

Orchestrating Radiation Oncology Workflows IntelliSpace Radiation Oncology

Dr Russell Banner

Clinical Oncologist and Radiotherapy Lead
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1 million population

4 Elekta Linacs

1 Philips Big Bore CTSim

2000 patients a year

10 WTE Clinical Oncologists

32 Radiographers

25 Physics / Dosimetrists

~8 Hospital Clinic locations

Mosaiq

Citrix

Mirada

Prosoma

Pinnacle

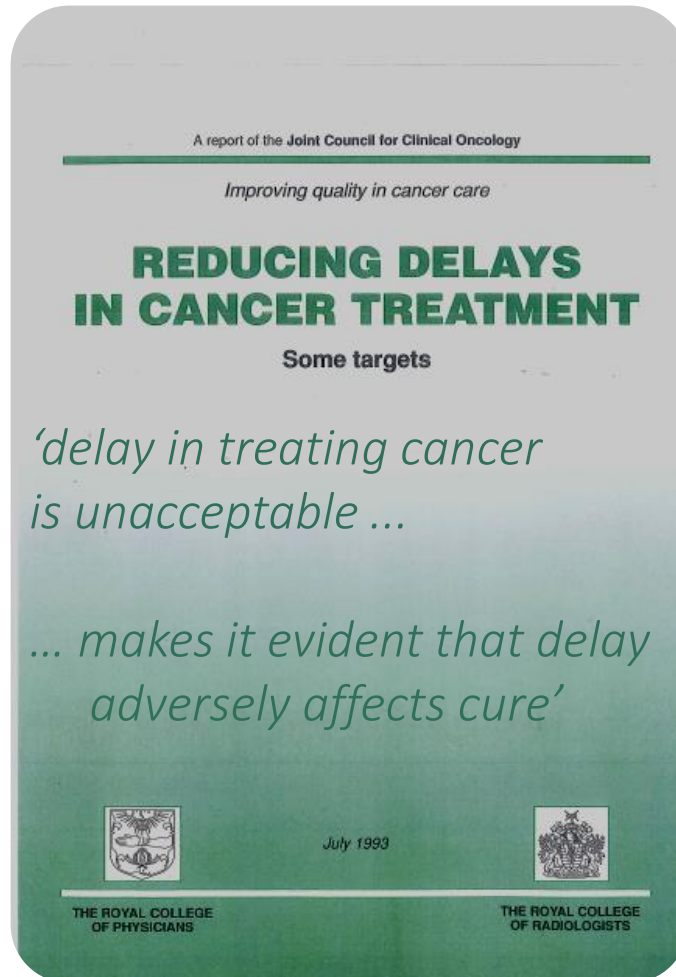




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Commentary

Time in radiation oncology – Keep it short!

Rebecca Bütof, Michael Baumann*

*Department of Radiation Oncology; ^bOncoRay National Center for Radiation Research in Oncology, University Hospital/Medical Faculty Carl Gustav Carus, Technische Universität Dresden, Germany; ^cInstitute of Radiation Oncology, Helmholtz Zentrum Dresden-Rossendorf, Germany

Radiotherapy and Oncology 87 (2008) 3–16
www.thegreenjournal.com

Systematic review

The relationship between waiting time for radiotherapy and clinical outcomes: A systematic review of the literature

Zheng Chen^a, Will King^a, Robert Pearcey^b, Marc Kerba^a, William J. Mackillop^{a,*}

^aQueen's Cancer Research Institute, Queen's University, Kingston, Ont., Canada, ^bCross Cancer Institute, Edmonton, Alta., Canada

'The risk of local recurrence increases with increasing waiting times for RT...

...and may translate into decreased survival in some clinical situations'





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JOURNAL OF CLINICAL ONCOLOGY

Critical Impact of Radiotherapy Protocol Compliance and Quality in the Treatment of Advanced Head and Neck Cancer: Results From TROG 02.02

*Lester J. Peters, Brian O'Sullivan, Jordi Giralt, Thomas J. Fitzgerald, Andy Trotti, Jacques Bernier,
Jean Bourhis, Kally Yuen, Richard Fisher, and Danny Rischin*



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Protocol

Vs





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Tweet



I've only seen an increase in fragmentation of systems in the last 10 years.

No one seems interested in simplifying things and other than paying lip service, proponents of digital systems & managers seem incapable of doing anything.



Up to 16 different passwords/PINs needed for day2day oncology practice in 2019 #NHS . Clumsy and ineffective. Or is it just me? Ready for a holiday!

1. Trust's IT system
2. Trust's Radiology system
3. Trust's Pathology system
4. 4-digit PIN NHS "so-called" smart card
5. 4-digit PIN for printer/scanner
6. Clinic e-outcomes system

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Protocol

Vs





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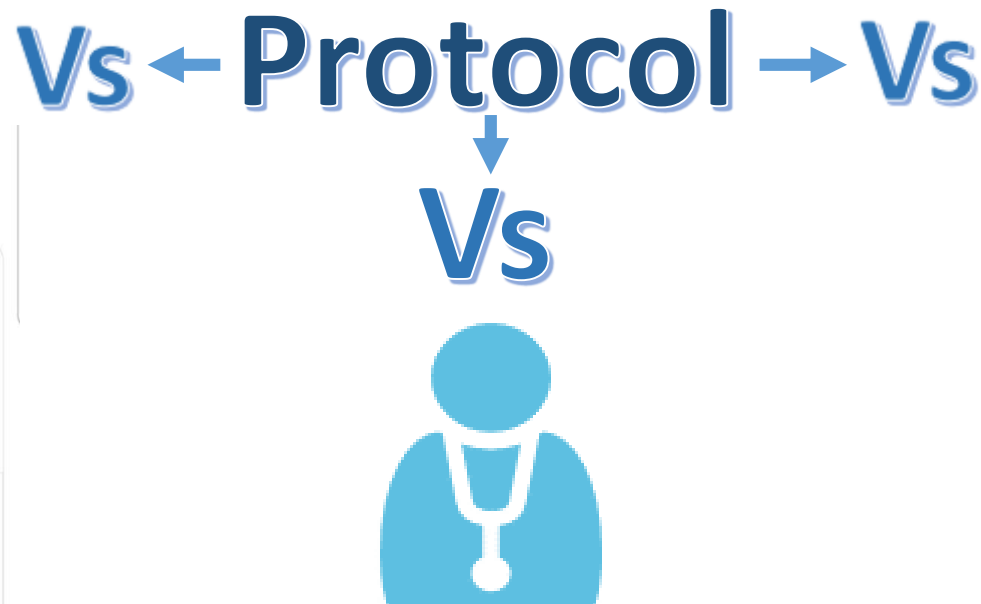
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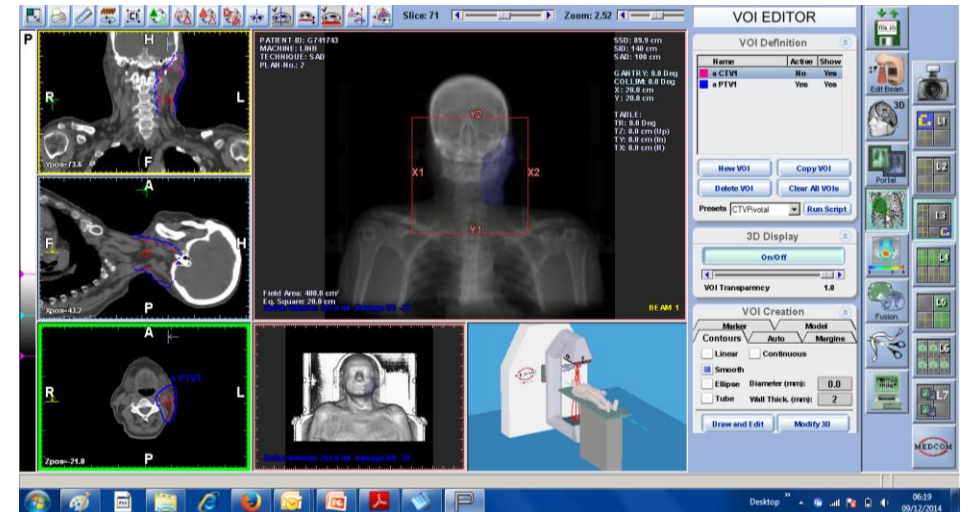
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SWWCC response: Pathway & Technology improvements

- Mosaiq
 - QCL Quality Check Lists
 - Localisation, Approval, Plan Query
 - Patient workflow
 - Departmental workflow
 - Electronic Booking form
 - Remote approval of outlining volumes
 - Remote approval of plans



- ProSoma
 - Remote outlining
 - Remote approval of plans





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QCL: Departmental overview

QCL Filter: Planning Work

10/01/2020	Phy Agility VF Plan Measurement Check	Rowley, K.	Jenkins, Rhys 1	Delta4 Checking/Work	Localisation in Proforma, complete eLoc form
10/01/2020	RT Localisation Breast SCF+Axilla	Saleh, Fari	RTH-Consultant	FMS Planning/Work	Review draft loc & localise nodes in Proforma, then complete eLoc prost form
10/01/2020	RT Localisation PPN	Lester, Ja.	Radiotherapy	JL Planning/Work	01-15
10/01/2020	Phy Plan Checking Rectum IMRT	Vigneswar, V	Vigneswar, V	DWT Checking/Work	Localisation in Proforma, then complete eLoc form
10/01/2020	RT Localisation Lung	Powell, C	Radiotherapy	CP Planning/Work	02-12 Create plan in Pinnacle, query, compromise PTV for bowel
10/01/2020	Phy Plan PPN VMAT	Phan, Mau	Phan, Mau-Don	HW Dosimetry	Review draft loc in Pro
10/01/2020	RT Loc Review Prostate	Phan, Mau	Radiotherapy	MDP Planning/Work	Please see navigator
10/01/2020	Phy Plan Query	Phan, Mau	Wong, Harold 1	MDP Planning/Work	01-15 Create plan in Pinnacle
10/01/2020	Phy Plan Breast IMRT	Pudney, D.	Sillman, Christine 1	RJ Dosimetry	
10/01/2020	Phy Agility VF Plan Measurement Check	Lester, Ja.	Jenkins, Rhys 1	Delta4 Checking/Work	Localisation in Proforma
10/01/2020	FT H&N RT Localisation	Banner, R.	Radiotherapy	RB Planning/Work	Localisation in Proforma
10/01/2020	FT H&N RT Localisation	Banner, R.	Radiotherapy	RB Planning/Work	Please see navigator
10/01/2020	Phy Plan Query	Rollis, Ma.	Wong, Harold 1	MR Planning/Work	
10/01/2020	CT Scan Query	Phan, Mau	Smith, Mitchell 1	MDP Planning/Work	
10/01/2020	Phy Plan Query	Pudney, D.	Jenkins, Rhys 1	MR Planning/Work	Heart V200cGy >30% (4
10/01/2020	RT vSIM Beam Localisation PaliRad Unp.	Saleh, Fari	RTH-Consultant	FMS Planning/Work	Tit sheet in CT-Sim
10/01/2020	Phy Plan Query	Pudney, D.	Li, Ada 1	MR Planning/Work	to review heart doses (r
10/01/2020	RT vSIM Beam Localisation PaliRad Unp.	Saleh, Fari	RTH-Consultant	FMS Planning/Work	Tit sheet in CT-Sim
10/01/2020	Phy Plan Query	Pudney, D.	Li, Ada 1	MR Planning/Work	heart out, please see n
10/01/2020	RT vSIM Beam Localisation PaliRad Unp.	Askill, Col.	RTH-Consultant	CS4 Planning/Work	Tit sheet in CT-Sim
10/01/2020	Phy Precise VF Plan Measurement Check	Taylor, Ro.	Jennings, Rebecca 2	Delta4 Checking/Work	Localisation in Proforma
10/01/2020	RT Localisation Breast SCF+Axilla	Saleh, Fari	RTH-Consultant	FMS Planning/Work	
10/01/2020	Phy Agility VF Plan Measurement Check	Banner, R.	Snelling, Joe 1	Delta4 Checking/Work	
10/01/2020	Phy Agility VF Plan Measurement Check	Banner, R.	Snelling, Joe 1	Delta4 Checking/Work	
10/01/2020	Phy Agility VF Plan Measurement Check	Phan, Mau	Snelling, Joe 1	Delta4 Checking/Work	
10/01/2020	RT Approval Breast IMRT	Rollis, Ma.	Radiotherapy	MR Planning/Work	Review plan and comp
10/01/2020	Phy Precise VF Plan Measurement Check	Taylor, Ro.	Jennings, Rebecca 2	Delta4 Checking/Work	
10/01/2020	Phy Precise VF Plan Measurement Check	Rollis, Ma.	Jennings, Rebecca 2	Delta4 Checking/Work	
10/01/2020	FT H&N RT Localisation	Banner, R.	Radiotherapy	RB Planning/Work	Localisation in Proforma
10/01/2020	CT Scan Query	Davies, Rh.	Butt, Sarah 1	RD Planning/Work	
10/01/2020	RT vSIM Beam Localisation PaliRad Unp.	Saleh, Fari	RTH-Consultant	FMS Planning/Work	Tit sheet in CT-Sim
10/01/2020	Radiographer breast plan query	Rollis, Ma.	Hunter, Rebecca 1	MR Planning/Work	BOOST FOR REVIEW P
10/01/2020	Phy Plan Query	Pudney, D.	Jenkins, Rhys 1	MR Planning/Work	Heart V200cGy out of to
10/01/2020	Radiographer breast plan query	Pudney, D.	Hunter, Rebecca 1	MR Planning/Work	LARGE LUNG VOL ? PE
10/01/2020	Phy Electron Stand Off Calc	Banner, R.	Farrington, Samantha 2	REH Checking/Work	
10/01/2020	RT Approval Brain IMRT	Taylor, Ro.	Radiotherapy	RET Planning/Work	Review plan and comp
10/01/2020	Phy Plan Breast IMRT	Rollis, Ma.	Butt, Sarah 1	HW Dosimetry	01-22 Create plan in P
10/01/2020	RT Localisation Anus	Phan, Mau	Radiotherapy	MDP Planning/Work	Localisation in Proforma
10/01/2020	Phy Plan Breast IMRT	Pudney, D.	Butt, Sarah 1	HW Dosimetry	01-23 Create plan in P
10/01/2020	Phy Plan Breast IMRT	Pudney, D.	Butt, Sarah 1	AL Dosimetry	01-27 Create plan in P
10/01/2020	Phy Wax Layer Checked	Askill, Col.	Farrington, Samantha 2	JRAW Checking/Work	01-29
10/01/2020	RT Localisation PPN	Phan, Mau	Radiotherapy	MDP Planning/Work	Review draft loc & local
10/01/2020	RT Loc Review Prostate	Lester, Ja.	Radiotherapy	JL Planning/Work	Review draft loc in Pro
10/01/2020	Phy Plan Breast IMRT	Pudney, D.	Sillman, Christine 1	AL Dosimetry	Create plan in Pinnacle
10/01/2020	Phy OAR Bladder	Davies, Rh.	Davies, Rhian	AL Dosimetry	Contour OARs in Proso
10/01/2020	RT Localisation Lung	Brewster, L.	Radiotherapy	AB Planning/Work	Localisation in Proforma
10/01/2020	Phy Plan Breast IMRT	Pudney, D.	Strafer, Helen 2	RJ Dosimetry	01-27 Create plan in P
10/01/2020	RT Localisation Breast SCF+Axilla	Saleh, Fari	RTH-Consultant	FMS Planning/Work	Localisation in Proforma
10/01/2020	RT Localisation Breast SCF+Axilla	Rollis, Ma.	RTH-Consultant	MR Planning/Work	Localisation in Proforma
10/01/2020	Phy Plan Prostate VMAT	Davies, Rh.	Davies, Rhian	HW Dosimetry	02-11 Create plan in P
10/01/2020	Phy Plan Prostate VMAT	Phan, Mau	Phan, Mau-Don	LF Dosimetry	02-04 Create plan in P
10/01/2020	RT Loc Review Prostate	Davies, Rh.	Radiotherapy	RD Planning/Work	Review draft loc in Pro
10/01/2020	Phy Plan Bladder VMAT	Davies, Rh.	Davies, Rhian	AL Dosimetry	01-21 Create plan in P
10/01/2020	RT Localisation Bladder	Lester, Ja.	Radiotherapy	JL Planning/Work	Localisation in Proforma
10/01/2020	Phy CBCT fusion review	Banner, R.	Radiotherapy	MWD Dosimetry	CBCT-CT fusion review
10/01/2020	Phy pseudo CBCT creation	Banner, R.	Radiotherapy	MWD Dosimetry	Deform planning CT to
10/01/2020	Phy CBCT dose assessment	Banner, R.	Radiotherapy	MWD Dosimetry	Recalculate plan on CB
10/01/2020	Phy CBCT dose assessment check	Banner, R.	Radiotherapy	MWD Dosimetry	Adaptive plan assessment
10/01/2020	RT vSIM Beam Localisation PaliRad Unp.	Phan, Mau	RTH-Consultant	MDP Planning/Work	Tit sheet in CT-Sim

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Etheridge, Douglas 1

Select Patient

Home Chart Navigator Demographics Assessments RTP Import D and I Evaluate Images Reports RO Treat Documents Facesheet Chart Check QCL CT/SIM Combined Daily View Mould Room Quick Orders Help

Home

My Work Loading / Outlining / Planning Verifications / Checking Localisations / Queries / Approvals

Location Quality Check List - Physics Dosimetry

Add Change Delete Complete Skip Note

Filters

View: By Location Location: Physics Dosimetry Include Selected Locations

Date Range: Surrounding Weeks: 52

Show All Incomplete Items Overdue Show Only Items Requested By Staff

Complete Incomplete All

Due Date	Priority	Patient	Task	Consultant	Responsible	Comment	Note
13/01/2020			Phy Plan Anus VMAT	On	Physics Dosimetry	01-20 Create plan in Pinnacle	
15/01/2020			Phy Plan Breast IMRT	Ro	Physics Dosimetry	01-29 Create plan in Pinnacle	
15/01/2020			Phy Plan Breast IMRT	Ro	Physics Dosimetry	01-29 Create plan in Pinnacle	
15/01/2020			Phy Plan Breast IMRT	Ro	Physics Dosimetry	01-29 Create plan in Pinnacle	
14/01/2020			Phy Plan H&N VMAT Bilat	Ro	Physics Dosimetry	02-04 Create plan in Pinnacle	
10/01/2020			Phy Pacemaker/CD Dose Calc	Da	Physics Dosimetry	02-25 Pacemaker/CD Dose Calc (CT 20-01-10)	

Contains([Task], [Date] And Contains([Responsible], [Physics Dosimetry])

Contains([Task], [TRT] And Contains([Responsible], [Physics Dosimetry])

Not Contains([Responsible], [Physics Dosimetry])

Contains([Responsible], [Physics Dosimetry])

Contains([Task], [OAR] And Contains([Responsible], [Physics Dosimetry])

Contains([Task], [Loading] And Contains([Responsible], [Physics Dosimetry]) Or Contains([Task], [RET] And Contains([Responsible], [Physics Dosimetry]) Or Contains([Task], [Fusion] And Contains([Responsible], [Physics Dosimetry])

Contains([Task], [Plan] And Contains([Responsible], [Physics Dosimetry]) Or Contains([Task], [Calc] And Contains([Responsible], [Physics Dosimetry])

Edit Filter

Exit Window



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Orchestrating Radiation Oncology Workflows IntelliSpace Radiation Oncology

- Time to RT
 - combination of pathway and technology - paperless / QCLs
- Excellent Team but Limited resources
 - physical and workforce
- Got so far, now can see opportunity to go much further
 - Automation
 - Flow



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Orchestrating Radiation Oncology Workflows IntelliSpace Radiation Oncology

- SWWCC and Philips
 - Existing Big Bore CT user
 - 2017 TPS replacement with Pinnacle
 - Using Autoplan and VMAT / IMRT solutions all planned sites.
- 2018 a co-creation partnership
 - to develop an approach to consistent, efficient, high quality RT planning*
- **ISRO software** as a Patient Management solution
 - Protocol driven use of technology and automation
- **Radiation Oncology Practice Management**
 - Workflow management
- Prostate, Breast and Palliative pathways



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- Understanding current workflows with Practice Management support

Due Date	Actual ...	Task	Responsible
08/03/2019	28/02/2019	Dr SigPlt Consent	Pre Treatment
08/03/2019	28/02/2019	Appt Sent?	Pre Treatment
08/03/2019	28/02/2019	Received by Pre-Trt	Pre Treatment
28/02/2019	28/02/2019	RT Ready for Pre Treatment	Pre Treatment
01/03/2019	28/02/2019	Phy Plan Checking Breast	MAE Checking/Work
06/03/2019	27/02/2019	Appt Sent?	RT Appt Sent?
24/02/2019	26/02/2019	RT Approval Breast	MR Planning/Work
24/02/2019	22/02/2019	Phy Plan Breast	RJ Dosimetry
20/02/2019	19/02/2019	RT Trt Book	R/TH-Booking Office
19/02/2019	19/02/2019	RT vSIM Localised Breast Prosoma Check	Prosoma Breast
19/02/2019	18/02/2019	RT vSIM Beam Localisation Breast	Prosoma Breast
14/02/2019	14/02/2019	RT 3DCT Imaging Breast	CT-Simulator
12/02/2019	12/02/2019	Booking Form Breast Completed	R/TH-Book CT
11/03/2019		Received by LIN B	LINB
11/03/2019		1st day chat/pt info	LINB
08/03/2019		PT To Linac	Pre Treatment
08/03/2019		Image Prep/IDSticker	Pre Treatment
08/03/2019		Schedule & Trt Sheet	Pre Treatment
08/03/2019		Phone No. obtained	Pre Treatment
08/03/2019		Calclmport/calendar	Pre Treatment
23/02/2019		Phy OAR Breast	Physics OAR
23/02/2019		Breast Boost mark up	Breast Boost List
14/02/2019		RT SCF+Axilla pathway?	Prosoma Breast



- Breast and Prostate pathway mapping



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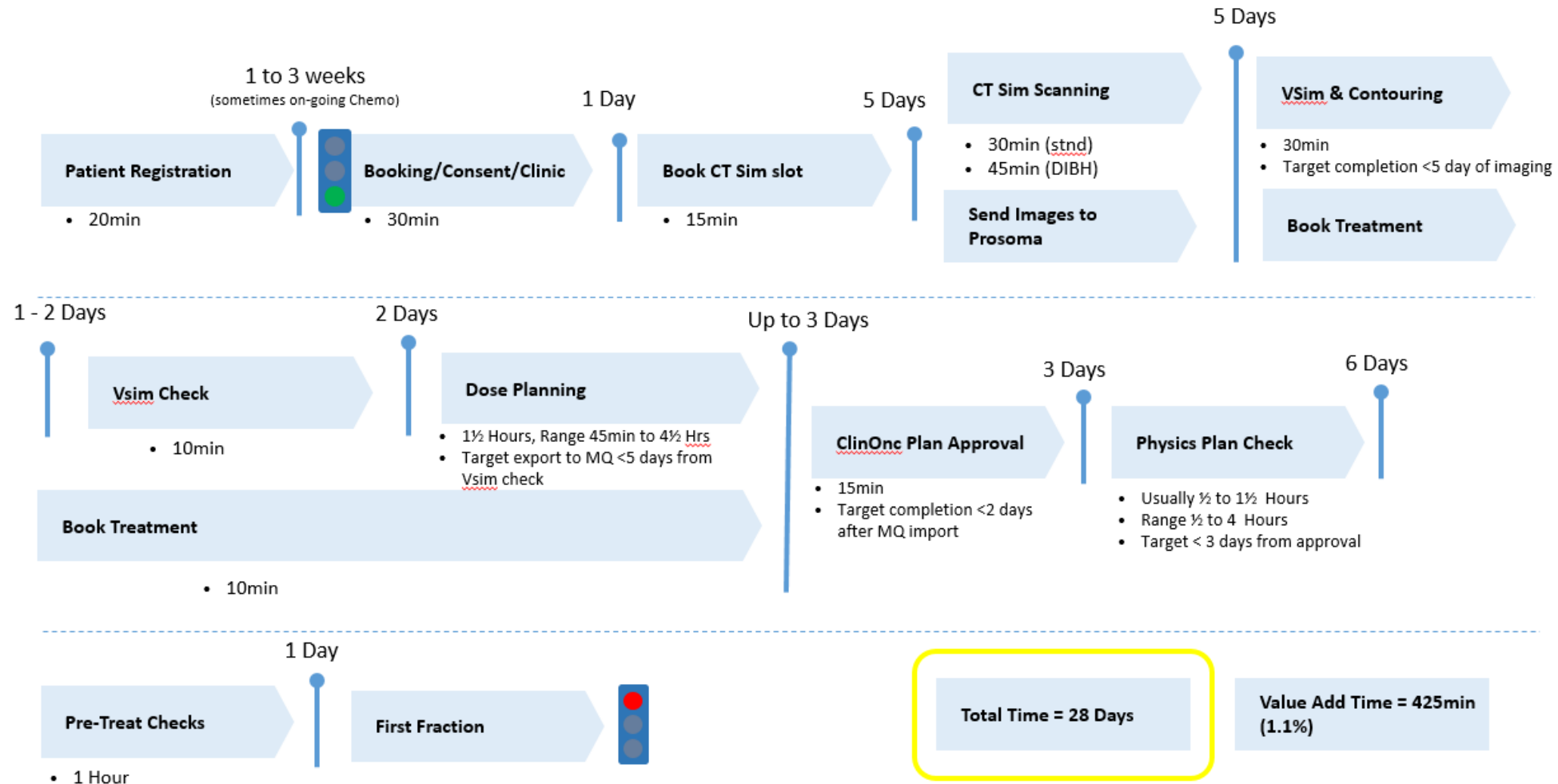
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SWWCC Breast Pathway

Practice Management

‘Current State – Time’





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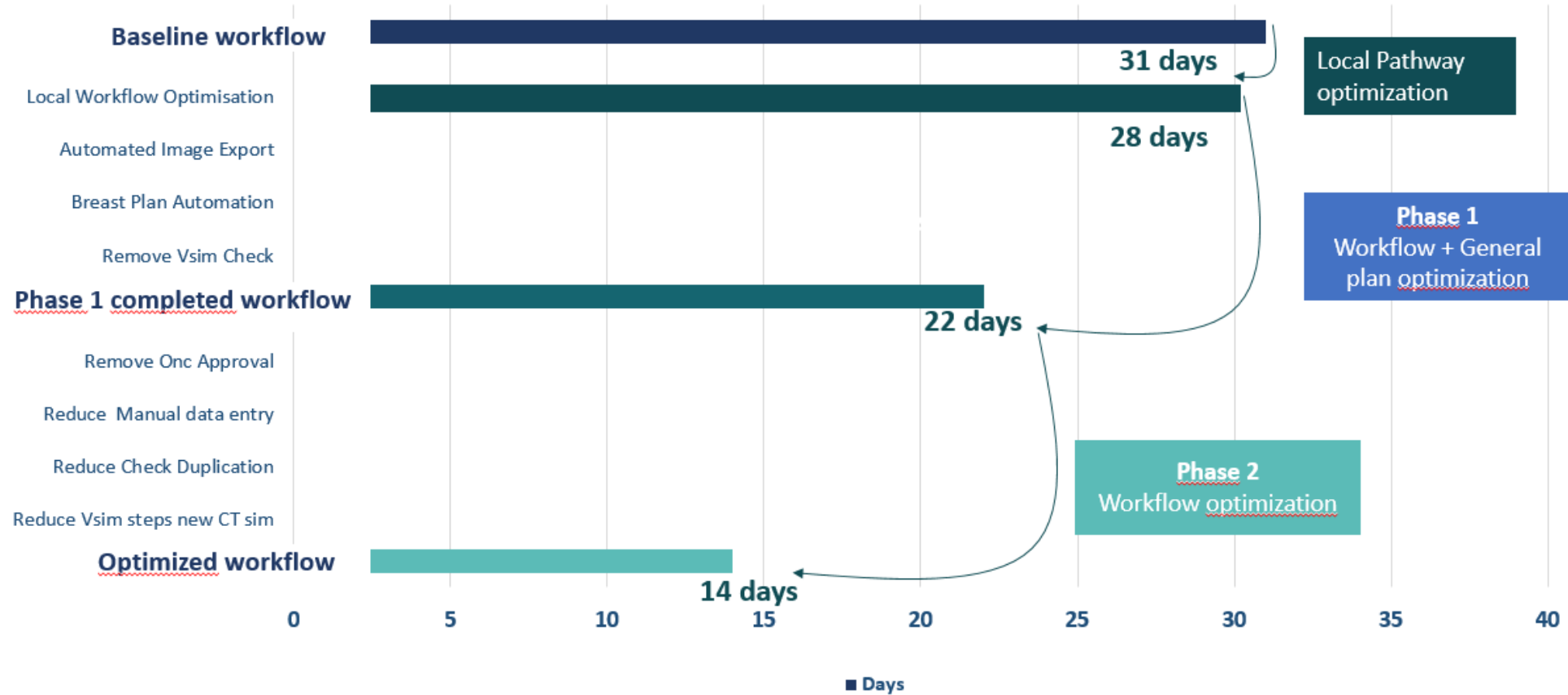
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SWWCC
Breast Pathway

Practice
Management

Improvement
Plan





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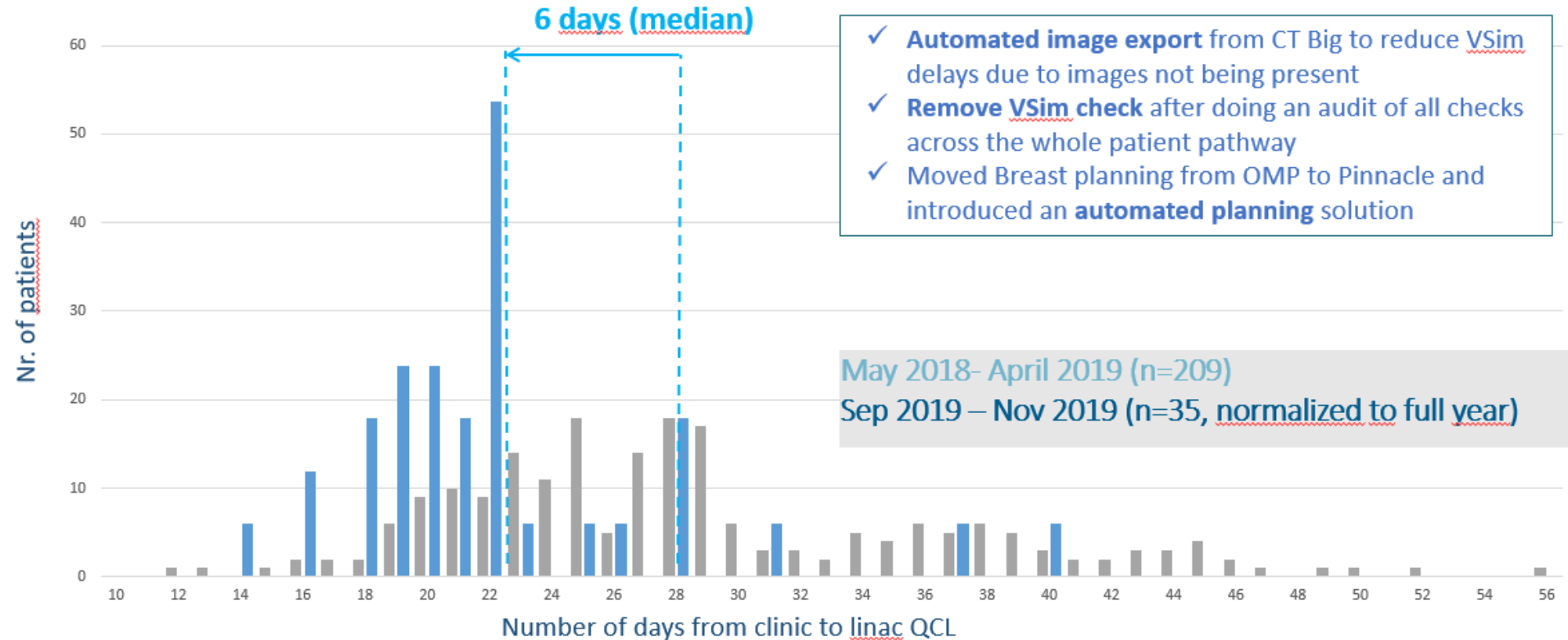
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SWWCC Breast Pathway

Practice Management

Phase 1



- ✓ Automated image export from CT Big to reduce VSim delays due to images not being present
- ✓ Remove VSim check after doing an audit of all checks across the whole patient pathway
- ✓ Moved Breast planning from OMP to Pinnacle and introduced an **automated planning** solution

• Results from case studies are not predictive of results in other cases. Results in other cases may vary.

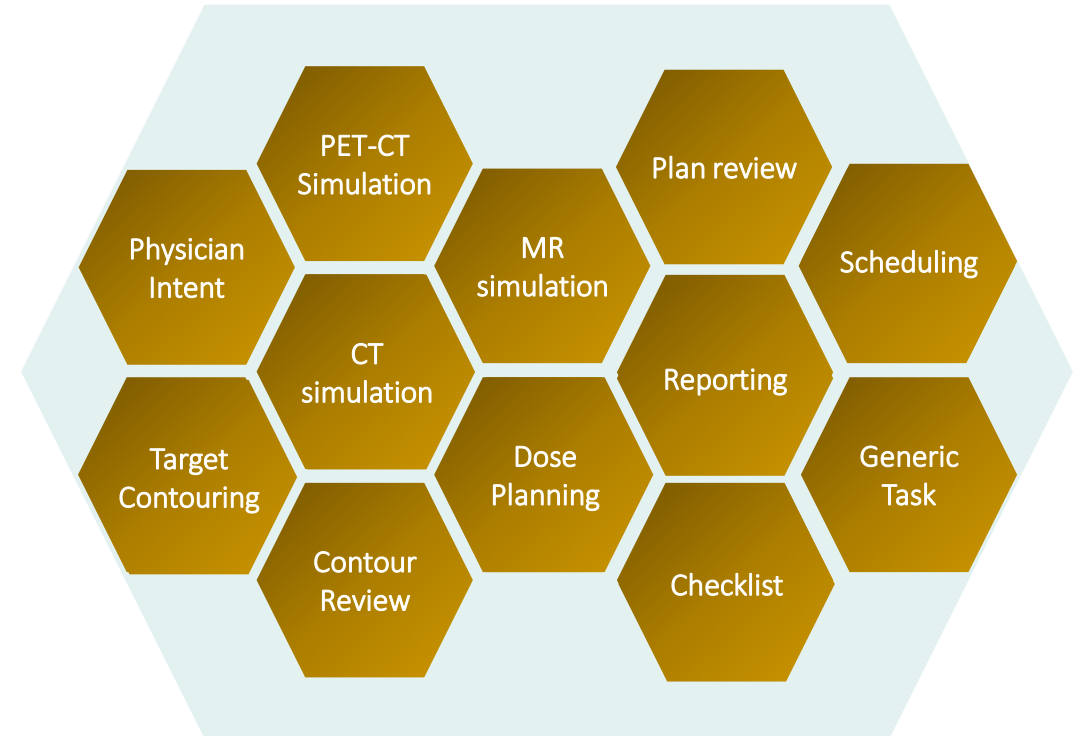


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- Building ISRO ProtocolCards
- SWWCC specific workflow
- Tumour site specific tasks



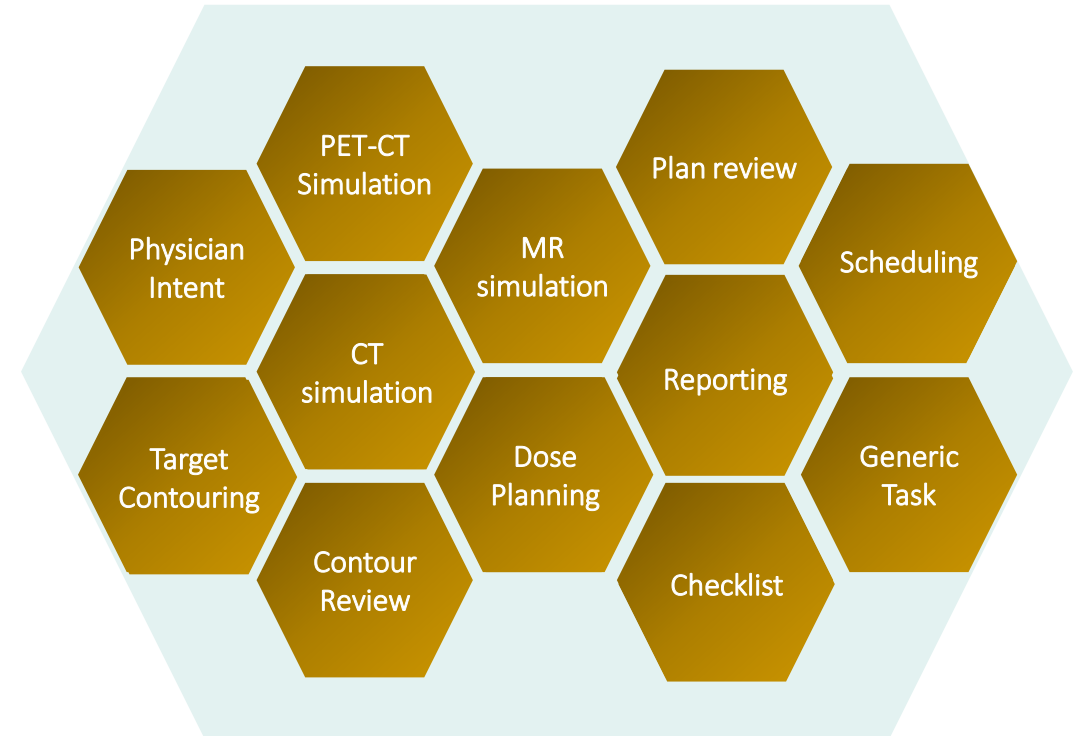


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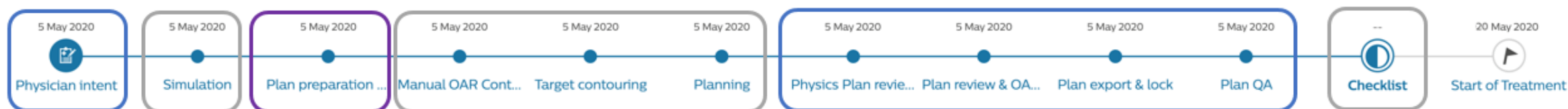


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Prostate ProtocolCard – *La Tour Hospital, Switzerland*



Prostate ProtocolCard – *Swansea Bay University, UK*



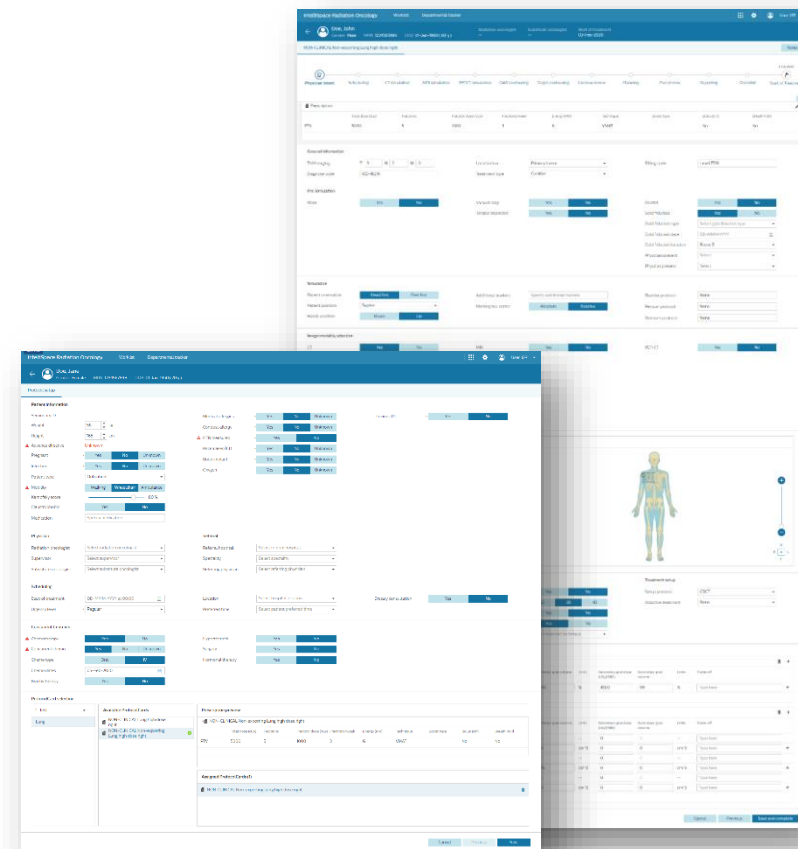


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- Start with Physician Intent
 - Single log in
- Patient information imported from HIS
- Any patient specific modifications highlighted as customised workflow

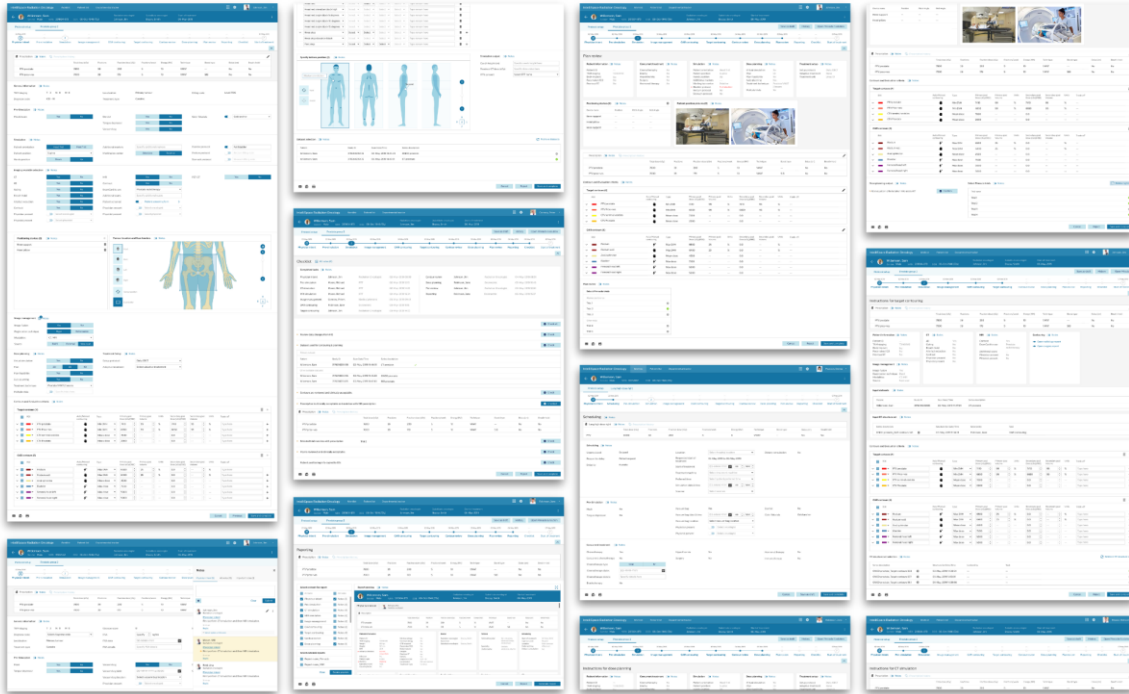




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- Build SWWCC task pages through workflow
- CTSim, Contouring, Planning...



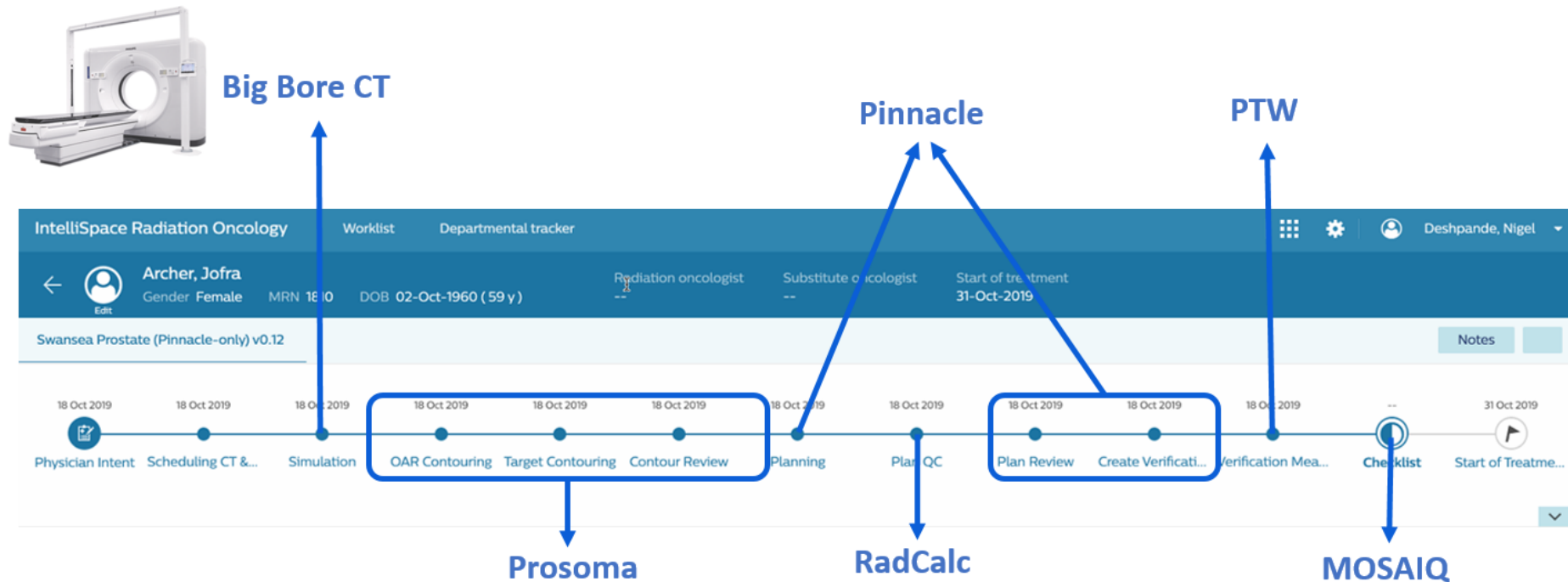


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- ProtocolCard customised to SWWCC equipment profile

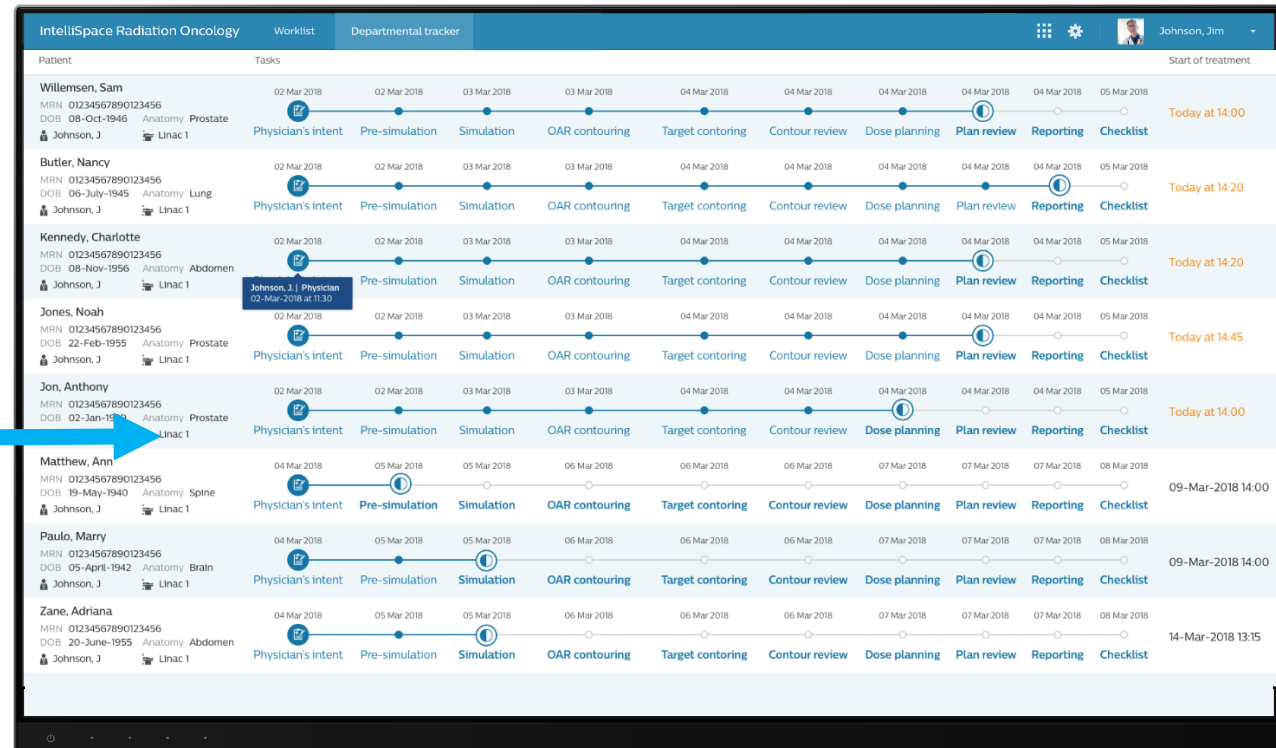


- Each user opens task specific software from within ISRO
- DICOM data automatically routed to each system

Orchestrating Radiation Oncology Workflows

IntelliSpace Radiation Oncology

- Overview of patients within Workflow
- Prioritisation by clinical urgency or planned treatment start date
- Whole SWCCC workload

[illegible]



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Orchestrating Radiation Oncology Workflows IntelliSpace Radiation Oncology

- Overview of patients within Workflow
- Prioritisation by clinical urgency or planned treatment start date
- Whole SWCCC workload
- Individual user tasks
 - Filter workflows
 - Launch applications
 - See Clinical Patient Info
 - Review completed tasks

User groups worklist

Patient	Gender	Date of birth	MRN	Physician	Anatomy	Technique	Task	Scheduled on	Start of treatment	Assigned to	Status
Willemsen, Sam	Male	06-May-1949	01234567	Johnson, J	Lung	VMAT	Physician intent	Today at 09:00	06-Mar-2019 13:30	Johnson, J	Not started
Butler, Nancy	Female	22-Feb-1955	0129875	Johnson, J	Lung	--	Guide simulation	Today at 10:00	06-Mar-2019 14:30	Johnson, J	Not started
Kennedy, Charlotte	Female	05-Apr-1942	01234522	Johnson, J	Breast	--	Guide simulation	Today at 12:00	06-Mar-2019 16:00	Johnson, J	Not started
Matthew, Ann	Female	19-May-1940	01219876	Johnson, J	Breast	--	Physician intent	Tomorrow at 14:00	07-Mar-2019 18:00	Johnson, J	Not started
Jon, Abe	Male	02-Jan-1939	0123771	Johnson, J	Prostate	VMAT	Guide simulation	Tomorrow at 09:00	07-Mar-2019 18:00	Johnson, J	Not started
Jon, Anthony	Male	02-Jan-1939	01234501	Johnson, J	Prostate	VMAT	Plan review	Tomorrow at 17:00	08-Mar-2019 12:00	Johnson, J	Not started
Matthew, Rachel	Female	11-Jun-1944	01266160	Johnson, J	Breast	IMRT	Target contouring	05-Mar-2019	08-Mar-2019 12:00	Johnson, J	In progress
Jacob, William	Male	11-Jun-1940	01223344	Johnson, J	Prostate	VMAT	Contour review	05-Mar-2019	08-Mar-2019 12:00	Johnson, J	Not started

Prioritized workload

Patient-specific communication

Launch integrated applications



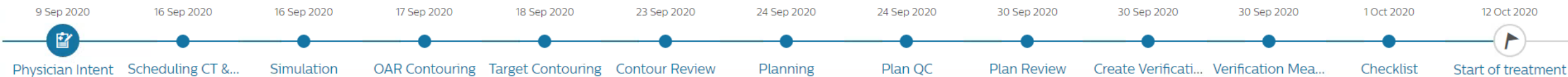
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Orchestrating Radiation Oncology Workflows IntelliSpace Radiation Oncology

- October 2020 experience of implementation in SWWCC

- Users new to ISRO



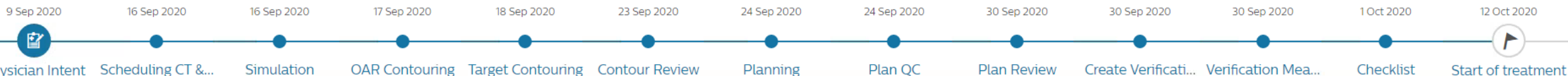
- 2 prostate patients
 - Physician intent and scheduling retrospective
 - All other tasks lives
- Dual planned on Clinical Pinnacle and ISRO Pinnacle
- Entire system check to work over Citrix, remote from hospital
- Worked well on tablets



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Orchestrating Radiation Oncology Workflows IntelliSpace Radiation Oncology



• Simulation page

- ‘excellent, liked the way it was specific to prostate set up only’
- ‘There was a lot less to fill out, saving time and minimising the room for error’
- ‘We added a few things that were missing – Philips said no problem’

‘It almost seems too simple’ - Helen, CTSim

The screenshot displays the IntelliSpace Radiation Oncology software interface. The top navigation bar includes 'Worklist', 'Patient list', and 'Departmental tracker'. The main header shows patient details for Willemesen, Sam (Male, MRN 201804-873, DOB 08-Oct-1946 (72y)), radiation oncologist Johnson, Jim, and substitute oncologist Bracey, Smith. The 'Start of treatment' is 06-May-2019. The 'Protocol setup' section is set to 'Prostate group 2'. A timeline at the top indicates the workflow steps: Physician intent, Pre-simulation, Simulation (highlighted), Image management, OAR contouring, Target contouring, Contour review, Dose planning, Plan review, Reporting, Checklist, and Start of treatment. The 'Instructions for dose planning' section contains several tables for patient information, concurrent treatment, simulation, dose planning, and treatment setup. The 'Positioning devices (2)' table lists 'Knee support' and 'Head pillow'. The 'Patient position pictures (2)' section shows two images of a patient in a treatment room.

Patient information	
Patient ID	---
TNM staging	T3 N0 M0
Body implant	No
Pacemaker/ICD	No
Previous RT	No

Concurrent treatment	
Chemotherapy	No
Brachy	No
Hyperthermia	No
Surgery	No
Hormonal therapy	No

Simulation	
Patient orientation	Head first
Patient position	Supine
Hands position	Up
Additional markers	--
Marking iso-center	Relative
Bladder protocol	Full bladder
Rectum protocol	No
Stomach protocol	No

Dose planning	
Virtual simulation	No
Plan	3D
Plan feasibility	No
Auto planning	Yes
Treatment technique	Prostate VMAT
Multiple trials	2 beams

Treatment setup	
Setup protocol	Daily CBCT
Adaptive treatment	None
Treatment unit	Linac 01

Positioning devices (2)			
Device name	Position	Pitch Angle	Roll Angle
Knee support	---	---	---
Head pillow	---	---	---

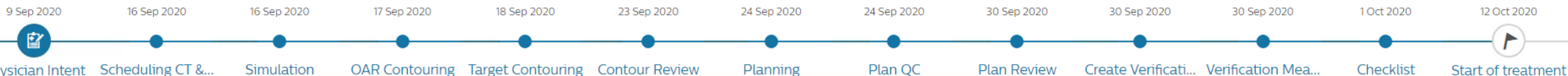
Patient position pictures (2)	



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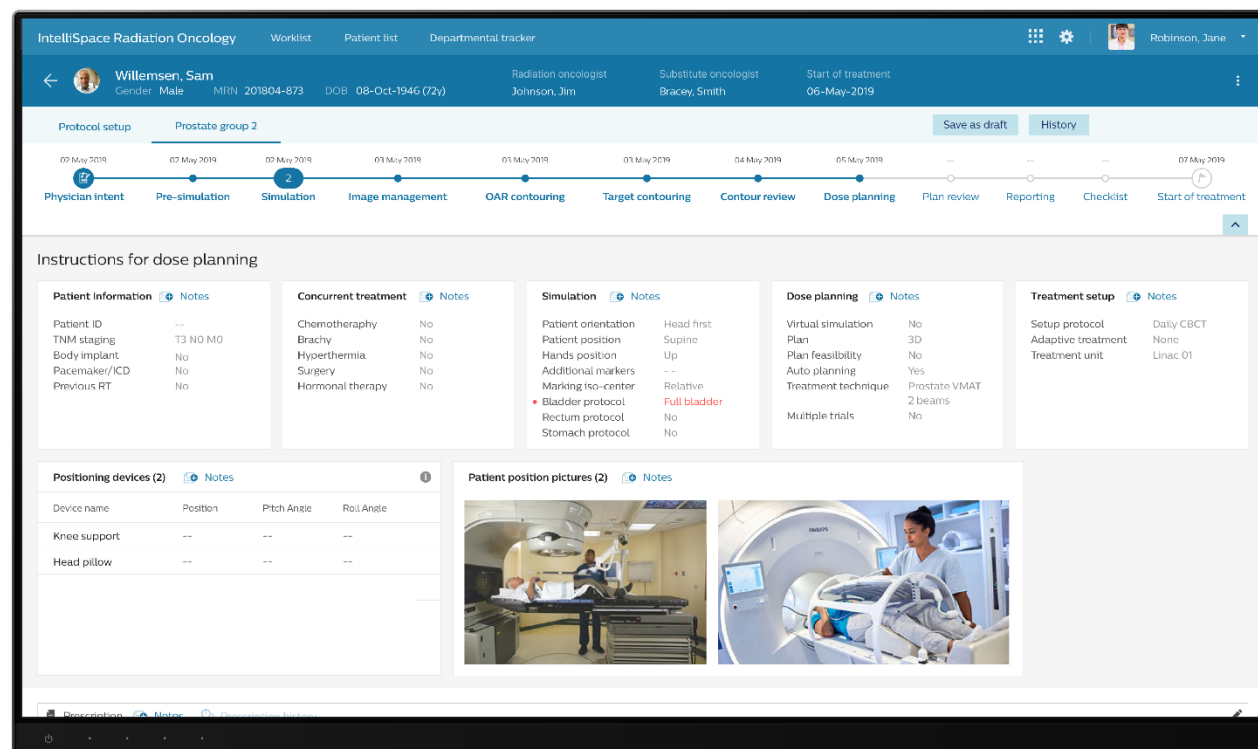
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Orchestrating Radiation Oncology Workflows IntelliSpace Radiation Oncology



- Stu, RT QI lead
 - The exercise was really useful
- ISRO is easy to use, clear to understand and a vast improvement on what we are currently using which could lead to reduction in errors
- Pauline, booking
 - Easy to use, some flexible changes to alter start date needed

'It almost seems too simple' - Helen, CTSim





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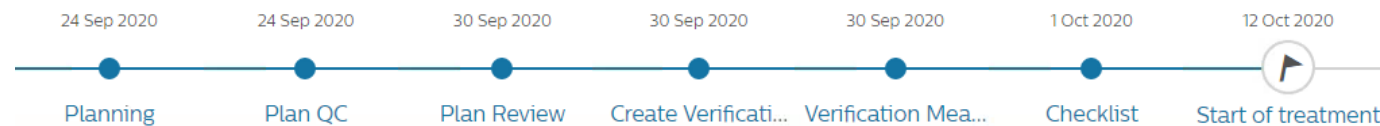
- Lots of constructive feedback
 - Really liked all the information was specific to the Prostate workflow
 - Reduced the un-needed information
 - 'Intuitive'

- Some additions suggested to ProtocolCard

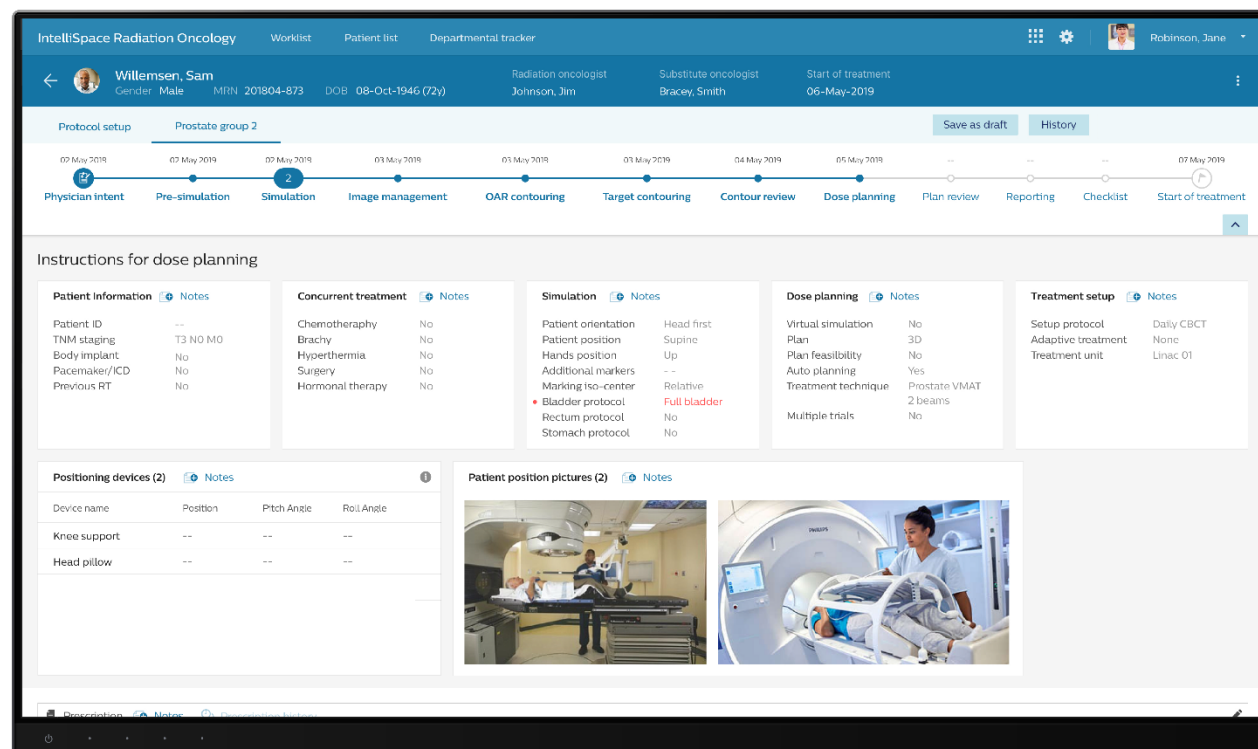
- Checking stage redesign
- Extend workflow to include pre-treatment
- Treatment summary at the end needed

- 'All in all everything was very positive and show really good potential, especially the future steps we plan when we integrate further automation to tasks'

– Doug, Head RT Physics Technologist



'It almost seems too simple' - Helen, CTSim





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Orchestrating Radiation Oncology Workflows IntelliSpace Radiation Oncology

- Connecting workflows, reducing time to treatment
 - Single log-in for access to all systems
 - Remote access
 - Filterable workflows
 - Clear priorities
 - Automation built in
 - Doesn't dictate equipment profile – using best tools for the task
 - Takes you straight to patient in software you need for that task



Sign on

Worklist

Physician Intent

Simulation

Contouring

Dose planning

Checklist

Departmental tracker



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Orchestrating Radiation Oncology Workflows IntelliSpace Radiation Oncology

- Practice Management and IntelliSpace Radiation Oncology
 - South West Wales Cancer Centre optimised workflows
 - ProtocolCards providing safe, intuitive and detailed information
 - Integrates automation, reduces time wasted
 - Bespoke user group views to allow tasks to be carried out efficiently
 - Improves communication between team members
 - Ensures our patients will be treated as soon as possible, as safely as possible

