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# The Centre for Rehabilitation and Ageing Research in Nottingham and Derby 2022. Excellence in care through world class research

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East Midlands Research into Ageing Network (EMRAN) is a research collaboration across the East Midlands to facilitate applied research into ageing and the care of older people. EMRAN was set up with support from National Institute of Health Research Applied Research Collaboration East Midlands (NIHR ARC-EM)

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## Key words

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## FORWARD

It is with pleasure that we present this brochure outlining the work of the Centre for Rehabilitation and Ageing and Research (CRAR) at the University of Nottingham and its partner NHS Trusts in Nottingham, and Derby and Burton.

The East Midlands Research into Ageing Network Discussion Paper Series previously published brochures describing our research in the care of older people in 2015[1] and 2018[2]. These documents were successful in uniting researchers collaborating in research in the care of older people across different sites, and in different schools within the university. Similar, unpublished brochures were developed to reflect the interdisciplinary groups in the University of Nottingham with expertise in rehabilitation research. The two groups have naturally worked together, and many individuals in both areas were based in the same division of the University of Nottingham, the Division of Rehabilitation, Ageing and Wellbeing. Changes in the structure of the University of Nottingham's School of Medicine in 2021 removed all existing divisions as administrative entities, making it helpful to bring together a summary of what we do. Such a summary is all the more important now that we lead the academic strategy for the National Rehabilitation Centre, which is led by Nottingham University Hospitals NHS Trust and due to open in 2022. We now use the term "Centre for Rehabilitation and Ageing Research (CRAR)" to refer to our cross-organisational grouping. It is therefore timely to create a brochure that reiterates the Centre's mission and vision reflecting the breadth and strength of our research across ageing and rehabilitation research.

Few people would doubt the high priority of ageing, the care of older people or rehabilitation as research topics. These areas of research can lack the critical mass necessary to address the major challenges the topics pose. But our groups have been working over many years to build research capacity in our fields. The research challenges are complex and we have been striving to apply research innovations to address them, and collaborating with the very best researchers in linked fields. This document aims to outline our achievements, not to boast but to send a message to other researchers and potential users of our research such as patients and professionals to say "this is what we do" and "we want to work with you".

With regard to research capacity, we have spent much effort to bring clinicians, particularly nurses and allied health professionals into research. Too often, clinical academics are medical doctors and this produces a bias in the nature of research that is conducted. There are many barriers making it difficult for nurses or therapists to become clinical academics, yet having people with both clinical and research skills is essential if the care of older people and rehabilitation are to apply and benefit from research. We have helped people take those first steps towards research, given them opportunities to have a proper research training through a PhD studentship, nurtured them in their post-PhD stages as early career researchers, and encouraged them to become senior academics. It is a necessary and long-term project to build and sustain such research capacity.

With regard to world-class research, part of our approach is to be inquisitive towards new developments in research methods and techniques, particularly those that help us understand the complex worlds of ageing and rehabilitation. An example is our use of realist methodology to understand how complex systems work. This sophisticated and relatively recently developed qualitative methodology helps to understand the complicated mechanisms about who does what, to whom, to what effect, and in what context. Another part of our approach is to use our clinical expertise to apply to existing methodologies to hard-to-study patient groups such as care home residents or people with dementia. Many other research groups fail to conduct meaningful research in care home residents, or routinely exclude people with dementia from studies. We cannot do this research without meaningful patient and public involvement.

Another part of our approach is to collaborate with other experts along all parts of the research pathway from discovery to delivery, creating new connections and innovations. Our roles in three local centres of research excellence help us to do this: the Medical Research Council (MRC) and Versus Arthritis (VA) Centre for Musculoskeletal Ageing Research (CMAR) and the NIHR Nottingham Biomedical Research Centre develop new discoveries for us to translate towards patient benefit, and the NIHR Applied Research Collaboration East Midlands supports us in driving them to achieve those benefits.

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## INTRODUCTION

In this brochure we provide brief descriptions of our most important research studies, sections on ways of working and summaries of key bits of infrastructure that support world class research.

We begin the telling of our story with the Medical Crises in Older People research programme (2008-2013) – a National Institute for Health Research Programme Grant for Applied Research (NIHR PGfAR)[3]. Our heritage extends much further back, as our most senior researchers developed their skills in neurological rehabilitation in the 1990s and early 2000s led by Professor Nadina Lincoln, but we chose this to start this brochure as it was a large award that was pivotal in demonstrating that we were conducting research of the highest standards and in creating the critical mass for much of what was to follow.

One of the work streams in the Medical Crises in Older People was about the health of the residents of care homes. Even more than today, this group of people was almost invisible to the research world. To be frank, we did not really know at that time how we might tackle the research challenges, but we were convinced that there was much to be done. In sections that follow our description of the Medical Crises in Older People programme, we describe some of the work that we went on to conduct in care homes (the PEACH, LPZ, and FinCH studies). Our expertise in research in care home settings enabled us to react rapidly to the challenge posed by the COVID-19 pandemic, and we report on this too.

Another work stream in the Medical Crises in Older People programme was about the care of people with dementia. At the time dementia, like care homes, was a greatly under-studied topic. This work stream led us to the successful award of a second NIHR PGfAR award, the PrAISED study (Promoting Activity and Independence in Early Dementia), and we also provide a brief report on this.

Our group's successes have not been confined to research in older people. Members of our team contribute considerably to the strong stroke rehabilitation research undertaken in Nottingham. The recent reorganisation of the University of Nottingham has moved stroke rehabilitation to a different academic unit from our Centre for Ageing the Rehabilitation Research: although we continue to collaborate closely with colleagues in stroke rehabilitation we have not included this substantial body of research in this brochure. However, we have included an example of another strand of our non-

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ageing research, in vocational rehabilitation which helps people with health conditions to stay in work or return to work after illness.

### Ways of working

Without hesitation, our research group sees that patient and public involvement (PPI) in research is vital to world class research. We describe how we work in this area to maximise the value of PPI to our research and avoid tokenism.

Another crucial lesson we have learnt in conducting world class research is to collaborate with the very best in the field. No longer is it acceptable to be a good researcher: funders and the users of our research demand only the very best. We know that even our strong group cannot contain all the world's necessary expertise. We describe some of our key research collaborations.

The third area we describe under the heading of "ways of working" is about building research capacity. Ageing, rehabilitation, nursing and the professions allied to medicine have historically been research minnows compared to the medical giants of cardiology, gastroenterology, respiratory medicine and so on. We realised that part of the role of our Medical Crises in Older People research programme was to develop the individuals and teams capable of exploiting the opportunities to conduct world class research in ageing and rehabilitation. We prized the PhDs and promotions of our staff as much as our research articles. In this brochure we describe a high-profile contribution to research capacity development we have led that focusses specifically on nurses and allied health professionals – the Pre-doctoral Bridging Programme (formerly known as the Silver Scholar scheme).

### Infrastructure

We are keenly aware of the need for world class research to be conducted by working with other world class researchers. We are also grateful to acknowledge that the University of Nottingham has several researchers of world class renown, as evidenced by the University hosting several externally funded centres of research excellence. We describe our involvement in the NIHR Applied Research Collaboration East Midlands, and the NIHR Biomedical Research Centre. We also use this part of the brochure to describe our leadership of the academic strategy for the National Rehabilitation Centre – awarded to us because of our strength in rehabilitation research.

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## STUDIES

### Medical Crises in Older People (MCOP)

MCOP was a programme of research funded by the National Institute of Health Research which we conducted between 2008 and 2013[3]. It was an ambitious programme driven at outset by a brainstorming session in 2006 where we concluded simply that we needed to address the biggest issues facing older people at the time. We chose to look at health in care homes and dementia care in hospital because we felt they were sorely neglected. We chose to look at the acute hospital care of people with frailty because we saw on a daily basis that care at the time had not adapted to the needs of people with frailty.

The care home strand shed a much-needed light on the needs of care home residents and the inadequate health care response to them[4,5]. This work led on to further work over the last decade to address these inadequacies as described later in the PEACH and LPZ sections. Without being immodest, we believe that this work has helped care home medicine come "out of the cold". We earnestly hope that the shock elicited by the scandal of how the COVID-19 pandemic was handled in care homes, and our contribution to mitigating the consequences, will provide opportunities for the advice arising from our research over the years to be listened to.

The strand focussing on dementia care in hospital has similarly been part of a movement that has recognised that dementia is not a rare, exceptional, dismissible or un-improvable condition, but that dementia care permeates and at times dominates the management of older people in hospital. Further, we developed and evaluated a specialist ward for people with medical crises who also had delirium and dementia and showed that quality of care was markedly improved, and that the families of the patients appreciated this. Because of the cumulative effect of a number of marginal gains in outcome and in efficiency, we showed that the specialist ward was cost-effective[6]. The ward remains a flagship for Nottingham University Hospitals NHS Trust to this day.

The acute care strand identified the importance of the newly emerging concept of frailty in determining the outcome of acute hospital care. The intervention we studied was "interface geriatrics" aiming to bring geriatric medicine expertise to patients with frailty being rapidly discharged from hospital acute medical assessment units. Ultimately this approach was not sufficient to make a

difference[7]. But negative results are just as important as positive ones, and this failure spurred Simon Conroy (then a junior researcher but now a professor and national lead in frailty care) to develop of the speciality of acute frailty care.

There is not space here to list all the achievement of MCOP, but we set up a website to record our outputs and impacts https://www.nottingham.ac.uk/mcop/about.aspx

## Proactive Healthcare for Older People Living in Care Homes (PEACH)

PEACH was funded by the Dunhill Medical Trust to apply principles of evidence-based care of older people to healthcare of those who live in care homes. It took place between 2016 and 2019.

We worked with colleagues in the East Midlands Academic Health Sciences Network to develop an automated algorithm identifying care home residents in hospital databases. This enabled us to better understand when care home residents came into contact with hospital services[8]. The technology has since been applied by ambulance trusts, and primary care providers across the East Midlands and beyond.

We brought together the evidence for Comprehensive Geriatric Assessment (CGA) in a realist review[9]. This showed us that CGA in care homes was more complex than in hospitals. It brings together the assessments of healthcare professionals who don't routinely meet, and who often see residents at different times. The work highlighted how important it was for professionals to develop systems to work together in this context. We found that little work had been done around how to give voice to care home residents and their families as part of healthcare planning. We identified lots of ambiguity over who leads healthcare planning in care home settings. Insights from this work are informing ongoing efforts to co-ordinate healthcare in care homes more coherently as part of the NHS England Enhanced Health in Care Homes Programme.

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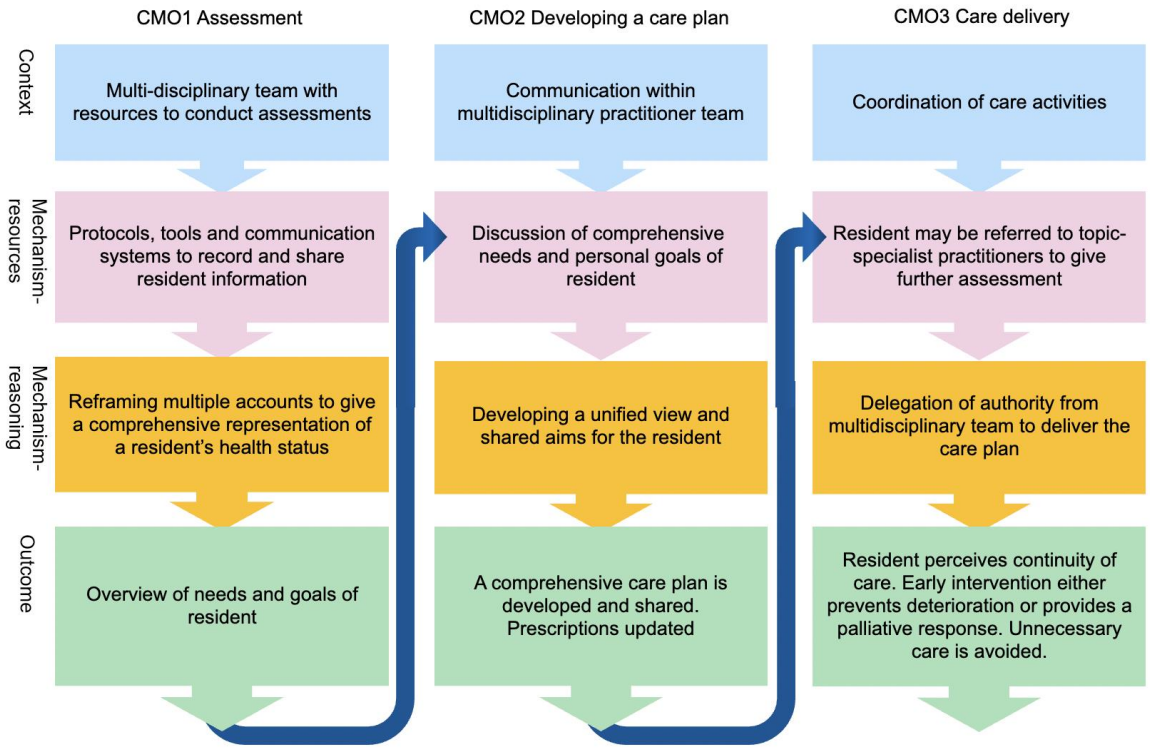


*Figure 1 - What Comprehensive Geriatric Assessment looks like in Care Homes – from Chadborn NH, Goodman C, Zubair M, Souza L, Gladman JRF, **Gordon AL**. 2019. The Role of Comprehensive Geriatric Assessment in Healthcare of Older People in UK Care Homes: realist review. BMJ Open 8:9(4)*

We then went on to establish a Quality Improvement Collaborative (a particular group with a particular way of working) across four Clinical Commissioning Groups (CCGs, or administrative geographical groups used in the NHS at the time) in South Nottinghamshire to learn about how CGA could be implemented in care homes[10]. We found that the language of CGA often baffled community and care home teams and that it was more important to start from a position of understanding local priorities, protecting time in job plans for healthcare delivery in care homes, establishing relationships with care home providers and staff, and empowering these staff to engage fully in service design and delivery. These recommendations were published in early 2021 and we are currently producing dissemination materials based upon them.

Leading on from PEACH, the group have gone on to research the role of GPs in co-ordinating improvement in care homes (the GRAPE study)[11], how care home staff navigate NHS and Social Care

initiatives that are imposed on them (the DAMSON study)[12] and we have reviewed the evidence-base on how new innovations are implemented and sustained in care homes (the SUSTAIN study, sadly without a fruit-based acronym)[13].

Together these studies are helping healthcare policymakers, commissioners and providers to develop a systematic approach to healthcare delivery that will help deliver more co-ordinated and effective healthcare in the future.

### LPZ (Landelijke Prevalentiemeting Zorgkwaliteit) and UK care homes

LPZ is a benchmarking system established in care homes in the Netherlands in the 1990s to measure the prevalence of common care problems. It looked initially at pressure sores and then broadened to look at falls, nutrition, continence and pain management.

In 2014, working with the East Midlands Academic Health Sciences Network Patient Safety Collaborative, we started applying the LPZ process in a handful of East Midlands care homes, as a means of understanding what the important safety issues were[14].

Between 2014 and 2019 we conducted the LPZ audit five times. It grew to involve 66 care homes and over 1500 residents. Around the annual audit we developed a programme of quality improvement training and regular interaction with a network of care homes, so the LPZ initiative effectively became a quality improvement collaborative.

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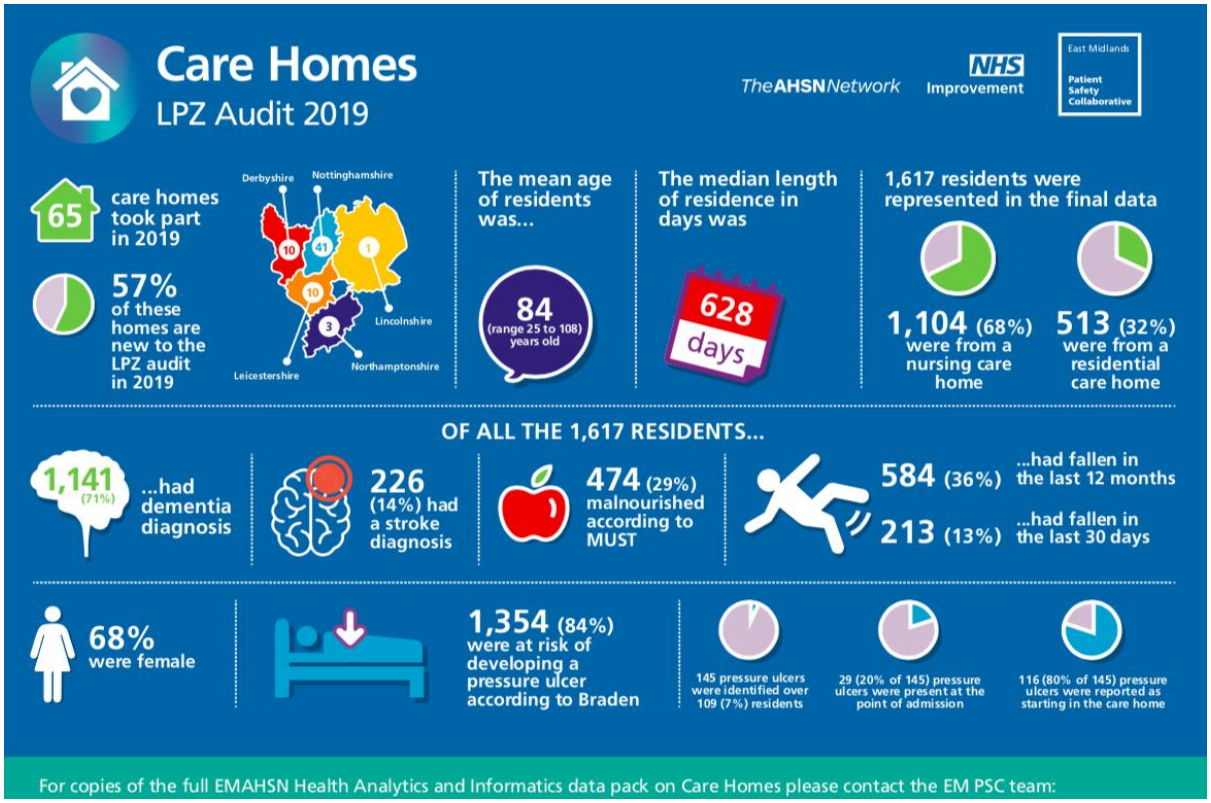


*Figure 2 - An infographic - data from the UK LPZ audit during its final cycle in 2019*

This work was, at the time, pioneering: hitherto care homes had rarely collaborated in this way to address care problems. We gathered evidence that LPZ had enabled care homes to reduce pressure ulceration and falls rates, and that it had broader impacts including how they planned menus and mealtimes to maximise nutrition for residents. Several participating homes saw their Care Quality Commission inspection ratings improve as a consequence of their involvement in the work.

In 2019, in recognition of the work, we received a National Patient Safety Award. The East Midlands LPZ initiative closed in 2021 but has laid the foundation for an ambitious and comprehensive patient safety agenda in care homes across the region. National discussions about incorporating LPZ measures in national benchmarking and improvement initiatives in the UK are ongoing. An important paper summarising the work to date was published as part of the EMRAN series in 2021[15].

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*Figure 3 The LPZ-UK team at the National Patient Safety Awards*

**FinCH**

The Falls in Care Homes (FiNCH) study was, and remains, the largest ever randomised controlled trial conducted in UK care homes. It was a cluster-randomized trial of an evidenced based approach to falls prevention called the Guide to Action for Falls Prevention in Care Homes (GtACH). GtACH draws together multiple interventions into a simple to use package that can be implemented directly by care home staff. The development of GtACH was recognised by an East Midlands Innovation in Healthcare Award (Fig 4).

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*Figure 4 - Professor Pip Logan and team receive an East Midlands Innovation in Healthcare award for development of the GtACH intervention*

The intervention successfully reduced falls rate and was cost-effective[16]. Follow-on studies, conducted through the NIHR Applied Research Collaboration-East Midlands (ARC-EM), are looking at how to consistently implement these findings across the full spectrum of care homes across the UK. FiNCH generated important methodological learning about how to conduct complex randomized controlled trials in care homes[17],[18]. Patient and public involvement representatives were co-applicants and were closely involved in the running of the study, analysis of data, and report and dissemination of its findings. This now represents a template for PPI involvement in all health services research led by our group.

Working closely with local stakeholders, the FiNCH team have helped produce educational resources for care home (React to Falls) which are available online: https://www.reactto.co.uk/resources/react-to-falls/

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## COVID-19 and care homes

The COVID-19 pandemic has been a particularly difficult time for residents, relatives and staff in the care home sector and a supremely important time for research. During the pandemic, we have:

- Led the Care Home Workstream of the CONDOR national point-of-care evaluation platform for COVID-19 tests, including the first ever implementation of point of care polymerase chain reaction and automated antigen tests in UK care homes[19–24].


*Figure 5 - Care home staff using point-of-care PCR for the first time as part of the CONDOR study*

- Established the PROTECT-CH randomised controlled trial platform. The first ever platform RCT in UK care homes, specifically established to evaluate COVID-preventative treatments in this population. This was ultimately closed early due to the changing epidemiology of COVID-19 in care homes, which rendered the proposed RCTs unfeasible, but it rendered invaluable learning about the infrastructural changes required to make care home research sustainable[25].
- Worked with care home staff to understand their support needs (as part of the DAMSON study)[12] and supported the establishment of a pioneering care home community support app[26], replicated in other parts of the country, and recognised with a 2020 national Nursing Times Care of Older People Award.

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**Promoting Activity, Independence and Stability in Early Dementia (PrAISED)**

PrAISED grew out of our combined interests in falls prevention and dementia, initially seeking to address why people living with dementia fall so often and whether effective prevention interventions could be developed. As with other populations, early work revealed that this was a vain hope – people with dementia do not see themselves at risk of falling, but do value activity, independence and social connection. Exercise is a prime candidate to slow progression of cognitive impairment or prevent some of its adverse consequences but has to be made attractive and relevant to encourage participation. PrAISED is a £3.3M NIHR programme grant, supported by PhD fellowships. It comprises 7 parts, to develop and operationalise an exercise and activity-based therapy intervention, incorporate behaviour change expertise, undertake feasibility and definite multi-centred RCTs, with embedded process and economic evaluations, and an implementation study. It is due to complete in 2023. Over 50 collaborators are involved, across academic disciplines and provider services.

**Videoing to Improve dementia Communication Education (VOICE)**

VOICE is a joint study between the Schools of Health Sciences and Sociology in Nottingham, Leeds Becket University and UCL, funded by NIHR HS&DR, and closely involving Speech and Language Therapists. Language disorder is part of dementia. There are many 'top tips' on communicating with a person with dementia, but little hard evidence. We used a linguistic research method called conversation analysis to identify successful communication between people living with dementia and healthcare professionals. In our first study, we uncovered findings on negotiating requests and refusals, ending conversations and reactions to hard-to-understand talk. We used these findings to train healthcare professionals in better communication skills, using actors as simulators, and showed changes in knowledge, confidence and communication behaviours. In a follow-up study, VOICE2, commencing in March 2022, we will study the use of language in the prevention, de-escalation and resolution of distress and challenging behaviours for people with dementia in hospital. We will then use a train-the-trainer model and digital teaching resources to train staff across 3 hospital sites, and evaluate the training.

**Vocational rehabilitation**

This research addresses the problems faced by people who acquire or develop long term health conditions, such as stroke, traumatic brain injury (TBI), inflammatory arthritis and Multiple Sclerosis (MS) or who sustain traumatic injuries to return to and or remain in work. This type of support is

known as Vocational rehabilitation, defined as 'a process whereby those disadvantaged by illness or disability can access, maintain or return to employment'[27], typically falls into four areas: Preparing people for work who may never have worked, for example those who sustain injuries in childhood (Job Preparation); Keeping people in work who already have a job (Job Retention); Finding new work for people who may require (re)training following insult or injury and job preparation (Work Return) and helping people withdraw from work or retire.

Our research is predominantly focussed on return to work (RTW) and Job Retention and is grouped in two main areas;

a) developing and testing the effectiveness of vocational rehabilitation interventions to support people who develop long-term health conditions, to return to and remain in work, and
b) evaluating processes, tools and technologies to support return to work and job retention.

This work began in 2006 with an initial study[28] comparing the work, health and wellbeing outcomes of people with a traumatic brain injury admitted to a major trauma centre, who by virtue of postcode had access to TBI specialist vocational rehabilitation delivered by an Occupational therapists (OT) via the Nottingham Traumatic Brain Injury Service, to the outcomes of those of those without access to this support. We found that people who received the specialist VR support were more likely to be in work at 12 months post injury etc. and that this support had a particular impact on people with more moderate and severe injuries [ref].

This study prompted the National Institute for Health Research (NIHR) Health Technology Assessment (HTA) funded 'FRESH' trial the first multicentre feasibility trial of VR for TBI civilians, which tested whether OTs from three different sites could be trained to implement a TBI specialist VR intervention and whether we could measure its costs and effects on job retention, mood, and wellbeing. This highlighted a) the challenges of implementing complex interventions like VR which crosses organisational boundaries, involves interactions between multiple stakeholders, is highly individually tailored to the individual patient and requires behavioural change by the patient, their family and employer and b) of ascertaining work outcomes in younger people with acquired brain injury[29]. This research has prompted several studies exploring factors affecting the delivery of complex interventions[30], implementation fidelity (the degree to which an intervention or programme is delivered as intended), therapist competence[31] and methods of training and mentoring therapists for their role in supporting RTW and job retention[32]. One example of this is the

CREATE study which compared the effectiveness of face-to-face training with online training using a reusable learning object in upskilling OTS to complete Advisory Fitness for work reports– otherwise known as 'the AHP fit note[33].

Importantly questions arose about whether the early TBI specialist intervention and training package we had developed for FRESH could be adapted for use in stroke survivors and for people with other types of injury. This led to the CLAHRC-NDL funded Return to Work after Stroke feasibility study and subsequent definitive HTA funded multicentre Return to work After stroKE (RETAKE) trial (underway) – testing whether early vocational case management in additional to usual NHS rehabilitation makes a difference to whether people are working or not 12 months after stroke[34].

More recently, we secured funding for a (NIHR) Programme Grant (RP-PG-0617-20001), Return to Work After Trauma (ROWTATE) to determine whether the intervention could be adapted for delivery to people admitted to UK Major Trauma centres who sustain serious injuries and whether this makes a difference to job retention and wellbeing at 12-months post injury (https://www.rowtate.org.uk). This six-year programme involves work packages to adapt and develop the intervention and training package, test the feasibility of delivering it in the NHS[35], including mapping usual care pathways (ref), followed by a definitive trial to determine how effective it is and if it saves the NHS more than it costs to provide. Both ROWTATE and RETAKE include embedded theory driven process evaluations to answer questions about the acceptability/usefulness of the interventions and identify the factors likely to affect their implementation and longer-term sustainability in the NHS.

During the Covid-19 pandemic intervention delivery in both of these studies was negatively impacted, so we worked rapidly with Professor Tash Lannin, an Occupational Therapy Professor from Melbourne, Australia, who had previously conducted trials of remote rehabilitation, to adapt our ROWTATE intervention for remote delivery by Telehealth and with permission from our programme manager, tested the feasibility of delivering it and its acceptability to traumatic injury survivors[35]. This new collaboration has subsequently secured $1M Australian dollars for a new feasibility trial within a cohort (TWIC), comparing the effectiveness of two different vocational rehabilitation approaches (Resource Facilitation and Stroke Specialist Vocational Rehabilitation) to the outcomes of stroke survivors receiving usual care in the Australian health context.

While our research focus is vocational rehabilitation, our collective methodological expertise is in the development, evaluation and implementation of complex rehabilitation interventions using mixed methods research. Therefore, alongside the large randomised controlled trials with embedded process and economic evaluations[36], we have used single case designs and co-production methods to develop job retention interventions for people with multiple sclerosis and Covid-19, systematic reviews[30] and both surveys[37,38] and qualitative research to understand unmet need[39] and identify important outcomes for measurement in the trials[40]. These smaller studies are frequently the focus of our PhD and masters' students.

Akin to our role in supporting research careers through these programmes, early career researchers, Dr Blanca de Dios Perez has secured post-doctoral funding from the MS Society for a study to follow on from her PhD to determine whether an intervention designed to prevent job for people with multiple sclerosis can be implemented in the NHS and Dr Jade Kettlewell has secured an NIHR School for Primary Care Research post-doctoral fellowship to Explore the use and implementation of rehabilitation prescriptions for people admitted to UK major trauma centres.

Members of the research group are multidisciplinary and include (at the University of Nottingham):

Professors Kate Radford, Roshan das Nair, Avril Drummond, Dr Jain Holmes, Dr Julie Phillips, Dr Jade Kettlewell, Dr Blanca de Dios Perez, Dr Juliet Hassard, Dr Diane Trusson, Ms Katie Powers, Ms Kristelle Craven, Professors Denise Kendrick and Nikos Evangelou

## WAYS OF WORKING

### Patients and Public Involvement

Patient and public involvement is at the heart of everything we do. Every bid from our group has a PPI representative as a co-applicant and members of the public help design our research, prepare bids for submission, in the day-to-day running of our research, and in dissemination. Our group maintains an active PPI group which meets multiple times per year as a committee to meet with researchers to address questions or dilemmas about their work. Members of this group often go on to join and become directly involved in the research. Previous studies have seen PPI members participating directly by reviewing papers, or interviewing research participants. In 2019 the RETAKE Study team and PPI partners won the UK Stroke Forum Award for Patient and public Involvement in research and In 2021, two PPI members of the PROTECT-CH study team won the University of

Nottingham Community Volunteer of the year award for work undertaken in supporting this large national platform study: https://www.nottingham.ac.uk/alumni/giveyourtime/community-volunteer-award-winners.aspx.

**International collaborations**

Since 2010, the group have been working closely with researchers at the Universities of Maastricht and Leiden in the Netherlands. This has seen implementation of the LPZ quality metric in UK care homes, close working around consensus guidelines for rehabilitation in older people, and the establishment of the EU-COGER study looking at rehabilitation in older people post-COVID.

A new collaboration with colleagues at the Faculty of Medicine of the State University of Sao Paolo, in Botucatu, was established in 2017. This has seen a fertile programme of exchange with three international workshops – two held in Botucatu and one in Nottingham – multiple exchange visits and a series of publications. Ongoing collaborations focus around implementation of musculoskeletal turnover measures established in Nottingham, in studies designed and conducted by researchers at Botucatu.


*Figure 6 - UK and Brazilian Researchers at the OPAL workshop held at the Faculty of Medicine of the State University of Sao Paolo in Botucatu*

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## INFRASTRUCTURE

### NIHR Applied Research Collaboration East Midlands – Building Community Resilience and Enabling Independence (BCREI)

Applied Research Collaborations are part of the NIHR's infrastructure to support and develop world class applied health and social care research. Prof John Gladman led a theme in each of the two preceding organisations (called NIHR CLAHRCs) and Prof Adam Gordon leads the BCREI theme with the NIHR Applied Research Collaboration - East Midlands (ARC-EM). Since 2019, BCREI has already:

- Described in detail the challenges faced by the care home staff during the COVID-19 pandemic as they navigated new guidance imposed on them by national and local government and the NHS – providing important lessons for how to work with the sector going forward and providing important data used by the Social Care Working Group of the Scientific Advisory Group for Emergencies as it reported to government.
- Developed consensus guidelines for community based rehabilitation for people with severe disability following stroke using a novel online implementation of nominal group technique.
- Developed a series of metrics to understand and evaluate integrated stroke rehabilitation in the community.
- Evaluated a novel intervention by ambulance staff to prevent recurrent hypoglycaemia in diabetics following initial attendance.

Over the next two years it will:

- Develop and implement an implementation and delivery package to prevent falls in care homes nationally.
- Evaluate diabetic deprescribing interventions in care homes.
- Implement and evaluate the consensus guidelines for rehabilitation of stroke survivors with severe disability in the community.
- Use the established metrics to understand the impact of integrated approaches to stroke rehabilitation.
- Develop a model of why some care home residents trigger more ambulance call outs and attendances and understand what can be done to deliver more appropriate support from ambulances to the care home community.

**NIHR Nottingham Biomedical Research Centre Musculoskeletal theme**

NIHR Biomedical Research Centres (BRC) are the other main research infrastructural investments made by the NIHR. They focus upon "translational" research, referring to the early stage of translation of bioscience into clinical settings and populations – "bench to bedside" research. The NIHR Nottingham BRC has six themes, one of which, the Musculoskeletal theme, is led by Prof John Gladman. The theme covers a wide spectrum of research including pain research, many different types of arthritis, and sports medicine. But the most relevant parts of the theme for this brochure are in musculoskeletal ageing and the development of novel complex interventions.

We joke that more is known about the dark side of the moon than about the physiology of very old and frail people. However, fundamental physiological research conducted in recent years by the Medical Research Centre and Versus Arthritis Centre for Musculoskeletal Ageing Research (another centre of research excellence, a collaboration between the Universities of Birmingham and Nottingham) has shed a much-needed light on the topic. For example, we are beginning to understand what factors control why muscle shrinks and weakens with age, and that simple things such as exercise, optimal nutrition, hormones and physical therapies have the potential to prevent or even reverse the ageing process.

There is a major challenge facing all early translational, bench to bedside research and that is the produce collaborations between those who generate new bioscientific knowledge, typically in laboratory, and clinical academics who need to take up that knowledge in applied health research in new treatments and eventually to patient benefit. We have spent recent years developing these collaborations through activities such as having PhD supervisors from both basic and applied scientists, and taking the effort to produce comprehensive research teams – including holding evening meetings in dubious curry houses.

One example of a body of research that we have been pleased to support is in the area known as "prehabilitation". This is a form of rehabilitation applied before surgery or a major medical procedure, aiming at preventing the adverse effects associated with such interventions. The mainstay of rehabilitation is exercise aimed at improving cardiovascular fitness, since this is the factor that most strongly predicts who does well or badly after surgery or major medical procedures, and nutritional support is also required. We have described this work in another EMRAN paper[41] listing 32 bio-scientific research papers reporting the results of studies we have conducted over the last decade on

skeletal muscle physiology and metabolism, a further 16 review articles demonstrating knowledge synthesis and mobilisation, and a further 22 early translational studies where this bio-science knowledge has been applied to develop and evaluate nutritional and exercise prehabilitation interventions.

Another, linked, body of our research aims to develop novel approaches to the problem of clinical frailty. Frailty is a word used to describe a state of vulnerability to challenge experienced by many older people resulting from the accumulation of age-associated impairments in structure and function. Clinical frailty is a term used to refer to people who present clinically to health services with problems that are commonly seen in frailty states such as falls, loss of mobility and the associated disability. Much frailty research across the world is focussed upon delaying ageing processes and hence preventing frailty. As clinical academics, we are best placed to try to reverse these processes, however difficult that might be. At first, one might think that reversing ageing is as impossible as reversing time - but the knowledge that shows that the ageing processes can be slowed demonstrates that they are not inevitable. Next, it is tempting to look for a single anti-ageing pill or procedure. However, what is known about the ageing processes is that they are multiple and cumulative: this means that almost certainly any effective attempt to reverse frailty will need to be multifactorial and target several different impairments in different ways. We already know that exercise is a remarkable intervention that seems to have effect upon many different aspects of physiological systems and, for sure, exercise must be a common part of any strategy to reverse frailty. But we are exploring several ways to augment the effects of exercise. These approaches include electrical muscle stimulation or “vibration therapy” which could help some people who can’t exercise fully to gain its benefits, or anabolic drugs or nutrients which could boost the effect of limited exercise, and new exercise paradigms that train not only muscles but also the nervous system that controls them.

## National Rehabilitation Centre

Since March 2020, following a competitive bidding process, the University of Nottingham has worked successfully in partnership with Nottingham University Hospitals NHS Trust (NUH) and Loughborough University (LU) to develop plans for the National Rehabilitation Centre (NRC). The Government has decided that the NRC will be the first of the ‘New Hospitals Programme’ and it is scheduled to open in autumn 2024.


*Figure 7 Architects drawings of the planned National Rehabilitation Centre building*

The National Rehabilitation Centre will be the only such facility in the UK and will rival the top rehabilitation centres worldwide. It will establish a new operating model which integrates clinical rehabilitation for 70 inpatients, with education and training, research and innovation under one roof. The building will be co-located with the Defence Medical Rehabilitation Centre (DMRC) at the Stanford Hall Rehabilitation Estate on the Nottinghamshire/Leicestershire border. Co-location with the DMRC provides unparalleled opportunities for sharing knowledge, facilities, education and research with further potential to capitalise on the opportunities presented by both the NHS and Defence needs in rehabilitation.

The main benefits will be:

- Enabling a step-change in quality, reputation and capacity of our nationally-competitive rehabilitation education and research to make it internationally-leading.
- Increasing our taught student numbers in a growth area by 143 FTE per year (at maturity) and more importantly increasing the academic entry standards and tariff of our national and international students. We will be expanding existing courses but also opening new markets, building on our strengths to meet future professional global workforce needs. We will increase our CPD offer in rehabilitation which is an under-resourced as highlighted by workforce surveys in the NHS and social care organisations.

- Expanding our rehabilitation research portfolio across health, psychology, engineering, physics, the built environment, pharmacy, social sciences, and build on our reputation as one of the top universities in the UK for rehabilitation research to become a global leader, transforming the national and international landscape and becoming a beacon for world-wide knowledge transfer.
- In addition to the three main partners, a consortium of 26 other Universities will invest in the NRC.
- Providing a major opportunity to drive the agenda for future care and workforce development, having real impact on patients, helping people back into work, but also being innovative is such areas as Smart Environments, engineering, and functional imaging.
- The nature of the NRC being an integrated building (clinical, education and research from numerous organisations using the space) and sharing facilities with the military has a very strong alignment to the University's strategy of civic, regional and academic impact and provides an opportunity to contribute to the levelling up agenda.

## CONCLUSION

In this brochure we have described some of the flagship research studies undertaken by our Centre for Ageing and Rehabilitation Research, some of our key ways of working, and key parts of the local research infrastructure that are important for our current and future success.

As in the Foreword, the main purpose of this brochure is to provide a snap shot of who we are and what we do so as to encourage further productive research collaboration. Feel free to explore the personal profiles of the authors on the University of Nottingham website, and to contact us about shared areas of interest.

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