented in Jan 2024
- No Impact on time slots

Conclusion:

- First reported results of a RCT of fully open 3-point + 5 Point mask
- OPEN masks superior:
 - Improved patient experience
 - Equivalent setup accuracy
 - Reduced replanning rates
 - No signif impact on linac capacity
- New Standard of Care in H&N Cancer
- Potential benefit paediatric + neuro-oncology patients



Changing the Face of Head + Neck Radiotherapy

“mask was so tight, couldn't breath through mouth,..breath using nose instead. took a while to get used ...was panicking first 2 days but got used to it on day 3”

“hard to tolerate....some times it is unbreathable”



Changing the Face of Head + Neck Radiotherapy

“I got the one with the open face....It’s brilliant.It’s very easy. I was amazed at how easy it was”



ARM B: 3 point OPEN mask

OPEN Trial LBA @ESTRO 2025: Best of ESTRO

ESTRO 2025 17:22 **OPEN: Optimising Patient Experience in head and Neck radiotherapy, A phase 3...** Plenary Hall

Thank you



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Institute of Cancer Research

St Lukes Cancer Research Fund
Charity Ref CHY 5854

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IRROG
Targeting Cancer Together

IRROG

orfit

WELCOME

cancer trials Ireland



Sinead Brennan
Ireland

Question

#ESTRO25

Bright Spark
National Clinical Innovation Awards

Best MDT Award

Award Finalist



IHCA

IRISH HEALTHCARE CENTRE AWARDS 2026

FINALIST

CLINICAL TEAM OF THE YEAR
- PUBLIC

Overcoming Barriers to Healthcare Change

Reluctance to Adopt Change



Open masks significantly improve patient experience.



Proven benefit to patient experience

Lack of Time



Open masks + SGRT do not slow treatment delivery



No increase in treatment time with SGRT

Financial Constraints



Open face masks cheaper balancing SGRT investment



Open face masks cheaper balancing SGRT investment

Lack of Experience



Evidence, publications and shared learning reduce the learning curve.



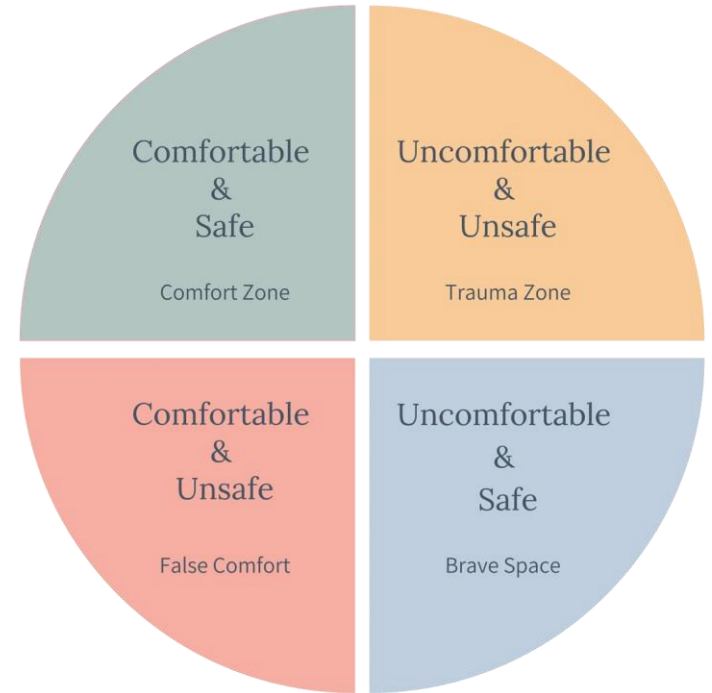
Shared learning + published protocols



Supports adoption of open face masks with SGRT

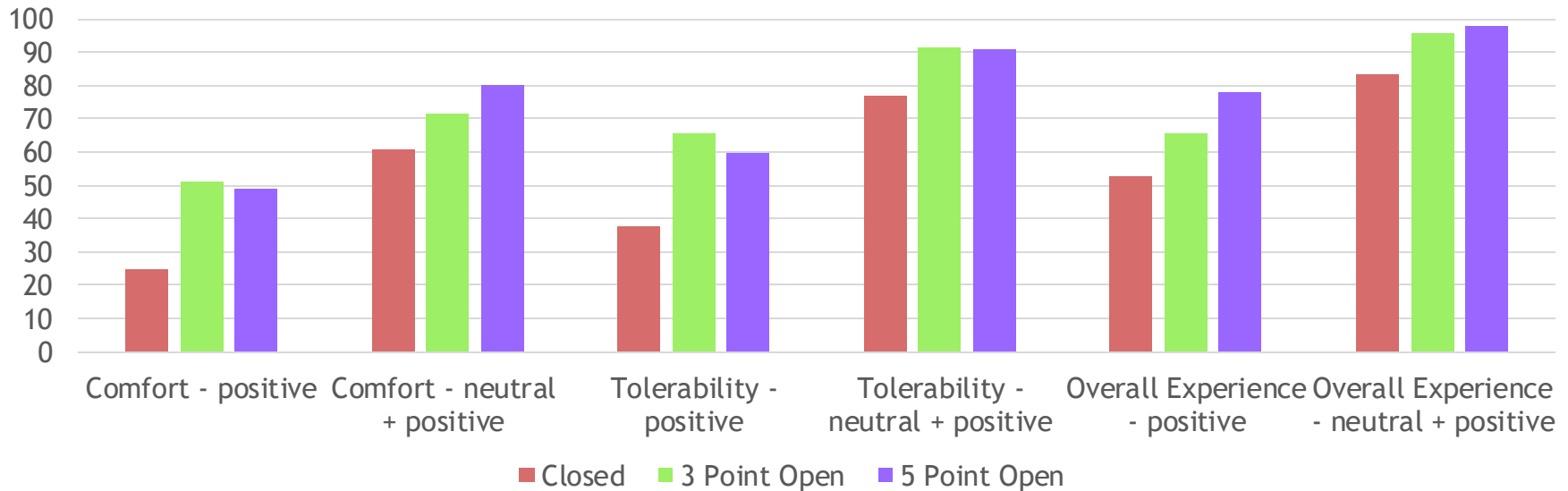
What's next in this space?

- Moved from Brave Space to Comfort Zone
- Current rates of comfort excellent
- ? Fully Maskless RT
- ? Explore other benefits of SGRT .. accuracy



Results Questionnaires: Mask Comfort, Tolerability and Overall Experience

Absolute Ratings %

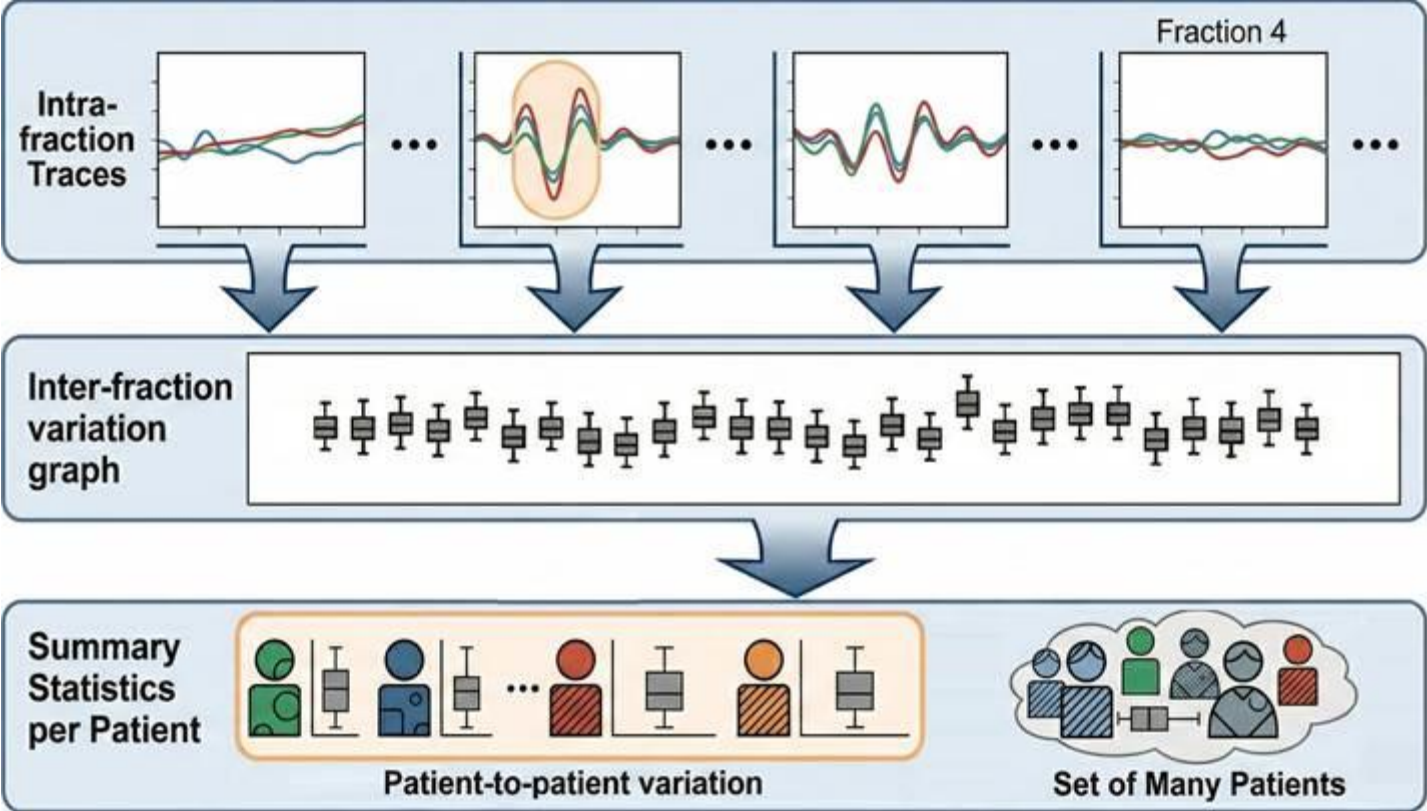


PPI: “Not prepared to trade safety for comfort”

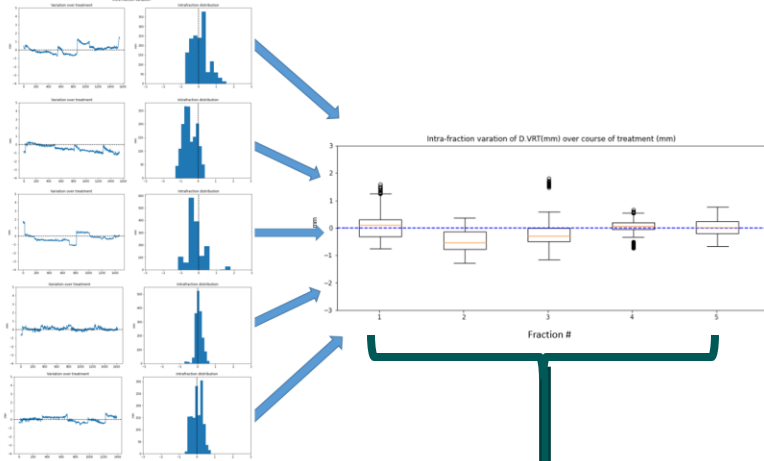


SGRT Data:

Intra-fraction variation per patient # + per patient over treatment course

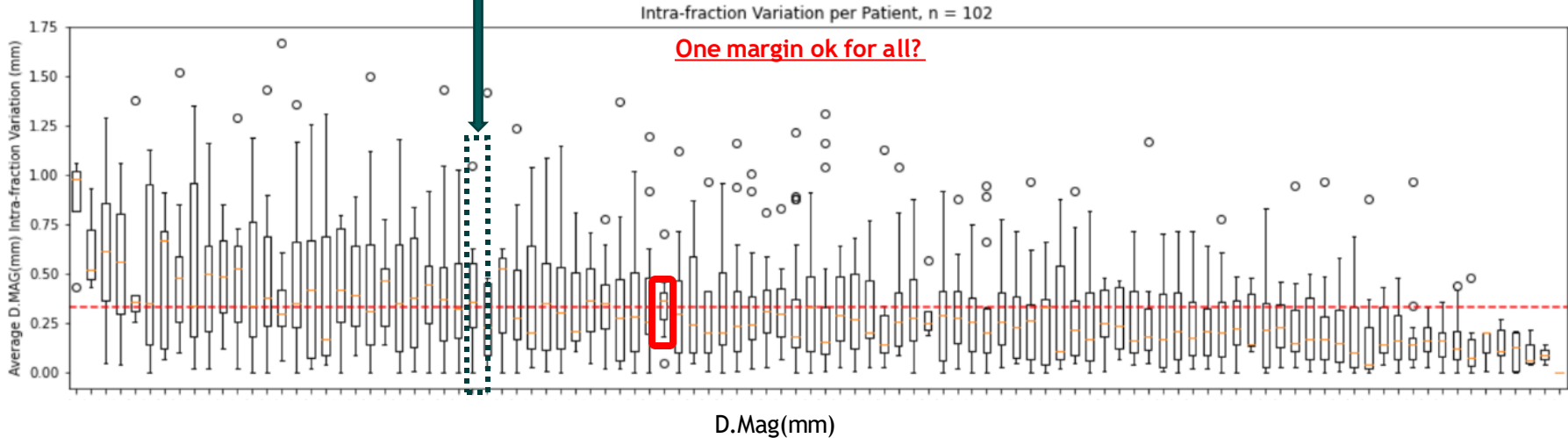


Intra-fraction variation quantification



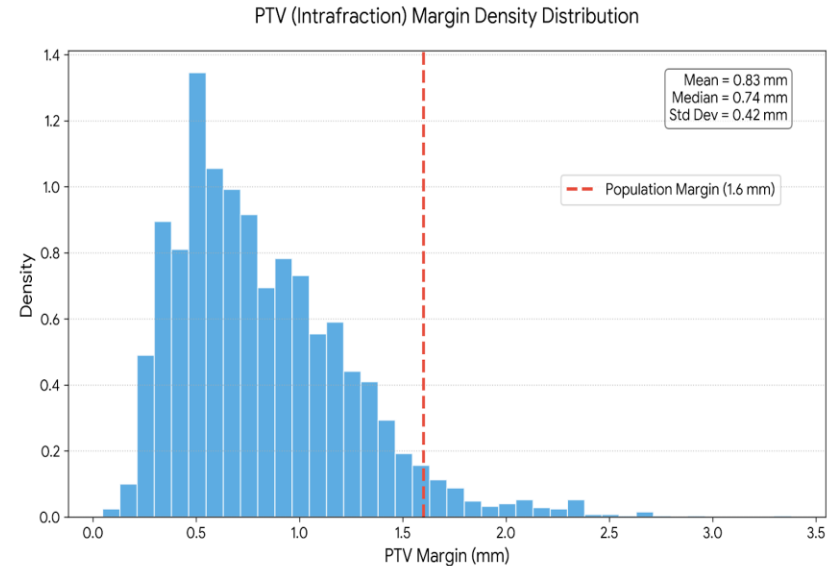
SGRT data allows for robust quantification of motion:

- Fraction aware features
- Patient aware features
- Population aware features
- Overall motion description during beam-on



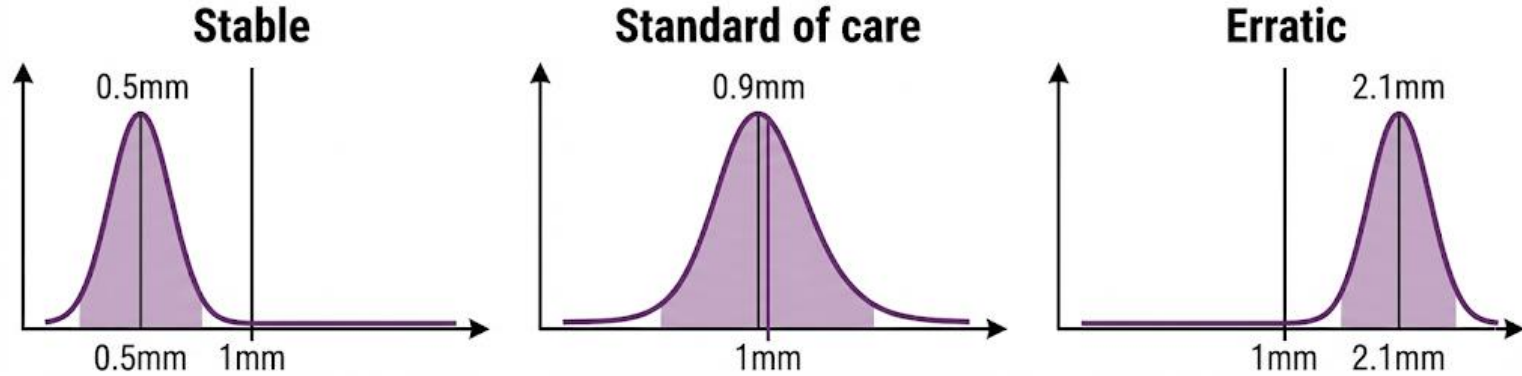
PTV Margins

- Margins added to account for uncertainty
- DOI CBCT manages Interfraction Motion
- Main contributor: Intrafraction Motion
- Currently use population based margins - van Herk

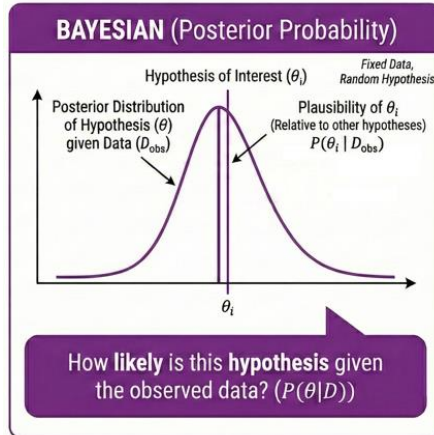


- Graph: range of individual intra-fraction PTV margins vs OPEN population margin 1.6mm (red line).
- Population-based margins prioritize the cohort average at expense of patients at extremes of the distribution
- Patients at ends of the distribution could benefit from SGRT supported individualised margins

Bayesian Neural Network to predict personalised intrafractional PTV margins



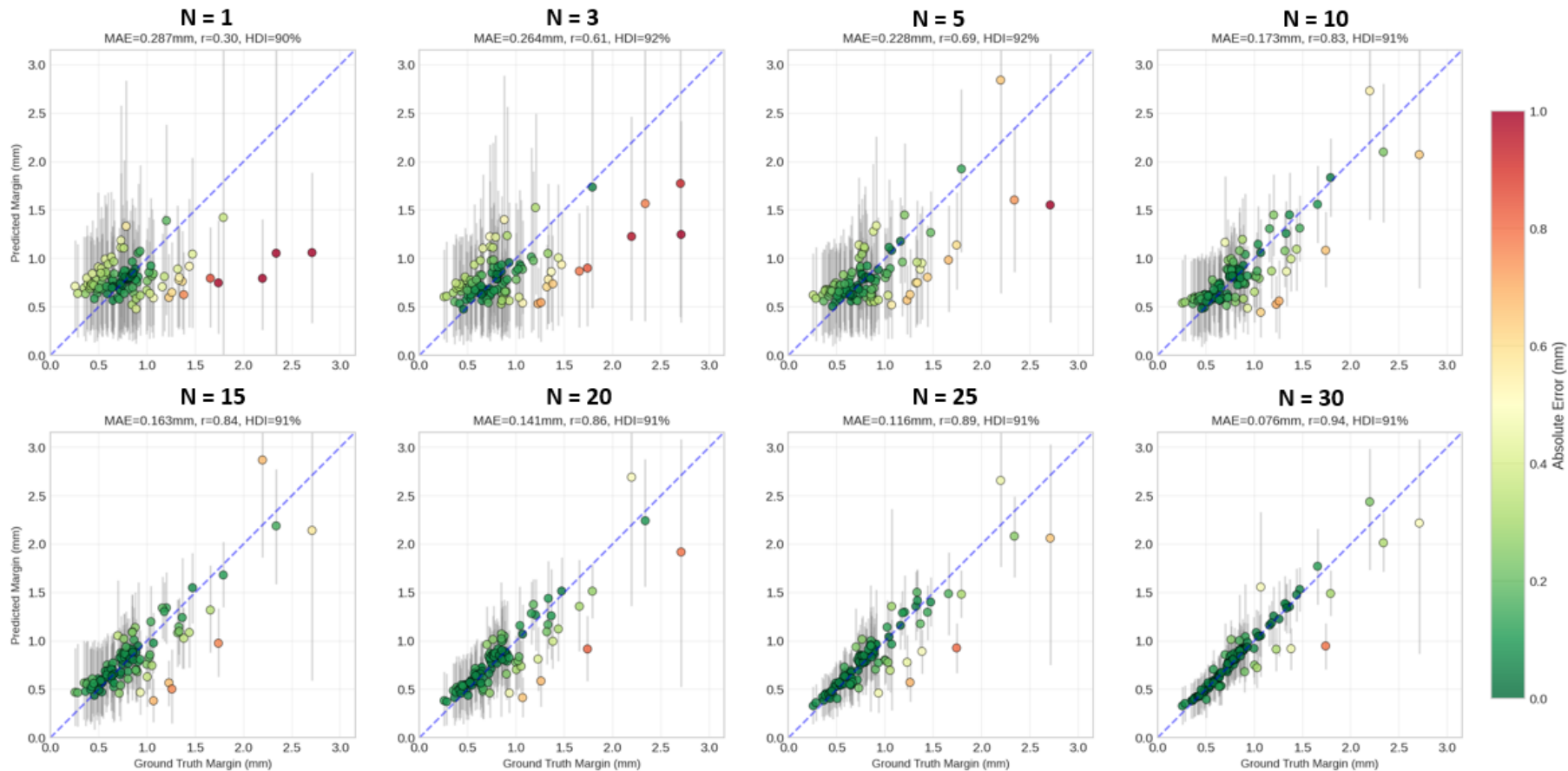
Shaded region = High density interval (HDI) of likely values



Clinical Category	HDI Criterion	N (%)	Accuracy	Clinical Action
Margin Reduction Possible	HDI_High < 1.0 mm	25 (24%)	84% correct	Reduced margin appropriate
Standard Margin	HDI spans 1.0 mm	74 (70%)	—	Use population margin
Margin Increase Required	HDI_Low > 1.0 mm	6 (6%)	100% correct	Increased margin needed

Total Actionable: 31 patients (30%) could receive personalised margins with high confidence.

Comparing Ground Truth Margins with Predicted Margins?



Dosimetric Impact of reducing PTV margins from 3mm to 2mm in stable patient subset

OAR Dose Reduction	Lower H&N Cases	Upper H&N Cases
$\geq 1.5\text{Gy}$	69%	60%
$\geq 2.0\text{Gy}$	62%	42%

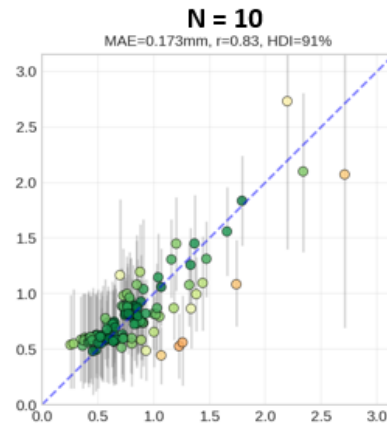
Replanned stable pts with 2 mm margin

Found 62% of patients could benefit from $\geq 2\text{Gy}$ reduction in OAR dose

Upper H+N: skull base cases

Validation Study

- Currently validating our model on 100 patients to confirm the model's ability to accurately predict PTV margins
- #1-5: Identify stable patients - Predict PTV margin groups
- #1-10: Confirm the patient group allocation
- #1-30/35: How many of the patients were correctly stratified using the first 10#.
- If this work is validated we intend to take this forward into a prospective trial of personalised pvt margins



The "OPEN" Trial: The Path Forward

Enhanced Comfort?

Reduced Margins?

✓ More Open Mask Design

🏠 Increased Patient Comfort

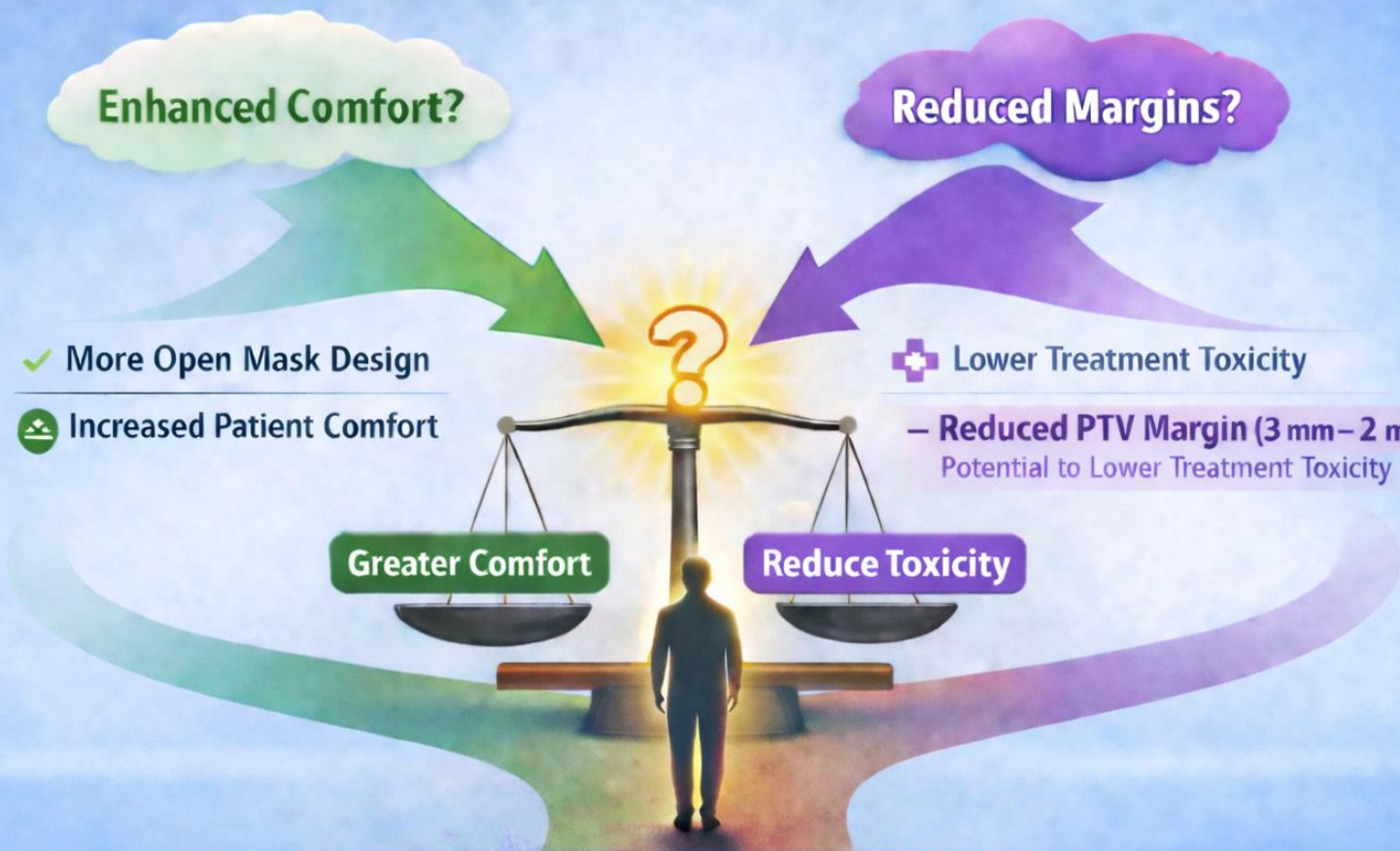
✚ Lower Treatment Toxicity

– Reduced PTV Margin (3 mm – 2 mm)
Potential to Lower Treatment Toxicity

Greater Comfort

Reduce Toxicity

making a shared decision



Thank you



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