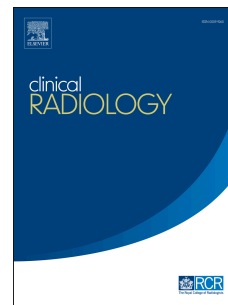# Journal Pre-proof

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NIHR Imaging Group. Who are we and what do we do?

S. A. Taylor[1], A. Darekar[2], V. Goh[3], S. Neubauer[4], A. Rockall[5], J. Solomon[6] on behalf of the NIHR Imaging Group and NIHR Imaging Champions

[1]Centre for Medical Imaging, University College London, Charles Bell House, 43-45 Foley Street, London W1W 7TS, UK

[2]Department of Medical Physics, University Hospital Southampton NHS Trust, Southampton, UK

[3]Cancer Imaging, School of Biomedical Engineering & Imaging Sciences, King's College London and Department of Radiology, Guy's & St Thomas' NHS Foundation Trust, London, UK

[4]Department of Medicine, University of Oxford Centre for Clinical Magnetic Resonance Research, Oxford, UK

[5]Department of Surgery and Cancer, Imperial College London, Hammersmith Campus, Du Cane Rd, London W12 0NN, UK

[6]NIHR CRN National Specialty Cluster, School of Life Course & Population Sciences, Faculty of Life Sciences & Medicine, King's College London, London SE1 1UL, UK

*Guarantor and correspondent: S. A. Taylor, Centre for Medical Imaging, University College London, Charles Bell House, 43-45 Foley Street, London W1W 7TS, UK. Tel.: ???

E-mail address: stuart.taylor@ucl.ac.uk

INTRODUCTION

The National Institute for Health Research, now the National Institute for Health and Care Research (NIHR), was established in 2006 essentially to promote world-class research within the National Health Service (NHS). Centred on England, the NIHR works closely with the devolved nations and works in partnership with the NHS, universities, local government, other research funders, and patients and the public and is funded by the Department of Health and Social Care (1). The NIHR funds primary research and also invests in the people and infrastructure needed to deliver research. The clinical research network (CRN) is the part of the NIHR that is soon to be rebadged as the NIHR Research Delivery Network. It supports the delivery of health and social care research, contributing to the costs of staff, training, facilities, and support services. There are currently 15 local CRNs (LCRNs) across England. The CRN supports research delivery through 30 speciality areas, each of which has in place a network of research expertise and clinical leadership to deliver NIHR portfolio studies. These specialties range from ageing, anaesthesia, cancer, and cardiovascular through to trauma and emergency care. Imaging is, however, not one of the 30 defined specialty groups, and so such infrastructure is currently lacking.

Imaging is a cross-cutting, rapidly developing, multidisciplinary specialty, which plays a key role in many patient pathways and convergence science. Much clinical research is crucially dependent on high-quality imaging. Imaging may be used in a supportive capacity, such as in the categorisation of response within a treatment trial, or may be the main focus of research, for example, where investigators explore technical aspects, diagnostic accuracy, or study imaging as a predictive or prognostic biomarker. In addition, research may measure the impact of imaging in determining treatment planning and the associated patient outcomes and health economic benefits.

Undertaking high-quality primary imaging research remains very challenging and is typically limited to a select number of academic centres. Furthermore, delivering imaging in a support capacity is difficult, with issues around scanner capacity, costing, and workforce availability and expertise (2).

Against this backdrop, and following a multidisciplinary scoping meeting held in September 2019, the NIHR Imaging Group was founded in 2020 to address the need for a single coordinated body within the NIHR for those involved in imaging research. Initial funding was secured by Specialty Cluster C (part of the CRN Coordinating Centre's (CRNCC) Medical Directorate) from CRNCC reserves. The overall aim of the Group is to bring together a multidisciplinary community of practice to make a visible, coordinated, and effective contribution to scientific advances in imaging research, support the development of the imaging research workforce, improve the delivery of imaging research in the NHS, and enable a much more effective and coordinated approach to collaboration with industry partners.

The Group is overseen by a steering committee and has three working groups: Imaging Science, Workforce, and Research Delivery. Membership across the various groups (Electronic Supplementary Material Appendix S1) includes representatives from the Imaging Champions (see below), NIHR LCRNs, NIHR Biomedical Research Centres (BRCs), *NIHR Office for Clinical Research Infrastructure* (*NOCRI*), members of the public, Radiology Academic Network for Trainees (RADIANT), and representatives from the three key professional bodies: the Royal College of Radiologists (RCR), the Society of Radiographers (SoR), and the Institute of Physics and Engineering in Medicine (IPEM).

The Group works closely with each of the 15 LCRN's "Imaging Champions", (Electronic Supplementary Material Appendix S2) who are appointed to provide local leadership to expedite the development and delivery of imaging research in their network. The Group aims to increase the visibility of the Imaging Champions and collate feedback to identify areas of need to inform work group activities. To date, funding models for Imaging Champions differ between LCRNs, with only a minority currently providing funding for ring-fenced time.

Below is an update on the challenges prioritised by each working group and their work to date. Further details can be found on the NIHR Imaging Group website (3).

IMAGING SCIENCE WORKING GROUP

The Imaging Science Working Group focuses on primary imaging research. Individuals undertaking primary imaging research face a number of challenges, including determination of appropriate study design and methodologies often unfamiliar to traditional clinical trials units (CTUs), technical challenges regarding application of consistent image-acquisition protocols at multiple sites, transfer and storage of large datasets, complex integration with other clinical meta-data, privacy and confidentiality in data handling and transfer, and the changing landscape, in particular, related to artificial intelligence (AI) research and development.

The Imaging Science Working Group has set a series of short- and longer-term goals. In the short-term, the Working Group has produced an organogram (Fig. 1) illustrating the current complex landscape in digital research to identify the gaps where the NIHR Imaging Group could contribute. Members of the Working Group have direct links with

the BRCs, RCR, NHS England, Health Data Research UK (HDRUK), and the NIHR Centre for Business Intelligence to avoid duplication of effort. The group has created a database of current open-access imaging repositories, which can be accessed at https://sites.google.com/nihr.ac.uk/nihrimaginggroup/support-for-imaging-research/imaging-data-sets.

Following a survey, a list of CTUs with specific capabilities to run imaging trials has also been created (https://sites.google.com/nihr.ac.uk/nihrimaginggroup/support-for-imaging-research/ctus-with-imaging-capacity). A comprehensive list of studies on the CRN portfolio in which imaging is pivotal and/or the primary research focus is under development to formally document the importance of imaging for the NIHR, and to inform future strategy. One intended medium-term output of this endeavour is the creation of an imaging dataset repository for portfolio studies, in collaboration with relevant stakeholders. A next step would be integration of software to support large-scale image data labelling, likely working with the National Cancer Imaging Translational Accelerator (NCITA) programme (https://ncita.org.uk/). Longer-term goals are the development of NIHR-supported imaging CTUs to deliver primary imaging research in the NHS, and to create a repository of exemplar documents, for example, data-sharing agreements, imaging dataset anonymisation protocols, and collaboration agreements for use by the imaging research community.

WORKFORCE WORKING GROUP

The NHS imaging workforce crisis has impacted on academic multidisciplinary workforce development, and radiology research capability and delivery, as highlighted by recent imaging stakeholder surveys (2, 4-6). The goal of the Imaging Workforce Group is to support the development of the NHS imaging research workforce, growing

imaging research at all career levels. The group focuses on building academic opportunities, promoting retention, and expansion. One short-term goal recently achieved is the publication of a workforce gap analysis (7) based on membership surveys of the stakeholder groups and feedback from NIHR Clinical Research Network Imaging Champions.

Working closely with stakeholder organisations, e.g., RCR, SoR, IPEM, the Group promotes participation in workforce development schemes, such as the NIHR-Academy of Medical Royal Colleges (NIHR-AoMRC) Clinician Researcher Credential framework and NIHR Associate PI schemes, and disseminates opportunities in the NIHR Academy, including the Integrated Academic Training (IAT) programmes, clinical lectureships, and fellowships programmes (pre-doctoral, doctoral and postdoctoral). The Group includes representation from the highly successful RADIANT radiology trainee network (https://www.radiantuk.com). To raise visibility of NIHR imaging research activity, the group launched the 'I am an imaging researcher' campaign (#imagingresearcher) (8), coinciding with the International Day of Radiology in November 2021. The campaign featured stories, both video interviews and quotes cards, from a diverse range of imaging researchers and was repeated in 2022. Plans have not yet been finalised for 2023.

The Group's medium- to long-term goals include developing a multidisciplinary national support network for imaging researchers, auditing the outcomes of NIHR-integrated academics (survey data currently submitted for publication), exploration of flexible funding for clinical research time in the NHS through various sources, and building on partnership working between the NIHR and RCR, including setting up joint clinical research fellowships.

RESEARCH DELIVERY WORKING GROUP

Geographic inequalities increasingly challenge the delivery of primary imaging research and the provision of imaging support to clinical trials. Imaging capacity within the NHS is currently insufficient, due to both staffing and equipment shortages, exacerbated by the COVID-19 pandemic. There are also challenges in cost allocation (including AI research) and funding to support imaging research activity. The Working Group aims to help address some of these challenges.

In 2020, the group conducted a national survey to evaluate the barriers to delivery of timely, reliable, and high-quality imaging services for research, which is now being repeated post-pandemic, linking with the NIHR restart framework (9). Working with the CRNCC, the group has devised a set of exemplar research studies to clarify how imaging costs should be correctly allocated using the Attributing the Costs of Health and Social Care Research and Development (ACoRD) framework (10). A second document will then use these exemplar case studies to produce a framework for how individual hospitals can efficiently measure their research activity (including support activity) and retrieve this cost from the appropriate funding sources. In the medium-term the group aims to explore the set-up of regional networks to support imaging research, perhaps using a hub-and-spoke approach to provide greater flexibility in providing imaging capacity. Such networks could include mentorship for sites less experienced in delivering imaging research. Longer-term, this work also aims to explore increasing access to imaging platforms in collaboration with private providers and NHS Imaging Networks/Community Diagnostic Centres.

ONGOING DEVELOPMENT AND FORWARD LOOK

The Imaging Group currently has funding until March 2024 (mainly for administrative support). A priority is to secure funding from the NIHR beyond this date. A process of working group membership renewal has recently been completed, with positions being advertised on the group website and through stakeholder organisations.

A joint, face-to-face NIHR National Imaging Group/BRC Imaging Themes took place in Oxford on 20 March 2023. This meeting was a direct collaboration between the National BRC Imaging Network and the NIHR Imaging Group showcased the work of both groups.

Overall, the NIHR imaging group has increasing visibility within the NIHR structure, with a range of collaborative opportunities developing. The formation of a single coordinated body within the NIHR for those involved in imaging research will better equipe the speciality to address the many challenges it faces in the short and longer term.

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Figure 1. Organogram illustrating a range of stakeholders involved in digital/AI research, education, regulation, and implementation. Knowledge of the current landscape is important for the NIHR Imaging Group to avoid duplication and identify areas of unmet need. DB, database; SOR, Society Of Radiographers; BIR, British Institute of Radiology; RCR, Royal College of Radiologists; UKRI, UK Research and Innovation; ISCF, Industry Challenge Fund; CRUK, Cancer Research UK; NCITA, National Cancer Imaging Translational Accelerator.

SOR
Education and Training
Delivery for imaging
repositories

BIR
Education and Training
Delivery for imaging repositories

RCR
Education and Training
Evaluation/trust pilot role
Data curation challenges
Radiant network

NIHR Imaging Science WG
Document repository
DB NIHR imaging studies
DB BRC Network
DB for Imaging CTU
NIHR Guidance for image data curation
Software repository for anonymization

NIHR BRC
Imaging collaboration network
Annual Imaging Research Day
Contribution to Imaging Repository data

Regulators
MHRA
British Standards

UKRI/ISCF
5 centres of excellence
Work on inter-operability
Hubs for federated learning

CRUK NCITA
Image Repository data
Imaging research CTU

NHS England's Transformation Directorate
Hardware infrastructure
Linkage between sites
Standardisation of anonymization protocol

NIHR
NIHR Research Delivery Network
Imaging research CTUs
Imaging champions
NIHR Imaging research delivery and workforce
working groups
Potential contribution to image repository

NHS Scotland Data Safe Haven
Scottish National Image Repository

Declaration of interests

☐ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

☒ The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

All authors sit on the NIHR Imaging group