

# Research breakthroughs **Our future plans and the successes behind them**

Latest update from NIHR University College  
London Hospitals Biomedical Research Centre





## Welcome

Welcome to our latest UCLH biomedical research centre (BRC) magazine. We're taking the opportunity to tell you about just some of our plans for the future, and the achievements behind them. At the end of 2022, after a long and intensely competitive process, we were delighted that the National Institute for Health and Care Research (NIHR) recognised our outstanding translational research vision and partnership across UCLH and UCL, with

one of only two BRC research awards over £90m for the next five years. This is recognition of our exceptional clinical research infrastructure, our bold research strategy and most of all, our outstanding people. Our vision is focused on transforming patient outcomes, safety and experience, through world class research. Improving access to research and addressing inequalities in health outcomes by preventing and tackling the diseases that reflect those inequalities. As well

as training the next generation of research leaders and skilled research delivery staff. In the pages that follow, we highlight, in no particular order, our strengths, and the exciting new future we are planning. I hope you enjoy reading all about them.

### **Professor Bryan Williams Director**

Director, NIHR University College London Hospitals (UCLH) Biomedical Research Centre  
Director of Research, UCLH

# Driving digital health research forward to include everyone

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**BRC research teams work under a principle of digital equality of opportunity in order to 'leave no patient out' from research.**

UCLH and UCL have become leaders in data-driven and digital medicine research. One special feature of this work is that researchers use data from comprehensive nationwide samples spanning birth to death, and they combine this with more detailed records of health and disease generated by patients and their doctors locally at UCLH.

UCLH and UCL believe research for a person with one condition is as important as research for a person with another condition, regardless of who is affected or how many people are affected.

For example, among 56 million people in England, BRC research has shown how multiple health datasets, when joined up, help to piece together the health experience of people over time. There are few, if any, countries in the world who have such a scale and comprehensive coverage of health data.

Our researchers have built tools and methods to work with these national data and have led efforts to identify and visualise patterns of multimorbidity across ethnic groups and at different stages in the life course for 308 diseases – substantially more than any previous study.

Importantly UCL and UCLH researchers have defined these diseases using open, reproducible methods, and are now extending this to cover thousands of standalone diseases captured using the International

Classification of Disease (ICD-10th revision) codes.

Early in the COVID-19 pandemic, the UCLH BRC team offered the public a mortality risk calculator according to underlying health conditions. BRC funded investigators also led the national VIVALDI study, which integrated routine data with serial blood sampling in care home residents and staff to generate critical insights into COVID-19 infections

and immunity, informing the use of public health control measures to limit the spread of infection.

Now research teams are trying to join up such emerging insights from national data with local data on the patients diagnosed and managed at UCLH. Working with a patient-led Data Trust Committee, researchers at the BRC have recently been able to securely access anonymised data on patients treated at UCLH.

Since UCLH implemented its electronic health record system in 2019, 1.7 million patients have attended UCLH Outpatients, A&E or have been admitted. Working with clinicians and patients researchers seek to learn new insights to research new treatments, and to improve the quality of care offered to patients at UCLH.

## How using large datasets can answer medical questions

A large European-wide study which in the UK was co-ordinated at UCLH and UCL found that high blood pressure and treatments to control it do not increase the risk of hospitalisation and death from Covid-19.

The CAPACITY COVID study resolved a key question during the pandemic of whether high blood pressure and its treatments were linked to poorer outcomes from Covid.

Using data spanning 12 countries and over 9,000 patients, the

research team found that when adjusted for age and other conditions linked to hypertension such as diabetes, obesity and advanced kidney disease, there was no link between high blood pressure and the risk of worse outcomes from Covid. The study highlighted the importance of large, well-curated datasets that can be analysed to answer important questions.



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## AI tool predicts number of A&E patients admitted into hospital

An AI tool developed by UCL alongside UCLH is being used to predict how many patients coming through the emergency department will need to be admitted into the hospital, helping planners manage demand on beds.

The tool estimates how many hospital beds will be needed

in four and eight hours' time by looking at live data of patients who have arrived at the hospital's emergency department.

The tool is responsive to real time changes in patient demand and characteristics. Once refined it will improve patient experience and outcomes.

# More cancer patients to benefit from CAR T-cell therapy

Greater numbers of patients will benefit from a revolutionary approach to treating cancer as researchers at UCLH and UCL continue to develop and refine CAR T-cell therapy.

UCLH hosts the largest CAR T-cell therapy programme in Europe, and the second largest globally.

UCL and UCLH have been key to developing and refining the therapy in which T-cells – part of our immune system which normally kill infected cells – are taken from a patient's blood and 're-programmed' to recognise and kill cancer cells before being injected back into the body.

The ultimate beneficiaries have been patients, with treatment given on CAR T trials saving lives which would otherwise have been lost to cancer.

Researchers will continue refining the treatment, both to increase

the efficacy of CAR T-cells, and to minimise the harmful immune response that can occur in some patients, when the immune system is over-activated after treatment.

CAR T therapy has already shown promise in blood cancers such as relapsed B-cell acute lymphoblastic leukaemia (B-ALL).

And it is now being given to patients with relapsed/refractory B-Cell Non-Hodgkin's Lymphoma (B-NHL) and chronic Lymphocytic Leukemia (CLL) – the most common type of blood cancer – and Small Lymphocytic Lymphoma (SLL).

## CAR T in solid tumours

Over the next five years BRC supported teams will trial the therapy in solid tumours – a big step in the research.

Researchers led by Dr Martin Pule at the UCL Cancer Institute have already found a way to modify T-cells so that they can kill solid tumour cells.

But a difficulty has been that the activity of these T cells drops after a few weeks – much sooner than would be the case in blood cancers – with the tumour and its surroundings becoming accustomed to the modified T-cells.

There are other challenges too. Identifying features of solid tumours to target is challenging because a lot of these 'targets' also exist on normal cells. In addition, solid tumours are often made up of lots of different types of cancer cells, and it can be tough to target all of these cancer cells at the same time.

## Personalising TB risk prediction and treatment

Worldwide, TB is amongst the most common infectious diseases that cause death. Infection with the bacteria that cause TB is common, but most people do not develop the disease.

Through the use of new markers of disease in the blood and data-driven risk prediction models, infection researchers are to look for new ways of predicting who is most likely to develop disease after being exposed, in order to offer targeted preventative antibiotic treatment.

And for patients who do go on to develop TB disease, research will aim to find new ways of personalising antimicrobial therapy – so that the

duration of therapy can be tailored to each patient, using biomarkers to monitor ongoing response to treatment.

Work will be carried out by infection researchers in collaboration with multi-morbidity and inclusion health researchers.

Professor Maddy Noursadeghi, BRC Infection, Immunopathology & Immunotherapeutics theme co-lead, said: “Our focus is on targeted and personalised risk prediction, prevention and treatment, to improve outcomes for these patients, some of whom come from groups which have been historically marginalised.”

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## Better ways of predicting patient outcomes in critical care and surgery

Researchers are working to devise new and better ways of predicting how a patient’s condition will progress when they are in critical care or after major surgery.

Better predictions of possible complications would help hospital teams reduce risk and manage resources. For example, accurately identifying the highest risk patients might help triage to critical care following surgery.

Teams led by Professor Ramani Moonesinghe and Dr Steve Harris will make use of the latest technology to predict patient outcomes, including analysing data in real time from the hospital’s electronic health record system, as well as from devices such as wearable monitors. The research will

also target health inequalities, which increases the chances of worse health outcomes in patients from some ethnic minorities, or who live in more deprived areas.

The work is part of the BRC’s Critical and Perioperative Care theme. Perioperative care refers to care given at or around the time of a patient’s surgery.

Professor Moonesinghe said: “By improving prediction of patient outcomes we will be able to offer more personalised treatment to our patients, including making sure they are in the right place of the hospital at the right time for them. The development of these risk-prediction models will also enable the hospital to manage its resources as effectively as possible.”

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Better risk prediction could reduce health inequalities as some ethnic and socioeconomic groups are likely to have worse outcomes

# Could gene therapies be the future treatment for neurological diseases?

Our neurology and dementia researchers will be carrying out multiple first-in-human and early phase genetic studies in neurological diseases.

Many neurological diseases cannot be cured with current treatments, but they are potential candidates for gene therapy, an approach that can correct the genetic abnormalities contributing to their development.

Therapies can range from correcting a genetic defect, to adding genes which change the way nerve cells behave.

Gene therapy techniques are now becoming available thanks to a better understanding of the development of neurological

disease and the development of treatments that can effectively target cells in the central nervous system.

At UCLH and UCL, teams will be analysing genetic data from patients to understand and predict how Alzheimer's disease progresses.

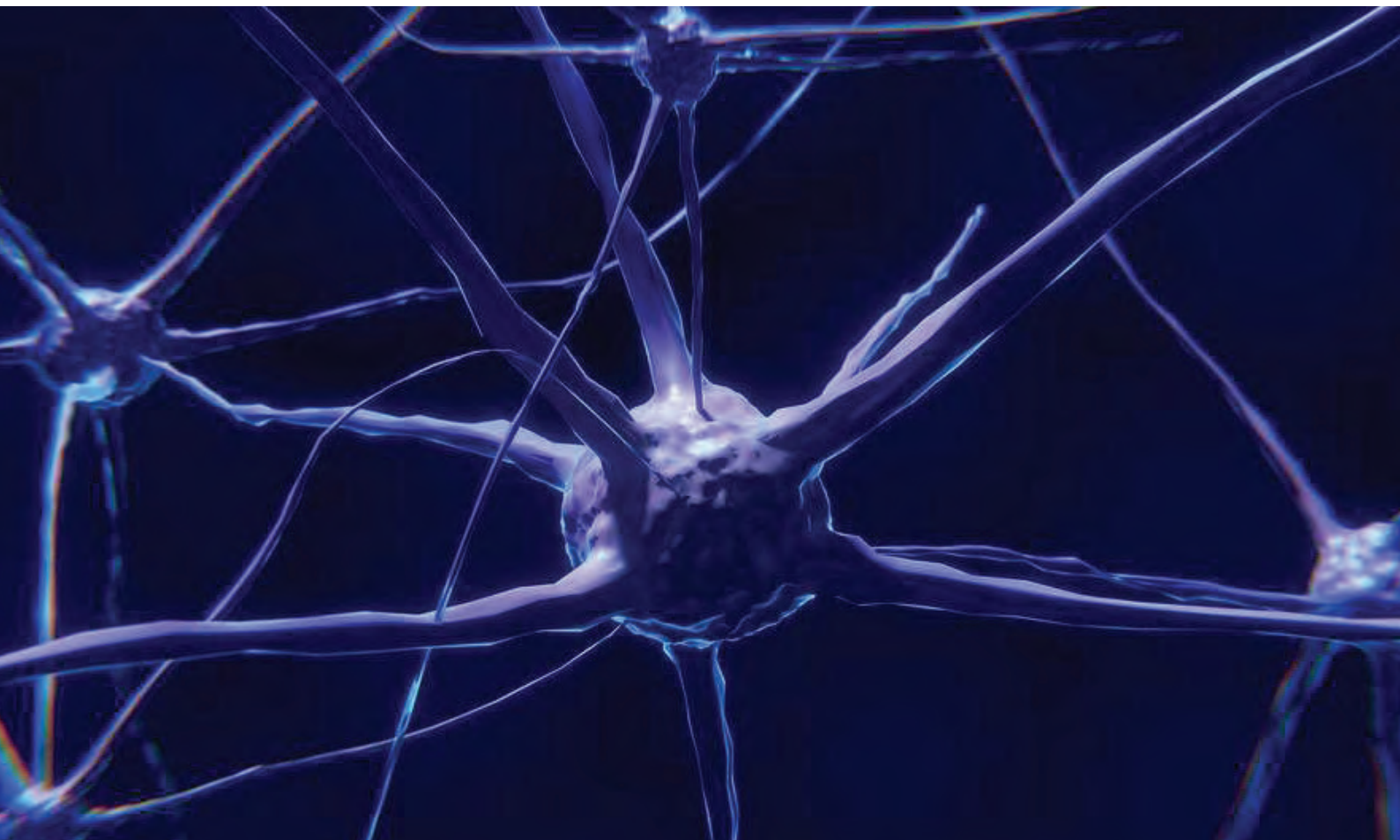
After identifying 'genes of interest' researchers will then look for ways to 'knock out' these genes – using CRISPR technology – and in this way prevent onset or progression of disease.

Epilepsy researchers will continue to work on a gene therapy they have developed which is only expressed in cells that participate in the generation of seizures.

This therapy could in future be extended to many other disorders such as Parkinson's disease, schizophrenia, pain disorders and even dementia.

Genetic therapies will be trialled in patients with conditions including Alzheimer's disease, Huntington's disease, motor neurone disease, epilepsy neuromuscular disease and other conditions.

In many trials it will be the first time in the world that a treatment will be looked at – with work done at the only NIHR-supported neurodegeneration-specialised Clinical Research Facility and the Dementia Research Centre at UCL.



## Transforming hearing care and testing

Work by UCLH and UCL researchers is revolutionising how hearing problems are diagnosed and treated.

Hearing loss affects 1.5 billion people worldwide with a profound and costly impact on social, mental, and physical health, but current treatments and diagnostic approaches do not meet patient needs.

Research has found current hearing tests fail to capture the difficulties patients experience in daily life.

NHS audiologists rarely test understanding of speech, the main problem for people with hearing loss, as tests are regarded as too difficult and expensive.

Tests for memory loss rely on good hearing and fluency in English, making tests unreliable for older people with hearing loss and with different first languages.

To address these issues, our researchers have worked with hearing technology companies to develop easy-to-use and freely available hearing tests that capture real life problems for people with hearing loss including understanding of speech in quiet and noise, and identifying the direction of speech.

They also adapted memory tests so they can be done with text and images on an iPad or computer.

## Making specialist hearing care accessible to everyone

Hearing care can be difficult to access for many, because it involves multiple visits to different NHS professionals and services.

Our hearing researchers have developed a remote ear and hearing service that has transformed the way patients with hearing problems receive care.

Working with high street providers and technology companies, researchers set up clinics in London communities and trained local audiologists to use specially developed hand-held, mobile equipment to remove earwax, undertake ear examinations and perform hearing tests.

The results were streamed digitally and securely to hospital specialists for remote review. This new service made hearing care much more efficient with 65% of patients not needing a hospital visit. Researchers are currently working with NHS

partners to expand this award winning service together with the newly developed hearing and memory tests to two million people across North London communities.

Professor Anne Schilder, who leads the BRC's Hearing Health theme, said: "Our approach to testing means we are putting patients' needs and expectations first, and the community care we are expanding will improve care for patients, making it more convenient for them and reducing the number of people who need to attend hospital for an appointment."

Mr Nish Mehta who co-leads the theme, said: 'It is an exciting time for patients and professionals as new treatments that may protect or restore hearing in patients with specific types of hearing loss are being studied in clinical trials.'

# Patients work with researchers on new trials in lung disease

Researchers will be working with patients to prioritise and design clinical pathways and trials in inflammatory and fibrotic lung disease (ILD).

Researchers will first work with a patient group to determine the acceptability of certain procedures, already established clinically, which researchers plan to use.

These include home-based spirometry – a simple test which measures how much air a person can breathe out in one breath – and bronchoscopy, where samples (known as washings) are taken from the lung using an instrument inserted into the airways. As they come straight from the disease site, washings may be more sensitive to changes in the lung than a blood test.

Conversations between patients and clinicians will shape the design of clinical trials looking at early detection and management of acute deterioration in ILD.

Work with patients will be through the charity Breathing Matters – part of UCLH Charity – which supports UCLH and UCL respiratory research.

Professor Joanna Porter, BRC Immunopathology subtheme lead, said: “Working closely with our patient partners means that the research we go on to do will be rooted in patient input and preferences. This approach will lead to more successful delivery of research.”





## Innovative trial designs speed up treatment development

Researchers will be using novel clinical trial designs which enable studies to be done more quickly and efficiently so promising treatments can be brought to patients sooner.

‘Multi-arm’ studies – where multiple treatments are trialled in parallel – have already been done at UCLH and UCL. In 2018 a team led by consultant neurologist Professor Jeremy Chataway completed a trial in multiple sclerosis called MS-SMART, published in *Lancet Neurology* in 2020. In this trial three different drugs were tested at the same time against a placebo arm, instead of doing three separate trials (each trial testing one drug versus placebo) – a world first in progressive neurological disease research.

Designing a trial with multiple drugs is a complex statistical

exercise, despite it being a simple concept, which is why it hasn’t routinely happened in the past.

Professor Chataway will now lead a trial using a multi-arm, multi-stage (MAMS) trial design in patients with progressive MS – the first ever trial of this kind in multiple sclerosis. The trial is called OCTOPUS and is funded by the UK MS Society.

A MAMS trial aims to test multiple experimental drugs at the same time and it seamlessly integrates traditional phase 2 and 3 evaluations into a single trial.

The drugs in the trial can be given to more participants if they show promise – or be removed from the trial if they do not. This flexibility means different ‘stages’ of research can be done in one trial: usually, offering a treatment to a wider group of participants

and obtaining results about the drug’s efficacy sooner than with traditional trial designs.

Professor Chataway said: “Running these studies speeds up the development of new treatments. These studies mean we can be flexible and adapt to what we see during a trial: if a treatment looks effective, we can quickly open up access to new patients, and move it from an initial stage to a second stage; and if a treatment does not appear to be helpful, we can remove it from a study, and add in an alternative potential treatment. And while the speed of research is good for patients and good for research teams, it is also saves money, which means that more trials can be run.”

## Can treating oral disease tackle other diseases?

UCL and UCLH researchers will be looking at what links oral diseases to disorders of other body tissues and organs such as cardiovascular disease and diabetes, and will be running clinical trials to address multiple coexisting diseases at the same time.

Oral diseases affect 50% of the world's population and have a substantial negative effect on individuals, communities, healthcare systems and the wider society. Oral diseases, which cost the NHS £3.4bn a year, particularly affect socially disadvantaged and vulnerable groups.

Researchers will be working to identify which factors link oral diseases with disorders such as diabetes, cardiovascular disease, rheumatic, neurological and gastrointestinal disorders, and pregnancy-related conditions.

They will consider genetic factors, characteristics of the oral microbiome, activation of inflammatory pathways, as well as social factors. The researchers will then develop early-stage trials to see if reducing oral disease can improve health outcomes across several conditions at once.

For example, building on previous work showing a link between a common chronic oral infection (periodontitis) and diabetes, researchers plan to deliver a large trial in a primary care setting aiming to improve glycaemic control in people with diabetes by treating periodontitis and reducing related inflammation.

Our Oral and Dental Medicine (ODM) theme will be working with our BRC Multimorbidity and Inclusion Health theme, as well as Computational Medicine, to make use of electronic

health records and other data sources to enhance understanding of the connections between oral disease and systemic disorders.

Professor Francesco D'Aiuto and Professor Andrew Smith, both of the UCL Eastman Dental Institute, will lead the work.

Professor D'Aiuto said: "We want to understand the fundamental mechanisms of multimorbidity linking oral diseases to other disorders. If we do this, we may be able to develop treatments that address multiple conditions all in one go."

Professor Stefano Fedele, the ODM Theme Director, said: "We are very fortunate to have been re-allocated BRC funding as the only theme nationally fully dedicated to research in oral disease. We have aligned our research programme to the most pressing research needs co-identified by patients, clinicians and stakeholders, including the multimorbidity of oral diseases and systemic disorders, which is one of the core research topics of our BRC theme."

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# Researcher education and training expanded to promote diversity

The BRC is to expand its education and training support for researchers with the aim of increasing diversity among researchers and creating a more inclusive environment.

Over the past five years, the BRC Experimental Academy, delivered by the Academic Careers Office at UCL, has supported over 2,600 early career researchers – offering training and mentorship in leadership and resilience and building research capacity and culture across UCL and UCLH.

This work will now be expanded in partnership with the UCLH Research Education and Leadership Unit and the UCLH/UCL Centre for Medicines Optimisation Research and Education.

Programmes of work build resilience by focusing on wellbeing and mental health, and by helping

researchers become better equipped to handle the highs and lows of a research career. Training and coaching will also aim to destigmatise failure.

Training in digital and data science will be expanded and the team will be developing new partnerships in innovative initiatives, including a pilot scheme with Oracle Research to deliver training in cloud computing research.

Head of the Academic Careers Office Felipe Fouto said: “This is just some of the work we will be doing over the coming years which we are incredibly excited about. We endeavour to continue evolving our programmes so that we are at the forefront of capacity development, and lead new trends in healthcare research.”

## Addressing loneliness in severe mental illness

Researchers will look to improve loneliness experienced by people who have serious mental illness.

Loneliness is associated with poor clinical and social outcomes in serious mental illness, including greater symptom severity.

Our researchers have a track record of developing interventions for loneliness in mental health, including a programme of peer support for people with treatment resistant depression, for which the definitive trial has just been funded by the NIHR.

Teams led by Professor Rob Howard and Professor Elvira Bramon will work with patients with mental health conditions to co-produce interventions to trial in loneliness and will work alongside researchers in deafness and hearing health.



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The work is part of a wide-ranging programme of research into mental illness planned by our Mental Health theme that will include trials of neurosurgery, work to prevent mental ill health in children, and use of health data to improve and personalise drug treatment.

# Taking an innovative approach to weight loss

Researchers aim to develop innovative treatments for people with severe obesity which enable the kind of sustained weight reduction needed to improve health.

Most adolescents and adults with severe obesity are unable to lose sufficient weight through existing interventions such as lifestyle changes and medication to see their quality of life improve.

However, the development of new treatments such as gut hormone-based approaches, which target the body's own appetite regulating pathways, is set to change how severe obesity is managed, and we have been at the forefront of these advances.

Researchers will also develop endoscopic approaches to treatment – for example where non-invasive and non-surgical devices such as gastric balloons are placed in the stomach which makes the person feel fuller with less food.

Researchers will also be focusing on how weight loss, regardless of how it is achieved, can be maintained. Maintaining weight loss is a major challenge due to the activation of powerful biological mechanisms in the body which try to return the body to its highest previous weight.

Researchers will be looking to identify predictors of weight-loss maintenance compared to weight regain, and then develop strategies to support long term weight loss.

Obesity theme lead Professor Rachel Batterham said: “Historically there have been challenges with anti-obesity medication and lifestyle approaches but there are new approaches including gut hormone-based treatments and new endoscopy procedures, which we believe could prove incredibly beneficial in terms of helping people lose weight, and helping people maintain weight loss.”

## Combating obesity stigma

The theme will also grow its nationwide patient public stakeholder charity group Obesity Empowerment Network UK. OEN UK already has a UK-wide network of champions who are people with lived experience of obesity, and the group will increase its number of champions and the diversity of its members, in particular ensuring that the voice of young people is captured.





# UCLH developing AI systems for precision blood matching

UCLH and Cambridge University in collaboration with NHS Blood and Transplant are applying artificial intelligence (AI) to improve blood transfusions.

The new AI systems aim to transform the quality and efficiency of blood matching, reduce complications of blood transfusions, and improve clinical care for patients.

They are a key component of a programme of work called Haem-Match that aims to deliver extended blood group matching to improve outcomes for patients with sickle cell disorder and other heavily transfused patient cohorts.

Current practice is to match blood for transfusion based on the major blood groups. Blood groups are determined by antigens – molecules found on the surface of red blood cells. Being given blood with antigen mismatch between donor and recipient can occasionally cause serious complications and this is more common in people who are very dependent on blood transfusion – for example people with sickle cell disorder. These complications include formation of antibodies that can cause life-threatening reactions and make it very difficult to transfuse patients in the future.

Ideally, researchers would like to match for the minor blood groups too, known as extended antigen matching. However, this is currently not possible as testing for the minor blood groups is very expensive

and slow, and the whole process of matching is manually performed by scientists surveying some of the two million donations a year.

To get round this problem, the Blood transfusion Genomics Consortium have developed a way of testing genes for blood groups – which is a substantially cheaper, quicker and yet equally effective technique. A computer programme called bloodTyper will then convert the genetic sequences identified via the new test into blood types. This should allow researchers to determine the extended blood groups of all donors and multi-transfused patients in the future. With support from UCLH BRC, NHSBT and the NIHR, the Haem-Match consortium will be working with other BRCs as part of the NIHR Health Informatics Collaborative in Transfusion Dependent Anaemia to build the transfusion dataset. This will inform the design of the blood matching AI algorithm, and in the future, blood stocking AI algorithm to improve the transfusion care of patients with sickle cell disorder and other transfusion dependent anaemias.

## More information

Haem-Match [www.haemmatch.org](http://www.haemmatch.org)

Blood Transfusion Genomics Consortium  
[www.BGC.io](http://www.BGC.io)

NIHR Health Informatics Collaborative in  
Transfusion Dependent Anaemia  
[www.hic.nihr.ac.uk](http://www.hic.nihr.ac.uk)



# Faster and better heart imaging for improved patient care

UCL and UCLH cardiologists, physicists, and computer scientists have advanced cardiac magnetic resonance imaging (MRI) producing static and moving images of the heart in greater detail than ever before.

Strategic links with industry including, Siemens and Phillips, mean technological advances developed at UCLH are available to patients worldwide.

Having been incorporated into 14 international clinical guidelines, these techniques are revolutionising patient care not just locally, but globally.

Cardiac MRI has also become a standard test for assessing response to new drugs pushing the frontiers of treatment.

The UCLH team has made cardiac MRI faster (improving tolerability and patient experience), better (measuring structure and function, and now the biological changes leading to disease, to develop and evaluate targeted treatment) and more streamlined (using computer systems for image processing and interpretation).

Clinicians can now accurately identify early changes to heart muscle caused by inherited or lifestyle diseases, so that earlier treatment can prevent irreversible damage.

This has delivered benefits in the treatment of common and rare conditions (eg heart failure and familial heart muscle diseases) and led to insights into how the heart changes with age, athletic training, and pregnancy.

# Improving global tuberculosis control via Video Supported Care

People with tuberculosis (TB) require lengthy treatment with regular doses of drugs, and patients often need support to help them complete medication. Led by UCL and UCLH, a world-first trial of online Video Supported Care (VSC) for TB treatment demonstrated that VSC was cheaper and more effective than standard face-to-face observation, leading to its adoption internationally.

TB causes 1.5million deaths annually. Treatment requires 6-months of pills to be taken regularly. Some cases, known as multidrug-resistant tuberculosis (MDRTB), require up to 24 months of intensive and complex treatment. The side effects of this demanding medication regime and the temptation to stop when symptoms improve make completing treatment challenging, especially for those with complex social circumstances. The World Health Organisation (WHO) therefore recommends Directly Observed Treatment (DOT) to support all TB patients.

In the UK DOT is recommended for patients who have a history of poor adherence, those with previous TB, MDRTB, HIV, and socially complex patients including homeless people, drug users, prisoners, and those with alcohol and mental health problems. However, drawbacks to DOT include high cost, inconvenience, and stigma.

Instead of attending a healthcare site daily or three times a week, VSC users use a secure smartphone app to take a video

of themselves taking their medication and report any problems or side-effects. The app automatically shares the footage through a secure cloud with health workers remotely, who check it against a timestamp to ensure the correct dosage has been taken at the right time and address any issues.

The UCL VSC trial recruited patients eligible for DOT in 22 clinics in London, Leicester and Birmingham. 58% of participants had a history of homelessness, drug use, imprisonment, alcohol problems or mental health issues.

The trial provided free smartphones and data plans for participants. 70% of VSC patients successfully completed over 80% of their scheduled treatment observations over six months compared to 31% of DOT patients. VSC costs were estimated at £1645 per patient over six months compared to £3420-£5700 for DOT.



The WHO now recommends VSC as an alternative to DOT, with high uptake in North America, Eastern Europe and China. VSC is now recommended by NHS-England and used as the standard approach for MDRTB and socially complex patients. UCLH deliver the national VSC service for tuberculosis in England.

Based on this trial, UCLH and UCL will adapt and test the same approach for inclusion health populations and other patients with poor adherence with HIV, hepatitis C and mental health drugs.

In hepatitis C VSC will be integrated with outreach screening and treatment initiation. Mental health will focus on those where outreach workers currently deliver antipsychotic medicines.



# Get involved in our research

We are looking for local residents and patients who want to help us design and conduct our research. We believe this kind of active input makes our research better.

If you are interested in joining our patient network, email Patience Renias-Zuva on [p.renias-zuva@ucl.ac.uk](mailto:p.renias-zuva@ucl.ac.uk)

The National Institute for Health and Care Research University College London Hospitals Biomedical Research Centre is a partnership between University College London Hospitals NHS Foundation Trust and UCL (University College London) and is part of the National Institute for Health and Care Research.

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