

NCRI Clinical and Translational Radiotherapy Research Working Group

Annual Report 2020 - 2021



NCRI Partners

NCRI is a UK-wide partnership between research funders working together to maximise the value and benefits of cancer research for the benefit of patients and the public. A key strength of the NCRI is our broad membership with representation across both charity and government funders as well as across all four nations in the United Kingdom.



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NCRI Clinical and Translational Radiotherapy Research Working (CTRad) Group

Annual Report 2020-21

1. Top achievements in the reporting year (up to three)

Achievement 1

Virtual engagement and multidisciplinary community building events

Outstanding virtual engagement and community building during COVID-19. Through 11 virtual workshops and meetings we engaged with the community and reached out beyond CTRad's established membership. These included:

- First virtual proposal guidance meeting pilot held in conjunction with the Lung Research Group May 2020; Radiotherapy (RT) trials showcase virtual event July 2020;
- NCRI's first cross Research Groups multidisciplinary Proposals Guidance meeting Oct 2020;
- CTRad Proposals Guidance meeting (9 new radiotherapy clinical trial proposals presented) - Jan 2021; Radiographer Research Workshop in collaboration with the Society and College of Radiographers (SCoR) Feb 2021;
- Five events in a series of Methodology Bitesize workshops held monthly from end of February 2021;
- Several COVID RT and Proton Beam Therapy (PBT) events described below, all with excellent feedback from the attendees.

Achievement 2

COVID RT: studying the impact of the COVID-19 pandemic on UK radiotherapy services and patient outcomes.

Rapid response to the COVID-19 pandemic to assess the impact on UK radiotherapy services. Developed in collaboration with the Royal College of Radiologists (RCR), SCoR, Institute of Physics and Engineering in Medicine (IPEM), continuous engagement with the National Radiotherapy Dataset (RTDS) team and with active participation from 55 of the 62 UK Radiotherapy centres from across all 4 UK nations. Three virtual events held April-May 2020 to engage and consult with the radiotherapy community, which were attended by over 250 multidisciplinary representatives from across the UK; launch of project end of April 2020; formation of COVID RT Steering Group June 2020 with key stakeholders; data partnership with the University of Oxford and CRUK's Cancer Intelligence / Trusted Research Environment team July 2020; COVID RT protocol finalised Sep 2020; IRAS ethics approval Dec 2020; editorial published¹ in *Clinical Oncology* journal Jan 2021; and COVID RT audio interview podcast² with the RCR Mar 2021.

¹ Lewis PJ, Morris EJA, Chan CSK et al. COVID RT – Assessing the Impact of COVID-19 on Radiotherapy in the UK. A National Cancer Research Institute Clinical and Translational Radiotherapy Research Working Group Initiative in Partnership with the Royal College of Radiologists, the Society of Radiographers and the Institute of Physics and Engineering in Medicine. *Clin Oncol.* 2021; 33(1) E69-E72. DOI: <https://doi.org/10.1016/j.clon.2020.08.008>

² COVID RT podcast hosted on RCR's website (<https://www.clinicaloncologyonline.net/yclon/audio>), the direct link can be found here: https://www.clinicaloncologyonline.net/pb-assets/Health%20Advance/journals/yclon/COVID_RT_Final_MP3-1614682034857.mp3 (last accessed 10/6/2021)

Achievement 3

Funding and recruitment into phase III randomised trials of proton beam radiotherapy

Appointment of new Chair (Prof Chris Nutting) and Deputy Chair (Dr David Thomson) for the NCRI CTRad PBT Clinical Trials Strategy Group; Funding of two randomised phase III trials of proton beam versus photon radiotherapy by NIHR EME: 'APPROACH' in good prognosis glioma - Leeds Clinical Trials Research Unit CIs Dr Louise Murray and Prof Susan Short; 'PARABLE' in breast cancer – Institute of Cancer Research (ICR) Clinical Trials and Statistics Unit (CTSU) CIs Prof Charlotte Coles, Dr Anna Kirby and Mrs Joanne Haviland. Good recruitment into the CRUK-funded TORPEdO trial, the first UK PBT versus photon study in oropharyngeal cancer – ICR CTSU CI Dr David Thomson. All trials were developed iteratively through CTRad's dedicated PBT workshops. Two virtual PBT events held Sep and Nov 2020 with an international speaker (Dr Rachel Jimenez, Associate Professor Department of Radiation Oncology, Massachusetts General Hospital) and a number of UK leads; PBT proposals guidance workshop with 4 new proposals Sep 2020.

2. Structure of the Group

- While Co-chair and Workstream membership recruitment have been suspended, CTRad has continued to grow its General Membership (just under 120 members end of Mar 2021), helping to widen engagement with the multi-disciplinary UK radiotherapy community.
- Two new radiotherapy consumer members (Helen Fleming and Thomas O'Regan) were interviewed and appointed to CTRad in March 2021.
- New NCRI CTRad PBT Clinical Trials Strategy Group Chair (Prof Chris Nutting) and Deputy Chair (Dr David Thomson) were appointed in April 2020. Under their leadership, the PBT Strategy Group has continued to drive UK PBT research during 2020-21 through PBT Strategy Group meetings (Jul 2020, Feb 2021), PBT Proposals Guidance Workshop (Sep 2020) and two virtual PBT events (Sep and Nov 2020).
- We have collaborated effectively with National NHS England (NHSE) Radiotherapy Fellows Dr Philippa Lewis (2020) and Dr Alexander Burnett (2021) – they have been invited as members on the CTRad Executive Group, and have helped drive the COVID RT project and facilitated links between NCRI CTRad and the NHSE Radiotherapy Learning Healthcare System (LHCS).
- Launch of the COVID RT project saw engagement with 55 of 62 UK Radiotherapy centres which have collected a consistent set of data to allow the impact of COVID-19 on UK radiotherapy patients and radiotherapy services to be assessed.
- Executive Group membership: Prof Nicola Curtin semi-retired in 2021 and gradually stepped down from her role as Chair of CTRad Workstream (WS) 1. Prof Curtin supported a merger between WS1 and WS2 (Co-chaired by Prof Richard Adams and Dr Sarah Brown) so there is a greater mutual understanding of the underlying science and clinical considerations within the WS, leading to better integration of translational research. In addition, this merger enables better alignment and cooperation with CRUK's Radiotherapy Research Centres of Excellence Network (RadNet), where RadNet will focus on the discovery/pre-clinical radiation/radiobiology research space whilst CTRad will focus on clinical translation, clinical trials and the real world impact of UK radiotherapy research.

3. Clinical and Translational Radiotherapy Research Working Group & Workstream strategies

Clinical and Translational Radiotherapy Research Working Group (Executive Group)

The CTRad Strategic Vision 2018-2021 is unchanged and consists of five 'pillars' all of which are delivered with patient and public involvement and described in more detail in Appendix 2: -

- Evaluating and implementing technological advances
- Converting discovery science into patient benefit
- Building the radiotherapy research workforce.
- Integrating radiotherapy into precision medicine
- Changing practice through a portfolio of innovative and collaborative clinical trials

Throughout 2020 and 2021, the CTRad Executive Group has continued to hold virtual meetings every 5-11 weeks and work towards our strategic objectives, outlined in Appendix 2.

Challenges:

- The key challenge has been to completely change to a virtual format
- To be sensitive to the enormous pressure on most of our members in the UK radiotherapy community, many of whom had to suspend research to support the NHS response to COVID-19
- Adapted to deliver successful virtual meetings – for example, our bite-size methodology workshops
- To balance our priorities to a changing landscape during the pandemic – ie COVID RT has been and continues to be a substantial piece of work; Proposals Guidance Meetings were restarted in Jan 2021 at the right time to respond to community availability and changes to various funding schemes.

The CTRad Executive Group has overseen the activity of our workstreams (see below), PBT Clinical Trials Strategy Group (see 'Achievements' in section 1), National Radiotherapy Trials Quality Assurance (RTTQA) group and the COVID RT Steering Group.

CTRad has been working closely to build close links with CRUK's RadNet, and Prof Mererid Evans (CTRad Deputy Chair) has joined as a member of the RadNet Steering Board. CTRad is recognised as critical to the successful translation of discovery research. It is actively engaged in discussions with CRUK's ECMC Network where CTRad can play a major role in the delivery of early phase clinical trials across the UK.

CTRad's Consumers members underpin all the above work as detailed in Section 6.

Workstream 1: Science Base (Chair, Prof Nicola Curtin)

WS1's original strategic objectives are outlined in Appendix 2.

Personnel and overview

As mentioned under 'Structure of the Group' earlier, Prof Nicola Curtin semi-retired in 2021 and is gradually stepping down from her role as Chair of WS 1.

CRUK RadNet (mentioned earlier) has a major focus on discovery science and the CTRad Executive Group has taken a strategic decision to avoid unnecessary duplication. In view of this it has been agreed that WS1 will merge with WS2, supporting the translation of new discoveries into the clinic. Although WS1 did not have any formal business meetings over the last year, they continued to make progress on two projects and supported CTRad's Proposals Guidance meetings and workshops.

Publication of radiotherapy biobanking paper

A manuscript reviewing the radiotherapy biobanking landscape in the UK (“Radiotherapy biobanking in the UK: Current landscape, opportunities, challenges and future aspirations”) has been submitted to the *Journal of Pathology*. This work is in collaboration with WS2, WS3 and a member of NCRI’s pathology initiative CM-Path. See details in Section 4 ‘Cross-cutting Research’.

Preclinical Dosimetry Taskforce

This Dosimetry project Taskforce started out as a CTRad WS1 / National Physical Laboratory collaboration to discuss preclinical irradiator dosimetry and quality assurance (QA), and is led by one of WS1’s member. This collaborative Taskforce is looking at how to work with or combine efforts with the new RadNet standardisation Dosimetry Subgroup which has very similar goals and overlapping membership.

The Taskforce has been planning a publication and will develop it further in the next few months; this could then form the basis of future discussions/developments in conjunction with the RadNet subgroup, with the involvement of CTRad helping to access the wider community.

Workstream 2: Phase II trials (Co-Chairs, Prof Richard Adams and Dr Sarah Brown)

Throughout the last year WS2 has continued to hold quarterly meetings with members and work towards our strategic objectives, outlined in Appendix 2.

Facilitating development of novel combination trials

We have engaged with members of the British Society for Immunology (BSI), NCRI and CRUK RadNet to scope out potential programmes for a radiotherapy-immunotherapy combinations workshop, to be held in Q4 2021. A schedule of presentations focusing on the clinical development of these combinations is under development, engaging expertise across CTRad and more widely, including industry representation, patient involvement and engagement, and supporting early career researchers to take an active role in development and delivery.

One of CTRad’s ex-officio members contributed a short commentary as part of a MediaPlanet Q4 2020 supplement, ‘Innovations in Oncology’³, on the topic of Radiotherapy-Immunotherapy research in *New Scientist*.

Initial, positive, discussions with Aoife Regan, Head of ECMC Programme Office, and Sarah Danson, Chair of the ECMC Adult Network Strategy Group, have taken place to identify opportunities for collaboration and engagement between ECMC centres and CTRad. WS2 co-chairs have joined the RadNet radiotherapy-drug combination working group to ensure engagement and interaction between RadNet and CTRad and to facilitate transition of pre-clinical research to early phase clinical trials. This represents a major future opportunity for CTRad.

PPIE involvement

Our consumer representative has been involved in a survey conducted through the ICR relating to the use of patient reported outcome measures in phase I clinical trials.

Integration of imaging

A WS2 member has joined the NIHR Imaging Group, and has reviewed RadNet centre workstreams, collectively enabling landscape evaluation and transparency of imaging research and activity. This positions us to identify opportunities for integration of imaging in early phase clinical trials.

Publishing and promoting experiences of novel methodologies

³ ‘Innovations in Oncology’ MediaPlanet supplement is available here:

https://issuu.com/mediaplanetuk/docs/innovations_in_oncology/6 (last accessed 18/6/2021)

A manuscript on phase I trial design methodology for radiotherapy-drug combinations has been drafted for submission to *Nature Reviews Clinical Oncology* as a result of a methodological project led by WS2.

We have also delivered webinars as part of a monthly virtual CTRad Methodology Bitesize series which started from the end of Feb 2021, developed by five senior methodologists across WS2 and WS3. See details in Section 4 'Cross-cutting Research'.

WS2 have been involved in the development of the CONCORDE trial, a phase I drug-radiotherapy platform study for patients with lung cancer, which has recently published the trial protocol⁴ and recruited its first patient in May 2021 (Cardiff). A methodology paper is in submission, and we have promoted the application of novel methodology to this phase I platform through an NIHR webinar⁵.

Developing the workforce and knowledge

As part of our focus on developing early career researchers, WS2 supported a successful application to the 2020 Methods in Clinical Cancer Research workshop (Dr Sarah Hargreaves, Cardiff/Bristol).

We have provided review and support at CTRad Proposals Guidance Meetings, and the PBT Proposals Guidance workshop, held throughout 2020 and 2021. Peer review of a low-dose lung radiotherapy COVID trial proposal was also undertaken.

Workstream 3: Phase III trials and Methodology (Co-Chairs, Prof Robert Huddart and Dr Yat Man Tsang)

Throughout the last year WS3 met every few months to update on progress towards their strategic objectives, which are outlined in Appendix 2.

Changing practice through a portfolio of innovative and collaborative clinical trials (CTRad Strategic aim 5)

Regular proposal guidance – CTRad provided various proposal guidance and development support offline through the WS3-led RADCAS service, and CTRad held our first virtual proposals guidance meeting on 28 Jan 2021; WS3 also continued to lead the process of providing timely reviews for CRUK's Clinical Research Committee prior to their committee meetings.

Improved links between Clinical Trial Units (CTUs) and national RTTQA group – Recommendation document for best working practices between CTUs and RTTQA⁶ has been written and distributed to CTUs nationally in Nov 2020.

Survey of NIHR trial recruitment portfolio to investigate the frequency and extent of translational research – Paper authored by WS3 member Duncan Gilbert on biobanking in radiotherapy, "Biobanking in radiotherapy trials – a challenge to the clinical research community", published⁷ in *Nature Reviews Clinical Oncology* in Feb 2021.

Assess Health Economics in current trial portfolio – an editorial writing group led by WS3 was formed to look at the utilisation health economics within clinical trials.

⁴ Walls GM, Oughton JB, Chalmers AJ et al. CONCORDE: A phase I platform study of novel agents in combination with conventional radiotherapy in non-small-cell lung cancer. *Clin Transl Radiat Oncol*, 2020; 25, 61-66. DOI: <https://doi.org/10.1016/j.ctro.2020.09.006>

⁵ NIHR Webinar: "CONCORDE: a phase I platform trial using the TITE-CRM design" took place on 28 Oct 2020. The recording is available here: <https://statistics-group.nihr.ac.uk/event/concorde-a-phase-i-platform-trial-using-the-tite-crm-design/> (last accessed 10/6/2021)

⁶ Radiotherapy Clinical Trials Roles and Responsibilities RTTQA Group and CTUs guidance hosted on the NCRI website: <https://www.ncri.org.uk/wp-content/uploads/RTTQA-CTU-roles-and-responsibilities-vs1.0-110521.pdf>

⁷ Gilbert DC and Spiers V. Biobanking in radiotherapy trials – a challenge to the clinical research community. *Nat Rev Clin Oncol* 2021; 18, 191-192. DOI: <https://doi.org/10.1038/s41571-021-00486-0>

Evaluating and implementing technological advances (CTRad strategic aim 1)

WS3, together with WS4, organised a virtual MR-Linac discussion meeting in Feb 2021 bringing together over 20 representatives from across the different MR-Linac Consortium and centres interested in clinical research evaluating state-of-the-art MR-Linac technology to discuss collaborative MR-guided studies. See details in Section 4 'Cross-cutting Research'.

Building the radiotherapy research workforce (CTRad Strategic aim 3)

Continue to upskill RT workforce – WS3 organised a virtual Radiographers Research workshop together with WS4 in conjunction with the ScoR on 1 Feb 2021 – see details in Section 4 'Cross-cutting Research'.

WS3 also delivered webinars as part of a monthly virtual CTRad Methodology Bitesize series which started from the end of Feb 2021, developed by five senior methodologists across WS3 and WS2. See details in Section 4 'Cross-cutting Research'.

Workstream 4: New Technology, Physics and Quality Assurance (Chair, Prof Karen Kirkby)

Throughout the last year WS4 met every few months to update on progress towards their main priorities, which are outlined in Appendix 2.

PBT and Particle Therapy

In the past year the paper outlining a roadmap for the clinical implementation of heavier ions has been published⁸; this follows a workshop which took place in March 2019. This publication is being used to inform a funding proposal to UKRI (A project to estimate the impact of COVID-19 on PBT and RT services more generally at national and regional levels across the UK).

A one-day workshop on FLASH RT in 2020 which CTRad WS4 collaborated on has led to the development of a new conference series in Flash RT and Particle therapy (FRPT) which will take place in Vienna December 2021.

Close collaboration with CTRad's PBT Clinical Trials Strategy Group resulting in three PBT clinical trials being funded and others in development.

Collaboration with CRUK RadNet working groups: Prof Karen Kirkby leads the FLASH Working group and other members of WS4 are involved with other groups.

Imaging in RT

CTRad supported a focus-group style Deformable Image Registration in RT workshop originally planned for April 2020, which was expecting participants from 5-10 centres across the UK; the workshop was postponed, and instead online interviews were conducted to follow up on the earlier audit / survey work. A follow up workshop towards the end of the project is being planned. WS4, together with WS3, organised a virtual MR-Linac meeting in Feb 2021 bringing together over 20 representatives from across the different MR-Linac Consortium and centres interested in clinical research evaluating state-of-the-art MR-Linac technology to discuss collaborative MR-guided studies. See details in Section 4 'Cross-cutting Research'.

Workforce development

WS4 organised a virtual Radiographers Research workshop together with WS3 in conjunction with the ScoR on 1 Feb 2021 – see details in Section 4 'Cross-cutting Research'.

General

⁸ Kirkby KJ, Kirkby NF, Burnet NG et al. Heavy charged particle beam therapy and related new radiotherapy technologies: The clinical potential, physics and technical developments required to deliver benefit for patients with cancer. Br J Radiol 2020; 93:20200247. Doi: <https://doi.org/10.1259/bjr.20200247>

Karen Kirkby (WS4 Chair) and David Sebag-Montefiore (CTRad Chair) are invited members of a STFC Advisory Committee discussing novel particle therapy opportunities in the UK. WS4 members also reviewed their main priorities from time to time.

4. Cross-cutting research

CTRad is committed to facilitating cross-cutting, UK-wide RT research which is exemplified in many of our activities over the last year.

COVID RT: this project, detailed in section 1, is a UK-wide initiative led by CTRad in partnership with the three UK bodies which represent the multi-disciplinary UK RT workforce: The RCR, ScoR and IPEM. Representatives from these three organisations, the National RTDS team, as well as the NIHR CRN Cancer Specialty Lead for RT and Imaging, are members of the COVID RT Steering Group. NHS England's National Radiotherapy Fellows, Dr Philippa Lewis (2020) and Dr Alexander Burnett (2021), have supported the COVID RT initiative. COVID RT has engaged the UK's RT research workforce in a common endeavour during the COVID-19 pandemic.

NHS England Radiotherapy Learning Healthcare System (RT LHCS): CTRad's Chair, Deputy Chair and Chair of the CTRad PBT Clinical Trials Strategy Group are members of the RT LHCS, helping to ensure alignment on aspects of RT LHCS activities relevant to RT research. Prof Tim Illidge, past Chair of CTRad, was appointed Chair of RT LHCS in early 2021 and ongoing close collaboration is planned, ultimately helping to implement the findings of RT research studies into practice within the NHS in a timely and effective way.

CRUK RadNet: Seven UK CRUK RadNet Centres and Units were established in 2019, funded by CRUK to make a step change in the UK's discovery and pre-clinical radiation biology and radiation oncology research. RadNet has presented CTRad with challenges as well as significant opportunities. Challenges: to avoid duplication with RadNet. Opportunities: to position CTRad so that we can maximise opportunities for RT Clinical Trials resulting from RadNet discoveries. Also, so that we ensure we represent the UK-wide RT research community and RT patient population, ensuring that as many centres as possible and as many patients as possible can engage in RT research. CTRad's Deputy Chair (Mererid Evans) represents CTRad on the RadNet Steering Board. CTRad's WS2 Co-Chairs (Richard Adams and Sarah Brown) represent CTRad on RadNet's Drug-RT Combinations Working Group. This representation will ensure that RadNet and CTRad work synergistically with each other in future.

Radiotherapy Trials Quality Assurance (RTTQA):

CTRad works very closely with the national RTTQA Group, with RTTQA members sitting on CTRad's Executive Group, Workstreams, General Membership and most projects and workpackages. Over the last year, the RTTQA Group continue to provide RT QA for around 45-50 NIHR portfolio RT trials, including those using advanced delivery techniques such as PBT and MR-Linac technology. The RTTQA Group remains active in national and international groups to support accuracy and consistency of RT delivery in clinical trials. The Group have also been tasked by NHSE to provide RT QA for the expansion of Stereotactic Ablative Radiotherapy (SABR) in England.

CTRad-RTTQA collaborative work:

- RTTQA/CTU working group: To promote closer working relationships between RTTQA and CTUs – slide set produced Mar 2020. From this original collaboration further areas of work have been identified including facilitating data sharing for trial related research purposes.
- CTRad PBT QA working group: This group arose from discussions in a CTRad PBT proposals guidance workshop. Article published⁹ in *Clinical Oncology*, "Comparing proton to photon radiotherapy plans: UK consensus guidance for reporting under uncertainty for clinical trials".
- CTRad clinician contribution to the consensus on organ at risk outlining descriptors published by the Global Quality Assurance of Radiation Therapy Clinical Trials

⁹ Lowe M, Gosling A, Nicolas O et al. Comparing Proton to Photon Radiotherapy Plans: UK Consensus Guidance for Reporting Under Uncertainty for Clinical Trials. *Clin Oncol*. 2020; 32(7) 459-466. DOI: <https://doi.org/10.1016/j.clon.2020.03.014>

Harmonization Group. Article published¹⁰ in *Radiotherapy and Oncology*: “Organ at risk delineation for radiation therapy clinical trials: Global Harmonization Group consensus guidelines”.

- Collaborative work with RTTQA to develop guidance for centres to claim RT QA service support costs¹¹, this work arose from initial discussions about barriers to RT trial set up at a previous CTRad Proposals Guidance Meeting.

Cross-cutting workshops and meetings

CTRad workstreams have worked together on cross-workstream initiatives during the last year.

CTRad Bitesize Methodology series: these monthly webinars which started from Feb 2021 are part of a workshop series developed by five senior methodologists across CTRad's WS2 and WS3. The aim of this series is to provide bitesize-talks in current areas of trial methodology, which would be of interest to researchers wanting to improve the quality and efficiency of trial design. The sessions covered biomarker trial design and justification for sample collection, the choice of endpoints as well as co-primary and composite endpoints, and an introduction to phase II designs. Each session comprises a 15-minute talk followed by Q&A for up to 15 minutes (WS2 and WS3 collaboration).

CTRad's WS3 and WS4 organised a virtual **MR-Linac meeting** in Feb 2021, in collaboration with CRUK's Advanced Radiotherapy Technologies Network (ARTNET), bringing together over 20 representatives from across the different MR-Linac Consortium / centres interested in clinical research evaluating state-of-the-art MR-Linac technology to discuss collaborative MR-guided studies. Follow-up meeting to be organised to discuss possibly forming a Steering Group to drive things forward. (WS3 and WS4 collaboration)

A **manuscript reviewing the radiotherapy biobanking landscape in the UK** “Radiotherapy biobanking in the UK: Current landscape, opportunities, challenges and future aspirations” has been submitted to the *Journal of Pathology*. This work is a collaboration between WS1, WS2, WS3 and a member of NCRI's pathology initiative CM-Path.

As described above, CTRad have also worked with other national bodies/organisations to organise collaborative events that benefit the UK-wide RT research community:

- **Radiographer Research Workshop** organised by CTRad in collaboration with the ScoR in Feb 2021 to develop the UK Radiographer research workforce (WS3, WS4 and ScoR collaboration)
- CTRad's **PBT Proposals Guidance virtual events workshop** in Sep and Nov 2020 were organised in collaboration with the two NHS PBT Centres (Manchester and UCLH)
- A programme of six **Molecular Radiotherapy virtual workshop series** has been developed in collaboration with NIHR, CRUK RadNet and the British Nuclear Medicine Society, and will be launched from June 2021
- CTRad's WS2 has been working with NCRI's Strategy and Initiative Team through a strategic partnership with the BSI, and also with CRUK RadNet to develop a **programme of Radiotherapy-Immunotherapy** workshop for later in 2021, which would be run similar to the CTRad RT-DDR Inhibitor Combinations Workshop in Nov 2019 with wide engagement across the community and with industry.

¹⁰ Mir R, Kelly SM, Xiao Y et al. Organ at risk delineation for radiation therapy clinical trials: Global Harmonization Group consensus guidelines. *Radiat Oncol*. 2020; 150, 30-39. DOI: <https://doi.org/10.1016/j.radonc.2020.05.038>

¹¹ RT Trials QA Service Support Costs Guidance document hosted on CTRad's website: <https://www.ncri.org.uk/wp-content/uploads/RT-QA-Service-Support-Cost-Guidance-vs1.0-final-Jan-2021.pdf>

5. Funding applications in last year

Table 1 Funding submissions in the reporting year

Study	Committee & application type	CI	Outcome	Level of Group input	Funding amount
Cancer Research UK*					
Dec 2020					
PRIMALUNG	CRC Clinical Trial Award	Corinne Faivre-Finn	Funded	CTRad Proposals Guidance meeting	
NIPRO: Nivolumab with PROtonbeam therapy in patients aged over 70 years with oropharyngeal cancer –a single arm phase II trial	CRC Clinical Trial Award	David Thomson	Not recommended for support	CTRad PBT Workshops	
PATHOS -T: A Bioresource Collection associated with PATHOS, a Phase II/III trial of risk-stratified, reduced intensity adjuvant treatment in patients undergoing transoral surgery for Human papillomavirus (HPV)-positive oropharyngeal cancer	CRC Prospective Sample Collection Award	Terry Jones Mererid Evans	Funded	CTRad Workshop	
March 2021					
CRAIN: A phase Ib clinical trial with dose escalation and dose expansion phases of ASTX660 in combination with standard radical radiotherapy in cervical cancer with chemoradiation.	CRC Clinical Trial Award	Peter Hoskin	Conditionally supported	CTRad/CRUK Radiotherapy-Drug Combinations Consortium (RaDCom) and CTRad Proposals Guidance meeting	
INSPIRE – (Investigating National Solutions for Personalised Iodine-131 Radiation Exposure) Measuring absorbed dose to tumour and organs at risk following routine iodine ablation therapy.	Biomarker Project Award	Jon Wadsley	Not supported	CTRad Proposals Guidance meeting	

PROTIS: A phase III trial of proton beam therapy versus intensity-modulated radiotherapy for the treatment of sinonasal malignancy	Clinical Trial Award - Outline	David Thomson	Full Application Invited	CTRad PBT Workshops	
Radiotherapy Dose De-Escalation in HPV Positive Oropharyngeal Squamous Cell Cancers, Maintaining Outcomes and Reducing Toxicity - The ResPeCT trial	CRC Clinical Trial Award	Claire Paterson	Not Supported	CTRad Proposals Guidance meeting	
PROTEUS - Proton Beam Therapy and adjuvant Immunotherapy in Oesophagus cancer	Clinical Trial Award - Outline	Maria Hawkins	Full Application Invited	CTRad PBT Workshops	
Other committees**					
Study	Committee & application type	CI	Outcome	Level of Group input	Funding amount
PARABLE (PBT / breast cancer)	NIHR EME	Charlotte Coles Anna Kirby Joanne Haviland	Funded	CTRad PBT Workshops	
APPROACH (PBT / good prognosis glioma)	NIHR EME	Louise Murray Susan Short	Funded	CTRad PBT Workshops	

*CRUK CRC applications for table 1 completed by NCRI Executive.

**Other applications in the table to be completed by Group Chair

6. Consumer involvement

CTRad's activities are underpinned by excellent Consumer input.

The four CTRad Consumers have ensured a Consumer presence at every virtual Workstream and Executive group meeting over the last year and have collectively or individually responded to every request for advice or assistance from researchers. Alongside colleagues from the NCRI Consumer Forum, this has also included commenting on all proposals at CTRad's Proposals Guidance meetings, and to CRUK's review of its trial portfolio in July 2020.

The most significant piece of work for the Consumer team was writing and presenting a paper to the Executive Group about themes for future radiotherapy research, explicitly linking them to the NCRI-JLA Living With and Beyond Cancer Research Priorities. All three suggestions – radiosensitivity, toxicity and late effects – are likely to be adopted into the new CTRad Strategy.

CTRad Consumers currently sit on management groups for PLATO, PETNECK2 and NIPRO as well as the NIHR PGfAR lung cancer survival programme, the GALLERI screening study, the European PRIMALUNG trial and (as a co-investigator) the EPRIMM and the Purastat studies. CTRad Consumers also hold roles as Patient Advisor to the Salivary Gland Cancer Charity, membership of advisory boards (eg Glasgow CTU and Leeds RadNet hub) and posts on NHS delivery organisations and NIHR clinical research networks.

CTRad Consumers have co-authored two publications^{12,13} in the year, and have hosted six online presentations and workshops for fellow Consumers, for NCRI and for industry.

In March 2021 two new Consumers were recruited (Helen Fleming and Thomas O'Regan), restoring the team to full strength for the first time in over two years, adding new skills, experiences and perspectives to CTRad's Consumer Involvement.

¹² Morris M, Alencar Y, Rachet B et al. Fleshing out the data: when epidemiological researchers engage with patients and carers. Learning lessons from a patient involvement activity. *BMJ Open*. 2020; 10:e036311. DOI: <http://dx.doi.org/10.1136/bmjopen-2019-036311>

¹³ Dal-Ré R, Stephens R, Sreeharan N. Letter to the Editor: "Let me choose my COVID-19 vaccine". *Eur J Intern Med*. 2021; 87, 104–105. DOI: <https://doi.org/10.1016/j.ejim.2021.01.030>

7. Collaborative partnership studies with industry

The CONCORDE study, developed through a consortium established by CTRad and the NCRI Lung Group, is a collaborative platform study funded jointly by CRUK and AstraZeneca. The industry partnership has progressed well through 2020 with contracts signed and the study now being open to recruitment to the first two radiotherapy-drug combination arms. Discussion regarding future arms is ongoing with AstraZeneca. First patient recruited May 2021. The journey of CONCORDE has been documented as an NCRI case study¹⁴.

The PRIME-RT study explores the use of neoadjuvant RT and oxaliplatin based chemotherapy in combination with Immunotherapy in the form of Durvalumab in patients with rectal cancer, as a partnership with AstraZeneca. It went through CTRad's Proposals Guidance Meeting in June 2017, funded by CRUK in late 2019.

The recently funded CRAIN study (Peter Hoskin and Kaye Williams) - RT-drug combination (Astex) in cervix cancer started as a CTRad/CRUK Radiotherapy-Drug Combinations Consortium (RaDCom) lab project in 2016, and has gone right through the CTRad pipeline (reviewed at CTRad's Proposals Guidance meeting Dec 2019) to phase I trial being funded by CRUK's CRC at their March 2021 meeting.

¹⁴ NCRI Case Study "Developing better cancer trials for non-small cell lung cancers", available at <https://www.ncri.org.uk/developing-better-trials-for-non-small-cell-lung-cancers-concorde/>

8. Priorities and challenges for the forthcoming year

Priority 1

Improving patient outcomes by facilitating the translation of novel agent drug-RT combinations from the laboratory into the clinic and bringing new RT technologies into the clinic in an evidence-based way. This will include a new focus on Molecular RT and a continued commitment to lead the strategic direction of PBT research in the UK.

We will achieve this aim through collaborative working, strengthening existing collaborations and building new research partnerships, both in the UK and internationally.

Priority 2

Refreshing our strategy and workstream structure so that our future priorities and focus reflect the changing landscape of UK RT research and the needs of the UK RT workforce and patient community.

Challenge 1

Ensuring equality of opportunity across the UK for patients, RT centres and members of the multi-disciplinary workforce to engage with research.

CTRad will address this challenge by representing the UK-wide RT community, providing opportunities to engage with workshops and scientific meetings, supporting the next generation of multi-disciplinary researchers and influencing future funding opportunities to benefit the wider RT community.

Challenge 2

Ensuring we engage widely to optimise and future-proof our refreshed strategy and structure.

We will present proposals to the RT community and our partners, launch our refreshed strategy and use it as an opportunity to showcase UK RT research, celebrate successes and ensure the next generation of multi-disciplinary researchers are engaged and feel inspired.

Professor David Sebag-Montefiore (Clinical and Translational Radiotherapy Research Group Working Chair) and Professor Mererid Evans (Clinical and Translational Radiotherapy Research Working Group Deputy Chair)

Appendix 1

Membership of the Clinical and Translational Radiotherapy Research Working Group Executive Group

Name	Specialism	Location
Prof David Sebag-Montefiore (Chair)	Clinical Oncologist	Leeds
Prof Mererid Evans (Deputy Chair)	Clinical Oncologist	Cardiff
Prof Anthony Chalmers	Clinical Oncologist	Glasgow
Prof Jonathan Wadsley (NIHR)	Clinical Oncologist	Sheffield
Prof Chris Nutting (PBT)	Clinical Oncologist	London
Dr Philippa Lewis (NHS England) (2020)	Clinical Oncologist	London
Dr Alexander Burnett (NHS England) (2021)	Clinical Oncologist	Sheffield
Prof Richard Adams (Workstream 2)	Clinical Oncologist	Cardiff
Prof Robert Huddart (Workstream 3)	Clinical Oncologist	Sutton
Mr Richard Stephens	Consumer	Stevenage
Prof Karen Kirkby (Workstream 4)	Medical Physicist	Manchester
Mrs Elizabeth Miles (RTTQA)	Radiographer	Middlesex
Dr Yat Man Tsang (Workstream 3)	Radiographer	Middlesex
Prof Kaye Williams (RaDCom)	Scientist	Manchester
Prof Nicola Curtin (Workstream 1)	Scientist	Newcastle
Dr Sarah Brown (Workstream 2)	Statistician	Leeds

Membership of the Workstreams

Workstream 1: Science Base		
Name	Specialism	Location
Dr Shree Bhide	Clinical Oncologist	London
Dr Ross Carruthers	Clinical Oncologist	Glasgow
Dr Paul Shaw	Clinical Oncologist	Cardiff
Dr Tim Humphrey	Consumer	Oxford
Prof Nicola Curtin (Chair)	Scientist	Newcastle
Prof Mark Hill	Scientist	Oxford
Prof Barbara Pedley	Scientist	London
Dr Samantha Terry	Scientist	London
Prof Gillian Tozer	Scientist	Sheffield
Dr Vessela Vassileva	Scientist	London

Workstream 2: Phase II trials		
Name	Specialism	Location
Prof Richard Adams (Co-chair)	Clinical Oncologist	Cardiff
Prof Ananya Choudhury	Clinical Oncologist	Manchester
Dr Tim Ward	Consumer	Manchester
Dr Sean Buckland	Industry specialist	Surrey
Dr Richard Baird	Medical Oncologist	Cambridge
Dr Martin Forster	Medical Oncologist	London
Prof Andrew Scarsbrook	Radiologist	Leeds
Dr Sarah Brown (Co-chair)	Statistician	Leeds
Mrs Joanne Haviland	Statistician	Sutton

Workstream 3: Phase III trials and methodology		
Name	Specialism	Location
Prof Robert Huddart (Co-chair)	Clinical Oncologist	London
Prof Corinne Faivre-Finn	Clinical Oncologist	Manchester
Dr Duncan Gilbert	Clinical Oncologist	Sussex
Dr Anna Kirby	Clinical Oncologist	London
Dr Louise Murray	Clinical Oncologist	Leeds
Dr Beatrice Seddon	Clinical Oncologist	London
Mr Richard Stephens	Consumer	Stevenage
Dr Ane Appelt	Physicist	Leeds
Dr Yat Man Tsang (Co-chair)	Radiographer	Middlesex
Prof Emma Hall	Statistician	Sutton
Dr Chris Hurt	Statistician	Cardiff
Ms Lucy McParland	Statistician	Leeds

Workstream 4: New Technology, Physics and Quality Assurance		
Name	Specialism	Location
Dr David Cutter	Clinical Oncologist	Oxford
Dr Shaista Hafeez	Clinical Oncologist	London
Dr Teresa Guerrero-Urbano	Clinical Oncologist	London
Mrs Julie Wolfarth	Consumer	Lincolnshire
Prof Karen Kirkby (Chair)	Physicist	Manchester
Dr Antony Carver	Physicist	Birmingham
Dr Sarah Gulliford	Physicist	London
Dr Jamie McClelland	Physicist	London
Dr Christopher South	Physicist	Surrey
Dr Aileen Duffton	Radiographer	Glasgow

CTRad General Membership: 118 members as of end of March 2021

Appendix 2

Clinical and Translational Radiotherapy Research Working Group & Workstream Strategies

A – Clinical and Translational Radiotherapy Research Working Group Strategic Vision 2018-2021

CTRad's **mission statement** - To maximise quantity and quality of life for patients receiving radiotherapy by optimising tumour control and minimising toxicity

Patient and Public Involvement (PPI) is a particular strength and priority of CTRad and has a key role in all five areas of the strategy. CTRad consumers will continue to develop the channels through which patient opinions, experiences and insights are heard within CTRad, thus providing a bridge for dialogue between patients and clinicians.

1) Evaluating and implementing technological advances

- a) Ensuring robust clinical evaluation through collaborative networks of adequately supported and funded radiotherapy centres.
- b) Prioritising early evaluation and adoption of new and emerging technologies ensuring maximum benefit for the national patient population.
- c) Horizon scanning to identify promising new technologies (recent examples include proton beam therapy, the MR-Linac, SABR, IGRT and adaptive radiotherapy).

Objectives:

- Nationally co-ordinated strategic planning for proton beam radiotherapy trial design funding and implementation.
- At least two national clinical trials of proton radiotherapy developed through the CTRad pipeline and submitted for funding.
- At least two trials evaluating MR-guided radiotherapy developed through the CTRad pipeline and submitted for funding.

2) Converting discovery science into patient benefit

- a) Building on the success of RaDCom to develop and execute robust assessment of novel RT-drug combinations through strong pre-clinical and clinical collaborations with Pharma.
- b) Designing and delivering scientifically driven, early phase clinical trials that bring together new knowledge of cancer biology and immunotherapy with novel imaging and radiotherapy technologies.
- c) Overseeing more rapid progression from discovery science to practice-changing trials through more efficient translational evaluation and definition of routes to registration.

Objectives:

- Implement a robust programme of pre-clinical radiotherapy QA.
- Increase the number of new agents being developed in collaboration with pharmaceutical companies in pre-clinical and early phase clinical research projects.
- Maintain an effective pre-clinical pipeline that underpins a portfolio of clinical trials evaluating novel radiotherapy-drug combinations.

3) Building the radiotherapy research workforce

- a) Developing a functional network of eight to ten Centres of Excellence (CoE) and utilising the outcomes of our CoE exercise to address gaps.
- b) Working with partners and stakeholders to increase funding opportunities for radiotherapy researchers across all of the relevant disciplines.
- c) Building capacity and establishing effective networks of expertise across tumour sites and technologies.
- d) Inspiring, training and mentoring the next generation of radiotherapy researchers.

Objectives:

- Identify the resources, investment and funding schemes required to bring the number of Established Centres of Excellence to six centres from the current three.
- Increase the number of applications for clinician scientist fellowships and/or lectureships.
- Work with funders to deliver at least one new post-doctoral funding scheme that will support successful transition of MD/PhD fellows into career researchers.

4) Integrating radiotherapy into precision medicine

- a) Promoting research aimed at increasing the accuracy and precision of radiotherapy by evaluating new treatment modalities, new image guided delivery methods and real-time adaptation of dose and volume during treatment.
- b) Facilitating progress in 'personalised radiotherapy' through integration of molecular and imaging biomarkers and patient recorded outcome measures.
- c) Unlocking the potential of radiotherapy 'big data' to inform individualisation of treatment by utilising dosimetric and imaging datasets from clinical trials and routine practice.

Objectives:

- Organise at least one 'Precision Radiotherapy' symposium at a major national or international cancer conference.
- Facilitate integration of molecular or imaging biomarkers into at least one multicentre clinical trial of a novel radiotherapy treatment or combination study.
- Lead the formation of a UK network that utilises large radiotherapy datasets to inform future treatment decisions.

5) Changing practice through a portfolio of innovative and collaborative clinical trials

- a) Leading the world in the design and delivery of high quality, high impact clinical trials that will change national and international practice.
- b) Championing robust evaluation of novel technologies and combinations.
- c) Realising the full scientific potential of clinical trial data by routinely integrating high quality translational research into study design.

Objectives:

- Maintain and further develop a world-leading portfolio of innovative clinical trials founded on strong science, clear clinical hypotheses and network-wide cross-specialty collaboration.
- Document and disseminate evidence of how UK radiotherapy clinical trials have influenced and changed national and international clinical practice and guidelines.

- Oversee routine incorporation of translational and health economic components into radiotherapy clinical trials to enhance their scientific richness.

Patient and public involvement

The success of PPI input depends on it being integral to each component of the strategic vision. We will continue to change practice by measuring what works and what doesn't so that we can continue to engage and inspire our community, which will include new members. Measuring PPI impact will be a key part of our work over the next three years.

Good impact reporting helps everyone to understand, engage, focus and work to achieve their vision. If we can establish and explain our impact, we will have a strong foundation upon which honest and open conversations can be built and the greatest possible impact achieved.

Our ambition for 2021 is that CTRad consumers will be able tell their stories clearly and fluently. These stories will reflect an active partnership between the public and researchers which will ensure that:

- research has relevance and asks the right questions
- outcome measures are acceptable and appropriate and measure what is important to patients and their families
- treatments are not duly onerous for participants
- better information is provided, enhancing recruitment and retention
- the patient perspective is considered in interpreting findings
- results are disseminated more effectively to public audiences
- consumer involvement is routinely reported in grants, trial management and outputs.

B – Workstreams Strategy

Workstream 1

Alignment with CTRad Strategic Vision 2018-2021

Strategic aim 2: Converting discovery science into patient benefit

- Implement a robust programme of preclinical radiotherapy QA
 - National programme of pre-clinical QA
 - Build links between UK academic researchers and industry
 - Input to QA data reporting criteria for publication
- Increase the number of new agents being developed in collaboration with pharmaceutical companies in pre-clinical and early phase clinical research projects
 - Interaction with Industry partners – via links with RadCom
 - Optimise opportunities for academic collaborations
 - Horizon scanning for priority projects, new funding and national/international partners
- Maintain an effective pre-clinical pipeline that underpins a portfolio of clinical trials evaluating novel radiotherapy-drug combinations
 - Access relevant tissue/blood from previous and current RT studies
 - Define network of research active labs in UK
- Promote interaction with PPI Groups with PPI input and signoff for specific projects
 - Information re benefits of pre-clinical work
 - Development of a vision for the role of PPI in preclinical work, including early involvement in projects
 - Clarity on how working with pharma can work well to demystify the relationship
 - Develop consumer information around the complexity of the science – radiochemistry, molecular radiotherapy, biobanking etc.

Alignment with CTRad Strategic Vision 2018-2021

Strategic aim 4: Integrating radiotherapy into precision medicine

- Facilitate integration of molecular or imaging biomarkers
 - Develop biomarkers for clinical studies
 - Gap analysis for sample collection and sharing

Alignment with CTRad Strategic Vision 2018-2021

Strategic aim 5: Changing practice through a portfolio of innovative and collaborative clinical trials

- Oversee routine incorporation of translational components into radiotherapy clinical trials to enhance their scientific richness
 - Input into study review meetings – ongoing WSI representation at workshops
 - Project-specific review and advice – proforma redesigned to encourage early discussion with WSI

Workstream 2

Objective	Mechanism for delivery	Outputs
Facilitate development of 3 projects building on novel combinations, proof of mechanism and optimal integration of drugs with Radiotherapy	<p>Demonstrate interactions with preclinical scientists, RaDCom, RadNet, WS1 and ECMC Combinations Alliance, demonstrating conversion of these interactions to early phase trials</p> <p>Provide mentorship and critical appraisal to all new proposals and cross link with WS1; assess if recommendations are implemented at application stage</p> <p>Facilitate workshops to engage all partners, working best science in to best clinical trials</p>	<p>RA/SB members of RadNet radiotherapy-drug combinations working group;</p> <p>Facilitators to proposals assigned from proposals guidance meetings</p> <p>RT-IO workshop planning</p>
Facilitate involvement of PPIE in developing optimised trial design/delivery and dissemination in all trials developed through WS2	Integrate PROMs evaluation in early phase studies, including for potential validation of PRO instruments, and ensure publication of PROMs results	Involvement in PROMs survey on use of PROMs in phase I clinical trials
Work closely with RadNet and other preclinical groups as well as translational and imaging scientists to aid integration of molecular or imaging biomarkers into trial development based on scientific hypotheses	Work with RadNet and other partners to integrate imaging into early phase trials, delivering at least one sub-study	<p>Reviewed RadNet centre workstreams to identify imaging components</p> <p>Membership of NIHR Imaging Group</p>
<p>Publish and/or promote experiences and recommendations for</p> <ul style="list-style-type: none"> methodologies for evaluating new drug-radiotherapy combinations 	<p>Publications on RT combinations in clinical trials</p> <p>Publish a paper on trial methodology for new drug-radiotherapy combinations</p>	<p>CONCORDE protocol paper published</p> <p>Methodology paper in draft for submission to Nat Rev Clin Onc</p>

Promote and adopt novel early phase methodologies to optimise future trial delivery	<p>Review paper on trials methodologies (as above)</p> <p>Share experiences/training of methodological approaches to radiotherapy trials</p>	<p>Methodology paper in draft for submission to Nat Rev Clin Onc</p> <p>Bitesize methodology workshop series launched</p> <p>NIHR early phase webinar on CONCORDE methods</p>
Run National Workshops to develop workforce and knowledge, including trainees	<p>Support applications to MCCR via mentorship, working with RCR</p> <p>Trainee participation in WS2 meetings and workshops</p>	<p>MCCR 2020 successful application supported</p> <p>Involvement in development of RT-IO workshop</p>

Workstream 3

Alignment with CTRad Strategic Vision 2018-2021

Strategic aim 5: Changing practice through a portfolio of innovative and collaborative clinical trials

Objective		
Maintain and further develop a world-leading portfolio of innovative clinical trials founded on strong science, clear clinical hypotheses and network-wide cross-specialty collaboration.	<ul style="list-style-type: none"> • Regular protocol guidance meetings • Improve link between protocol submitted and WS • Improve link between CTUs and RTTQA • Improve consumer feedback to CIs • Continue to upskill RT workforce by improved information on methodology • Update information on RADCAS 	
Oversee routine incorporation of translational and health economic components into radiotherapy clinical trials to enhance their scientific richness.	<ul style="list-style-type: none"> • Survey of current NIHR portfolio to investigate the frequency and extent of translational research • Assess Health Economics in current trial portfolio • Develop HE workshop 	

Alignment with CTRad Strategic Vision 2018-2021

Strategic aim 1: Evaluating and implementing technological advances

Objective	Key actions	
At least two trials evaluating MR-guided radiotherapy developed through the CTRad pipeline and submitted for funding.	<ul style="list-style-type: none"> • Support MRL proposals through proposal guidance meeting • Develop MRL working group • Protons not included here as predominantly under Proton development group 	
Document and disseminate evidence of how UK radiotherapy clinical trials have influenced and changed national and international clinical practice and guidelines. To provide a clear roadmap to showcase clinical impact from trials (failed example: ANTAC trial)	<ul style="list-style-type: none"> • Publications looking at changing practice from NCRI trials • Monitor national audits • Monitor National guideline 	

Alignment with CTRad Strategic Vision 2018-2021

Strategic aim 3: Building the radiotherapy research workforce

Objective	Key actions	
Inspiring, training and mentoring the next generation of radiotherapy researchers.	<ul style="list-style-type: none"> • Develop career pathways for research radiographers –organise radiographer research meeting in collaboration with the SCoR 	

Workstream 4

Main priorities (updated May 2021)

Evaluating and implementing Technological advances:

- UK strategy meeting for heavier ions (2-day workshop which culminated in a publication in BJR which presents a UK roadmap). This is being used by STFC to inform a funding proposal to UKRI. A working group in this area will be proposed to RADNET; The paper also proposes that any trials involving FLASH or heavier ions should be looked at via CTRad trials prioritisation meeting.
- Flash RT (Links in to PBT, but also brings in electrons, photons and heavy ions). In person workshop on 14th Feb 2020 (with CTRad) linking in to RadNet led to development of new conference series Flash Radiotherapy and Particle Therapy which also comprises

3rd FLASH workshop. More details can be found on the website <https://frpt-conference.org/>. First PBT FLASH clinical trial has opened in USA

- Real life data from wearable devices

Changing Practice through a portfolio of innovative and collaborative clinical trials

- Protons, linking closely in to clinical treatment and research activities in London and Manchester. 2 day meeting in collaboration with PBT clinical trials activity in March 2019. Also linking in to proton clinical trials activity (cross cutting). 3 PBT trials now funded and Torpedo kept open despite Covid-19 and is recruiting well
- Heavy ion and FLASH clinical trials

Integrating Radiotherapy in to Precision Medicine

- MR-Linac there is huge scope for future meetings on this subject and looking to develop national trials, using a similar model to that used for protons
- Imaging for motion management links in to MRlinac, PBT and other advanced RT modalities

Patient and Public Involvement

- A draft for a consumer workshop in PBT has been developed and presented to WS4. Based on feedback this will be adapted and presented to the CTRad Exec. It has been proposed that other advanced radiotherapy modalities develop similar consumer workshops and this will also be presented to CTRad Exec

Building the radiotherapy research workforce

- Career pathways radiographer meeting in collaboration with WS3 (completed 1 Feb 2021) and development of research pathway for radiographers

Converting discovery science into patient benefit

- Big data: ML and AI – linking in to RadNet –
- Mathematical modelling of the Impact of Covid-19 and also using big data approaches to investigate and interrogate data to extract information on the impact of covid-19 and its impact on radiotherapy delivery.

Workstream 4's top 3-5 priorities next 12 months (updated May 2021)

- Heavier charged particles, following on from initial workshop (linking in to RadNet) clinical trials to provide evidence base and working with funders and working through different scenarios
- Development of translational PBT research integrating in to PBT trials
- Proton consumer days
- FLASH RT (linking to RadNet) FRPT and looking towards first FLASH clinical trials integrated with proton clinical trials activity – and linking through to EPTN WP7 activity on health economics
- Career pathways – opportunities to link to HSST; Radiographer PhDs (RadNet); academic pathway for clin onc
- Big data: ML and AI – linking in to RadNet – impact of Covid-19 also bringing in data from wearable devices
- National initiatives on MR-Linac

- Imaging DIR workshop moved online

Appendix 3

Top 5 publications in the reporting year

Lewis PJ, Morris EJA, Chan CSK et al. COVID RT – Assessing the Impact of COVID-19 on Radiotherapy in the UK. A National Cancer Research Institute Clinical and Translational Radiotherapy Research Working Group Initiative in Partnership with the Royal College of Radiologists, the Society of Radiographers and the Institute of Physics and Engineering in Medicine. Clin Oncol. 2021; 33(1) 69-72. DOI:

<https://doi.org/10.1016/j.clon.2020.08.008>

Lowe M, Gosling A, Nicolas O et al. Comparing Proton to Photon Radiotherapy Plans: UK Consensus Guidance for Reporting Under Uncertainty for Clinical Trials. Clin Oncol. 2020; 32(7) 459-466. DOI: <https://doi.org/10.1016/j.clon.2020.03.014>

Walls GM, Oughton JB, Chalmers AJ et al. CONCORDE: A phase I platform study of novel agents in combination with conventional radiotherapy in non-small-cell lung cancer. Clin Transl Radiat Oncol, 2020; 25, 61-66. DOI: <https://doi.org/10.1016/j.ctro.2020.09.006>

Mir R, Kelly SM, Xiao Y et al. Organ at risk delineation for radiation therapy clinical trials: Global Harmonization Group consensus guidelines. Radiat Oncol. 2020; 150, 30-39. DOI: <https://doi.org/10.1016/j.radonc.2020.05.038>

Kirkby KJ, Kirkby NF, Burnet NG et al. Heavy charged particle beam therapy and related new radiotherapy technologies: The clinical potential, physics and technical developments required to deliver benefit for patients with cancer. Br J Radiol 2020; 93:20200247. DOI: <https://doi.org/10.1259/bjr.20200247>

Appendix 4

Recruitment to the NIHR portfolio

The radiotherapy recruitment data in the NIHR portfolio is not up to date at the time of submission of this report.

Prof Jon Wadsley, NIHR CRN Cancer Specialty Lead for Radiotherapy and Imaging, advised that relevant filters in the NIHR ODP Platform are being adjusted for searches to be made for radiotherapy studies. The Cluster Team and coordinating centre are working on this and it will take a while to ensure the database is up to date; the NCRI Executive will continue to work closely with them.



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