

Advancing imaging biomarker development and translation through the National Cancer Imaging Translational Accelerator (NCITA)

It is estimated that someone is diagnosed with cancer every two minutes in the UK. Clinical imaging offers a minimally invasive way of diagnosing and managing a variety of cancers. The National Cancer Imaging Translational Accelerator (NCITA) consortium now provides researchers with the infrastructure to conduct high-quality, multi-centre clinical research in the quest to develop standardised imaging biomarkers and accelerate their translation into clinical use. The NCITA consortium and collaborators aim to improve clinical outcomes for patients through early cancer identification and new treatment discoveries.

In 2019, a Cancer Research UK Accelerator Award funded the establishment of a new translational cancer imaging research infrastructure known as the National Cancer Imaging Translational Accelerator (NCITA). NCITA is based on the foundation of long-standing collaborations between several departments across University College London (UCL) and King's College London (KCL) since 2008, when the Comprehensive Cancer Imaging Centre was established. NCITA provides extensive infrastructure across nine centres of excellence for cancer imaging in the UK, namely: UCL, University of Oxford, the University of Manchester, University of Cambridge, Institute of Cancer Research London (ICR), Imperial College London, KCL, The University of Glasgow and Newcastle University.

The goals of NCITA are to provide specialised infrastructure support for multicentre clinical imaging research to develop standardised quality assured methods for imaging biomarker qualification and to accelerate these

biomarkers into clinical practice in the NHS. Other objectives include the safe storage of research data (a data repository) to enable data sharing for collaboration between institutions, and training and development of professionals from multiple disciplines to ensure a highly skilled network of staff. NCITA is also engaging with key imaging stakeholders from the NHS, industry, regulators, funding bodies and Patient and Public Involvement (PPI), to agree consensus guidelines for standardising the imaging biomarker qualification pathway. Using advanced imaging technologies and based on a foundation of collaboration and knowledge sharing, the NCITA consortium brings a promise of change in cancer management and treatment and a move towards personalised medicine for cancer patients.

CUTTING-EDGE INFRASTRUCTURE

NCITA offers access to a range of cutting-edge clinical imaging techniques including both nuclear medicine and Magnetic Resonance Imaging (MRI) options. Nuclear medicine imaging techniques, such as Computed Tomography (CT) and Positron Emission Tomography (PET), use radioactive methods to produce images for the diagnosis of diseases. NCITA also supports a range of MRI techniques from whole-body MRI to novel methods such as oxygen-enhanced MRI (OE-MRI). Hybrid modalities such as PET-MRI and PET-CT are also accessible.

A variety of professionals make up the NCITA network including research scientists, oncologists, medical imaging experts and physicists. Together they provide the knowledge



The NCITA consortium works to provide the infrastructure necessary to develop quality-assured imaging biomarkers for clinical use.

and expertise to develop imaging protocols that are standardised, and remove variability introduced in clinical trials when different scanners and personnel are used. Such a consensus approach aims to improve cancer diagnosis and classification as well as treatment management.

There are eight core exemplar studies that demonstrate the translational benefits of the NCITA infrastructure in supporting multicentre clinical imaging research studies for imaging biomarker qualification. Additionally, NCITA adopts and supports other clinical studies with twenty-five studies currently adopted.

(translating research findings into clinical benefit for patients).

The NCITA CTU helps researchers access funding applications by supporting their host institution study set-up and governance. For example, in 2021, the CTU submitted five applications to ethics and regulatory committees for both exemplar and adopted studies. The CTU plays a key role in supporting NCITA's exemplar studies and also eleven adopted studies (examples include trials into the use of MRI in the diagnosis of prostate cancer and a study using PET-CT to assess the response to radiotherapy in oesophageal cancer, among others).

The QA/QC unit is also establishing a national MRI Core Lab, to support and monitor sites involved in MRI clinical studies and quality assure MRI biomarker development and qualification for clinical use. PET imaging standardisation and quality assurance is achieved through a close collaboration between NCITA and the UK PET Core Lab based at St Thomas' Hospital in London.

The NCITA Image Repository Unit provides quality-assured processes and advanced image analysis abilities using artificial intelligence (AI) and innovative machine learning tools. AI tools are also being developed to annotate images for radiologists, and the Repository Unit collates datasets to aid development of AI tools. The unit is developing technology to enable clinicians to join 'virtual tumour boards' enabling joined-up thinking and analysis of biomarker data. Additional repository nodes at the University of Cambridge, Imperial College London, and the University of Manchester, will expand these capabilities further. Safe data storage for analysis and sharing is a crucial element of the Repository Unit with short- and long-term storage options available to researchers. Soon, advanced database integration will enable researchers to collate and search

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Embedded in the infrastructure are three units and three activity groups. The imaging clinical trials unit (CTU), the quality assurance/quality control (QA/QC) unit, and the repository unit, combined with the engagement, training, contracts management and governance groups, work together to bring about the common goal of clinical translation

The purpose of the QA/QC unit is for image acquisition, processing, and analysis standardisation as well as overall quality assurance. This is fundamental to NCITA as robust and reproducible imaging data are needed to qualify imaging biomarkers and translate these into clinical practice to improve early diagnosis and treatments for patients.



Clinical outcomes will be improved through early identification of cancers and better treatment.

data from a number of collaborating institutions, expanding a rich source of data in cancer research.

Two recent publications by Dr Martina McAteer and colleagues, namely, 'Introduction to the National Cancer Imaging Translational Accelerator (NCITA): a UK-wide infrastructure for multicentre clinical translation of cancer imaging biomarkers' in the *British Journal of Cancer*, and a blog 'Delivering high quality clinical imaging research' published by the Association of Medical Research Charities, provide a useful overview of NCITA's unique infrastructure and expertise for multicentre clinical nuclear imaging and MRI studies. A recent review article by NCITA entitled 'An Overview of Nuclear Medicine Research in the UK and the Landscape for Clinical Adoption', in the *Journal of Nuclear Medicine Communications*, provides a useful overview on the current nuclear imaging research landscape in the UK. In addition, open channels of communication via the NCITA website and social media ensure researchers and



UK institutions involved in the consortium.

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the public are kept updated on progress and plans. Training and development – both highly important themes – have been achieved so far by running workshops, webinars, and a national NCITA annual conference.

THE FUTURE: STRONGER TOGETHER

Key to success is the close alliance between research aims and health service needs. Through engagement and close communication with stakeholders including NHS representatives, regulatory bodies, charities, PPI, and the Cancer Research UK Commercial Partnerships team, NCITA aims to advance the translation of imaging biomarkers into clinical practice in the NHS to help patients who need it the most. Through both academic and industry-based domestic

and international collaborations, NCITA aims to develop and sustain its capacity and support. An example is NCITA's current international collaboration with Stanford University and Oregon Health and Science University, USA, on the [International Alliance for Cancer Early Detection \(ACED\) programme](#). ACED is a partnership between Cancer Research UK, Canary Center at Stanford University, the University of Cambridge, OHSU Knight Cancer Institute, University College London, and the University of Manchester.

Cancer imaging is core to NCITA but the consortium also seeks collaborations for imaging biomarker development in other diseases. It is hoped that through shared learning in other diseases, imaging protocols and AI algorithms for cancer detection may be improved. NCITA

therefore provides an extensive imaging infrastructure for cancer studies and research into other diseases. Currently, the UK National COVID-19 Chest Imaging database (NCCID) is hosted in the NCITA Repository Unit, an example of how the NCITA infrastructure can support all types of research. Preferably before submitting funding applications, researchers are encouraged to get in touch with NCITA to discuss the infrastructure and support on offer for their research proposal by emailing ncita_general@ucl.ac.uk or visiting the NCITA website and using the [contact form](#).

This consortium provides novel state-of-the-art infrastructure, enabling collaboration at a time when joint thinking and knowledge sharing is more important than ever. Through innovative thinking and working together, gaps in our knowledge and treatment of various cancers can be addressed. Over the course of five years, NCITA, with Cancer Research UK Accelerator funding, gives us a promising opportunity to shorten the time between vital clinical imaging research discoveries and their implementation in clinical practice to improve patient diagnosis and healthcare.

Behind the Research



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W: www.nature.com/articles/s41416-021-01497-5 **W:** www.commercial.cancerresearchuk.org/imaging

Research Objectives

The National Cancer Imaging Translational Accelerator (NCITA) consortium works to advance the standardisation and translation of quality-assured cancer imaging biomarkers for clinical use.

Detail

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leads engagement communications for NCITA's multi-site projects and coordinates the NCITA engagement group and consensus group activities.

Funding

Cancer Research UK – Accelerator Award

Bio

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Professor Geoff Higgins is an NCITA governance group member and Chair of the NCITA engagement group, and is based at the Department of Oncology, University of Oxford.

Collaborators

Cancer Research UK Commercial Partnerships team

References

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Personal Response

Currently, what are the main challenges you face in the implementation and management of NCITA infrastructure and studies, and how are these overcome to ensure the aims of the funding are met?

“ The UK is at the forefront of clinical imaging research, yet the translation of new imaging techniques into clinical practice remains challenging. NCITA aims to overcome this challenge by providing a specialised integrated infrastructure for imaging biomarker qualification and clinical translation. Through a collaborative approach with our partners across academia, industry, the NHS, and the Cancer Research UK Commercial Partnerships team, we will ensure our discoveries are fully validated for clinical application. Given the impact of the COVID-19 pandemic across the cancer diagnosis pathway, our collective efforts to integrate imaging research are more important than ever to ensure we meet our funding aims of driving improvements in early diagnosis and treatment of cancer patients. ”