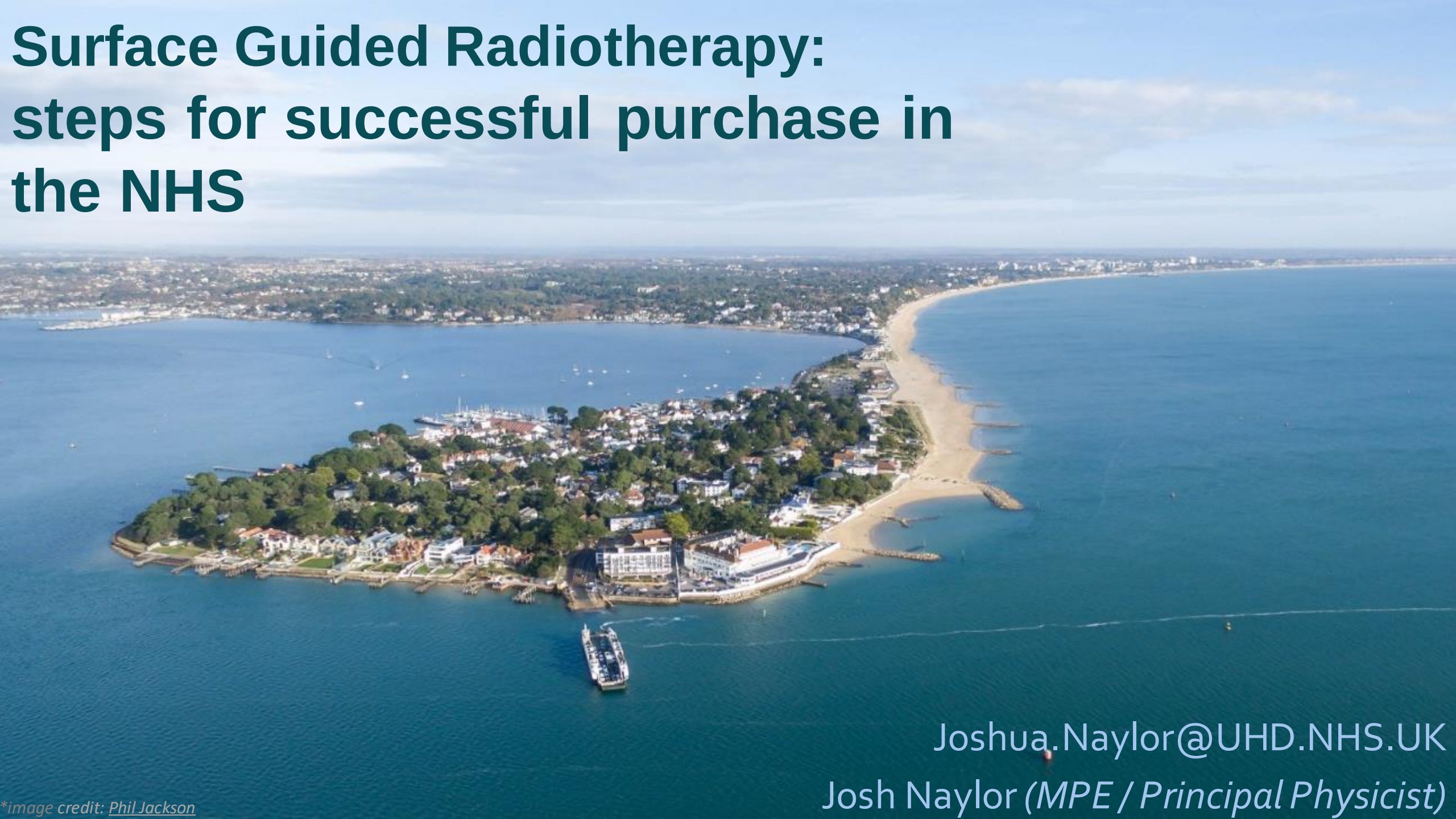
Surface Guided Radiotherapy: steps for successful purchase in the NHS



Joshua.Naylor@UHD.NHS.UK

Josh Naylor *(MPE / Principal Physicist)*

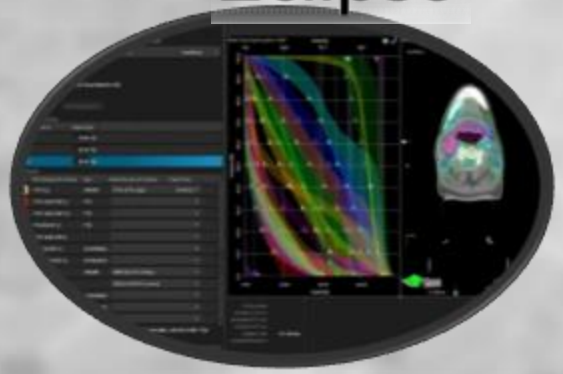
*image credit: Phil Jackson

NHS
University Hospitals Dorset
NHS Foundation Trust

Main Poole site

Dorchester Satellite

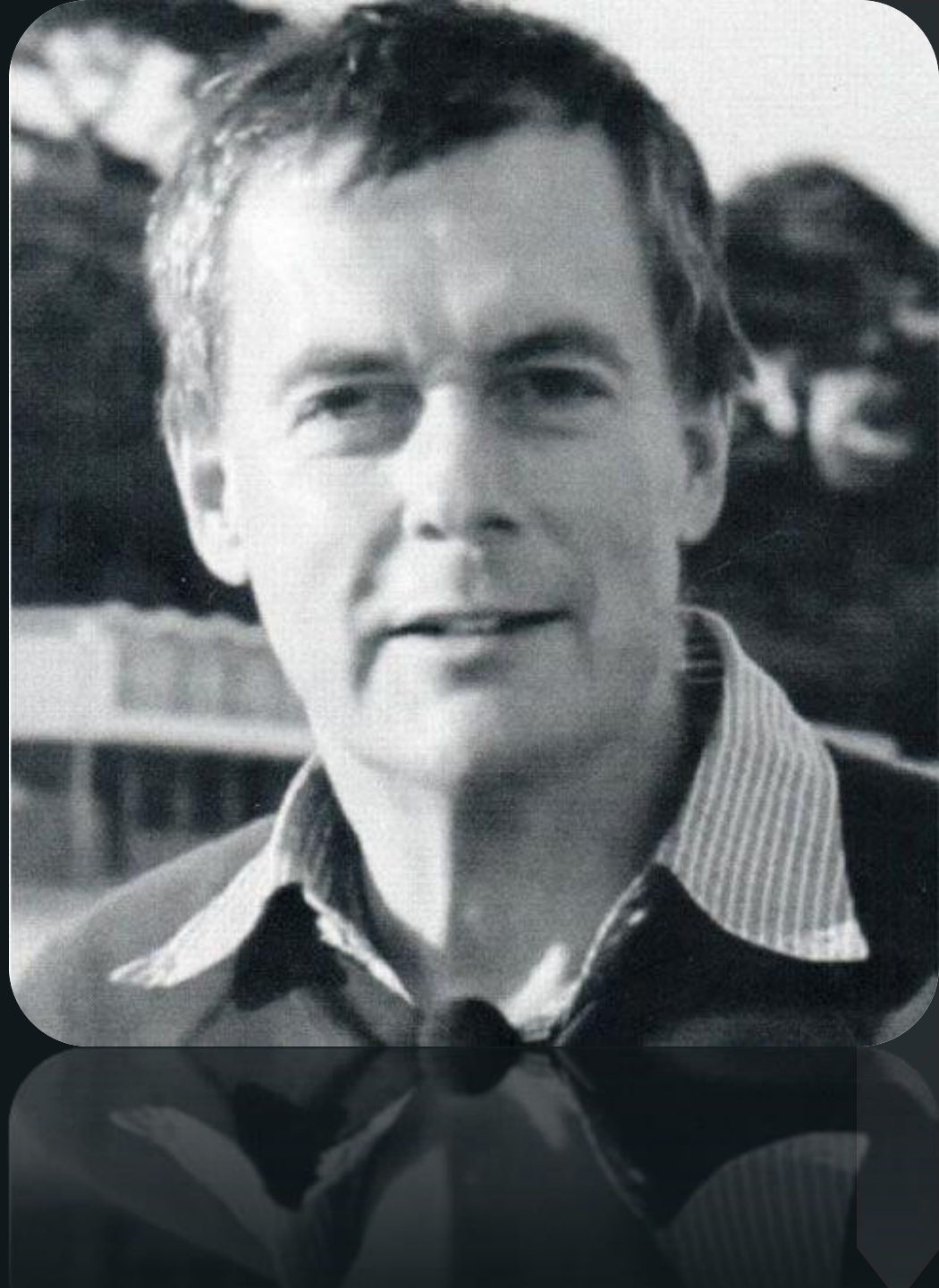
Eclipse



varian


VARIAN
Elekta
Harmony
Chambers, Jane

Robert White



BONHAMS ROBERT WHITE COLLECTION REALISES £3 MILLION TO BENEFIT SOUTH COAST CANCER CARE

ROBERT WHITE
Legacy Fund
FIGHTING CANCER

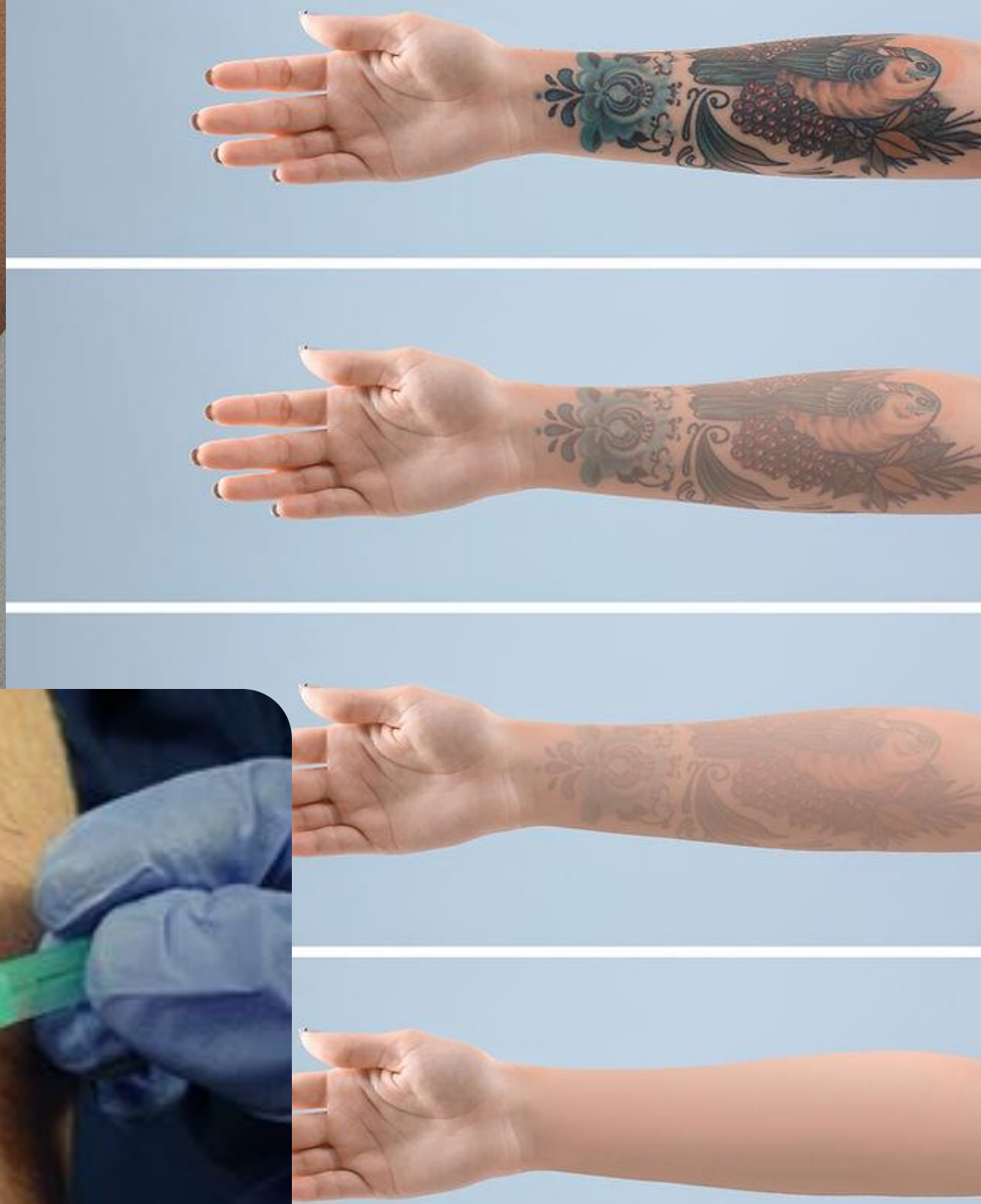
Christmas 2020

Business case

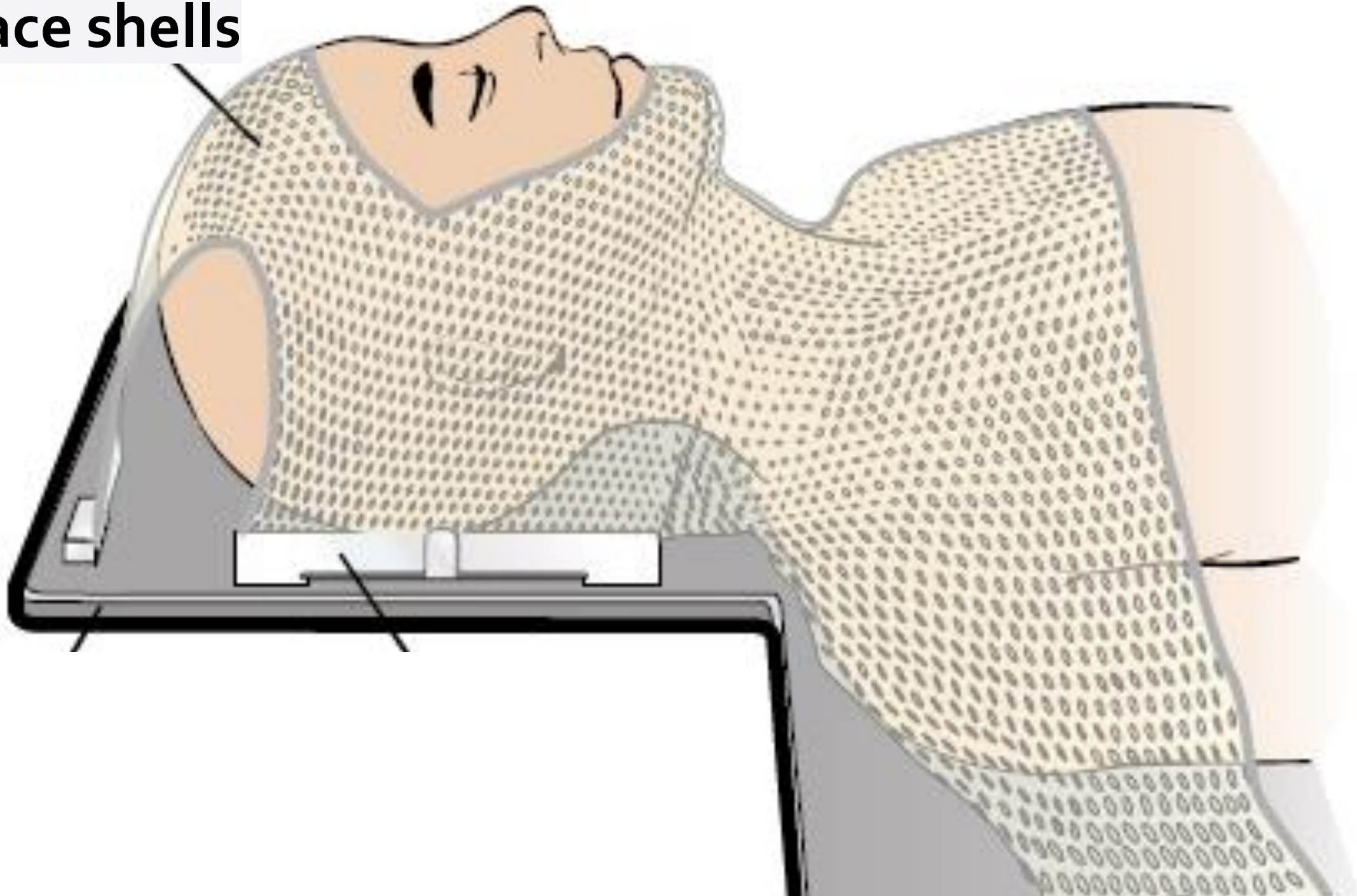
Patient benefit:

- Safety- ↑ accuracy, ↓errors
- SABR (/hypofractionation)
- Confidence (monitoring)
- Quality
- Psychological factors…

Tattooless



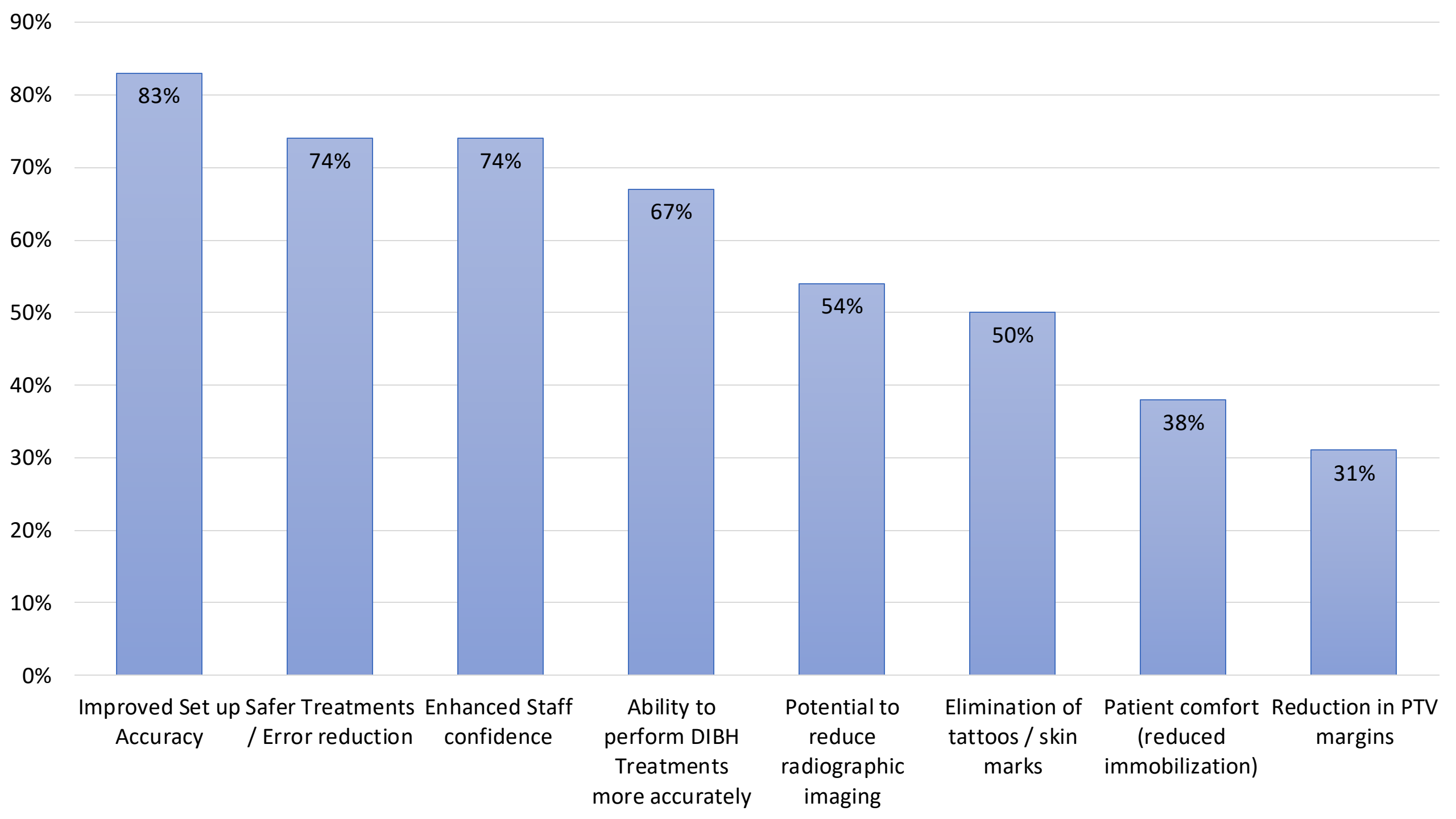
Open face shells



Business case

Staff/centre benefit:

- Error reduction
- Recruitment/retention
- Manual handling
- Fast install
- Reputation
- Technique development
- Efficiency (throughput)…


90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
83%
74%
74%
67%
54%
50%
38%
31%
Improved Set up Accuracy
Safer Treatments / Error reduction
Enhanced Staff confidence
Ability to perform DIBH Treatments more accurately
Potential to reduce radiographic imaging
Elimination of tattoos / skin marks
Patient comfort (reduced immobilization)
Reduction in PTV margins

HOME ABOUT US WHAT IS THE OJEU? WHY USE US? USEFUL LINKS CONTACT US

Welcome to OJEU.eu

OJEU stands for the Official Journal of the European Union (previously called OJEC - the Official Journal of the European Community). This is the publication in which all tenders from the public sector which are valued above a certain financial threshold according to EU legislation, must be published.


NHS
NHS Supply Chain
9
NHS
Delivering value to the NHS
NHS Supply Chain
DAF
F J16 W JC

SGRT options

C-RAD

IDENTIFY varian

visionrt

BRAINLAB

DOI: 10.1002/mp.15532

AAPM SCIENTIFIC REPORT

AAPM task group report 302: Surface-guided radiotherapy

Hania A. Al-Hallaq[1] | Laura Cerviño[2] | Alonso N. Gutierrez[3] | Amanda Havnen-Smith[4] | Susan A. Higgins[5] | Malin Kügele[6,7] | Laura Padilla[8] | Todd Pawlicki[8] | Nicholas Remmes[9] | Koren Smith[10] | Xiaoli Tang[11] | Wolfgang A. Tomé[12]

TABLE 2 Performance overview of commercially available SGRT monitoring systems as of October 2019

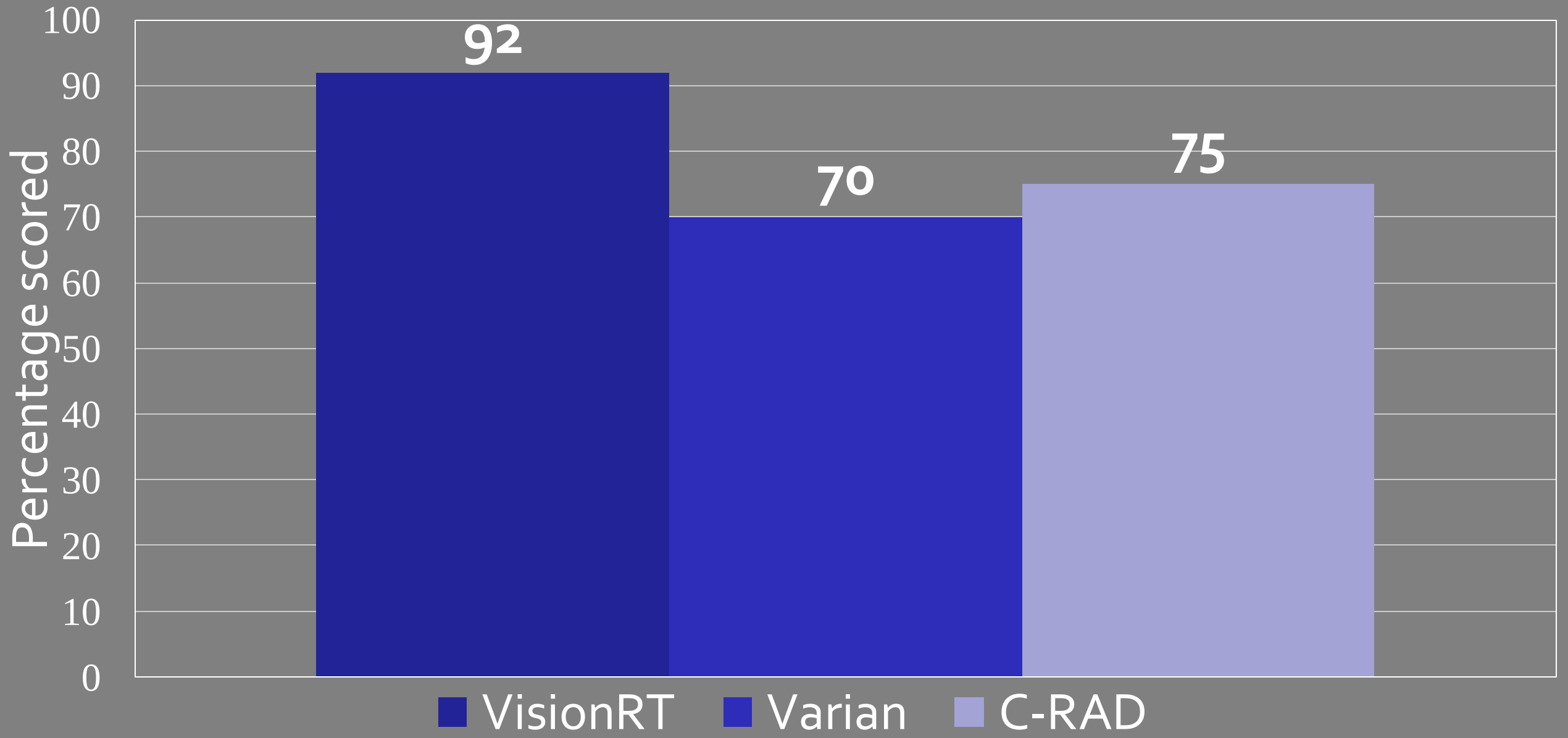
System (Vendor)	Optical technology	Camera size (W × H × D); Weight	Field-of-view* (Lat × Long × Vert)	Camera resolution	Frame rate	Positioning accuracy#	Registration algorithm
AlignRT (Vision RT)	Stereovision using a speckle pattern	430 × 66 × 186 mm; 4.5 kg	650 × 1000 × 350 mm^3	2048 × 2048 px (4MP)	4-24 fps	<1.0 mm <1.0°	Rigid
Catalyst (C-RAD)	Structured light imaging	620 × 390 × 280 mm; 16 kg	1100 × 1400 × 2400 mm^3	640 × 480 px (0.3 MP)	8-24 fps	<1.0 mm <1.0°	Deformable[27]
IDENTIFY (Varian)	Stereovision using a speckle pattern	500 × 80 × 182 mm; 3.3 kg	500 × 500 × 400 mm^3	1280 × 1024 px (1.3 MP)	10 fps	<1.0 mm <1.0°	Rigid

*FOV is specified for three-camera systems for SGRT tracking functionality only and defined relative to couch coordinates at the nominal position (Lat = Lateral, Long = Longitudinal, Vert = Vertical).
#Assessed in-phantom.
fps, frames per second; px, pixel.

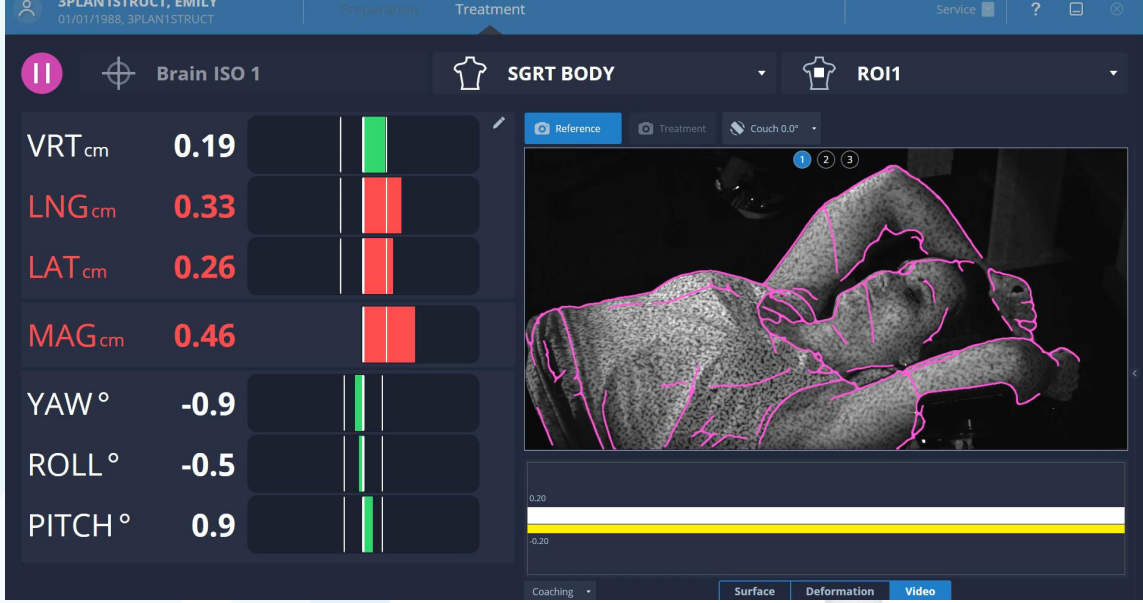
SLIDE CREDIT: TG302

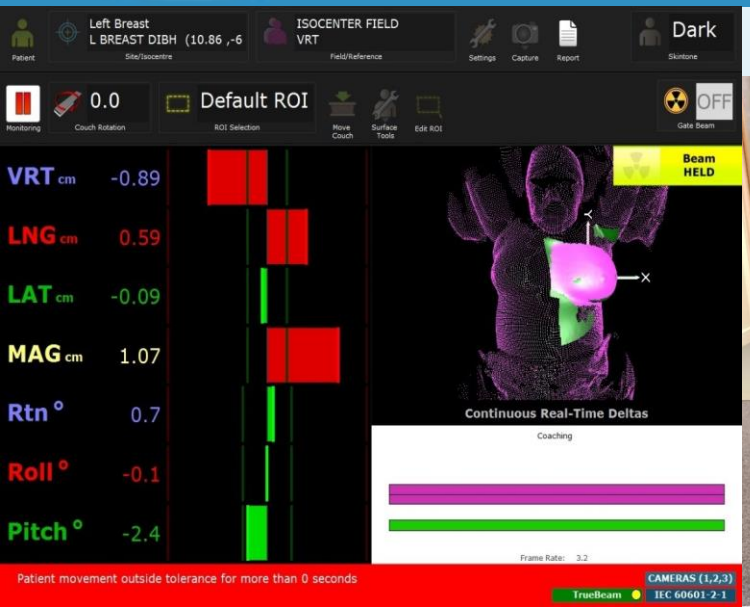

JEU
Specification criteria
• Markerless
• Installation
• Maintenance
• Tech spec
• DIBH
• Safety
• Functionality
• Accuracy
• Patient interaction
• Support
• CT scanner gating
• tient identification

Our decision (Sept 2019)



Evolution of SGRT





SGRT.ORG


RECEPTION

TABLE 3 Overview of the interface capabilities with known vendors of commercially available SGRT monitoring systems as of October 2019

System (Vendor)	CT Simulator interfaces		Photon treatment unit interfaces		Proton treatment unit interfaces	
	Capability^	Vendor	Capability	Vendor	Capability	Vendor
AlignRT (Vision RT)	Prospective & retrospective acquisition	Philips Siemens GE Cannon	Automatic patient selection, beam-hold ability, couch shift ability	Varian (TrueBeam/C-series) Elekta Siemens#	Beam hold	IBA Hitachi
Catalyst (C-RAD)	Prospective & retrospective acquisition*	Philips Siemens GE Cannon	Automatic patient selection, beam-hold ability, couch shift ability	Varian (TrueBeam/C-Series) Elekta Siemens#	Beam hold	IBA Mevion
IDENTIFY (Varian)	Prospective & retrospective acquisition through marker-based tracking**	Philips Siemens GE	Automatic patient selection and record of treatment/simulation session from/to OIS	OIS-based: Varian (ARIA) Elekta (MOSAIQ)	Works in Progress	Works in Progress

^See Section 4.5 for more details.
#Couch shift not available.
*Supported by Sentinel SGRT system (C-RAD).
**Supported by Respiratory Gating for Scanners (RGSC).
OIS, Oncology Information System.

SLIDE CREDIT: TG302

TABLE 3 Overview of the interface capabilities with known vendors of commercially available SGRT monitoring systems as of October 2019

System (Vendor)	CT Simulator interfaces		Photon treatment unit interfaces		Proton treatment unit interfaces	
	Capability[1]	Vendor	Capability	Vendor	Capability	Vendor
AlignRT (Vision RT)	Prospective & retrospective acquisition	Philips Siemens GE Cannon	Automatic patient selection, beam-hold ability, couch shift ability	Varian (TrueBeam/C-series) Elekta Siemens[a]	Beam hold	IBA Hitachi
Catalyst (C-RAD)	Prospective & retrospective acquisition[*]	Philips Siemens GE Cannon	Automatic patient selection, beam-hold ability, couch shift ability	Varian (TrueBeam/C-Series) Elekta Siemens[a]	Beam hold	IBA Mevion
IDENTIFY (Varian)	Prospective & retrospective acquisition through marker-based tracking[**]	Philips Siemens GE	Automatic patient selection and record of treatment/simulation session from/to OIS	OIS-based: Varian (ARIA) Elekta (MOSAIQ)	Works in Progress	Works in Progress

[1] See Section 4.3 for more details.
[a] Couch shift not available.
[*] Supported by Sentinel SGRT system (C-RAD).
[**] Supported by Respiratory Gating for Scanners (RGSC).
OIS, Oncology Information System.

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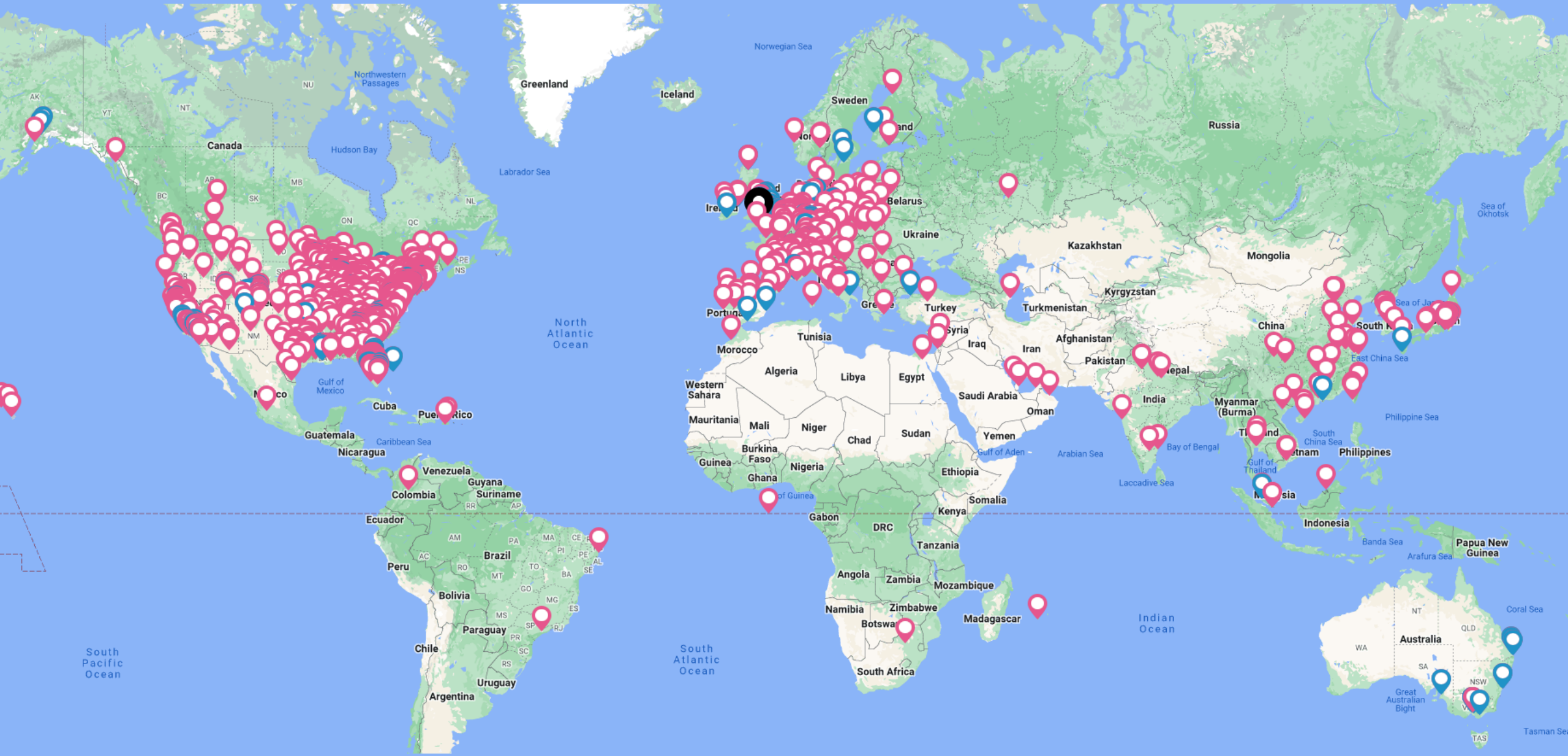

Greenland
Iceland
Norwegian Sea
Sweden
Russia
Northwestern Passages
Canada
Hudson Bay
Labrador Sea
Belarus
Ukraine
Kazakhstan
Mongolia
Kyrgyzstan
Turkmenistan
Turkey
China
Afghanistan
Pakistan
Iran
Iraq
Syria
India
Myanmar (Burma)
Philippines
Indonesia
Papua New Guinea
Australia
North Atlantic Ocean
Gulf of Mexico
Cuba
Caribbean Sea
Guatemala
Nicaragua
Venezuela
Colombia
Guyana
Suriname
Ecuador
Peru
Brazil
Bolivia
Paraguay
Chile
Uruguay
Argentina
South Pacific Ocean
South Atlantic Ocean
Morocco
Tunisia
Algeria
Libya
Egypt
Western Sahara
Mauritania
Mali
Niger
Chad
Sudan
Burkina Faso
Guinea
Nigeria
Ghana
Gabon
DRC
Ethiopia
Somalia
Kenya
Tanzania
Angola
Zambia
Mozambique
Namibia
Zimbabwe
Botswana
South Africa
Madagascar
Saudi Arabia
Yemen
Oman
Gulf of Aden
Arabian Sea
Laccadive Sea
Bay of Bengal
Indian Ocean
Sea of Okhotsk
East China Sea
South China Sea
Philippine Sea
Gulf of Thailand
Banda Sea
Arafura Sea
Coral Sea
Great Australian Bight
Tasman Sea

INSTALL BASE (UK & IRE)

- Christie NHS
- Queen Elizabeth, Birmingham NHS
- Guy's and St. Thomas NHS
- Raigmore, Inverness NHS
- Poole NHS
- Royal Derby NHS
- Royal Berkshire NHS
- Lincoln NHS
- Southampton NHS
- Coventry NHS
- Nottingham NHS
- Imperial College NHS
- UCLH (Proton) NHS
- Preston NHS
- Taunton NHS
- Addenbrookes NHS
- Truro NHS

- St. Luke's Hospital, Dublin HSE
- Beaumont Hospital, Dublin HSE
- St. James Hospital, Dublin HSE
- Cork University Hospital HSE
- Galway University Hospital HSE
- UPMC Cork
- Beacon Hospital, Dublin
- St. Vincent's, Dublin
- Galway Clinic
- Mater Private, Limerick
- HCA Guys
- HCA Harley Street
- Parkside
- HCA UCH
- 16 x Installations across GenesisCare UK Network

- Sheffield Hallam University

visionrt | Safety. Ingenuity. Community.

45% Elekta 55% varian

Publications

Accuracy | Breast (general) | DIBH - Left Breast | GateCT | InBore | **Patient Safety** | Pediatric | Pelvis | Proton

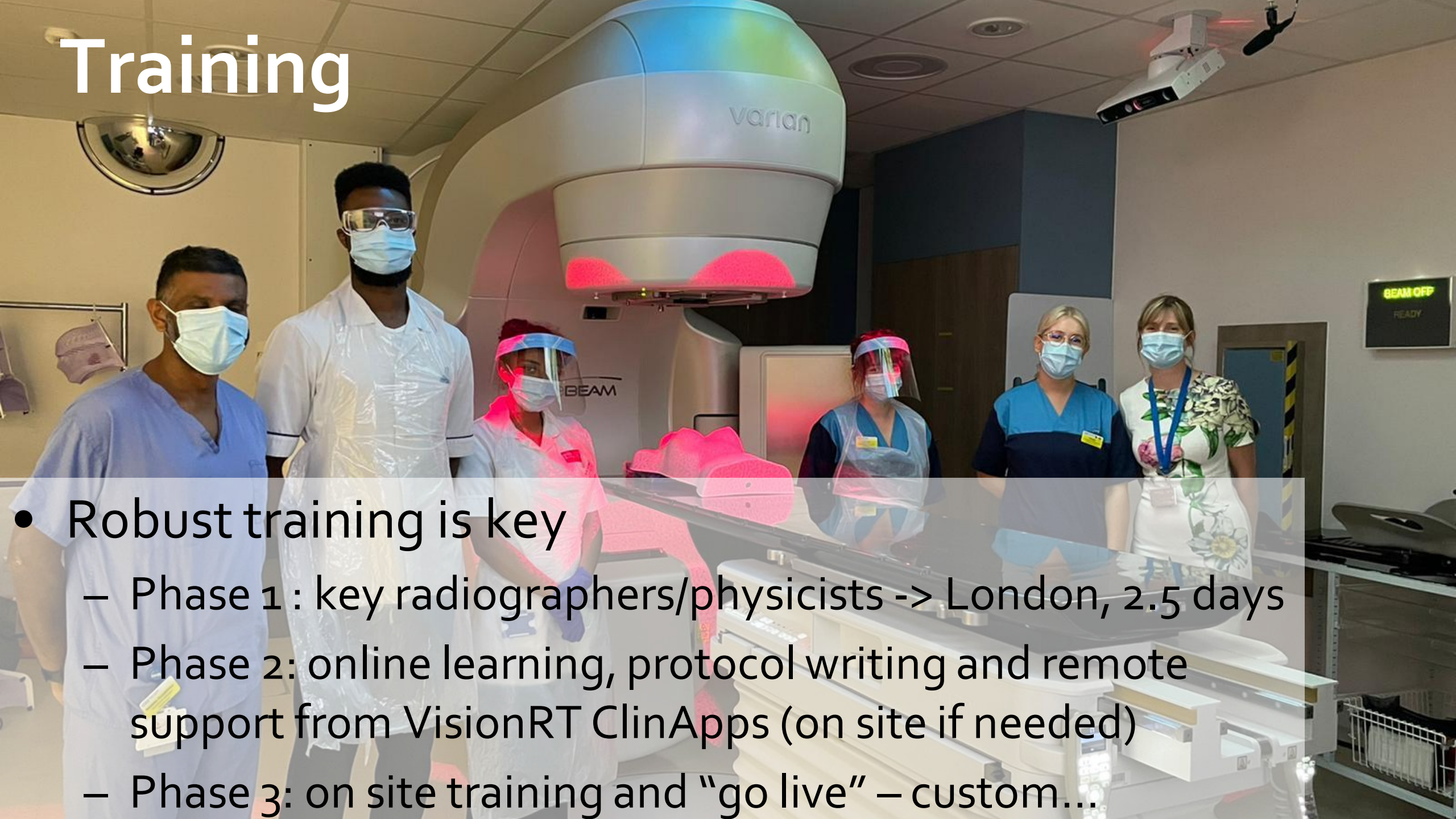
Sarcoma | SBRT / SABR | SRS | Other

- Al-Hallaq, Hania; Batista, Vania; Kügele, Malin; Ford, Eric; Viscariello, Natalie; Meyer, Juergen: The Role of Surface-Guided Radiation Therapy for Improving Patient Safety. In Radiotherapy and Oncology. DOI: 10.1016/j.radonc.2021.08.008.
  ABSTRACT AVAILABLE

- Nicola Blake, et al. (2021). "Surface-guided radiotherapy for lung cancer can reduce the number of close patient contacts without compromising initial setup accuracy."
  ABSTRACT AVAILABLE

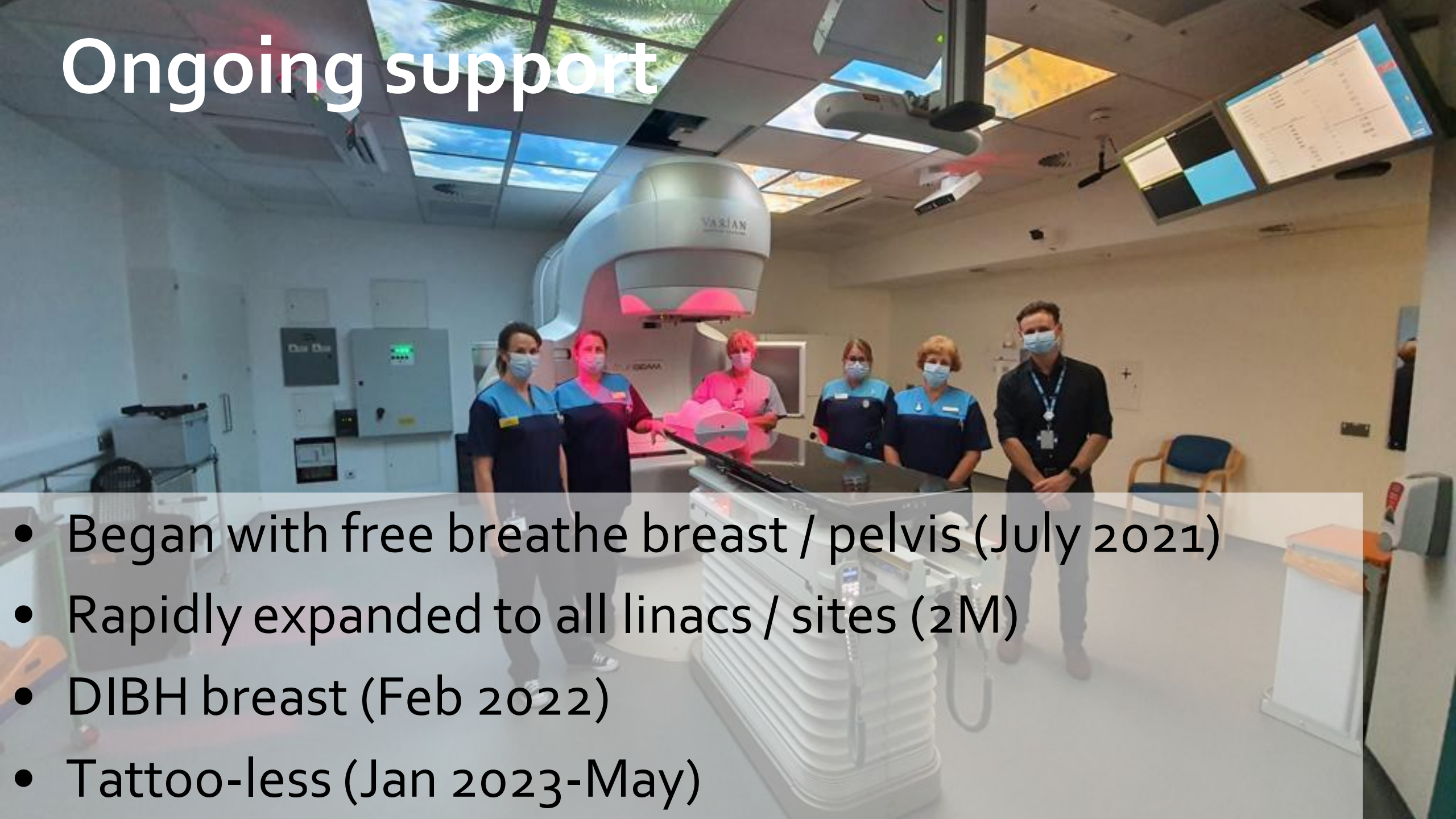
- Wiant, D. B., et al. (2016). "A novel method for radiotherapy patient identification using surface imaging."

Training

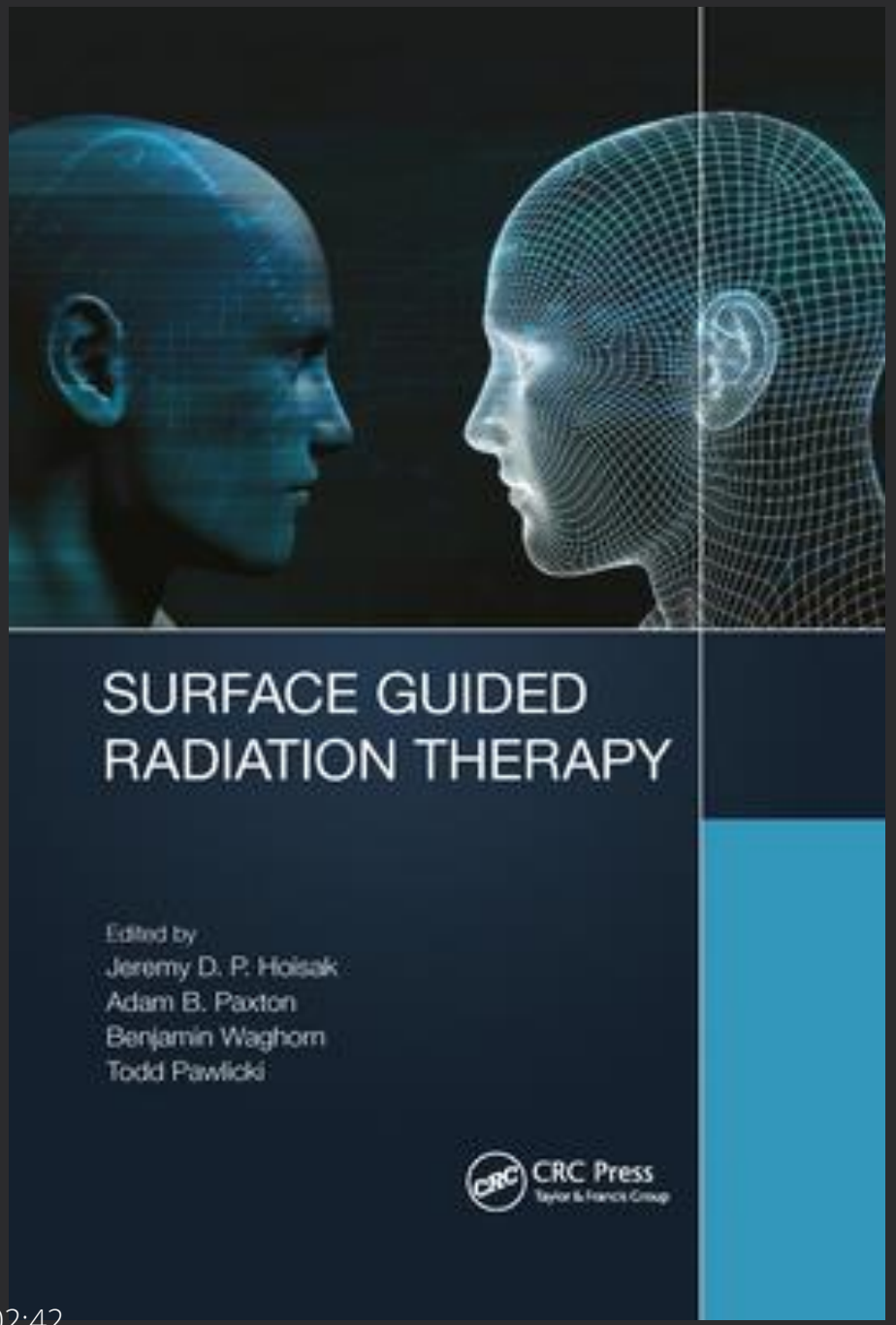


- Robust training is key
  - Phase 1 : key radiographers/physicists -> London, 2.5 days
  - Phase 2: online learning, protocol writing and remote support from VisionRT ClinApps (on site if needed)
  - Phase 3: on site training and "go live" – custom…

Ongoing support



- Began with free breathe breast / pelvis (July 2021)
- Rapidly expanded to all linacs / sites (2M)
- DIBH breast (Feb 2022)
- Tattoo-less (Jan 2023-May)



SURFACE GUIDED RADIA

SGRT

COMMUNITY


SGRT
COMMUNITY
01 Coach
02 Center
03 Capture
04 Prepare
DIBH CBCT with Couch Centering

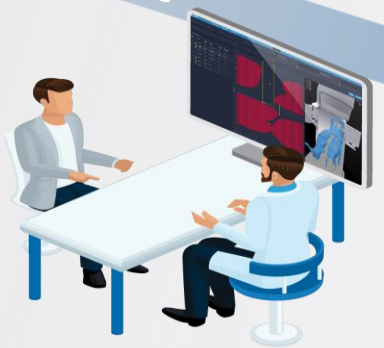
*slide credit: Ben Waghorn, VisionRT

SIMULATION

4D AND BH CT

simrt™

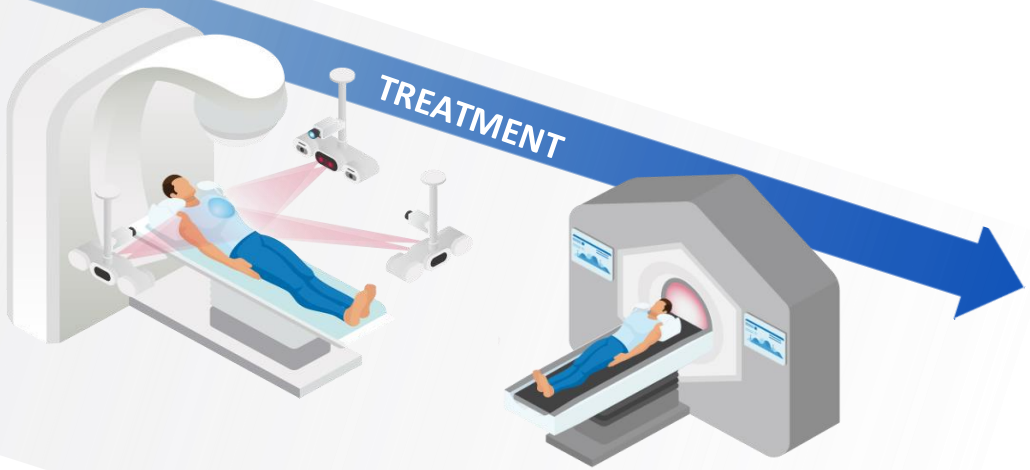
PLANNING



CLEARANCE MAPPING

maprt®

TREATMENT



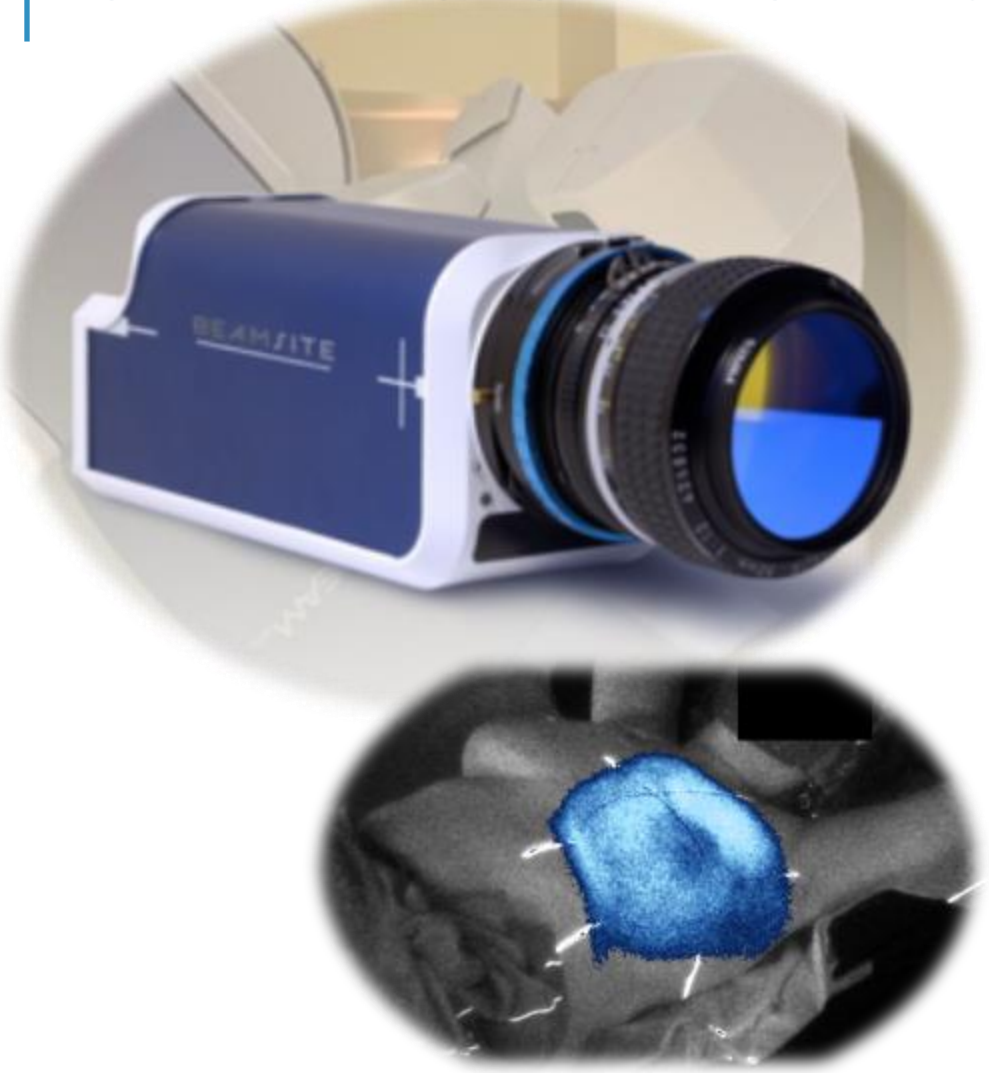
MOTION MANAGEMENT

alignrt® InBore™ alignrt® dosert™ Powered by BeamSite®

*Not currently available for sale

visionrt

CAMERA SYSTEM CAPTURES CHERENKOV LIGHT

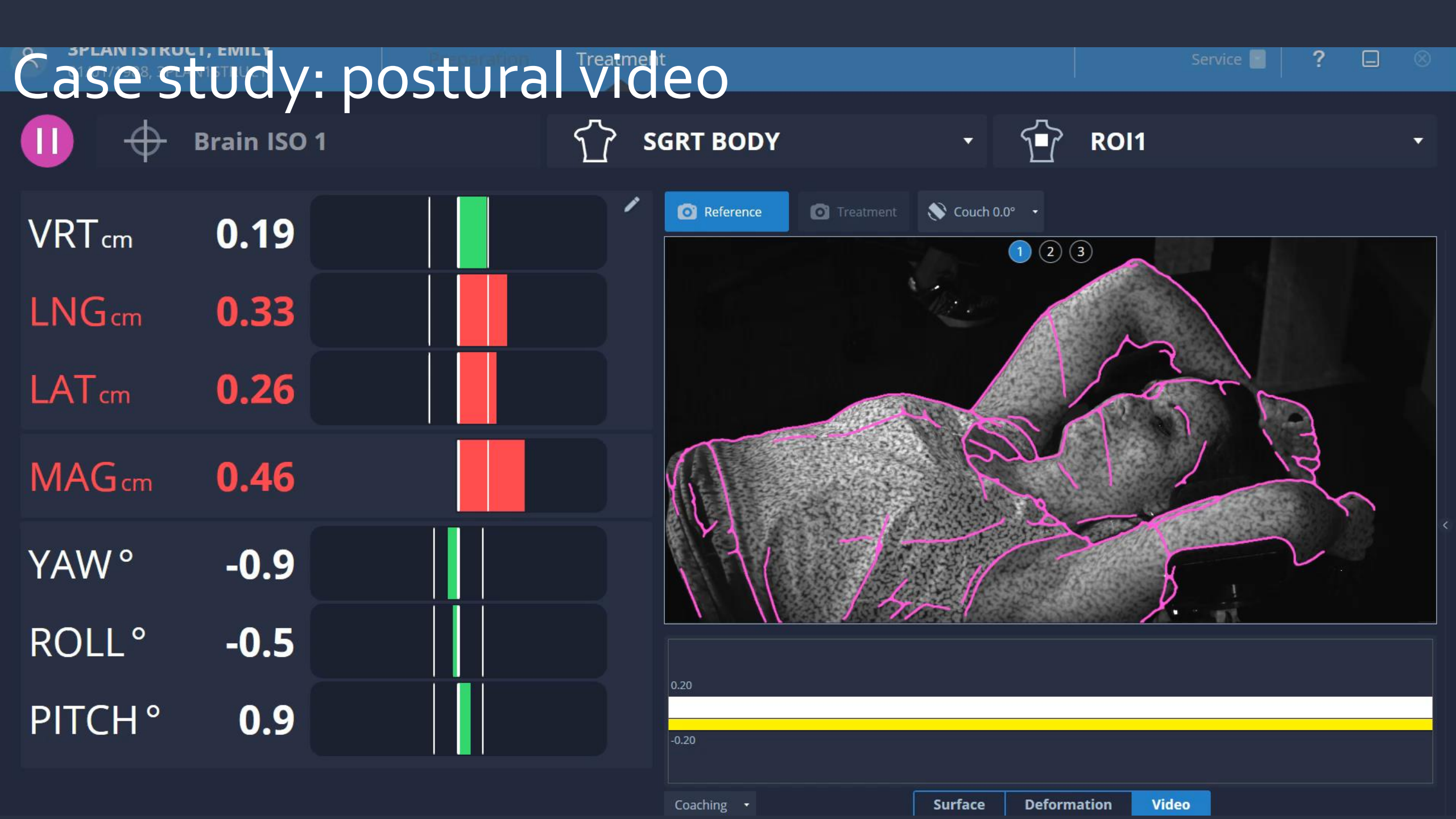


dosert™
Powered by BeamSite™

- ✓ High sensitivity cameras capture Cherenkov light and feed images into AlignRT
- ✓ Real time monitoring
- ✓ Saved for later analysis

visionrt

Case study: postural video



Conclusions

- SGRT = vital
- Careful procurement
- Use supply chain
- Training/support is crucial
- New tech, so a known quantity (tried and tested) is wise
- Benefit in having other users to draw learning from
- New field still so R&D investment important

Any questions?

*image credit: Phil Jackson

Joshua.Naylor@UHD.NHS.UK