ACRC
Advanced Care Research Centre

Meeting the challenges of good health in later life

History, Aims and Vision of the ACRC

We are to host this ground-breaking collaboration with colleagues at Legal & General. This exceptional partnership will re-imagine care for the mid-21st century. As our population ages, so we need to develop innovative new approaches to provide individually-tailored care. This is the big challenge that the partners will address, bringing to bear pioneering research from the brightest academic minds across multiple disciplines to deliver creative and trusted solutions to solving real world problems.

Professor Peter Mathieson
Principal of The University of Edinburgh, February 2020.

THE UNIVERSITY of EDINBURGH

Legal & General

The ACRC was established in February 2020 as part of a £20 million partnership between Legal & General plc and The University of Edinburgh.

We bring together experts in relevant fields from across The University of Edinburgh and beyond, with partner organisations University College London, and Newcastle University.

The ACRC is a multi-disciplinary research programme combining research across fields including medicine and other care professions, engineering, informatics, artificial intelligence, data and social sciences.

Our vision is high-quality data-driven, personalised and affordable care that supports the independence, dignity and quality-of-life of people in later life living in their own homes and in supported care environments.

Using innovation and change to make life easier for people in their later years.

ACRC Management Group

Professor Bruce Guthrie
Director of ACRC and Lead,
Data-driven prediction and insight

Dr Beatrice Alex
Lead, Enhancing the data infrastructure

Professor Katie Brittain
Lead, Understanding the person in context

Professor Jacques Fleuriot
Lead, New technologies of care

Professor Barbara Hanratty
Lead, New models of care

Professor Eileen Kaner
Lead, New models of care

Alan Marshall
Lead, Data-driven prediction and insight

Dr Lucy McCloughan
Programme Manager

Professor Stewart Mercer
Lead, New models of care

Professor Dame Louise Robinson
Lead, Understanding the person in context

Professor Ian Underwood
Director of ACRC Academy

Professor Heather Wilkinson
Lead, Understanding the person in context

Dr Honghan Wu
Lead, Enhancing the data infrastructure

Engagement

'Science is not finished until it has been communicated.'

Public and stakeholder engagement is a fundamental part of our work in the ACRC. All our research and expertise would be for nothing if it was not successfully communicated. We have submitted consultation responses, developed briefing papers, issued monthly newsletters, published articles and more:

We held a successful launch event for the ACRC in November 2021. We had 200 attendees for the main launch; and between 30 and 50 people at each of six seminars, including a range of senior figures from academia, business, third sector, the public, UK and Scottish Governments.

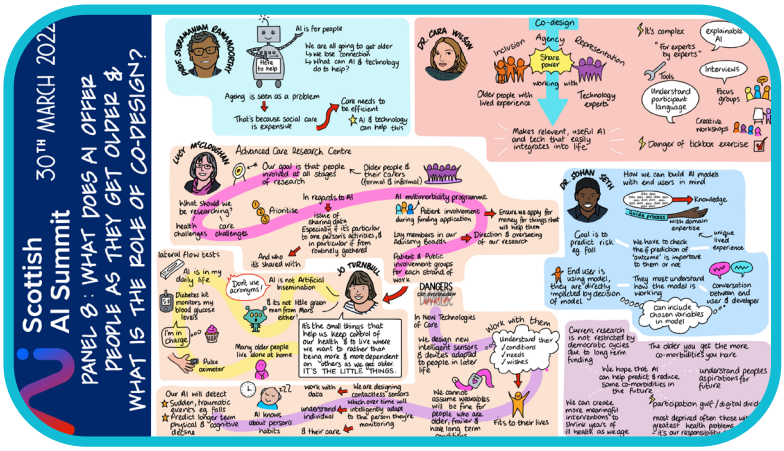


Illustration by Clare Mills (listenthinkdraw)

The ACRC led a workshop at the Scottish AI Summit in March 2022 on the role of patient and public involvement and co-design in developing AI for people in later life. This multidisciplinary workshop included speakers from across the ACRC.

During Edinburgh Science Festival in April 2022, we held 'Worlds of Care', a photography exhibition aiming to explore how care is commonly portrayed, perceived and experienced. A variety of photos were displayed and people attending the exhibition were given the opportunity to offer feedback into how the images made them feel about both giving and receiving care in later life.

Alongside this, a CareTree allowed people to put three words which they associated with care. With each new leaf added, the CareTree grew and bloomed.

Patient and Public Involvement (PPI)

At the ACRC, we want to keep people in later life at the heart of everything that we do. Our patient and public involvement programme is key to us achieving this goal.

Patient and Public Involvement (PPI) in research means that research is done 'with' or 'by' the public, not 'to' or 'for' them. It means that members of the public with relevant experience are actively involved in deciding how research is designed, conducted, and shared with the community.

PPI is central to everything that we do at the ACRC and there are lots of ways that people feed into our work. Some examples include:

- Joining meetings to discuss what research participants will be asked to do and suggest changes to the research to make it easier for older adults to take part.
- Helping to write and review information that will be shared with the public and making sure it's accessible.
- Helping researchers to interpret and share findings with members of the public.
- Presenting at seminars and conferences.

"Dr Nav Aujla has been working with some of our Public Involvement Network members on a project to develop new models of care for older adults.

"It's been great to work with PPI contributors on our project, from giving feedback on study design, to reviewing our ethics documents, and joining us in presentations about the research.

We're trying to identify innovative ways to improve health and social care for people in later life. It's enormously valuable to hear peoples' first-hand experiences of care. Without these insights, it would be impossible to know how to improve things for people, in the ways that work best for them."

Jenny Robertson, Patient and Public Involvement and Engagement Coordinator

We're always looking for people to join our Public Involvement Network who consider themselves to be in later life, who have experience of health and social care, and who are interested in how we can use technology and data to improve healthcare.

"During my involvement with ACRC I've felt valued and my views listened to. The respect and care I've experienced from the friendly staff and fellow Network members has been first class".

Stella, a member of our Public Involvement Network

The Academy

Leadership

The **ACRC Academy for Leadership and Training in Advanced Care** is an intensive, 48 month cohort-based PhD Programme. It supports the mission of the ACRC by developing and equipping a new generation of doctoral-research-trained leaders as pioneers of creation, innovation and implementation across the spectrum of the care sector: in government, industry, the NHS, academia and the care and voluntary sector.

Interdisciplinarity

The Academy consists of PhD training spanning all three colleges – Engineering and Science; Arts, Humanities, and Social Sciences; and Medicine and Veterinary Medicine. Our guiding core belief is that interdisciplinary working will produce transformative synergies and outcomes that we otherwise would not realise, and which are essential to addressing the challenges of an ageing population.

External involvement

External expert input ensures that the students are focused on urgent, real-world problems, and are aware of the wider context outside the academic arena. Leaders in the field of ageing contributed to teaching, while students have sat on NHS National Framework Meetings, contributed to a Royal Society Rapid Assistance in Modelling the Pandemic Study Group, collaborated with a homeless charity and have worked with many other government and NHS representatives.

Cohort

Reflecting the difficult, interdisciplinary nature of the challenges faced, students are selected to bring a wide range of background and experience to the Academy, with a mixture of mid-career professionals, such as a data analyst, optometrist, occupational therapist and a social worker. Their degrees cover subjects ranging from medicine and psychology to computer science, geography, engineering, public health, philosophy and classics.

Research

The Academy provides an agile research capability that supports the mission of the ACRC. Examples include: 'Access to greenspace for older people to improve quality of life'; 'Supported decision making in care transitions for older adults who lack capacity'; 'What can data tell us about our frailty'; 'Music and the ageing brain'; and 'Understanding care transitions in remote communities'.

ACRC
Advanced Care Research Centre

6 briefing papers published

£12.9m additional funding secured

1 patent filed

249 visitors to Worlds of Care exhibition

200 delegates at launch event

13 papers published

21 PhD students

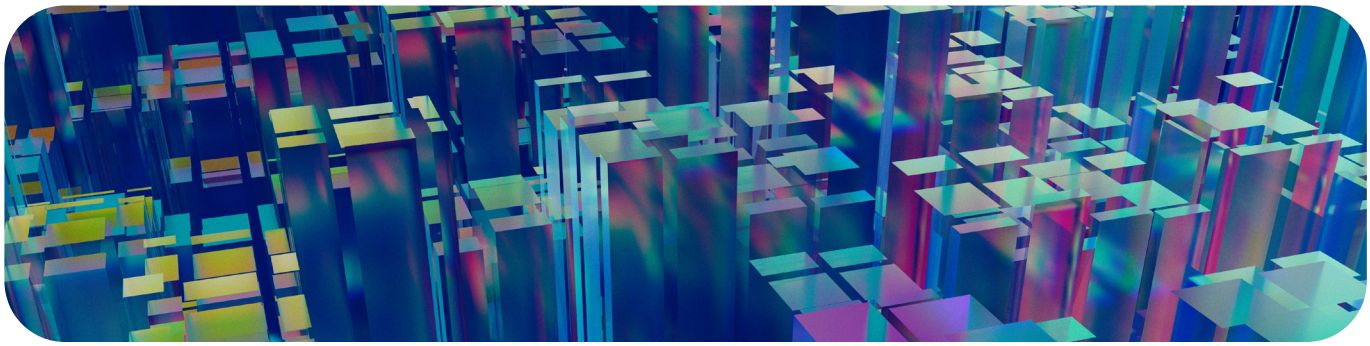
105,000 webpage views

600 applicants for PhD Studentships

409 on mailing list

Enhancing the data infrastructure

Data is transforming health-care on a global scale enabling life changing discoveries, improving health care services, changing patient outcomes and improving lives. **Enhancing the data infrastructure** seeks to develop, evaluate and routinely implement processing from unstructured clinical records to expand and enhance routinely available data for research. Many research studies only use structured electronic health records (codes, disease names, values e.g. Blood pressure). However, unstructured clinical records, or narrative text, written about patients such as GP notes, A&E admissions, and ward notes hold a wealth of information that cannot be found in shorter, more structured fields of data. Our researchers in this work package are specialists in applying Natural Language processing (NLP), automated algorithms which enable computers to understand text, to derive rich information from the unstructured clinical records. The work in this package is enabling the way for a wide range of potential applications within research and across health and social care.



We co-chaired the 5th annual HealTAC Healthcare Text Analytics Conference, with researchers leading tutorial sessions and the PhD student forum. An incredibly successful event was very well received with around 130 attendees.

Using data held by Generation Scotland, we have been working with radiology head scans. Our work seeks to improve existing NLP based algorithms that predict cerebrovascular disease, such as strokes, and expand this to other areas such as brain frailty.

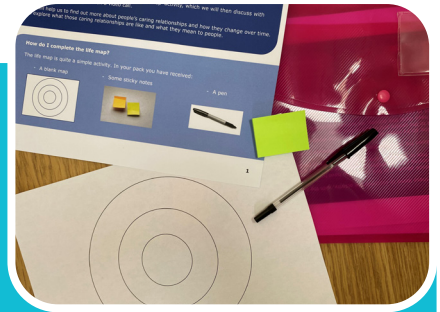
Alongside colleagues from Understanding the Person in Context, we are hosting a week long research event on Tiree. The focus of the week is on sharing understanding on health data, co-design and public engagement; exploring how data and care interact, with a particular interest on how it applies to rural settings.

We have developed an algorithm which provides the required data infrastructure to improve geographical analyses of health care data. Currently it operates at 97% adjusted accuracy and we are improving it to achieve 99%.

Understanding the person in context

Understanding the Person in Context uses social science research methods to understand how people plan for or manage the challenges posed by changes in physical and mental function as they age. This includes social support, personal financial circumstance, community resources and statutory services. The work package consists of five longitudinal projects, the findings from which will feed into other ACRC work packages. We offer a taste of our research and our approaches below.

Ageing in Place Successfully is a multi-methods study exploring how the physical and social environment shapes the experience of those aged 80+ who remain at home. Analysis of existing ageing cohort studies, including the Newcastle 85+ Study, has so far identified that adults living at home at 85 are likely to stay there for their remaining years. Further work describes how levels of dependency changes from age 85 to 95, and how these findings correlate with social and cultural factors.



Starting qualitative research for Understanding Care Transitions during the pandemic required creative thinking: how could the research team meet, speak with, and get to know research participants and collaborators when so much of our lives had gone remote? To address this challenge, we developed an interview method, the 'life map', which could be sent by post ahead of an online interview with participants. Once we were able to start meeting people face to face again, we adapted this into a 'hybrid' methodology. We now conduct our research in person, over the phone, on a video call, or through a mixture of these methods. Working under conditions imposed by the pandemic has encouraged us to be flexible with our methods in ways that have probably made the research more inclusive and accessible for people with a wide range of circumstances and needs.

Environmental support for flourishing in older age explores how outdoor environments support older people to do the activities they enjoy and contribute to their wellbeing. To help us understand how older adults interact with their local environments we carried out 'walking interviews' where participants are joined by a researcher and invited to choose a route around their local area. We have conducted walks through a range of physical environments including urban and residential areas, through parks and woods, and along rivers and seafronts. We have included participants with different levels of walking abilities to understand what makes it easy or difficult for older people to spend time outdoors. By being in place, we hope we can better capture how people interact with and relate to their local neighbourhoods and outdoor environments as they get older.

Data-driven insight and prediction

Data Driven Insight and Prediction focusses on analysis of data, allowing for new insights into health, vulnerability and care in later life which will enable better predictions of care needs and more effectively targeted interventions.

Frailty and Austerity: A key element of our work is understanding how experiences in later life change over time in response to wider social and political events. One example of such research is our analysis on changes in levels of frailty among older people in England before and then after the financial crisis of 2008 and its subsequent austerity policies. Drawing on 16 years of data from the English Longitudinal Study of Ageing (ELSA) our analysis tracked people over time; we observed steeper increases in frailty after the financial crisis and introduction of austerity policies compared to before.

Health and care outcomes in later life appear to be sensitive to wider events and the policy responses to them, bringing important implications for policy decisions particularly as we emerge from the coronavirus pandemic.

Communicating Research on Frailty: Despite the high prevalence of frailty among people in later life (up to half of over 85s are frail), there is very limited public awareness in the general population about what frailty is and many negative perceptions and stereotypes. In Scotland, increasing public awareness about frailty has been identified as a priority area for the NHS but existing information resources on frailty are extremely limited. We worked with three public contributors to co-design an information resource on frailty for the general public, to ensure that communication is relevant, accessible and engaging.

The next phase of our work will involve using routine data on the use of health and social care, to predict risks of suffering adverse events, such as increase in care needs, hospitalisation or mortality in later life. We will evaluate existing risk prediction models and draw on advanced machine learning techniques to derive new approaches. We aim to disseminate a suite of risk prediction tools to be applied in clinical and care settings with guidance on their accuracy and use. All this work is guided by our PPI panel and collaborations across ACRC with clinicians so as to ensure our models are connected to useful practical applications that will improve health and care outcomes in later life.

New Technologies of Care

New Technologies of Care develops practical, care-driven technologies that are fit for people in later life for effective interventions and the prevention of adverse outcomes.

An in-ear temperature sensor is a promising device to measure the core body temperature of a patient which can be used as an early indication of many viral infections (including COVID). It can help affected care home residents to isolate quickly and avoid the spread of any major viral outbreak. The device is a battery-free solution where the main sensor is inbuilt within an earbud or hearing aid and the data reading is established wirelessly. This device is in development considering the comfort of the patients also their safety.

Our incontinence management device is an important research topic to support old people in keeping them socially active. Urinary incontinence, or Overactive Bladder (OAB) Syndrome, is a very common phenomenon for people above 70. OAB can be the reason for losing confidence and reduced mobility. The development of a comfortable and easy to use non-invasive incontinence management system is in progress. The proposed device will be unobtrusive and built within a standard sock that will let subjects use it at home without any professional help.

We are investigating changes in motion when 1.8kg weights are added to wrists. Being able to detect, track and analyse upper body motions while people eat allows us to see what can affect the ability to eat of people in later life, and by how much.

An increase in fluid in the stomach, kidneys and liver can precede an injury in people who are vulnerable to falls due to limited mobility. Low tolerance to wearable monitoring devices is very common in such populations, however technologies capable of noninvasively monitoring bodily fluid compositions are almost non-existent. To tackle this challenge, our researchers have developed smart furniture with integrated electromagnetic sensors that offer a comfortable method for real-time collection of in-body fluid data. A combination of current readings and historical data can be processed using artificial intelligence (AI) models not only to monitor, but also potentially predict, the needs of the person under observation and alert caregivers to changes which may require their attention.

The pandemic brought about a new challenge in the way care should be provided. Emphasis on enabling the independence, respecting privacy of the individual, and having less human-to-human interaction has led to the development of technologies that will unobtrusively and safely monitor the vital signs of people in care environments. We developed smart and data-driven unobtrusive sensing systems to monitor parameters such as breathing, heart rate, falls, and tremors in order to provide a sense of safety and privacy to the individual, while alerting caregivers only in the event of an emergency.

WP7: New Models of Care

Care for older adults is often delivered as distinct services that are not well integrated and are often reactive to events rather than responsive to individuals' wishes, priorities and needs. Alongside our Public and Patient Involvement Group (PPI), we aim to work with health and social care providers to support the development and evaluation of new models of care, which are responsive to individual circumstance and have the potential to be implemented at scale within health and social care sectors.

Key areas of focus include:

- Community and third-sector support.
- Integration of health and social care services for people living in the community.
- Transitions into care homes.
- Improving the care and wellbeing of people already living in care homes

Policy review: We mapped national, overarching policies relating to the physical and mental health, social care, or wellbeing of older people (aged 65-years+), published between 2011-2021.

We reviewed 18 policies in England and 21 in Scotland overall, and prepared a comparative overview, submitted to a leading international policy journal. The review found that despite differences in the structure of care (e.g., integrated care) between England and Scotland, there are similarities in the vision of policies around service delivery/processes of care (e.g., person-centred care) and in performance and patient outcomes in the two countries.

Systematic reviews: We are reviewing international evidence related to our work:

- Facilitators and barriers to implementing new technologies to support paid and unpaid care for older adults.
- Digital technologies to enable older people to remain in their living environments
- Community-based health and social care organisational interventions for quality of life and independent living in older adults: a systematic review and meta-analysis

Scoping of innovations: We gathered information on over 90 innovations in practice. We spoke to over 50 health and social care providers informally and interviewed 14 senior-level stakeholders to find out more about local innovation in health and social care.

Innovations range from use of tools to detect frailty in the community, use of digital innovations in practice, community projects and social prescribing interventions, indoor and outdoor physical activity programmes, comprehensive geriatric assessment in primary care and decision-making tools in care homes.

Going forward, we will develop and evaluate 'new models of care' for older people based on our findings, drawing on expertise and knowledge across our diverse work packages.

If you would like to collaborate, please contact us.

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