



East Midlands Research into Ageing Network (EMRAN) Discussion Paper Series

ISSN 2059-3341

Issue 20, June 2018

**Health care for older people research
in Nottingham and Derby 2018
Excellence in care through world class research**

Gladman JRF^{1, 2, 7, 8}, Masud T^{2, 8}, Harwood RH^{2, 4, 8}, Sahota OS^{2, 8}, Logan PA^{1, 7, 8}, Drummond AE⁴, Gordon AL^{1, 3, 7, 8}, Goldberg SE^{4, 7}, Blundell A², Robertson K⁵, Robinson K^{1, 7}, King A^{1, 7}, Garden G^{6, 7}, Godfrey M, Marshall F¹, Ong T^{1, 2}, Anthony K^{1, 7}, Goodwin R^{1, 7}, Lunt, E^{1, 2, 8}, van der Wardt, V^{1, 2}

East Midlands Research into Ageing Network (EMRAN) is a research collaboration across the East Midlands to facilitate collaborative applied clinical research into ageing and the care of older people. EMRAN was set up with support from NIHR CLAHRC East Midlands.

Address for correspondence: Professor John Gladman, University of Nottingham, School of Medicine, Division of Rehabilitation & Ageing, Queen's Medical Centre, Nottingham. NG2 7UH. Email: john.gladman@nottingham.ac.uk

¹ University of Nottingham, School of Medicine, ² Nottingham University Hospitals NHS Trust, ³ Derby Hospitals NHS Foundation Trust, ⁴ University of Nottingham, School of Health Sciences, ⁵ Nottinghamshire Healthcare NHS Trust, ⁶ St Barnabas Hospice, Lincoln, ⁷ CLAHRC East Midlands ⁸ Nottingham BRC



Health care for older people research in Nottingham and Derby 2018

Excellence in care through world class research

Contents

East Midlands Research into Ageing Network (EMRAN) Discussion Paper Series.....	1
ISSN 2059-3341	1
Foreword.....	6
International collaboration.....	6
1 What we do	8
2 Our research topics.....	8
3 How we work	8
4 Who we are	8
5 Find out more	9
6 The health care of the residents of care homes	10
6.1 What we have achieved	10
6.2 What we are doing now	10
6.2.1 The LPZ and United Kingdom Care Homes (LaUnCH) study	11
6.2.2 The Proactive healthcare for older people in Care Homes (PEACH) study	11
6.2.3 Rehabilitation for outdoor activity and mobility (ROAM) in care homes.....	12
6.2.4 Falls in Care Homes (FinCH).....	12
6.2.5 End of life care for people with dementia in care homes	13
6.2.6 Defining the core competencies for registered nurses working in care homes ..	13
6.2.7 Defining the core competencies for UK doctors working in care homes	14
7 People with delirium and dementia, and their families	15
7.1 What we have achieved.....	15
7.2 What we are doing now	16
7.2.1 Promoting Activity, Independence and Stability in Early Dementia (PrAISED) ..	16
7.2.2 Communication training for hospital staff caring for people with dementia (VOICE)	17
7.2.3 Services for people with dementia in rural areas	18
7.2.4 End of life care for people with dementia in care homes.....	19
7.2.5 PERFECTED (Peri-operative Enhanced Recovery hip Fracture Care of paTiEnts with Dementia).....	19
7.2.6 Hypertension in Dementia (HIND).....	19
8 The aged musculoskeletal system: fractures, bone health, falls, exercise and sarcopenia.....	21
8.1 What we have achieved.....	21
8.2 What we are doing now	22
8.2.2 Preventing falls in care homes (FinCH)	23
8.2.3 Chair based exercise in the community.....	23
8.2.4 Chair based exercise in in-patients (PEDAL)	24
8.2.5 Engaging older people in long term exercise (OPREE).....	24

8.2.6 The Physical activity Implementation Study In Community-dwelling Adults (PhISICAL) study	25
8.2.7 Novel non-invasive techniques to measure mass, synthesis, and breakdown. ...	25
8.2.8 Perindopril and Leucine to improve muscle function in older people. (LACE Study)	26
8.2.9 Intravenous iron after hip fracture surgery.....	26
8.2.10 Care of people with vertebral fractures	26
8.2.12 Intranasal drug delivery development.....	28
8.2.13 Osteoporosis and Falls Collaboration between Nottingham and Denmark.....	28
8.2.14 Sarcofalls.....	28
8.2.15 Community Based Rehabilitation after Knee Arthroplasty (CORKA).....	28
8.2.16 Does occupational therapist led home environmental assessment and modification reduce falls among high risk older people? Occupational Therapy Interventions Study – OTIS	29
8.2.17 Nottingham Neck of Femur Vision Assessment (NoNOF-Vision)	29
8.2.18 The role of professions in implementation of self-referral physiotherapy in musculoskeletal primary care patients	29
9 Community services.....	31
9.1 What we have achieved.....	31
9.2 What we are doing now	31
9.2.1 Community hospitals (MOCHA)	31
9.2.2 Promoting resilience in older people (SOPRANO).....	31
10 Education and training.....	33
10.1 Undergraduate medical curriculum.....	33
10.2 Innovation and computer aided learning	33
10.3 Developing a curriculum for advanced nurse practitioners specialising in frail older patients	34
10.4 Multiprofessional geriatric training using simulation.....	34
10.5 Developing clinical academic careers for Nurses, Midwives and Allied Health Professionals	34
11 Collaboration with Universities in São Paulo, Brazil.....	35
12 Collaborations with Universities in the Netherlands	35
13 Patient and public involvement in our research	36
13.1 Patient, Public and Carer Involvement in Research group.....	36
13.2 Lay members on research teams	37
14 Research capacity building.....	37
14.1 Centre for Doctoral Training in Rehabilitation and Healthcare Research.....	37
14.2 Current research fellows and students	37
15 Research links and affiliations	38
15.1 The University of Nottingham Musculoskeletal Ageing Research Priority Area	38

15.2 The Birmingham / Nottingham MRC/ARUK Centre for Musculoskeletal Research (CMAR).....	38
15.3 NIHR CLAHRC East Midlands	39
15.4 East Midlands Academic Health Sciences Network (AHSN).....	39
15.5 East Midlands Research into Ageing Network (EMRAN)	39
16 Acknowledgments.....	40
17 Appendix – summary of our current portfolio of work	41

Foreword

It is with pleasure that I present this 2018 update of the brochure describing the work of the Nottingham and Derby Health Care of Older People Research Group.

Since the last brochure in 2016, there has been much to report. Professor Rowan Harwood has recently taken up a Chair in the School of Health Sciences in the University of Nottingham. This cements the relationship between the schools and divisions in the University of Nottingham that form the core of this research grouping, whilst maintaining our partnership with Nottingham University Hospital NHS Trust.

Other new members joining the research team are Drs Ellie Lunt, Ruth Willott and Hannah Enguell – all of whom are trainees in geriatric medicine. I am particularly pleased to welcome them to help secure the future of academic geriatric medicine. This brochure gives them a little space to comment of the future vision for themselves and this research group. Of course, we also have new PhD students including Lisa Patrick, Clare Burgon, Alison Cowley and Grace Ojo. In 2017, Vickie Booth, Ahmed El-Sharkawy and Katie Robinson were awarded their PhDs.

The Nottingham Biomedical Research Centre began operation in 2017. Our research group contributes to the Musculoskeletal theme of the Nottingham BRC – in particular to its complex interventions research area. Our section on the *Aged musculoskeletal system: fractures, bone health, falls, exercise and sarcopenia* has been updated to reflect this.

Fertile collaborations with international research colleagues have developed, led by Associate Professor Adam Gordon, who provides a brief summary of these developments below.

The information in this brochure is complementary to that posted on University, BRC and CLAHRC websites, and our individual web-pages. If the information you seek is not on these sites, please feel free to contact us directly.

John Gladman

International collaboration

The challenges and opportunities presented by an ageing population are recognised internationally and now is an important time for researchers in ageing to be building international collaborations to address big research questions, to learn from each other's experiences in developing services and to train the healthcare professionals of the future. Our group has risen to this challenge, developing the following important collaborations:

- With Prof Jos Schols, Prof Ruud Halfens and colleagues at Maastricht University, and through them with the international research group of the Landelijke Prevalentiemeting Zorgkwaliteit (LPZ) including representatives from the Universities of Graz, Berne and Istanbul. This collaboration focusses upon the important issues of measuring and comparing quality of care in care homes and long-term care institutions.
- With Prof Wilco Achterberg and colleagues at Leiden University. This collaboration focusses on training doctors in geriatric and elderly care medicine in the specialist area of geriatric rehabilitation. An important part of this has been an academic exchange, allowing quality improvement fellows from the East Midlands and academic trainees from Leiden to visit each other's places of work to develop an international perspective on the challenges they face.
- With Assoc Prof Alessandro Jacinto and colleagues at the Faculty of Medicine, State University of Sao Paulo, Botucatu, Brazil. This collaboration focusses on quality improvement in long term care, developing educational initiatives to train

healthcare professionals to provide care for older people, and quality of care following hip fractures. As part of this collaboration, the teams in Botucatu and Nottingham have successfully secured British Council Newton Funding to host an Early Career Researcher Workshop in Botucatu in June 2018. This will aim to develop collaborations between more junior researchers and will culminate in grant-writing groups.

- As part of the WE-THRIVE international consortium, led by Dr Kirsten Corrazzini at Duke University, North Carolina, to develop a package of core data-elements for use in long-term care research internationally. Dr Adam Gordon co-leads the outcomes work-stream of this initiative with Dr David Edvardsson of Latrobe University, Australia.
- Longstanding friendships with Professors Marcel Olde Rikkert, Rene Melis and their teams continue to nurture our work in frailty and dementia.
- The increasing international profile of our group has been associated with visiting professorships for Prof Tahir Masud at the University of South Denmark and Assoc Prof Adam Gordon at FMB-UNESP, the State University of Sao Paulo, Brazil.
- We have also welcomed Prof Maud Graf from Radboud University, Nijmegen, as a Visiting Professor at the University of Nottingham, affiliated to our group.

We always welcome international visitors and during 2017-18 our group has hosted colleagues from Brazil, Lithuania, the Netherlands, Switzerland, and Taiwan.

1 What we do

This multi-disciplinary group delivers world class applied health research into the health care of older people, particularly those living with frailty, thereby supporting the best possible health care for these people in practice.

2 Our research topics

We describe our research in these five overlapping and closely-related topic areas:

- The health care of the residents of care homes
- People with delirium and dementia, and their families
- The aged musculoskeletal system: fractures, bone health falls and exercise
- Community services for older people
- The education and training of staff in the care of older people

See our web page that lists current and previous studies:

<http://www.nottingham.ac.uk/research/groups/healthofolderpeople/projects/index.aspx>

3 How we work

To produce the very best research:

- Our work is multidisciplinary – across the range of health disciplines and collaborating with a range of academic disciplines along the research translational pathway
- Patient, Public and Carers Involvement which we consider central is continuing to be embedded at every stage in our numerous studies

To maximise the impact of our research upon the health of older people

- We value close links to clinicians in the NHS
- We value close links to regional, national and international health organisations and charities
- We drive our research findings into professional training
- We drive our research findings into practice

To develop local, national and regional abilities to pursue excellence in care through world class research

- We have established the Centre for Doctoral Training in health care research to provide world class research training aimed particularly at health care clinicians

4 Who we are

Our research is a result of collaboration between many institutions with an interest in the health and well-being of older people. At the core they comprise:

- The University of Nottingham (the School of Medicine in Nottingham and Derby and the School of Health Sciences)
- The Nottingham University Hospitals NHS Trust
- Derby Hospitals NHS Foundation Trust
- Nottinghamshire Healthcare NHS Foundation Trust

Senior academics who lead the group are:

- Professor John Gladman^{1, 2, 3, 4}
- Professor Tahir Masud^{2,1}
- Professor Rowan Harwood^{2,1}
- Professor Opinder Sahota^{2,1}
- Professor Pip Logan^{1, 2}
- Professor Avril Drummond⁴

- Associate Professor Adam Gordon ^{1,3}
- Associate Professor Sarah Goldberg ⁴
- Associate Professor Adrian Blundell ^{2,1}
- Assistant Professor Kate Robertson ^{5,1}

¹ University of Nottingham, School of Medicine

² Nottingham University Hospitals NHS Trust

³ Derby Hospitals NHS Foundation Trust

⁴ University of Nottingham, School of Health Sciences

⁵ Nottinghamshire Healthcare NHS Foundation Trust

Whilst the people with whom we work is too large to mention, we think it important to acknowledge in particular Professors Tom Dening, Martin Orrell and Justine Schneider in the Centre for Dementia, Institute of Mental Health (University of Nottingham and Nottinghamshire Healthcare). Also, close colleagues in the Nottingham BRC with whom we work include Professors Paul Greenhaff, Phil Atherton and Beth Phillips.



Professor John Gladman

5 Find out more

For more information on the work of the group and all the studies mentioned in this document, please visit our group's webpage

<http://www.nottingham.ac.uk/research/groups/healthofolderpeople/index.aspx>

CLAHRC East Midlands: <http://www.clahrc-em.nihr.ac.uk/>

Nottingham BRC Musculoskeletal theme

<https://www.nottingham.ac.uk/paincentre/research/brc/index.aspx>

6 The health care of the residents of care homes

Associate Professor Adam Gordon leads the work in this topic for the group.

Further details of all the studies listed here are found on our group's website:
<http://www.nottingham.ac.uk/research/groups/healthofolderpeople/index.aspx>



Associate Professor Adam Gordon

6.1 What we have achieved

In 2009 we reported that care home medicine had “come in from the cold”, having been hitherto largely overlooked - even by specialists in the health care of older people. Part of the evidence for the warming up of care home medicine was because in 2008 we commenced the Medical Crises in Older People (MCOP) research programme (2008-2013) in which one of its three workstreams was dedicated to health care for care home residents. The MCOP work reviewed the world literature on the topic, surveyed the health and needs of people in care homes, showing that there was a huge amount of robust information to guide many aspects of health care for the residents of care homes. This information is now used to guide the education and training of staff. The MCOP work also examined the challenges to the delivery of health care to the residents of care homes, focussing on the UK. This work also allowed us to develop a wide collaborative network of care home practitioners, most notably a leader of care home managers, Mrs Anita Astle MBE who has enthusiastically become one of our research team. Subsequently our group worked with Professor Claire Goodman (University of Herts), and other leading researchers in this field, on the recently completed “Optimal” study (2012-2016) to evaluate models of health care delivery for care home residents. The Optimal study showed that relationships between NHS staff and care home professionals take time to develop and should not be rushed, that healthcare to care homes works better when it recognises the pivotal role of the care home institution in delivering care, and that expertise in dementia care is integral to effective healthcare delivery in care homes.

6.2 What we are doing now

Given the importance of the Optimal findings to funders of health care (commissioners) in the UK, the findings are now being widely disseminated, such as via the NIHR dissemination portal (where the study appears as a “Signal” and is also mentioned in the Themed Reviews on both Co-ordinated Care and Advanced Care). We expect that the lessons from Optimal will resonate in other countries where health services and the provision of residential nursing care are potentially uncomfortable bed-fellows.

Our on-going research is to develop and evaluate health care interventions for the residents of care homes, and we are ensuring that the lessons from Optimal are applied

in this work: we are researching with care home staff, rather than “doing to” care homes. Our key current projects are described below.

6.2.1 The LPZ and United Kingdom Care Homes (LaUnCH) study

There are at least three times as many places in the care home sector in the UK as there are beds in the NHS, and the residents predominantly live with frailty. Yet mechanisms to maintain and improve safety in care homes are less developed than for hospitals. A major problem is that there is no common or reliable mechanism for measuring the prevalence of common care problems across care homes and hence no consistently recorded objective measure to drive, or measure the impact of, quality improvement initiatives in the sector. The International Prevalence of Care Problems (LPZ) tool was developed for this purpose in the Netherlands and is now implemented across many parts of mainland Europe. It was not clear whether this would be a feasible or acceptable approach to care homes in the UK – which are smaller and more diverse than those in much of the rest of Europe. The East Midlands Patient Safety Collaborative funded the LaUnCH project, the aims of which were to study the implementation of the International Prevalence of Care Problems (LPZ) tool in a small sample of care homes across East Midlands. The study was led by Dr Adam Gordon.

The LPZ tool has now been used three times in the UK – in each of 2015, 2016 and 2017. Funding for a further audit in 2018 has been secured. Over this time we have seen the number of participating residents and care homes increase (in 2017 it took place in 634 participants from 30 homes across five East Midlands Counties). Through implementation the project team have learned how to work with care home staff to develop quality improvement plans based around audit data. An ethnographic study conducted in 2017 and health economics data are currently being compiled to evaluate the sustainability of the model long-term.

6.2.2 The Proactive healthcare for older people in Care Homes (PEACH) study

The understanding we gained from our research in the MCOP programme and subsequent work on the Optimal study prepared us well to attempt to improve the health care of the residents of care homes. As part of Optimal we had shown that in the UK it is now not the case that the residents of care homes are simply ignored, and many different services and approaches are usually available – but they are often not sustained, or remain fragmented, leading to unacceptable variation in quality. The principles of comprehensive geriatric assessment (a proactive process using individualised, integrated care which is known to be effective) offer a rationale to improve the health care of the residents of care homes.

The PEACH study implements, and aims to sustain, proactive health care in care homes through:

- A region-wide quality improvement (QI) to deliver proactive health care to care home residents using the principles of comprehensive geriatric assessment
- A process evaluation of the QI programme and resulting changes to health care
- Measuring changes in Health-Related Quality of Life during the QI programme
- Costing health service use to consider cost-benefit
- Analysing records of hospital, GP and ambulance attendances to measure impact on health service use

This study is funded by the Dunhill Medical Trust and led by Associate Professor Adam Gordon.

The first quality improvement collaborative for PEACH took place in September 2016 and the last in February 2018. Work to collect individual outcomes from residents commenced in November 2016 and took place over 18 months. The East Midlands Academic Health Sciences Network Health Informatics workstream has generated an

algorithm to identify care home residents admitted to acute hospital and this has been used to generate some of the metrics required to drive the PEACH project.

6.2.3 Rehabilitation for outdoor activity and mobility (ROAM) in care homes

The health and well-being benefits of being active and getting out of the house are well-known, and Professor Pip Logan in our group has led several research studies showing how occupational therapists can improve outdoor mobility in people who become housebound due to disabilities and illnesses. This PhD study aims to extend this work to the residents of care homes. The main aim of the PhD is to identify practices and resources that increase residents' access to and engagement in outdoor activities and mobility in care homes gardens. The study is funded by CLAHRC-East Midlands and the PhD student is Amanda King, an experienced occupational therapist.

A mapping review of outdoor activities and mobility in care homes was conducted and helped to narrow the focus of the study to care home gardens and homes specifically providing dementia care, without nursing. Barriers to residents getting outside are consistently reported in the literature. Insights from this work was then used to inform case studies undertaken in three East Midlands Care Homes. Dementia care mapping was used to understand the relationship between environment and resident behaviours. Using detailed observations, patterns of organisation and staff behaviour that supported outdoor mobilisation were identified. At the completion of her project Amanda will use these findings to produce guidance to care homes to support outdoor mobility and activities for their residents.

6.2.4 Falls in Care Homes (FinCH)

Our group has worked for many years to develop and evaluate interventions to promote health and hence prevent falls – this work is described in the later section on the aged musculoskeletal system research theme. One overlap between themes is our research to try to prevent falls in the residents of care homes – falls in care homes residents are notoriously hard to prevent. Working closely with care home staff, Kate Robertson, Marie Ward and Pip Logan have developed a "Guide to Action" to be used by care home staff to help them prevent falls in those for whom they care. FinCH is a study to test whether putting the Guide to Action into practice in care homes prevents falls. The FinCH study is funded by the NIHR Health Technology Assessment programme, and led by Professor Pip Logan. This multicentre study started in April 2016 has recruited over 80 care homes and nearly 1700 residents. Staff in half of the care homes are trained to use the Guide to Action to Prevent Falls. The residents will be followed up over the next year and data about the number of falls will be used to see if the intervention is effective both clinically and economically. Alongside this a number of interviews and observation studies in the care homes will help us understand what is going on in the different locations and will help us spot areas for future work and how falls prevention interventions work best.



Kate Robertson

6.2.5 End of life care for people with dementia in care homes

Many people in care homes end their days there. Care home staff find end of life care challenging and are often unsupported in delivery of palliative care. As a result, many care home residents are admitted to and die in the unfamiliar surroundings of an acute hospital.

With funding from a local charity, the Bromhead Medical Charity, Dr Gill Garden, a liaison psychiatrist in Lincolnshire, developed and led an innovative service to improve end of life care for care home residents with dementia in Boston, Lincolnshire. The service involved training and support for care home staff in end of life care, assessment of residents with reference to Gold Standards Framework prognostic indicator guidance training and development of advance care plans with residents or on a best interests basis with families of residents who lack mental capacity. Evaluation of the service showed a 37% reduction in hospital admissions from the Boston care homes in the first year of the service, and 55% in the second and third years. All but one of the residents died in their or their family's preferred place of care.

The Bromhead Medical Charity awarded a further grant to develop a multidisciplinary care home service in Lincoln. Residents, irrespective of whether they have dementia or not, have been offered Comprehensive Geriatric Assessment (CGA) with the purpose of optimizing their care and developing care plans which reflect the residents' or their families' preferences for treatment, place of care and end of life care. An integral part of this service is education of care home staff and involvement of families. Gill Garden is using evaluation of this service as an opportunity to undertake a PhD study looking at the health service utilization of those residents or their families who choose a palliative approach to their health care as compared with those residents who opt for escalation of care and admission to hospital. The funding for this service will end in early 2018. Over six hundred residents have now undergone CGA. More than 200 have died to date with 86% of those residents dying in the preferred place of care. There will be a 12 month follow up of the health utilisation of residents who die.

6.2.6 Defining the core competencies for registered nurses working in care homes

Registered Nurses (RNs) working in UK care homes receive most of their training in acute hospitals. However, the type of care that they deliver in care homes and the core competencies required to do so, are quite different from those needed by hospital staff. Care homes often struggle to recruit and retain nurses and a lack of recognition of the specialist skills required by the sector has been stated as a contributing factor. With funding from Health Education East Midlands, Dr Miriam Stanyon, with Anita Astle and Assoc Professors Adam Gordon and Sarah Goldberg set out to establish a list of core competencies that could help to address this deficiency.

The group used a two-stage process, where a systematic literature review and focus groups with stakeholders were used to develop an initial list of competencies and then the competency list was modified over three rounds of a Delphi process with a multi-disciplinary expert panel of 28 members.

At the end of this process 22 competencies were agreed as essential for RNs working in care homes. These competencies provide a firm basis on which to build a curriculum for this staff group.

The findings from the Delphi process are now published in *Age and Ageing*. A local initiative in the East Midlands, funded by Health Education East Midlands, is using the competencies as the basis of developing a dedicated curriculum to train RNs as specialists in nursing home care.

6.2.7 Defining the core competencies for UK doctors working in care homes

At the moment, there is no dedicated specialty of care home or nursing home medicine in the UK. This is at odds with other countries, such as the Netherlands or USA, where such specialties are highly evolved and train to established curricula. It is possible that many of the competencies required to do medical practice in care homes are covered by the existing postgraduate training programmes in general practice, geriatric medicine, old age psychiatry, palliative care and rehabilitation – but nobody has mapped these curriculums to the type of care that care home residents require.

In 2017, Kayla Borley, a medical student working on her Bachelors of Medical Science, undertook a mapping review to identify, from the world literature, what were agreed competencies for older people with frailty in long-term care. In 2018 this work has been taken forward by Thomas Ancelin, a Bachelors student, who has commenced a Delphi process - informed by expert general practitioners, geriatricians, old age psychiatrists, rehabilitationists, palliative care specialists, care home representatives and nurses – to establish consensus around which of these outcomes are core for medical practice in and with British care homes. This process will culminate by mapping these outcomes to existing UK postgraduate curriculum to identify where competencies are covered and where further development is needed.

7 People with delirium and dementia, and their families

Professor Rowan Harwood and Dr Sarah Goldberg lead research in this topic.

Further details of all the studies listed here are found on our group's website:
<http://www.nottingham.ac.uk/research/groups/healthofolderpeople/index.aspx>



Professor Rowan Harwood



Dr Sarah Goldberg

7.1 What we have achieved

Our previous work to improve the hospital care of people with delirium and dementia and their families includes the "Better Mental Health" study (2008-2011) and a workstream of the Medical Crises in Older People programme (2008-2013), during which we developed our Patient and Public and Carers Involvement Group and valuable links with individuals who are part of our team, particularly Kate Sartain, Margaret Kerr, Marianne Dunlop and Maureen Godfrey. Over the past six years we have worked continuously with the Patient, Public and Carers Involvement Group. This focuses on dementia, frail older people and palliative care research. The members continue to work to provide valuable input into the numerous studies presented to their regular meetings. The diverse group are able to bring their lived experiences primarily as carers and also their transferable skills and knowledge from all aspects of their lives. All have worked on every aspect of research as well as promotional activities engaging with the public.



Maureen Godfrey



Kate Sartain



Margaret Kerr

In the Medical Crises in Older People (MCOP) programme, we learnt a great deal about the care of people with delirium and dementia in hospital. For example we showed that many people with delirium and dementia have very poor outcomes: by six months many will have died or gone into care homes, and most of the remainder continue with considerable physical and mental health problems. We showed that their families were under considerable strain. These findings show how important it is to take a palliative approach to such people to reduce their symptoms where possible, and to concentrate

on their quality of life. The main research in the MCOP programme was to develop and evaluate a specialist ward to deliver the principles of best care to older people with delirium and dementia. It was gratifying to note that this study showed that the quality of care was better on the specialist unit, and that carers were more satisfied with the care of their loved ones. It was also valuable to find that the unit was affordable - even though more resources were required to bring the quality of care up to what we felt was best practice, there were savings to be made in terms of a reduced length of hospital stay and fewer people admitted to care homes. NICE asked us to provide details of our findings for their forthcoming guidance, but it will need more studies such as ours to be conducted before there is widespread adoption of such specialist units in hospitals - ours was the first robust study and it is usually best for early positive findings such as ours to be repeated a few times in further studies.

However, we needed to learn a great deal about best practice in the care of people with delirium and dementia in the course of the MCOP programme. To help share our learning and improve the training of health care staff, we developed a brief documentary about the specialist unit and principles of care it applied. We then used a further research grant to develop it as an educational resource, alongside other educational materials summarising our collective knowledge and expertise. All these materials are now in widespread use in undergraduate and postgraduate clinical training.

7.2 What we are doing now

Our group's interest in the care of people with delirium and dementia in hospital continues. Professor Sahota leads local work on studies to improve the care of people with trauma-dementia with hip fracture and pelvic fragility fractures. Professors Harwood and Goldberg are exploring how to improve communication with people with delirium and dementia, since effective communication is at the heart of effective, personalised and respectful care.

Our experience that many of the people seen in hospital with dementia are relatively late in their disease has led us to give attention to helping people to live well with dementia. Two pieces of research in particular illustrate this: the PrAISED programme to develop and evaluate an intervention to maintain health and well-being and hence prevent falls in people with early dementia, and Scaling the Peaks, which is a study to understand and improve the organisation of services for people with dementia in rural areas.

A theme that permeates much of our research and many of our interventions is the adverse effects of medications in older people with frailty. One particular area of concern is drugs for hypertension in people with dementia. The Hypertension in Dementia (HIND) programme considers this.

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

The problems faced by people with dementia are many, but falls is one particular one that has been identified as a priority for research. Not only can falls cause, pain, injury, hospitalisation and even death, but for people with dementia some restrictive attempts to prevent falls could affect their independence. Importantly, although there are good interventions to reduce falls in people who do not have dementia, these do not work or work so well in people with dementia.

Our work aims to understand why people with dementia are so prone to falling and hence what might be done to mitigate this risk. There are two key problems: people with dementia are particularly prone to falls because the dementia process itself affects movement and balance; and people with dementia find it difficult to participate in existing programmes for falls prevention that rely heavily upon an intact memory.

However, there are good reasons to think that different types of exercises and new ways to deliver them for people with dementia will be effective.

We started work on this topic in 2012. This programme of work is now supported by a NIHR Programme Grant for Applied Research (PGfAR) award led by Professor Harwood, and an Alzheimer's Society Clinical Training Fellowship for Victoria Booth. We are grateful for the previous support from an NIHR Programme Development Award, Nottingham University Hospitals NHS Trust Charitable Funds, Nottingham University Hospitals Flexibility Support Funding, Nottingham University Hospitals Research and Innovation funding, and Nottingham City PCT and Nottinghamshire County Primary Care Trust Flexibility Support Funding.



In the last five years, we examined the evidence related to falls prevention, independence and physical activity in people with early dementia, developed an intervention consisting of physiotherapy, occupational therapy, and motivational psychology, and tested if the intervention programme is acceptable to people with early dementia. We found that the support for people with early dementia to do the exercises and physical activities regularly needs to be tailored. For some people it is helpful if the therapist comes to visit twice a week, for others this is not necessary. Some people like to get reminders, for example messages via their phone, others like to set up their own reminders using post-it notes or memory boards. In general, people prefer not to talk about the risk of falling but about staying independent and active. To be motivated to do the exercises, it is important that people find them relevant to how they want to live their life, for example being able to go for longer walks.

In our initial study, we tested the intervention in 60 people in Nottinghamshire and Derbyshire, which showed that the set-up is feasible and that the intervention is acceptable to people with dementia and their family carers. We have found that an ideal time to recruit people with dementia to engage in exercise is shortly after their diagnosis is made, as this is a time when they want to preserve their health and well-being for as long as possible. Clinicians from different disciplines (Physiotherapists, Occupational Therapists and Healthcare Assistants) worked together and delivered the intervention by visiting the participants up to 50 times over one year. We are now preparing the main study in different sites across the UK to examine if the intervention helps people to stay independent for longer.

Working with the Musculoskeletal theme of the Nottingham BRC, which has a cross cutting theme in imaging, we have gained approval for an MRI sub study. We have just started to test the feasibility of MRI scanning the brains of participants in the PrAISED feasibility study. If feasible, we will be doing a larger study of participants in the main RCT. The MRI study will give us new knowledge on the underlying mechanisms of how the PrAISED intervention changes brain structures.

7.2.2 Communication training for hospital staff caring for people with dementia (VOICE)

Successful communication between health care staff and patients and their families is central to safe, effective and high quality health care. Dementia often causes deficits that make communication difficult, and this requires health care staff to have greater communication skills. This project defines the most effective communications skills required, develops a teaching package, puts it into practice, and assesses its impact. This study is funded by the NIHR Health Service and Delivery Research Programme and ran between 2015 and 2018. The School of Health Sciences supports a PhD for Becca

O'Brian to work on this study. The study and PhD are led by Professors Harwood and Goldberg.

In the past year, we have video recorded 41 clinical encounters between healthcare professionals and patients with dementia. Working with experts from UCL (Dr Beeke) and the Department of Sociology (Prof Pilnick), these video recordings have been analysed in detail using a method called Conversation Analysis. This method allows us to explore interactional patterns across encounters by focusing on the fine detail of verbal and non-verbal behaviour. We have identified common phases across these encounters to be: opening, establishing the reason for the encounter, information gathering, business, closing. We have prioritised two striking features of the dataset for in-depth analysis:

- overt refusals by patients after requests for action
- the often-extended closing sequences of the encounter.

Using these findings, we developed an innovative dementia communication skills training course for healthcare professionals working in the acute hospital. The course was developed during four whole day workshops attended by family carers, clinicians, educational experts, and experts at using simulation in education. The course is grounded in experiential learning theory and includes lectures, simulation workshops, video workshops, a reflective exercise and reflection workshops and small group discussion. Following a pilot, we ran the course 6 times training 45 healthcare professionals. We evaluated the course in a before and after study. Following the course, the healthcare professionals attending improved their confidence in dementia care, their knowledge of communication in dementia, and changed their communication behaviours (assessed through an SLT blind rated simulation exercise before and after the course). The healthcare professionals rated the course very highly and reported still finding the skills useful and still using the skills one month after the course finished.

We are now working on commercialising the VOICE dementia communication skills training course.

7.2.3 Services for people with dementia in rural areas

In recent years there have been major initiatives to change the way that society is able to respond to the growing number of people with dementia - we are aiming for "dementia friendly societies" where people with dementia and those who care for them are not alienated, or even merely tolerated, but enabled to sustain their local connections and lead meaningful lives. There are larger numbers of older people living in rural than urban areas in the UK yet the majority of dementia care research is located within urban areas. This study bucks that trend and seeks to understand the particular aspects of living with dementia amongst rural dwellers. There are concerns that, despite the idyllic scenery of rural areas such as the English Peak District, the challenges to developing dementia friendly societies in rural areas are distinctive from those in urban areas.

In a study called "Scaling the Peaks; Understanding the barriers and drivers to providing and using dementia friendly community services in rural areas: the impact of location, cultures and community in the Peak District National Park on sustaining service innovations", we visually map the services and resources available to people with dementia and their carers, and examine how these are affected by the local geography and seasons of the year. It studies people with dementia and the providers of support in a very rural location with a particular interest in the influences of locality, culture and community have upon their experiences and well-being.

This study has commenced work with voluntary, health and social care providers by regularly meeting with them to observe and discuss the ways in which they collaboratively work to build and maintain dementia friendly communities. The range of approaches suggests that there is a diverse and committed number of mostly small

grassroots initiatives which seek to value all members of a community. Early findings suggest that the role of the church, local shop, pub and agricultural markets are seen as pivotal places which are valued by members of the community; arguably more so than public services locations such as health centres, libraries and village halls. Robust reliable and affordable infrastructures such as transport, internet and landline services, fuel and housing, as well as accessible health and social support are all considered as key characteristics of rural dementia friendly communities.

We are currently seeking to recruit up to 60 families living with dementia as part of the longitudinal study to understand their experiences and views about living in the Peak Park. Each family will be visited by the research team every few months to discuss their everyday lives and explore what they value the most in their communities. This will include physical, social and community sharing activities in addition to any care needs.



This information will be used to develop a visual and conceptual map of the area to provide a way of identifying the places and types of dementia friendly communities. This will help in the future planning of services and support the development of truly dementia friendly communities across the trajectory of living with dementia.

The study is a Post-Doctoral Research Fellowship funded by the Alzheimer's Society and runs between June 2015 and May 2019.

7.2.4 End of life care for people with dementia in care homes

We have previously described this study in the care home theme section (6.2.5).

7.2.5 PERFECTED (Peri-operative Enhanced Recovery hip Fracture Care of paTiEnts with Dementia)

People with dementia who break their hip are extremely vulnerable. The PERFECTED (Peri-operative Enhanced Recovery hip-fracture Care of paTiEnts with Dementia) National Institute for Health Research (NIHR) funded 5-year research programme aims to develop and pilot an evidence-based intervention to improve the hospital care of patients living with dementia who have fractured their hip, through 3 work packages.



The PERFECTED Enhanced Recovery Pathway checklist intervention (PERFECT-ER) has now been developed, (Work package 1&2) and we are currently in work package 3. Work Package 3 is a cluster randomised trial, currently recruiting across the country, ensuring the PERFECT-ER can be put into practice in health settings quickly and faithfully. Professor Opinder Sahota is the Nottingham collaborator on this programme, which is led by Professor Chris Fox, University of East Anglia. The programme runs between 2013 and 2019.

7.2.6 Hypertension in Dementia (HIND)

Our research in this area stemmed from our concern as clinicians that the treatment of high blood pressure may do more harm than good in some very fragile older people. We have set out to find out if this is true and, if so, what can be done about it. We have worked with Professor Simon Conroy in Leicester and Dr Jenni Harrison in Edinburgh on this project and, latterly, with Professor Sarah Lewis in the University of Nottingham – professor of medical statistics with whom we have long and successful links since the days of the Medical Crises in Older People (MCOP) programme.

Our first work was to look at the underlying evidence about whether there is good evidence already that lowering blood pressure in people with dementia is a good thing to

do or not. We found that there is very little evidence one way or the other, mainly because people with dementia were not entered into the trials.

This means that doctors presume that lowering the blood pressure of people with dementia has the same benefits and risks as in people without dementia, and our reviews showed that they manage hypertension in people with dementia just as they do in those without dementia. Our survey found that some GPs are a little uncomfortable with this, and many take special care to take individual factors such as dementia into account when offering blood pressure lowering drugs.

But we noted that people with dementia might be at greater risk of side effects from anti-hypertensive drugs than those without dementia, and many of these potential side effects were not studied in the original trials of anti-hypertensive medication. Furthermore, we noted evidence that lowering blood pressure might worsen the progress of dementia. People with dementia also tend to be frail and many are very old and these factors might increase the harm and reduce the benefits of antihypertensive drugs. Worryingly, although higher blood pressure is generally associated with poorer outcomes in most adults, the reverse is often observed in the very aged and those with disability.

Assistant Professor Tom Welsh's PhD looked at how hypertension is managed in the modern NHS. It was not an easy study and largely the fitter people with dementia were studied. By and large, their care was in line with modern best practice, but he noted a slightly increased proportion of people taking anti-hypertensive drugs reported potential drug related side effects. There was also a high rate of heart attacks and strokes, which is what anti-hypertensive drugs are supposed to prevent. However, this was not a study comparing matched groups given, or not given, antihypertensive drugs, and the patients Tom studied were at high risk of both heart attack and stroke and side effects.

Given the strong understanding that hypertension in people with dementia should be treated in the same way as in people without dementia, and given that there is no strong evidence to oppose this view, it is difficult at this stage to consider a trial of not treating high blood pressure unless in a very carefully selected group at high risk of death and anti-hypertensive side effects. However, when we reviewed the literature we found that many people taking antihypertensive drugs can stop them without their blood pressure rising to levels that would justify re-starting them. We therefore wondered in one way to optimise the potential benefits yet reduce the potential harms of antihypertensive drugs in people with dementia would be to attempt to withdraw them and only to re-start them if their blood pressure rose again to treatment levels. We tried this in a feasibility study led by Veronika van der Wardt and funded by the NIHR Research for Patient Benefit programme. We found that it was hard to recruit people into the study as it required a lot of engagement from GPs who are very busy, and there was understandable reluctance of people with dementia or their carers to wish to interfere with their long term medication. At present, we do not think that a large scale study is feasible in the UK using these methods.

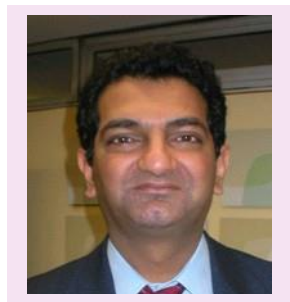
Thus, our research to date has not allayed our concerns that treating hypertension in people with dementia may not be safe and effective, yet we have found it difficult to find a research approach that will get a definitive answer. This is where our current research comes in. Much has been learnt about the benefits and harms of drugs from epidemiological studies of huge anonymised databases of GP records. The advantage of these databases is that they represent usual practice and do not require us to recruit participants which proved so difficult in our feasibility study of the withdrawal of anti-hypertensive drugs. Professor Sarah Lewis has supervised a Masters in Research Methods student to explore the relationship between antihypertensive drugs and a range of adverse outcomes in people with and without dementia – the first step of which has been to establish how patients with and without dementia can be identified and distinguished. Now this has been achieved, we hope that we will be able to observe whether the presence of dementia appears to modify the benefits of blood pressure lowering therapy, or increase the risks.

8 The aged musculoskeletal system: fractures, bone health, falls, exercise and sarcopenia

The aged musculoskeletal system research in our group is led by Professors Pip Logan, Tash Masud, Opinder Sahota and Rowan Harwood.



Professor Pip Logan



Professor Tash Masud



Professor Opinder Sahota

Further details of all the studies listed here are found on our group's website:
<http://www.nottingham.ac.uk/research/groups/healthofolderpeople/index.aspx>

8.1 What we have achieved

Whereas the previous research topics concern an important setting for older people with frailty (care homes) and the problems of the aged brain (delirium and dementia), this research topic concerns another major health care topic seen in older people, the aged musculoskeletal system. By this we mean fractures, the underlying bone diseases that make the older bone susceptible to fracture, the underlying muscular weakness that predisposes to falls, and the falls that precipitate a fracture. There is a lot of overlap between themes.

Our group has a long track record of falls research contributing to the evidence base for the benefit of interventions to prevent falls that now underpins routine clinical practice. One previous study showed that cataract surgery not only improves vision but prevents falls. Another previous study showed that community falls teams could prevent falls in people who fall at home but do not get sent to hospital. We have shown the limited value of attempting to prevent falls in people who are at risk of falling but have not yet done so in the geriatric day hospital. We have also been part of a multicentre study that demonstrated the value of group exercises in leisure centres in the prevention of falls in the community.

Professor Masud collaborated with Professor Kendrick in Nottingham and Professor Iliffe in London and others in the Pro-Act65+ study (of over 1200 people) which showed that physical activity levels could be increased by implementing the FaME exercise programme in community dwelling older people and that falls could be reduced with this approach. In further collaboration with the University of Loughborough (with Dr Brooke-Wavell), the bone arm of ProACT65+ showed that the impact of the FaME exercise and Otago exercise programmes was not sufficient to increase bone quality.

In collaboration with the University of Loughborough (Dr Brooke-Wavell) Professor Masud showed that whole body vibration in frail older people can improve leg muscle power and increase bone formation without affecting bone resorption.

Professor Masud has also been part of the clinical academic group that has written "A comprehensive fracture prevention strategy in older adults" the European Union Geriatric

Medicine Society Statement, demonstrating that our research is getting into guidelines that will improve care internationally.

8.2 What we are doing now

There are many active studies running in this theme, particularly about the role of exercise. The University of Nottingham has created several "Research Priority Areas" which aim to facilitate research in areas of strength and strategic importance. We are pleased to be part of one of these in Musculoskeletal Ageing. In the future we fully expect to conduct more applied health research that translates new understandings drawn from laboratory science, for example about exercise and diet, into clinical interventions and settings.

The NIHR-funded Nottingham Biomedical Research Centre began in 2017. The vision for the Musculoskeletal theme of this BRC is to provide a platform for translating outputs from our world-class discovery science programmes to improve quality of life and sustain people more effectively in the community. It will be achieved by using our comprehensive mechanistic understanding and novel biochemical, imaging and clinical technologies to develop and evaluate novel interventions matched to individuals, leading to a personalised medicine approach, linked to improved mechanistic understanding. The research themes include: phenotyping and outcome measurement; the joint; brain, nerve and psychosocial function; metabolism; and complex treatment packages. It is to the latter research area that our group contributes in particular. In general, by having access to, and skills in the study of, clinical populations, our group provides a vital contribution to the translational pathway from basic to applied health research and hence to ultimate patient benefit.

8.2.1 Cohort study of patients with non-weight bearing lower limb fractures

This study is conducted by Dr Ellie Lunt, Clinical Lecturer in geriatric medicine. The study is conducted as part of the Nottingham NIHR BRC in collaboration with Professor Paul Greenhaff, from the School of Life Sciences.



People with lower limb fractures are recommended not to put weight through the affected limb for 6 weeks (known as non-weight bearing) to allow the bones to heal. Lower limb fractures are common in older people, due to weaker bones (osteoporosis) and a higher tendency to fall. Research in this non-weight bearing fracture group was prompted by clinical observations of high readmission rates, worsening dependency and worsening mobility levels in these patients, at the end of the non-weight bearing period and after the subsequent rehabilitation. We presume that there will be considerable loss of muscle during this period due to the immobility.

This cohort study forms part of Ellie's PhD, and aims to investigate the rate and extent of loss in muscle size, strength and function that older people experience when they are non-weight bearing. The study will also look at how these losses match to adverse clinical events and whether there are any key processes in muscle metabolism that can be targeted in future studies to prevent such outcomes. With help from colleagues in the University of Nottingham in Derby, the study will employ some of the novel non-invasive techniques to measure muscle synthesis and breakdown. These techniques have been

validated in young populations where muscle mass has been increased by training but will now be applied to this clinical population to provide the much needed insight into how muscle mass and function change during immobility in the patient environment, and how these changes may depend on a person's degree of frailty. The study will also compare various methods of measuring muscle mass and strength to discover the most accurate and clinically feasible techniques.

Findings from the study will provide a detailed picture of the muscle molecular changes associated with immobility, from which we can extrapolate a better understanding of deconditioning of older people with frailty who may be immobile from other causes such as acute illness and hospital stay. Future work as part of the BRC will be to develop interventions to prevent and restore these losses.

8.2.2 Preventing falls in care homes (FinCH)

We have described this earlier in the care home theme section (6.2.4).

8.2.3 Chair based exercise in the community

Whilst the benefits of various forms of exercise on health and well-being are becoming ever clearer, there are difficulties in very frail people being able to participate and benefit from doing so. Many exercise programmes require the participant to be able to stand or walk. For those that cannot, there is chair based exercise. This has been little studied. Our group has reviewed the literature briefly once and found little, and is repeating this review to look deeper. The first review was somewhat stymied by the lack of definition of chair based exercise, so we produced a definition of what chair based exercise should be.

This work is supported by a CLAHRC PhD Fellowship for Katie Robinson (a physiotherapist) and by a NIHR Research for Patient Benefit programme led by Professor Tash Masud.



Katie has thoroughly reviewed the existing research on chair based exercise using our new definition: there is very little firm evidence that there are any physical health benefits from it. This is partly due to the lack of research, but also because most studies have not tested exercise regimes that are intense enough to change muscle strength. Despite this, her survey of current practice shows that chair based exercise is widely offered. We suspect that the justification

for chair based exercise as currently delivered – usually to frail older people such as those in care homes – is as a form of recreation rather than altering physical health.

Katie has however developed a more intensive chair based exercise regime which is capable of improving muscle function. Questions remaining now are whether this new intervention is feasible and sustainable in the sorts of people with frailty that chair based exercise is offered to, and in the settings where it is usually delivered.

Work is also being undertaken to optimise the method of evaluating the chair based exercise intervention to help design a future trial. This is being done through feasibility work across day centres, care homes and community groups in Nottinghamshire. This study is not designed to look at whether the chair based exercise intervention is effective: instead it focuses on whether the intervention can be delivered and whether it is possible to run clinical trial across a range of community settings. Little research of this kind has taken place across day centres and local community groups emphasising the importance of feasibility work to explore approaches to recruitment and delivery.

The chair based exercise intervention has now been delivered across all the settings. Community services and the older people using them were interested in taking part in the study however there were some challenges with recruitment and delivery of the study which need to be considered for a future trial. These challenges included changes in the provision of day care for older adults, temporary closure of centres due to outbreaks and the daily routine of centres. We now have a better understanding of how long the recruitment may take, what resources are needed and how we can minimise the impact to the study when centres have to close. There were also difficulties with delivering the chair based exercise intervention as planned with day centres and community groups only being able to accommodate exercise sessions once a week, which is not sufficient to make a real difference. Work is currently underway to gather the views of the older adults and staff at the centres. This will help to explore whether there are ways to improve how the intervention is delivered as well as the research process.

We then need to consider all the feasibility information to establish the most appropriate way to evaluate the chair based exercise intervention.

8.2.4 Chair based exercise in in-patients (PEDAL)

Another role for chair based exercise is in inpatients. Many patients are temporarily immobile, yet the hazards of inactivity especially in such settings are increasingly being recognised – muscles wastes away very quickly when not used. This pilot study compares the muscles strengths of in-patients using a cycle exercise machine to those who do not. This study is led by Professor Sahota and supported by a start-up grant from the British Geriatrics Society.

This is now complete and published in *Age and Ageing*. In summary, pedal exercises with minimal supervision is not feasible as a single intervention to improve physical activity and maintain muscle strength of older people in hospital. They may still have a role as part of a structured multifaceted strategy to improve physical activity in hospital. This study also highlights the need for further research to better understand the reasons behind the prevalence of physical inactivity in older people in hospitals, and what can improve patients' engagement in activities to combat this.

8.2.5 Engaging older people in long term exercise (OPREE)

Adult physical inactivity has been estimated to cost the UK economy £1billion. A recurring theme in all research involving exercise as an intervention is that sustaining exercise at levels necessary to have health benefits is challenging. For example, falls and the risk of falls, has been shown to be reduced in older people living in the community if they complete regular lower limb strength and balance training. The NHS provides this training for a short period of time with the expectation that people will maintain the exercises after they leave the training programme. Our research has demonstrated however, that of those referred to the exercise programme, a quarter fail to start, a third withdraw prior to completing half of the programme, and only a quarter complete the programme. The withdrawal reasons varied, and included concerns about the intensity of the programme, medical incidents, transportation problems, holidays, commitments or people being too busy. We are exploring why people do not attend the NHS training programmes by collecting data from NHS services, and from the patients themselves. Using the data and other published literature we are developing a number of strategies to increase the rate of attendance at the prescribed training and the ongoing exercises.

We have completed a systematic review of the literature, and found that there are very few evidence-based interventions that have been proven to help older people engage with exercise programmes in the community. The most promising strategies we found were: staff using the theories of "positive messaging"; regular monitoring and feedback; staff providing home visits to encourage attendance; staff being attentive to "self-

efficacy”; staff “signposting” people to appropriate resources to encourage sustained engagement with exercise; and some formal behavioural change techniques.

Interviews and focus groups with patients and staff have found that to make exercise classes more engaging they need to be purposeful, practical, affordable, fun, empathetic, and innovative, proven to be effective and not be time limited. Trainers need to be skilled in motivational techniques, be knowledgeable about local facilities and understand older adults’ needs.

Based on these understandings an intervention package has been developed (called OPREE). It was tested in a small group of people, which has shown that the intervention is acceptable. This work was being completed by Kevin Anthony as part of his CLAHRC East Midlands PhD Fellowship, supervised by Professor Pip Logan, Professor Tash Masud, Professor Kristian Pollock, and Dr Veronika Van der Wardt.

8.2.6 The Physical activity Implementation Study In Community-dwelling Adults (PHISICAL) study

The recent ProAct 65+ research study showed that the group-based Falls Management Exercise (FaME) programme was more effective in preventing falls than one-to-one exercise programmes. Nottingham and Derby, together with London were the recruiting centres for ProAct65+, with Professor Tahir Masud being a co-investigator on this large multicentre trial led by Professors Steve Iliffe (London) and Denise Kendrick (University of Nottingham). There is now sufficient justification for these to be put into practice widely. Public health teams in Leicestershire and Derby have implemented FaME programmes. Many implementation research questions are being answered while this has been done such as determining the barriers and facilitators to put this into practice at scale and pace, whether establishing a community of practice helps the implementation and embedding of the intervention, and whether the intervention retains its effectiveness when put into practice outside of a clinical trial. This study is funded by the NIHR Collaboration for Leadership in Applied Health Research and Care (CLAHRC) East Midlands, runs from 2015 to 2018, and is led by Professor Liz Orton.

This study hosts a clinical academic PhD student, Sarah Audsley, a physiotherapist. The title of her PhD study is Keeping Adults Physically Active Following the Completion of a Community-based Falls Prevention Exercise Programme: A Feasibility Study (KAPA). During her PhD Sarah will be exploring how best people who are offered the FAME programme can be help to stay engaged.



8.2.7 Novel non-invasive techniques to measure mass, synthesis, and breakdown.

At present, measuring muscle mass usually requires scans that have to be done in hospital, and measuring muscle synthesis and breakdown requires invasive laboratory

experiments. Together, the difficulty of making these measures hampers research in this field. Colleagues in the University of Nottingham in Derby have developed non-invasive techniques in which muscle mass, synthesis and breakdown can be calculated by the take up and excretion of molecules that are used to make up muscle proteins. In this study, A PhD Fellowship funded by the Abbeyfield Foundation, Jessica Cegielski examines the use of this new technique in a range of people, of varying ages, some of whom are undergoing exercise regimes and hence are expected to synthesise muscle and some of whom will have a limb immobilised and so would be expected to lose muscle. If this technique proves to be successful, it can be used to test the effect of interventions to prevent or reverse sarcopenia targeting synthesis, breakdown or both.

8.2.8 Perindopril and Leucine to improve muscle function in older people. (LACE Study)

Despite the problems we have in measuring sarcopenia, some research to date using existing techniques have noted that a drug called perindopril (widely used to lower blood pressure and help in heart failure) is associated with less sarcopenia, and an amino acid called leucine is a food component that is particularly important in triggering muscle synthesis. There is sufficient reason already to test these out properly in a research study to see if giving them to people with sarcopenia makes any appreciable difference. We already know that resistance exercise can prevent or reverse sarcopenia, but it is important to look for drugs and food stuffs that can also do so, either to be used in addition or instead of resistance exercise in those who are too weak to do resistance exercise. Professor Tash Masud leads the Nottingham arm of this study and Dr Adam Gordon leads the Derby arm, which is funded by the NIHR and led by a study team in the University of Dundee by Dr Miles Witham.

8.2.9 Intravenous iron after hip fracture surgery

Anaemia following hip fracture is common. Approximately 30 to 45% of patients are anaemic on admission - 10% are severely anaemic. Anaemia is associated with poor outcomes with regard to mobility, postoperative mortality and readmission. There is currently no clear consensus on the optimal method of managing perioperative anaemia in this group of frail patients with frequent comorbidity. One approach is to give iron by injection – it is often not well tolerated or absorbed if given by mouth. This study compares the outcomes of a group of 40 people after hip fracture surgery given intravenous iron to a group of 40 given usual hospital care. The primary outcome simply looks at whether the iron injections increase the amount of blood synthesis in the week after the surgery, although other outcomes such as the need for transfusions, complications, mobility and mortality will be looked at. If the results are promising, larger trials, big enough to see if intravenous iron improves clinical outcomes, will be justified. Professor Iain Moppett leads this study for the group and Professor Opinder Sahota is a collaborator. This study is ongoing.

8.2.10 Care of people with vertebral fractures

People with vertebral (spinal) fractures due to osteoporosis do not usually need treatment in hospital, but those that do are likely frailer, in significant pain and have poorer mobility. Treating their fracture needs to be done in conjunction with other age-related co-morbidities, polypharmacy, cognitive impairment, sensory impairment and frailty. Orthogeriatric medicine brings together expertise in fracture management (operative and non-operative), peri-operative medicine, rehabilitation and bone health assessment in a patient centred, co-ordinated multidisciplinary fashion. This has proven to be successful in the management of patients with hip fractures and could offer the same benefits in vertebral fractures.



The aim of the research is to explore if there is a role for such a multidisciplinary model for the management of older people admitted to hospital with vertebral fractures. The study is conducted by Dr Terence Ong, with support from a PhD Research Training Fellowship awarded from the Dunhill Medical Trust.

The first part of the research looked at existing literature to help understand the burden of patients admitted to hospital with vertebral fractures. Those admitted are usually in their eighth decade of life, have multiple co-pathologies and frail. Most are managed without an operation but do need at least two weeks to recover in hospital. Unfortunately, after their acute hospital care a significant proportion are transferred to a care setting and eventually a quarter do not survive beyond the next twelve months. Although information gaps were identified in this review, its findings have begun to inform us of the natural history of people admitted to hospital with vertebral fractures.

The next part of the research was an observational study following these patients in hospital. Its aim was to build on what has been identified in the literature; address the gaps identified previously, such as functional consequences of vertebral fractures and who is at risk of poor outcomes; and see what existing care looks like. Recruitment was complete in 2017, and the results will be available in 2018.

Alongside the observational study in 2017-2018 there is a consensus study aimed at developing an agreed statement of how people with vertebral fractures should be treated in hospital. The consensus study done using a web-based tool will be participated by clinicians involved in looking after this group of patients.

Findings from these three parts will address the question of whether there is a role for a multidisciplinary orthogeriatric model for the care of people admitted to hospital with vertebral fractures and what this model should look like.

8.2.11 Care of people with pelvic fragility fractures

The pelvis is the sturdy ring of bones located at the base of the spine. Broken (fractured) pelvic bones in older people are commonly caused by a low impact, such as a minor fall. These fractures are usually treated without an operation, but are associated with considerable risk of dying and disability, as well as prolonged hospital stay and significant healthcare costs. Keyhole surgery in this group of patients may be beneficial, but further research is needed to evaluate this.

The aim of this NIHR funded study, led by Professor Opinder Sahota, will be to undertake a preliminary study to help design a future trial to evaluate the benefits and cost savings of treating older people with broken bones in the pelvis with keyhole surgery. Older patients presenting to hospital as an emergency with a fractured pelvis will be randomly offered either keyhole surgery or no operation (routine care). We will determine whether there are enough patients to take part, whether patients are willing to be randomised and if the doctors are willing to randomise the patients and keep to their decision. We will collect important measurements (over 12 weeks) to establish whether a future study is practical. The main outcome of a future study will be a measure of mobility (we will test two different scales), together with measures of pain, pain medication taken, quality of life, use of health services and their costs. In addition, we will undertake interviews with participants and clinicians to explore their experiences and recommendations for improving a future trial.

8.2.12 Intranasal drug delivery development

As part of a large grant by the Technology Strategy Board (in collaboration with Alan Perkins and Richard Pearson, University of Nottingham and Critical Pharmaceuticals), Professor Tahir Masud led the clinical trial aimed at developing a new intranasal route for the bone building drug teriparatide. This is the first "First in Man" trial conducted in Nottingham University Hospitals NHS Trust. Valuable information has been gained about the effectiveness of intranasal absorption of teriparatide in both rodents and humans and further studies are being planned to develop this route further.

8.2.13 Osteoporosis and Falls Collaboration between Nottingham and Denmark

A collaboration between Nottingham and the University of Southern Denmark (funded by the municipality in Odense and the University of Southern Denmark) is led by Professor Tahir Masud who is supervising several PhD students investigating the prevalence of osteoporosis in people prone to falling, the usefulness of peripheral bone density in people who fall and the combination of whole body vibration and teriparatide in the treatment of osteoporosis. A further programme of research in collaboration with the University of Aalborg is investigating development of interactive gaming devices including the Wii in balance and muscle strengthening programmes. Another study is utilising Danish databases to investigate if adding falls risk factors to FRAX (Fracture Risk Assessment Tool) improves fracture prediction (collaboration with Dr Stig Anderson, Aalborg University and Professor Nadeem Qureshi, University of Nottingham). A computer programme has been developed to use the Wii board as a method for measuring leg extensor power as well as measuring body sway and hand grip strength (with the University of Aalborg).

8.2.14 Sarcopenia

A recent area of research for the group is in the field of sarcopenia – the age related loss of muscle mass and strength. Professor Masud leads a study on the prevalence of sarcopenia in people who fall (Sarcopenia), funded by NUH Charity. Initial evaluation of results suggests that using bioimpedance the prevalence of sarcopenia in frail fallers may be as high as 40%. However, bioimpedance may overestimate prevalence when compared to DEXA and a re-evaluation may be needed for cut-off points for the technique (being presented at EUGMS and currently being written up for peer review publications). The importance of this work is that if we are to develop treatments for sarcopenia and prevent the consequences, we need to be able to diagnose the condition and measure it.

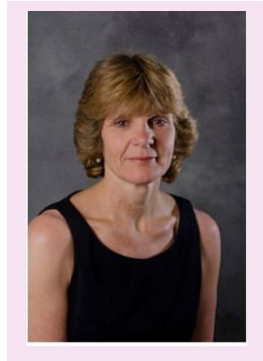
8.2.15 Community Based Rehabilitation after Knee Arthroplasty (CORKA)

CORKA is a large multi-centre trial which is investigating the rehabilitation of those at risk of a poor outcome after knee replacement. In 2013, there were over 90,000 knee replacement procedures in the UK, representing a 7.3% increase over 2011, and this is continuing to rise due to an ageing population and other factors such as obesity. However, although this is a routine procedure, around 15% of patients who undergo knee replacement surgery report they have continuing pain and mobility problems - a poor outcome – which limits or prevents them from being able to do activities they want to do. The study investigates the effect of a multicomponent community based rehabilitation programme on such patients after knee replacement surgery (knee arthroplasty), and compare this approach with standard care rehabilitation programmes. The trial is led by colleagues at the Universities of Oxford and Warwick with Prof Avril Drummond from Nottingham.

The recruitment target of 620 participants was met early in 2018.

8.2.16 Does occupational therapist led home environmental assessment and modification reduce falls among high risk older people? Occupational Therapy Interventions Study – OTIS

Falls in older people are highly prevalent and are a major contributor to morbidity in the community. A significant proportion of falls in the community occur at home with many caused by simple hazards such as tripping over a rug or lack of handrails. Consequently, relatively simple modification of home hazards could lead to a reduction in falls. Whilst there is some evidence that an assessment by occupational therapists can lead to a reduction in falls, this evidence is based on small trials. As a consequence, routine home assessment by occupational therapists it is not widely undertaken among older people at risk of falls. Thus the main aim of this trial is to establish whether environmental assessment and modification by occupational therapists will lead to reduction in falls among people at elevated risk of falling who are living in the community. Recruitment started in 2016 and by early 2018 nearly 900 participants were randomised from 8 UK sites. OTIS is led by colleagues in York with input from Oxford, Leicester, Sheffield, Australia and Prof Avril Drummond from Nottingham.



Professor Avril Drummond

8.2.17 Nottingham Neck of Femur Vision Assessment (NoNOF-Vision)

Ten percent of those who sustain a hip fracture will later fracture their other one, over half doing so within 2 years. Visual impairment is a recognised major risk factor for this, and many visual problems can be improved, but few studies have tried to do anything about this. The overall aim of this study was to prepare to improve the vision of people who have had hip fractures in an attempt to prevent future falls and fractures. Our objective in this study was to screen patients presenting with their first hip fracture for visual problems and to consider which of them could be improved. The early findings were that 20% had refractory problems that could be improved (with better glasses) and 30% met criteria for referral to an eye specialist. The findings give rise to optimism that there is a large number of people whose vision could be improved, which is worthwhile in itself and might reduce the chance of future falls and fractures. This study is led by Professor Sahota, and supported by a grant from the Nottingham University Hospitals Charity Fund.

The next stage of this study is to explore the prevalence of visual impairment in older people presenting to fracture clinic with a non-hip fracture. As part of a Bronze HEEM award, we have now received ethics approval for the study and looking for further funding to conduct the study.

8.2.18 The role of professions in implementation of self-referral physiotherapy in musculoskeletal primary care patients

UK general practice is under ever increasing pressure as a result of the continued austerity from the financial crisis in 2008, the increasing requirements of an ageing population, the expansion of lifestyle-related health conditions, and the recruitment and retention challenges facing general practitioners.

Musculoskeletal conditions make up to 30% of GPs workloads. Self-referral physiotherapy is an established practice with a body of evidence demonstrating efficacy which could be helpful to GPs, patients and the NHS. However, self-referral remains the exception rather than the rule with implementation patchy. Furthermore, even in those areas where self-referral is available, most patients still access physiotherapy services having already seen their GP. It would appear that there are obstacles to the successful implementation and subsequent uptake of physiotherapy by self-referral.

This research hopes to explore why there has not been a more comprehensive implementation. Often the rationale for issues such as this are attributed to financial constraints. However, we think there's perhaps more to it – perhaps anxiety from doctors that the physios may miss something serious, perhaps physios lack confidence in their abilities, or maybe patients' beliefs about who best to see when in pain. Our intention is to talk to all of these groups and explore the issues, beyond lack of money, because some of these issues may be more important to overcome.

By undertaking qualitative research, we aim to get at the root of issues, and describe them in ways that allow practitioners and systems to change and modernise. It should help patients and the public to take better control of their health. This means that the societal impact of this research could be extensive.

Self-referral physiotherapy does not provide all of the answers but has the potential to contribute significantly to the agenda of sustainability of primary care services within the NHS.

This PhD project is funded by the CLAHRC for a clinical academic physiotherapist, Rob Goodwin.

9 Community services

Professor John Gladman leads the work in this area for the group. Further details of all the studies listed here are found on our group's website: <http://www.nottingham.ac.uk/research/groups/healthofolderpeople/index.aspx>

9.1 What we have achieved

Two important previous studies in this area were our trials of different forms of "intermediate care" – short term rehabilitation to improve health and reduce the time spent in hospital. We studied a service that provided rehabilitation at home, and a service that did so in a care home. The home-based service led to better health outcomes, shorter lengths of stay and was good value for money, and this justifies the major role of home-based intermediate care services.

We have recently reviewed the evidence on a third type of intermediate care used in the UK run by home care workers known as "re-ablement", showing that at present this sort of service is poorly defined and has no robust evidence to show that it is effective. One of the theoretical concerns about re-ablement is that home care workers are not rehabilitation specialists yet the clients they typically see have complex conditions such as stroke, dementia, and falls which are known to respond to specialist care. With this in mind, Phillip Whitehead's recently completed PhD examined whether occupational therapy can help re-ablement services to be more effective. He showed promising findings in a small pilot study, and it is expected that re-ablement services will be more effective if they receive input and support from rehabilitation professionals than if they rely solely upon home care workers.



The recently completed Optimal study, described in the care home section, 6.1, is our most recent important study, which we expect to have a considerable and immediate influence on the commissioning of services for the care home sector.

9.2 What we are doing now

Whilst much of our current research deals with community based services (such as PeaCH in section 6.2.2, the end of life study in care homes in 6.2.5, Scaling the Peaks in 7.2.3, and PhISICAL in 8.2.4) two current studies we list here are a study to evaluate the role of community hospitals in the care of older people, and a study to explore the commissioning of community services to promote the resilience of older people.

9.2.1 Community hospitals (MOCHA)

There are several hundred community hospitals in the UK, and such hospitals are found throughout the world. Little research has been done into whether there are any particular models or configurations that are particularly efficient. This study used econometric methods to examine a national audit database of community hospitals to identify the characteristics of efficient community hospitals, and is conducting case studies of community hospitals with varying degrees of efficiency. The study is funded by the NIHR Health Service and Delivery Research Programme, and is led by a team from Bradford Teaching Hospitals NHS Foundation Trust and the University of Leeds.

9.2.2 Promoting resilience in older people (SOPRANO)

Much of our research work deals with mitigating the adverse consequences of old age such as by the use of rehabilitation. Whilst our group does not primarily lead research to

prevent the ageing process, we are aware that it makes sense to also attempt to protect people from the effects of ageing and ill health. This study aims to identify what is being commissioned to support older people to maintain their resilience. The word resilience refers to the ability to resist or bounce back from the challenges faced in older age (e.g. illness or bereavement). We have reported a theoretical model that proposes that resilience is a function of a number of "assets" that older people have – mental, physical, social, environmental, financial, and so on. The sorts of services that we think are likely to enhance resilience are those that promote a healthy lifestyle in general (exercise, smoking cessation, alcohol moderation, a healthy diet) but also those that help social aspects of health - such as services to reduce loneliness. We think that there are many sorts of low level interventions such as these that are available in society, some provided by the health services, some by the social services but many will be in the "third sector" (e.g. charities). We also recognise that these services will only be of use if they reach the people for whom they are intended and work together as required in an integrated way. The SOPRANO study (Supporting Older People's Resilience through Assessment of Needs and Outcomes), funded by the NIHR Collaboration for Leadership in Applied Health and Care Research (CLAHRC) East Midlands, studied how commissioners and providers of third sector services for older people work together with the aim of optimising the contribution of the third sector to the promotion of resilience in older people. Whilst we found that commissioners and third sector providers could see the value of working together, the commissioning process remains difficult for both parties. Another issue is that although commissioners accept that they would find routine data from the assessments and outcomes of individuals engaging with third sector services very useful (just as such data are available from the statutory services), such data are usually not collected nor sought. We believe that overcoming this problem will be of value and justifies further research and innovation.

We are particularly grateful for the support of the East Midlands Later Life Forum, via Andy and Moira Findlay, and Jo Smith, for their support and contribution to this study.

10 Education and training

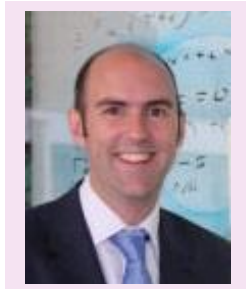
Health practitioners of the present and the future need to be skilled in the care of older people with frailty – given the ubiquity of older people with frailty this is now a core skill and not something for specialists. The evidence base for the care of older people is rapidly advancing. As a group delivering a wide range of research, and sitting alongside schools of medicine, nursing and physiotherapy, our group is ideally suited to influencing undergraduate curricula in this area. Also as a group with a high number of clinical academics, we are well placed also to ensure that post graduate training and education is up to date and evidence-based.

We describe here work we have done to develop national and international curricula in geriatric medicine, and illustrate some of our innovative work including computer aided learning and the development of advance nurse practitioners.

Over the last 3 years we have strengthened our education team with the joining of a nurse educator (Jocelyn Mjojo) and a Clinical Teaching Fellow (initially Jo Pattinson, Tom McGowan and now Ka Lun Ng)

Associate Professors Adrian Blundell and Adam Gordon have used their expertise in evidence-based practice and education to write the highly rated textbook "Geriatric Medicine at a Glance", published by Wiley (June 2015 ISBN: 978-1-118-59764-4).

This work is led by Associate Professors Adrian Blundell, Sarah Goldberg, Adam Gordon and Professor Tahir Masud



Associate Professor Adrian Blundell

10.1 Undergraduate medical curriculum

Back in 2007 we brought together a range of experts in biological, social and clinical gerontology to consider the specific knowledge and skill base required to deal with older people now and in the future, and we mapped this to the general guidance produced for the training of doctors in the UK by the General Medical Council (*Tomorrow's Doctors*) to produce a national undergraduate curriculum. We have since conducted two UK national audits of the delivery of this curriculum, helping medical schools across the country to prepare medical students better for their lives as doctors caring for older people. The Nottingham team led the development of the European Undergraduate Curriculum on Geriatric Medicine.

10.2 Innovation and computer aided learning

The challenges for medical education are that the number of students is rising, which potentially threatens the delivery of consistent teaching and training, and the amount of information that could potentially be taught is overwhelming, and so care must be taken to control their exposure to the things they need to learn to be safe and to prepare them for modern practice. Computer aided learning packages are a means of providing enjoyable, consistent, well-defined, quality-assured teaching of the relevant knowledge

base. Their use can mean that face to face teaching time is not used simply to pass on knowledge, but used to help students to apply that knowledge.

Our group has developed a suite of computer aided learning packages covering key topics such as delirium, dementia, continence, activity, and prescribing. They are freely available for use by anyone, anywhere from our website <http://www.nottingham.ac.uk/medicine/study/learningresources/geriatricmedicine.aspx>. We have shown in a number of studies that the use of these learning packages improves students' learning.

10.3 Developing a curriculum for advanced nurse practitioners specialising in frail older patients

Experienced nurses are beginning to take on some of the roles traditionally done by doctors. These nurses are called advanced nurse practitioners. Nottingham University Hospitals is one of the first places to train advanced nurse practitioners specialising in the hospital care of frail older patients. We have brought together experienced doctors, nurses, therapists and lay representatives to get expert agreement on a set of competencies and a role description for these roles. This work is being used as the basis of a curriculum for the training of these advanced nurse practitioners and will ensure consistent standards. The work is funded by Nottingham Hospitals Charity and led by Sarah Goldberg.

Over the past 18 months, we have gained consensus from an expert panel on the role and essential competencies of ANPs specialising in frail older patients. This work has been published and presented nationally. Many hospitals around the country are using this work to develop their own ANP service.

10.4 Multiprofessional geriatric training using simulation

Historically much simulation has focussed on high fidelity equipment testing acute medical emergencies. Our group has introduced and piloted several multiprofessional simulation activities included scenarios using simulated patients. The two main projects are an undergraduate multiprofessional simulated ward round and a multiprofessional postgraduate simulation teaching day covering core topics in geriatric medicine (funded through a grant from Health Education East Midlands). Both these innovations are currently being evaluated by the team.

10.5 Developing clinical academic careers for Nurses, Midwives and Allied Health Professionals

In the last year the group have won the contract from the Health Education East Midlands to deliver the ICA Silver Scholar programme over the next three years. This will allow up to 7 clinicians the chance to undertake a piece of research which will support a PhD proposal. The training will be provided by both academics and clinicians. Although it is across all research groups as the scheme is hosted in the Division of Rehabilitation and Ageing it is hoped that older peoples research will benefit. Professor Pip Logan leads this initiative.

11 Collaboration with Universities in São Paulo, Brazil

There are approximately 16 million people aged ≥ 65 in Brazil, which is set to increase to 65 million in 2050 and therefore the phenomenon of rapid population ageing and subsequently rising health and social care needs are pressing in Brazil. We are currently working with universities in the state of São Paulo to develop research collaborations. Since 2016 we have been developing collaborative partnerships with Alessandro Ferrari Jacinto, Associate Professor in Geriatrics at Botucatu Medical School São Paulo State University.

In 2017 we secured £46,000 from the British Research Council and São Paulo Research Foundation (FAPESP) to deliver a 5-day Newton Researcher Links workshop aimed at early career researchers. This workshop will take place in June 2018 in the city of Botucatu, at the Botucatu Medical School São Paulo State University (UNESP). At this workshop early career researchers will focus on 'Identifying and addressing shared challenges in conducting health and social care research for older people (OPAL)'. Dr Adam Gordon, and Professor Alessandro Ferrari Jacinto will lead the workshop, and will be supported by Professor Tom Dening (Professor of Dementia Research), Dr Jay Banerjee (Consultant in Emergency Medicine), Dr Paulo José Fortes Villas Boas (Associate Professor in Geriatrics), Professor Vanessa de A Citero (Liaison Psychiatry), Dr Kathryn Hinsliff-Smith and Dr Reena Devi. This workshop will create networking, knowledge sharing, and learning opportunities, and will enable early career researchers to create international partnerships with peers sharing similar research interests, with an aim of generating competitive research bids for external funding at the end of the week.

Through our partnership we are also developing research to explore the research gaps around quality improvement and assurance in Brazilian residential and nursing homes (referred to as long term care institutions (LTCIs) in Brazil). There are 3,549 LTCIs in Brazil, the arrangement of these, the level/content of care provided, and whether the quality of care is monitored is not yet well understood. We are applying for funding to explore this, and to conduct the ground work needed to understand where the research gaps are.

This work is nested in a broader range of collaborations focussing around the links between Assoc Profs Jacinto and Gordon and their research teams. Assoc Prof Gordon was appointed a visiting Professor at Botucatu Medical School in December 2017 and a series of collaborations including work around education in dementia care, communication in dementia, bone health and orthogeriatrics, simulation in geriatric medicine and musculoskeletal ageing has already been identified. The collaboration was cemented in November-December 2017, when Assoc Prof Jacinto visited Nottingham and Derby for two weeks and Assoc Prof Gordon paid a return visit to Botucatu Sao Paolo.

12 Collaborations with Universities in the Netherlands

Work with Prof Jos Schols, Prof Ruud Haalfens and Dr Irma Evering at Maastricht University, members of our team have become frequent and active contributors to the research group of the Landelijke Prevalentiemeting Zorgkwaliteit (LPZ). In addition to helping shape the future development of the LPZ quality benchmarking index, this has provided opportunities for Nottingham researchers and PhD students to interact with the LPZ PhD training programme, which supports researchers from the Netherlands, Austria and Switzerland. As collaborations with this group mature we aim to support Nottingham-based PhD students to interact more comprehensively with this programme.

Prof Wilco Achterberg and Dr Monica van Eijk at Leiden University have become important collaborators as we seek to internationalise training for our brightest geriatricians in training. 2017 saw the first exchange between our centres, with Dr Anouk Kaboord visiting Nottingham from Leiden to do research at one of our community

hospitals. Health Education East Midlands Quality Improvement fellows, Dr Barry Evans and Dr Rachel Cowan, in turn, visited Leiden to learn about service development, quality assurance and quality improvement in the innovative Elderly Medicine Services based there. The outputs of this exchange have so far informed a symposium at the meeting of the European Geriatric Medicine Society in Nice in 2017 and presentations at the British Geriatrics Society Spring Meeting in Nottingham in 2018. Plans for the next phase of the exchange, to occur in July 2018, are already in place.

13 Patient and public involvement in our research

It is now an accepted truth that the quality of applied research is often improved where there is involvement of patient or people who represent them in the research team, alongside clinical and non-clinical researchers, and the service-level stakeholders who are also affected by the research. By “patients and public involvement” in research we do not simply mean using patients or the public as the subjects or participants of research. We mean involving them to help in all stages of the research process: choosing and explaining research priorities; designing studies that will work in practice and respecting the altruism of those who agree to participate; and helping in the conduct, analysis and dissemination of studies. They bring their own skills and resources from their lives and experiences, they require academics to avoid the jargon that can undermine rigorous thought, and many have a wide experience across many fields of research that can be illuminating.

Our research group has considerable skill in the art of recruiting very frail patients and their families into research projects. But this group of people is usually very frail, and there are limits to how much they can truly contribute to the research process and how much is ethical to ask them to do so. What we have found is that amongst those who have cared, and do care, for them are knowledgeable and powerful advocates who welcome an opportunity to get involved in research quite simply to make the world a better place. Two areas illustrate how we have developed public, patient and carer involvement in our research: our PPCI group and our use of lay members on research teams.

13.1 Patient, Public and Carer Involvement in Research group

We have a wide network of patients and members of the public as we link into many local PPI groups and systems, such as CLAHRC-East Midlands and local NHS organisations. But in 2008 when we started our Medical Crises in Older People programme there were few such organisations and most were both overwhelmed and not focussed upon the care of older people. So we developed our own group. We used the contacts we already had and the group grew organically. We found that there were many people who wanted to engage in research but did not know how to, and they gradually coalesced around our group. The initial focus of the group was dementia care. We were fortunate to have a number of innovative research staff who led this work (in particular Associate Professor Sarah Goldberg, Nadia Frowd and Pippa Foster) and for us to continue to have staff to maintain the working of the group (Reena Devi, Clare Burgon, Rupinder Bajwa, Kristian Pollock and Sarah Goldberg). The group’s main role is to be consulted at the early stages of research grant preparation – or later stages as required. Another role is to identify members of the group who would like to play a more significant role than mere consultation in each study. The group has and continues to make a considerable contribution. Not only at the regular meetings reviewing and discussing papers but from this forum embracing every aspect of the studies where there is a required public interface. Other significant roles group members have been actively involved in include presentations, writing published articles, recruitment of research staff, delivering lectures to medical students, lobbying on behalf of the department and trialling and helping formulate interventions. It is a strong team which wherever possible uses its enthusiasm to effectively recruit others to help underpin the research.

13.2 Lay members on research teams

It is often not sufficient for patient and public involvement in research to be limited to consultation, and in our work we welcome patient and public contributors to our research studies as co-applicants. We are pleased to have Kate Sartain as a co-investigator on our communication in dementia study, Margaret Kerr as a co-investigator on our hypertension in dementia (HIND) studies, and Maureen Godfrey as a co-investigator on our falls in dementia studies.

14 Research capacity building

The world needs a larger and sustainable research base related to the care of older people: the need for research is not going to go away anytime or anywhere soon! The process of developing the clinical academics of the future begins with giving undergraduates and young clinicians a taste of research, but starts in earnest with the development of post graduate researchers, usually through Masters and PhD programmes. We need clinical academics (people jointly trained as clinical practitioners and also as researchers) to perform applied health research, but clinicians have to undertake post-graduate clinical training to become expert in their discipline, as well as arduous research training, and this can be difficult. Historically the main opportunities to combine clinical practice and research have been available only to medical doctors, but clearly we need clinical academics drawn from across the range of clinical disciplines such as nursing and the allied health professions. Getting a PhD is not enough: the professional development of clinical academics, whatever their professional disciplines, after they have completed a PhD is also not simple. We have considerable expertise in identifying and supporting doctors, nurses and allied health professionals in this process. We describe here our Centre for Doctoral Training, designed specifically for supporting PhD students coming from a range of health care disciplines.

Professor Pip Logan and Associate Professor Sarah Goldberg lead in research capacity development for the group

14.1 Centre for Doctoral Training in Rehabilitation and Healthcare Research

We are proud of the Centre for Doctoral Training in Rehabilitation and Healthcare Research (CDT RHR). It is an unusual unit in that it provides PhD training for clinicians who seek part-time doctoral study alongside a clinical role. The CDT RHR host research in several areas, not only in the health of older people but also in translational and applied clinical research in stroke rehabilitation, long term conditions, and community rehabilitation. It offers tailored training suitable for people with a clinical background doing work in clinical settings. We provide access to clinical placements during the PhD studies, career development support during and – importantly – after graduation. The CDT RHR is a joint initiative between the Schools of Medicine and Health Sciences in the University of Nottingham.

14.2 Current research fellows and students

- **Fellowship:** Alzheimer's Society Post-doctoral Fellowship. Scaling the Peaks; Understanding the barriers and drivers to providing and using dementia friendly community services in rural areas: the impact of location, cultures and community in the Peak District National Park on sustaining service innovations. Dr Fiona Marshall.
- **Fellowship:** Dunhill Medical Trust PhD Fellowship. Management of osteoporotic vertebral fractures – Dr Terence Ong
- **PhD:** End of life for people with dementia in care homes – Dr Gillian Garden
- **PhD:** Rehabilitation for Outdoor Activity and Mobility: the ROAM study. Amanda King

- **PhD:** Does improved adherence to long-term exercise in older people reduce the rate of falls? Kevin Anthony
- **PhD:** Volunteers working with patients with dementia in the hospital. Liz Charalambous
- **PhD:** Communication and Dementia. Becca O'Brien
- **PhD:** Prevalence and natural history of patients with dementia who call out in the hospital. Jessica Beaver
- **PhD:** Development of an intervention to encourage the continuation of physical activity following a structured exercise programme for falls prevention. Sarah Audsley
- **PhD:** Non-invasive measurement of muscle mass, synthesis and breakdown. Jessica Cegielski
- **PhD:** Use of hip precautions after hip replacement. Courtney Lightfoot.
- **PhD:** The role of professions in implementation of self-referral physiotherapy in musculoskeletal primary care patients. Rob Goodwin
- **PhD:** Dehydration in Older People Admitted to Hospital. Ahmed El-Sharkawy
- **PhD:** Assessment of rehabilitation potential in frail older people in the acute healthcare setting: a mixed methods study. Alison Cowley.
- **PhD:** Anticholinergic burden in older adults presenting to acute medical services. Grace Ojo.
- **PhD:** Cohort study of patients with non-weight bearing lower limb fractures. Ellie Lunt.
- **PhD:** Apathy in people with early dementia. Clare Burgon

15 Research links and affiliations

Research in the care of frail older people is complex, and requires a wide range of skills and perspectives. Our core research group subtends a range of clinical disciplines, and in previous sections we have described some of our core partners such as the Dementia Centre in the Institute of Mental Health (University of Nottingham and Nottinghamshire Healthcare NHS Trust) and Professor Simon Conroy and his team in the University of Leicester, and we have described how we bring the patient and public perspective into our research.

In this section and further to sections 11 (Brazil) and 12 (the Netherlands) we briefly acknowledge other key local, regional, national and international linkages that help us to undertake research or to disseminate the findings and put them into practice.

15.1 The University of Nottingham Musculoskeletal Ageing Research Priority Area

In 2016, the University of Nottingham completed a strategic review of its research and chose to develop and resource a number of cross-cutting Research Priority Areas, one of which is in Musculoskeletal Ageing. Our research group provides the main bulk of the applied health researchers in this group. The presence of this group emphasises the University's recognition of its research strength in this field.

15.2 The Birmingham / Nottingham MRC/ARUK Centre for Musculoskeletal Research (CMAR)

The Universities of Birmingham and Nottingham have world-renown research expertise in the ageing process, and with Medical Research Council and Arthritis Research UK support formed the CMAR. Professor John Gladman was part of the successful bid to these bodies. Whilst the strength of our research group is in applied clinical research into the care of older people, rather than in the ageing process itself which requires a life-course approach, this has enabled us to provide a translational research pathway for the findings of the CMAR into applied clinical research. The studies in our aged

musculoskeletal research topic section demonstrate our potential to translate findings from bioscience into clinical science and practice.

15.3 NIHR CLAHRC East Midlands

CLAHRCs are regional research collaborations between NIHR-funded research groups and the universities, trusts and clinical commissioning groups in each region. They conduct applied health research. Professor Gladman leads the Caring for Older People theme, which is one of five themes in CLAHRC East Midlands, and which supports two studies listed here (SOPRANO and PHISICAL) and several PhDs.

15.4 East Midlands Academic Health Sciences Network (AHSN)

AHSNs are regional collaborations of trusts and clinical commissioning groups aiming to develop and improve the quality of health services, in particular through facilitating the application of research knowledge. Professor Gladman led the Older People Living with Frailty programme, which ended in July 2016, ensured that all acute NHS trusts in the East Midlands participated in the NHS Benchmarking study of urgent care of older people, and use their findings to guide future service development and commissioning. Patient Safety Collaboratives (PSC) are NHS bodies linked to AHSNs, also with a regional organisation, to enhance patient safety. Professor Gordon's LaUnCH study works with the East Midlands PSC to put an internationally-developed quality assurance system into place in local care homes.

15.5 East Midlands Research into Ageing Network (EMRAN)

Launched and lead by Professor Gladman, and supported by CLAHRC East Midlands, this network aims to promote collaboration in the field of applied health research into older people across the East Midlands. EMRAN has also developed its own on-line journal the East Midlands Research into Ageing Network Discussion Paper Series, and Professor John Gladman, Associate Professor Adam Gordon, and Associate Professor Sarah Goldberg are among its editors.

EMRAN has run a number of successful seminars to put researchers together across the region. For more information see the EMRAN website (<http://www.clahrc-em.nihr.ac.uk/clahrc-em-nihr/emran.aspx>).

The EMRAN on line discussion paper journal is publishing a steady stream of work from regional research teams. For more information, see the EMRAN Discussion paper site (<http://www.nottingham.ac.uk/emran/index.aspx>)

16 Acknowledgments

The core staff listed in this document could not have achieved so much without the collaboration of many other people and organisations. There are so many people that it is impossible to list them all, but some members of our research teams we would like to mention other than those already mentioned elsewhere are:

- University of Nottingham, School of Medicine: *Mrs Gail Arnold, Dr Neil Chadborn, Dr Gina Sands, Dr Tomas Welsh, Dr Reena Devi, Dr Sam Taylor, Professor Marion Walker, Professor Sarah Lewis, Professor Anthony Avery, Professor Denise Kendrick, Associate Professor Elizabeth Orton, Prof Amanda Griffiths, Dr Miriam Stanyon, Mrs Gail Arnold*
- University of Nottingham, School of Health Sciences: *Associate Professor Kristian Pollock, Dr Catherine Vass, Dr Victoria Hood, Dr Philip Clissett*
- University of Nottingham, School of Pharmacy: *Professor Rachel Elliott, Dr Lukasz Tanajewski*
- Nottingham University Hospital NHS Trust: *Dr Fiona Kearney, Dr Aamer Ali, Dr Rob Morris, Dr Mike Azad*
- Nottingham City Care: *Mrs Marie Ward*
- Alzheimer's Society: *Mrs Pippa Foster*
- University of Leicester: *Professor Simon Conroy, Dr Jay Banerjee*
- PPI: *Margaret Kerr, Kate Sartain, Maureen Godfrey, Alan Caswell, Elizabeth Thraves, Kate Hodgett, Andy and Moira Findlay, Jo Smith, (and many others!)*
- East Midlands Research into Ageing Network (EMRAN): *Yvonne Simpson, Chris Craig*
- Centre for Musculoskeletal Ageing Research (CMAR) Universities of Birmingham and Nottingham: *Associate Professor Philip Atherton, Professor Paul Greenhaff, Professor Janet Lord, Associate Professor Carolyn Grieg*
- Enabling Research in Care Homes (EnRICH) Network – *Jo Greenwood, Claire Litherland, Kaela Stephenson, Amy Shuttlewood*
- Care homes: *Anita Astle MBE, Zimran Alam, Verity Hallam*

17 Appendix – summary of our current portfolio of work

More information about all of these studies (except those marked with *) can be found on our website:

<http://www.nottingham.ac.uk/research/groups/healthofolderpeople/projects/index.aspx>

PhD students and fellowships			
Student	Funder	Title	Supervisors (core group)
PhDs			
Lisa Patrick	Alzheimer's Society and CLAHRC EM		
Clare Burgon	SoHS and R&A	Apathy and early dementia	
Ellie Lunt	NIHR BRC	A cohort study of patients with non-weight bearing lower limb fractures	Gladman, Gordon
Gillian Garden	Bromhead Medical Charity	End of life for people with dementia in care homes	Gladman, Gordon
Amanda King	CLAHRC EM	Outdoor Activity and Mobility: the ROAM study.	Logan, Gordon, Gladman
Kevin Anthony	CLAHRC EM	Does improved adherence to long-term exercise in older people reduce the rate of falls?	Logan, Masud
Terence Ong	Dunhill Medical Trust	Management of osteoporotic vertebral fractures	Sahota, Gladman
Ditte Jepson (Denmark)	University of Southern Denmark and Municipality of Odense	Whole Body Vibration in addition to Teriparatide in the treatment of osteoporosis	Masud
Katje Thomsen (Denmark)	University of Southern Denmark and Municipality of Odense	Osteoporosis and Falls in Odense Study	Masud
Liz Charalambous	Nottingham Hospitals Charity	Volunteers working with patients with dementia in the hospital	Goldberg, Harwood
Becca O'Brian	University of Nottingham, School of Health Sciences	Communication and dementia	Goldberg, Harwood
Jessica Beaver	CLAHRC EM	Prevalence and natural history of patients with dementia who call out in the hospital.	Goldberg, Harwood
Sarah Audsley	NIHR National School of Primary Care Research	Development of an intervention to encourage the continuation of physical activity following a structured exercise programme for falls prevention.	Logan
Jessica Ceglijeski	Abbeyfield Foundation	Non-invasive measurement of muscle mass, synthesis and breakdown	Gladman

Alison Cowley	National Institute for Health Research	Assessment of rehabilitation potential in frail older people in the acute healthcare setting: a mixed methods study	Logan, Goldberg, Gordon
Rob Goodwin	CLAHRC EM	The role of professions in implementation of self-referral physiotherapy in musculoskeletal primary care patients.	Logan
Post-doctoral fellows			
Fiona Marshall	Alzheimer's Society	Scaling the Peaks; Understanding the barriers and drivers to providing and using dementia friendly community services in rural areas	Gladman
Research grants			
Investigators (core group)	Funder	Title	Duration
Goldberg, Harwood	NIHR CLAHRC EM	Videoing to Improve Communication through Education (VOICE)	2018
Gladman	NIHR BRC	A cohort study of patients with non-weight bearing lower limb fractures	2017-2020
Gladman	NIHR CLAHRC EM	SOPRANO (Supporting Older People's Resilience through Assessment of Needs and Outcomes)	2014-2017
Gladman, Logan	NIHR CLAHRC EM	Implementation of the FaME (Falls Management Exercise) programme	2015-2018
Gladman	NIHR HS&DR	An evaluation of community hospitals	2014-2018
Gordon, Gladman	East Midlands PSC	LAUNCH	2015-2019
Gordon, Gladman, Logan	Dunhill Medical Trust	PEACH	2015-2018
Harwood, Goldberg	NIHR HS&DR	Communication skills training for healthcare staff caring for people with dementia	2015-2018
Harwood, Masud, Logan, Goldberg, Gladman	NIHR PGfAR	PrAISED (Promoting Activity, Independence and Stability in Early Dementia)	2015-2021
Sahota	NIHR PGfAR	PERFECTED (Peri-operative Enhanced Recovery hip Fracture Care of patients with Dementia)	2013-2018
Sahota	National Academic Institute of Anaesthesia	Intravenous iron after hip fracture surgery	2013-2015
Logan, Robertson,	NIHR HTA	Falls in Care Homes study (FinCH)	2015-2019

Gladman, Gordon			
Drummond	NIHR HTA	Community Based Rehabilitation after Knee Arthroplasty (CORKA)	2014-2017
Drummond	NIHR HTA	Occupational Therapy Intervention study (OTIS)	2016-2019
Gordon	Newton Fund/FAPESP	Identifying and addressing shared challenges in conducting health and social care research for older people (OPAL) workshop	2018