



Research and Innovation in Northern Ireland in response to the SARS-COV-2 virus outbreak

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1. Introduction

There were many new and unexpected challenges that emerged for researchers during the rapidly evolving COVID-19 crisis. Across Northern Ireland experts and researchers have come together to support the global effort to advance our knowledge of COVID-19.

In order to tackle the unique and emerging issues posed by COVID-19 our experts are leading a range of research projects that will help further our understanding of this new virus, these include research addressing: therapies/treatments, diagnostics, prevention, behavioural approaches and e-health/apps. Below is an overview of the current research and initiatives we are aware of, this will be updated as more research is undertaken.

2. Development of therapies, treatments and vaccines

2.1 The Northern Ireland Clinical Research Network – Supporting COVID-19 research across the HSC

Northern Ireland Clinical Research Network (NICRN) is a network of over 100 research trained Health and Social Care staff, including nurses, Allied Health Professionals and clinical experts, who work at the interface between the research community, the HSC and patients to provide healthcare organisations with the support and facilities needed to make it easier for research to happen. For over 10 years, NICRN has ensured that the health, wellbeing and prosperity of the Northern Ireland population has benefited from access to high quality clinical research. The NICRN has stepped up to the front line of this pandemic to play a vital role in fighting this new disease by supporting COVID-19 research across the HSC. The COVID-19 trials currently supported by the NICRN include:

RECOVERY trial: Randomised Evaluation of COVID-19 Therapy (RECOVERY)

This is currently the world's largest randomised controlled clinical trial for COVID-19 treatment and is open and recruiting patients in all five HSC Trusts in NI.

There are a number of possible treatments for COVID-19 infection available. The RECOVERY trial will test whether these treatments work better than the treatments that are given in hospital at the moment. As well as normal hospital treatment patients with COVID-19 infection will either receive no additional experimental treatment, or will receive one of the following treatments: - a combination of Lopinavir-Ritonavir (antiviral drugs) - interferon β 1b (used to treat some kinds of multiple sclerosis) - low-dose corticosteroids (used to reduce inflammation) - hydroxychloroquine (similar to a drug used to treat malaria). The trial is designed so that it can also test other possible treatments as they become available. Information on time in hospital, the number of deaths in hospital, and the need for artificial ventilation will be collected. The study hopes to identify effective treatments within three months. Information is available at <https://www.recoverytrial.net/>

This trial has identified the steroid dexamethasone as the first drug to improve survival rates in certain coronavirus patients.

REMAP-CAP: Randomized, Embedded, Multifactorial, Adaptive Platform trial for Community-Acquired Pneumonia

The NICRN is supporting this trial in three Trusts in NI. The Belfast Trust site is led by Dr Jon Silversides and is in the top 5 recruiters to this study in the UK.

The aim of this trial is to determine the best range of treatments for patients who become severely ill due to COVID-19. Patients admitted to the Intensive Care Unit (ICU) with severe illnesses normally receive a combination of many different treatments to help them recover. For example, there are a number of different possible drugs to fight the coronavirus but patients also require treatment to help their breathing, circulation and kidneys. REMAP-CAP has many recruiting sites around the world and aims to enrol thousands of patients in more than 100 ICUs in the UK. The trial is designed to be flexible and adaptive. Each hospital will choose which treatments to make available to patients from those available within the trial. Currently the trial is evaluating different anti-viral drugs (Lopinavir-Ritonavir and hydroxychloroquine), steroids to reduce inflammation and treatments which act on the immune system, often used to treat other conditions such as rheumatoid arthritis, (interferon- β 1a, anakinra, tocilizumab and sarilumab). The trial will look at how these drugs work in combination. Additional treatments will be added over time. Information will be reviewed regularly and, dependent upon the results, the trial will allocate more patients to the treatments that seem to be the most effective. Information is available at <https://www.remapcap.org/>

PRINCIPLE: Platform Randomised trial of INTERventions against COVID-19 In older people

The first clinical trial in COVID-19 patients consulting in primary care, 'PRINCIPLE', will initially test if the anti-malarial drug hydroxychloroquine can reduce the need for people to go to hospital or speed up their recovery. They will recruit patients aged over 65 years (or aged 50-64 years with underlying health conditions), who consult in primary care (this trial is a national platform trial and is potentially available to all GP practices in the UK) and have COVID-19 symptoms. Patients will be tested for COVID-19 where possible, and will receive either the usual care provided plus hydroxychloroquine 200mg twice a day for 7 days, or, soon, azithromycin for 3-5 days, or usual supportive care without any experimental treatment. The trial aims to recruit over 3,000 people, and has been designed to be flexible, so new suitable treatments can be added into the trial when these become available.

This trial is supported in NI by the NICRN.

ACCORD (Accelerating, COVID-19 Research & Development)

This collaborative platform, known as ACCORD (Accelerating, COVID-19 Research & Development), aims to get an early indication of potential drug treatments' effectiveness in treating coronavirus. If positive results are seen, these drugs will advance rapidly into the large-scale trials in progress across the country.

This platform will accelerate the development of new drugs for patients hospitalised with COVID-19, reducing the time taken to set up clinical studies for new therapies from months to just weeks and helping to ease pressure on the NHS and ultimately save lives. Dr Lorcan McGarvey is a principle investigator for this trial in NI which is being supported by the NICRN.

The PRIEST Study: Pandemic Respiratory Infection Emergency System Triage

This observational study is open in the Southern HSC Trust supported by NICRN. It aims to optimise the triage of people using the emergency care system (111 and 99calls, ambulance conveyance, or hospital emergency department) with suspected respiratory infections during a pandemic and identify the most accurate triage method for predicting severe illness among patients attending the emergency department with suspected respiratory infection.

MERMAIDS – ARI: Multi-centre EuROpean study of MAJor Infectious Disease Syndromes (MERMAIDS): Acute Respiratory Infections in Adults

This observational study is open in Western and Southern HSC Trusts supported by NICRN.

Pathogens causing acute respiratory infections (ARI) are among the most likely candidates to cause the next pandemic. We need to better understand why some people become much more ill than others when they have an ARI. It is likely that individual risk factors affect the body's response to ARI in different ways and this in turn can influence the severity of disease. Within broad risk groups it is currently not possible to predict which individuals are at increased risk of becoming severely ill. Consequently, there are no opportunities to tailor preventive and therapeutic interventions. Increased insight into how different individuals respond to respiratory pathogens can allow us to better anticipate severity at individual patient levels. This in turn will enable us to formulate strategies for individualized treatment options to reduce disease severity, risk of complications and hospitalisations.

REALIST COVID 19 trial: A UK wide cell therapy clinical trial to help improve outcomes in COVID-19 patients

The UK-wide clinical trial, known as REALIST COVID-19¹ is led by Professor Danny McAuley and Professor Cecilia O'Kane both researchers at the Wellcome-Wolfson Institute for

Experimental Medicine² at Queen's University Belfast. The phase 2 trial is investigating the safety and efficacy outcomes in patients with Acute Respiratory Distress Syndrome (ARDS) caused by COVID-19, who have been administered allogenic mesenchymal stromal cells (MSCs).

ARDS occurs in approximately 20% of COVID-19 cases and respiratory failure is the leading cause of mortality. REALIST will investigate if a single infusion of MSCs will help in the treatment of ARDS. The trial is currently open and recruiting.

The trial is funded by the Health and Social Care Research & Development Division OF THE Public Health Agency³ and the Wellcome Trust, and is supported by the NI Clinical Trials Unit,⁴ the NIHR Clinical Research Network⁵ and the Northern Ireland Clinical Research Network⁶.

2.3 Repurposing FDA-approved drugs for treatment of 2019-nCoV-induced disease

Professor Ultan Power, in collaboration with Professor Ken Mills and their team of researchers at Queen's University Belfast, will use drug screening technology to select suitable anti-viral and anti-inflammatory drugs to test for effectiveness against COVID-19.

An alternative strategy to rapidly identify therapeutics to combat 2019-nCoV is drug repurposing; as the drugs are already FDA- approved, it is cost-effective and time-efficient. The team will use MuSIC (multiplex screening of interacting compounds) screening of a unique library consisting of approximately 1,000 drugs to identify single and synergistic interacting compounds that have either 2019-nCoV antiviral activity or anti-inflammatory activities, with limited/no toxicities. Drug candidates will then be validated using 2019-nCoV infection of human airway epithelial cell cultures.

Funding of almost £300,000 for the project was awarded by UK Research and Innovation (UKRI). The grant was awarded during the first round of projects that will receive £10.5 million as part of the £20 million rapid research response funded by UKRI, and by the Department of Health and Social Care (DHSC) through the National Institute for Health Research (NIHR).

2.4 The Northern Ireland Coronavirus Antibody Development Alliance: Fusion Antibodies work in partnership with Queen's University Belfast to tackle COVID-19

Fusion Antibodies⁸, specialists in pre-clinical antibody discovery and development, are working with Queen's University Belfast as part of The Northern Ireland Coronavirus Antibody Development Alliance (NICADA), which has been established to seek new therapeutic and diagnostic approaches to help in the global fight against the coronavirus pandemic.

NICADA aims to develop new therapeutic molecules that can be evaluated for their ability to neutralize SARS-CoV-2. Fusion Antibodies will collaborate with Professor Ultan Power from the Wellcome-Wolfson Institute of Experimental Medicine², Professor Chris Scott from The Patrick G Johnston Centre for Cancer Research⁹ and Dr Fuquan Lui in the School of Biological Sciences¹⁰, at Queen's University Belfast.

3. Diagnostic approaches and epidemiological research

3.1 Your data, fighting coronavirus: the COVIDENCE study

Researchers from the Institute of Public Health at Queen's University Belfast¹¹ are collaborating with colleagues from Queen Mary University of London, Kings College London, The University of Edinburgh, Swansea University and The London School of Hygiene and Tropical Medicine to carry out the COVIDENCE trial¹², a national observational cohort study. Funded by the Barts Charity the study will advance understanding of risk factors for coronavirus disease among UK adults. The study will investigate: how quickly people recover from coronavirus disease and whether there are any long-term complications of this illness; evaluate the impact of coronavirus disease on the physical, mental and economic wellbeing of the UK population, and, establish a platform for future research on coronavirus disease in the UK. The team hope to recruit at least 12,000 participants to the study which will run for five years. Recruits to the study are being asked to sign up here <https://www.qmul.ac.uk/covidence/>. Recruits must be over 16 years old, resident in the UK and able to provide informed consent.

3.2 Hg nCoV 19: COVID-19 rapid point of care testing trial

The European Commission under the Horizon 2020 research and innovation programme¹³ have awarded €930,000 to HiberGene Diagnostics Ltd¹⁴ who in partnership with Queen's University Belfast, Medcaptain in China, and Italian Hospital IRCCS Ospedale Policlinico San Martino, have developed a rapid diagnostic test for COVID-19. The "Hg nCoV 19" test delivers positive results within an average of 30 minutes and negative results within 60 minutes. HiberGene have successfully completed the CE marking of the new rapid molecular COVID-19 test, after completion of clinical evaluation. The test would allow clinicians to test for COVID-19 on site, thus eliminating the need to send tests to a centralised laboratory, saving time and resources.

3.3 Boosting COVID-19 testing in Northern Ireland

Due to the increased need for COVID-19 testing within the healthcare system, Ulster University in partnership with Western Health & Social Care Trust have increased the capacity for testing at Altnagelvin Hospital. By collaborating with The Agri-Food and Biosciences Institute and Queen's University Belfast to form a COVID-19 consortium, the team were able to use existing supply chain connections to obtain testing equipment,

reagents and robotics, allowing for increased testing capacity at the Western Trust, without compromising supplies to other regional testing centres.

Since the initiative began in April, there have been over 1000 COVID-19 tests at Altnagelvin completed as a result. In order to further scale up testing Professor Tony Bjourson and his team identified a robotic DNA purification machine which could increase output to as much as 500 tests per day. To finance the initiative, Ulster University launched a campaign that successfully crowdfunded donations in excess of £112,000 needed to purchase the machine.

3.4 COVID-19 expert modelling groups

Ulster University's School of Engineering, School of Computing along with a range of other research groups from across the University are working together on a project to develop mathematical models to better understand the transmission dynamics of COVID-19. The team are working in close collaboration with Dr Rob Brisk, ECME¹⁵-Ulster based researcher and cardiologist at the Southern Health and Social Care Trust.

The group's activities include: (1) Modelling the initial trajectories of COVID-19 in Northern Ireland and establishing the initial reproduction number of COVID-19; (2) Integrating the various intervention measures into the models and understanding the effect of such control actions on the 'R number' with a goal of reducing this and bringing the virus under better control; (3) Modelling the various options for exit and recovery strategies.

These activities will allow for strategic decisions to be made in terms of health planning and resources, leading to more efficient and effective care for patients.

3.5 PANDEMIC (Protective/risk factors, ANtibody response, Dna, gEnoMICs) study

This study led by Professor Tara Moore and Professor Jim McLaughlin from Ulster University aims to recruit 3000 participants in order to determine the number of people who have been exposed to COVID-19 in Northern Ireland. The study will use a fingerprick antibody test that delivers results within 15 minutes. Those who test positive for antibodies will then be asked for a blood sample which will be stored for genetic analysis.

More information about the study is available [here](#).

3.6 Seroprevalence of SARS-Cov-2 infection in healthy children

This seroprevalence study, led by Dr Thomas Waterfield, a researcher from the Wellcome-Wolfson Institute for Experimental Medicine at Queen's University Belfast², will determine the number of children who have been exposed to COVID-19 by measuring their antibody levels over a period of 6 months. The study will recruit 1000 children from Northern Ireland, Scotland, England and Wales. Funding for the study has been provided by the Health and

Social Care Research & Development Division (HSC R&D Division) of the Public Health Agency.

4. Prevention

4.1 QUB and UU researchers meet the increasing demand for PPE

To help meet the increasing demand for Personal Protective Equipment (PPE), researchers at Queen's University Belfast have been coordinating their efforts and repurposing technologies that have allowed the production of high volumes of protective face shields.

Dr Eneko Larrañeta, Dr Juan Dominguez-Robles and Dr Dimitrios Lamprou from the School of Pharmacy¹⁶ have designed protective face shields using a 3D printer, while Professor Brian Falzon from the School of Mechanical and Aerospace Engineering is using laser cutting technology to produce the equipment in high volumes.

Researchers from the Sonic Arts Research Centre¹⁷ at Queen's University have also been helping with 3D printing of face shields for use in local hospitals. Professor Falzon is using laser cutting technology of polymer sheeting to produce around 300 face shields per day.

4.2 Ulster University's School of Engineering¹⁸ are using their expertise in 3D modelling and medical device design and fabrication to support the Southern Health & Social Care Trust to design and make innovative prototypes which include: prototype respirator and aspirator covers, which will be trialled by respiratory consultants; laser and 3D printing technology to produce visors, and, formulating low-cost hand sanitiser alternatives derived from coconut oil.

5. Behavioural changes and mental health

5.1 Coronavirus Psychological Well-being Study

As lockdown measures are enforced throughout the UK and Ireland, a team of researchers from the Stress, Trauma, and Related Conditions (STARC) lab at Queen's University School of Psychology¹⁹ conducted a study of 2,500 people from across the UK to better understand the impact that COVID-19 has on the psychological wellbeing of people in Northern Ireland and the Republic of Ireland.

Professor Cherie Armour from the STARC lab at Queen's University led the project which involved an online longitudinal psychological wellbeing survey. The study found that of 470 people surveyed in Northern Ireland, one-third met the criteria for coronavirus-related anxiety and depression, while one in five met the criteria for post-traumatic stress disorder related to the pandemic. More results from the survey are available [here](#).

5.2 The effects of self-isolation during the COVID-19 pandemic

In collaboration with Anglia Ruskin University, Ulster University's Professor Mark Tully launched a national survey to understand the impact that self-isolation is having on both mental and physical health. For those who are self-isolating and would like to take part in the survey it is available [here](#), and should take no more than 15 minutes to complete.

5.3 Patient Client Council shielding survey

In Northern Ireland approximately 80,000 people have been impacted by the advice to shield. In light of this the Patient Client Council (PCC) would like to hear from those who are shielding, and those supporting them. The PCC shielding survey is available [here](#). The purpose of gathering this information is to better understand the impact shielding has had on individuals, to ensure those affected have their voices heard, and to inform future decisions and processes.

5.4 COVID-19 Psychological Research Consortium Study

In partnership with Public Health England, this study is jointly led by the School of Psychology at Ulster University and the University of Sheffield. The study began in March 2020 and is a longitudinal multi-country study. It aims to assess the long-term social and psychological impact of the pandemic on the lives of adults in the general population. Initial findings from the study are available [here](#) and regular study updates are available from the study [Twitter account](#).

5.5 International survey to understand the effects of loneliness during the Covid-19 pandemic

The survey has been developed by the International Loneliness and Social Isolation Research Network (I-LINK), this includes the Institute of Public Health along with Ulster University, Trinity College Dublin and Maynooth University as well as colleagues from the UK, Netherlands, Norway, New Zealand, Canada and the USA.

The survey will explore how the COVID-19 pandemic has impacted individuals, families, communities, policies and services with a view to developing evidence to inform policy and decision making. The survey is available to complete [here](#).

5.6 Seeking views from NI parents on experience of remote schooling during COVID-19

Ulster University researchers are seeking parental views of children from primary, post-primary and special schools across Northern Ireland on their experience of supporting their children's learning during the coronavirus pandemic.

The pandemic has led to school closures globally, with schools in NI closing on 20 March and resulting in an expectation that children learn at home with their parents. The team of researchers, lead by Dr Una O'Connor Bones from the UNESCO Centre, School of Education at Ulster University²⁰ aim to explore how parents/guardians of children from primary, post-primary and special schools are supporting their child/children's learning, and what support, resources and communications exist between the schools and parents/guardians. Connections with the wider community will also be considered by exploring how parents interact with other parents during this time and the online resources.

6. e-health and app development

6.1 COVID Evidence Bot

Dr Ciara Keenan, an information retrieval specialist for Campbell UK and Ireland, has developed an automated aggregating twitter feed www.twitter.com/@COVID_Evidence.

This Twitter account has a focus on live automated evidence acquisition on COVID-19. It produces a diverse range of real-time, peer-reviewed/soon to be reviewed research and commissioned reports directly on a feed using the RSS sources from a range of science and medical databases. The developers intend to add databases and improve the search strategy based on requirements and requests from the public and academic partners.

6.2 COVID-19 NI information app

The Department of Health Northern Ireland²¹ launched a COVID-19 NI information app. The app is aimed at providing people across Northern Ireland with immediate advice and links to vital trusted information, with information updated as the pandemic evolves. Included in the app is guidance on the symptoms of coronavirus infection. The app also includes advice on actions to take should an individual believe they have coronavirus. The app has an integrated Advice Search 'chatbot' that allows users to ask specific questions, with answers based on automatic reviews of inbuilt guidance to find a response to match individual queries. By providing early and easily accessible advice to the public, and information on whether someone may need to speak to a healthcare professional the app should also help with easing pressure on GP surgeries, pharmacies and other community services.

The app is available to all individuals who are currently residing in Northern Ireland. To download the Covid-19 NI app - search for Covid-19 NI on the Apple app store and Covid-19 NI on google play.

6.3 Ulster University create COVID-19 data tracker

The COVID-19 data tracker was created by Dr Magda Bucholc, Lecturer in Data Analytics (George Moore Fellow) from the School of Computing, Engineering and Intelligent Systems at Ulster University²². The tracker charts COVID-19 positive cases, number of tests

performed and deaths in Northern Ireland. Members of the public can access the tracker via the university's website [here](#). Changes in daily mobility by region and across different categories of places and activities using Google and Apple feeds can also be visualised using the tracker.

7. Other coronavirus-related research

Necessary discussions: Advance care planning for nursing homes in a COVID-19 outbreak

This project, led by Professor Kevin Brazil, School of Nursing and Midwifery Queen's University Belfast²³, is a collaboration with Lancaster University²⁴, Marie Curie Hospice Edinburgh²⁵, and Dementia UK²⁶ to develop and evaluate an online advance care planning (ACP) COVID-centric intervention for training nursing home staff and providing an information resource to family carers. The expected outcomes include: (a) enhanced knowledge of conducting end of life discussions during COVID distancing measures; (b) improved ability for staff to assess resident needs and respond more appropriately in relation to ACP; (c) enhanced decision making among family members regarding resident care; (d) improved communication between staff and family carers regarding their relatives health care needs; (e) increased evidence of completed ACPs; (f) development of open source online ACP COVID-centric resources for use by nursing homes. The project has the potential to impact on staff, families and nursing homes during the COVID pandemic within the next 18 months and beyond. The project has received funding from ESRC and HSC R&D Division.

7.1 THEMIS: Protecting Human Rights and Public Health in Global Pandemics

THEMIS (2018-2020) is funded by the EU Horizon 2020 programme and hosted at the Health & Human Rights Unit, School of Law, Queen's University Belfast²⁷

Dr Patrycja Dąbrowska-Kłosińska a Marie Skłodowska-Curie Research Fellow, is the Principal Investigator on the project and she works under the mentorship of Professor Thérèse Murphy Director of the Health & Human Rights Unit.

The project reacts to the increasing occurrence of global pandemics, like the present COVID-19 pandemic, and restrictive public health measures that are often taken in response to threats. It aims to contribute to better understanding of how to prepare for, and respond to, global pandemics through a rights-based approach, and offers a reference for policy-making at national/global levels that prioritises fair pandemic preparedness to cross border health threats.

8. Dissemination of information

8.1 FactcheckNI.org

FactcheckNI²⁸ is an independent, non-profit Community Interest Company (CIC) registered in Northern Ireland. Submitted claims are researched using only publicly available sources and the subject matter includes topics such as law, health and politics. A section has now been added on COVID-19, it is accessible [here](#).

8.2 Public Health Agency COVID-19 Blog

A series of blogs intended to help develop understanding around the management, impact and epidemiology of the COVID-19 pandemic in Northern Ireland has been developed by the Public Health Agency.

The blog will also feature articles and advice on looking after your physical and mental health for the public and key audiences in this difficult time.

Professionals from the Public Health Agency and beyond will contribute their expertise, and we will also welcome ideas from their readers. The blog is accessible [here](#).

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