

## Annual Report for period 1 October 2019 to 31 March 2020

### 1. Overview of Activities

#### Progress on Short and Medium-term aims

*Aim 1: Engage organisations commissioning and providing NHS services, clinicians, and members of the public in identifying and prioritising information needs and translate these into clearly delineated questions amenable to research.*

*Aim 6: Ensure effective links across the landscape of health and social care providers and commissioners, including local authorities.*

We have successfully established our partnerships with the 23 organisations who form part of the ARC collaborative and have held the first ARC Management Board meeting of representatives from these organisations. We continue to use these contacts to ensure that we understand the key issues facing NHS/SC organisations to inform our research programme. The close working relationship with the SW AHSN is of particular importance in ensuring effective links between organisations as we largely share members and have complementary aims.

We are particularly pleased with progress in two areas:

- The **Police Service** provide an important component of social care, often acting as first responders in moments of crisis and increasingly aiming to work preventively with communities. NIHR PenCLAHRC was part of a programme of work funded by the College of Policing, which aimed to increase the capacity of police officers and analysts to effectively use research evidence. We have continued to build on this relationship, including developing the Police Service Modelling Associates (PSMA) programme, which allows staff to be seconded to work with PenCHORD (the PenARC operational research modelling group), developing skills in modelling while solving a problem that is directly relevant to the challenges they face
- 420,000 people in England and Wales live in **Care Homes** and it is well recognised that the system faces myriad challenges in providing effective and compassionate care. We have built increasingly close links with a group of some 80 local care homes (partly through the EXCHANGE grant from the Alzheimers Society detailed below) who are keen to improve their practice. We see this as a major opportunity to increase research and service improvement activities in this area.

*Aim 2: Lead and contribute to programmes of work in areas of national priority*

PenARC themes reflect many areas of national priority – Complex Care, Mental Health, Dementia and Public Health. Our strategy of linking closely with partners in the NHS/SC system ensures that the specific topics addressed reflect the most important issues facing the system within these areas.

The NIHR call for cross-ARC national priority areas has provided a further opportunity to develop these areas.

We successfully led a consortium of 9 ARCs to establish a national collaboration to address Children's Health and Maternity. After COVID-19 related delays agreed by NIHR, the collaboration will begin work in October 2020.

In addition, we played a leading role (one of four core partners) in the successful bid to establish the Aging Frailty and Dementia Collaboration and contributed to other national priority bids including Inequalities and Mental Health.

*Aim 3: To undertake research and improvement work to address identified priorities, where appropriate gaining external funding.*

The PenARC model depends on deploying NIHR funding to provide an infrastructure of skilled researchers and research support to enable us to identify key questions with partners and seek to address them. Smaller studies may be conducted with our own resources but many will require external funding.

During the first six months of PenARC, our staff attracted a further £7.5m in external grant funding as either PIs or Co-Is. Amongst these grants highlights include:

- A 3 year Fellowship awarded to Dr Sean Manzi of PenCHORD from the THIS Institute to develop his work on using modelling to improve mental health services
- The [DACHA](#) study (Developing research resources And minimum data set for Care Homes' Adoption and use), led by Prof Goodman from the University of Hertfordshire and including Co-Is from our Implementation Science group, seeks to develop a consistent approach to data recording in care homes which will provide a resource to underpin research in this population
- The Alzheimer's Society-funded [EXCHANGE](#) project led by PenARC and the proprietors of local care homes, which will establish a network where care homes can identify existing evidence to support their practice and identify information needs for which no research currently exists
- A grant from NHS Scotland to allow PenCHORD to extend their work on modelling the most effective distribution of specialised stroke services. Similar work in England, Northern Ireland and Wales has already been used to underpin national decision-making
- Funding from the Youth Endowment Fund to evaluate the feasibility and pilot evaluation of a transition hub for looked-after children and those on the edge of care.

*Aim 4: With partners, including the AHSN, mobilise evidence to achieve service improvement and conduct research into effective methods for doing so.*

As demonstrated by our Added Value Examples, we continue to work with partners to exploit research evidence to improve services and health outcomes. Much of this work is currently a continuation of programmes begun during the life of NIHR PenCLAHRC.

PenCHORD, the operational research modelling group within PenARC, have a particularly strong programme of work around service improvement. This includes both the HSMA/PSMA programme, described in detail in an AVE, which combines capacity building and building solutions to problems facing organisations, and work with partners on specific areas of service development. An example of the latter is a programme which aims to help decision makers consider the trade-offs implied by plans for geographical location of specialised services. Examples have included the siting of thrombectomy services in each of the 4 nations of the UK, and of neonatal intensive care units in England.

*Aim 5: Build receptivity in the health workforce to research and innovation.*

We seek to develop long-term relationships with local organisations and staff, so that over time the approach we offer in using evidence to facilitate service improvements is seen as having delivered

benefits, engendering a virtuous circle. Similarly, we encourage health and social to engage with research studies in order to encourage those with an interest and talent to become active in the generation as well as use of evidence.

This aim is supported by a wide range of opportunities for staff in partner organisations and members of our PPI network to develop their skills in the use and generation of evidence. These range from short courses such as “Making Sense of Evidence” (MSE) to “clinics” where they can discuss specific methodological issues. The MSE programme is of particular importance as it serves not only to help participants develop skills, but also allows the identification of potentially important research questions which can be considered through our prioritisation system and of individuals who can be helped if they are interested in developing research careers.

In addition, we offer longer-term training on secondment such as the HSMA/PSMA programme. The alumni of these programmes form an important group spread through partner organisations with whom we can work on future projects. The importance of this group has been demonstrated by the events of the recent pandemic where they played a significant role in brokering opportunities for effective use of the skills we can offer as their organisations sought to redesign services.

*Aim 7: Gain the maximum impact from current PenCLAHRC projects.*

Although there have been changes in our themes between NIHR PenCLAHRC and the establishment of NIHR PenARC, there is sufficient continuity in the thrust of the work and of key staff to enable us to continue to deliver benefits from research established within PenCLAHRC.

Many studies have external funding, which has enabled them to continue and will deliver outputs during the life of PenARC. In addition, we have continued to build on previous work, particularly in the area of service improvement. For instance, research conducted within PenCLAHRC on geographical siting of specialist services forms the basis for ongoing work addressing similar problems in different circumstances. A programme of work on evidence for the effectiveness of social prescribing in PenCLAHRC has formed the basis for a substantial grant from a local CCG and STP to help them develop evidence-based approaches to social prescribing appropriate to local primary care.

### **NIHR ARC Leadership, Governance and Strategy**

The structures, processes and strategic vision for PenARC have largely continued unchanged from those agreed in the application process.

As agreed with NIHR, Dr Iain Lang stood down as our Implementation Lead and has been replaced by Prof Nick Axford.

We have expanded the membership of our Executive Committee to formally include all those leading significant strands of work within the ARC and have increased the frequency of Exec committee meetings open to all staff to improve our communication. Other arrangements remain as envisaged.

## 2. Progress Made in Each Research Theme

### Complex Care Theme

#### **Leadership of the theme:**

- Prof Byng remains theme lead.

#### **Progress of the strategy:**

The short-term aims of this theme were: increase engagement with people with complex needs and carers; generate and synthesise evidence aimed at improving care; and, facilitate implementation of evidence-based interventions:

- PPIE is a major activity. A recent highlight was a collaboration with NIHR CIPRU on behalf of the DHSC to examine what young people with complex needs and carers perceived as important to their interactions with services, and what research they believed should be prioritised ([view report](#)). This work is being synthesised with results of similar consultations with older adults and those of working age to inform the service user perspective on what research is needed for those with multiple long-term conditions
- Our activities are wide-ranging but prioritise the needs of people with frailty and multiple long-term conditions, child health and needs of marginalised groups. We have sought to build both local and national collaborations: Vicki Goodwin and Linda Clare were part of the successful bid led by Wessex ARC for Ageing, Frailty and Dementia priority funding. PenARC led a successful bid for the Children's Health and Maternity priority area.
- Our Person-Centred Coordinated Care programme (researchers collaborating with local health systems supporting service development and generalizable knowledge) continues but progress was hampered by staff changes though subsequently re-invigorated by the needs highlighted by the pandemic. We have strong links with local providers. (Richard Byng is Regional Clinical lead for Personalised Care and part of the regional NHSE Integrated Personalised Care team.)

#### **Major grant awards**

Highlights include:

- "Development of a family-focused intervention to promote physical activity among young people with cystic fibrosis and their families" £152k **NIHR RfPB**
- "Facilitating access to online NHS primary care services - current experience and future potential" £800k **NIHR HSDR**
- "The feasibility and pilot evaluation of a transition hub for looked after children and those on the edge of care" £158k **Youth Endowment Fund**

#### **Highlights of research activities:**

- A substantial part of our work programme is the continuing delivery of PenCLAHRC projects. In childhood disability this includes further development of work on interventions to promote continence in children with disabilities which has received widespread attention and will report towards the end of 2020. An NIHR RfPB pilot trial of an intervention to improve wellbeing developed by and for carers of children with disabilities has led to funding from the ESRC to further develop the intervention and from the Lottery Fund to support continuing carer involvement.
- As part of our activities around frailty, the local ambulance Trust have funded a qualitative study on the attitudes of older people, carers and health care professionals on getting up following a fall to help inform their response to call outs.

#### **Highlights of implementation research:**

- Active dissemination and engagement in international studies using measures developed in the PenCLAHRC Person 2C Programme

- Building on [Engager](#) programme for prison leavers with mental health problems we are working with those redesigning services for prison leavers linking health and justice services.

## **Dementia Theme**

### **Leadership of the theme:**

- Prof Clare remains theme lead

### **Progress of the strategy:**

The short-term aims of this theme were: to maximise impact from existing research; better understand the needs of people affected by dementia; and, develop interventions to improve care and support.

The direction of our work is guided by partner organisations, including our care homes research network, people with dementia and their carers, and clinicians. Partnerships with charities are vital for ensuring relevance and we have a particularly strong relationship with Alzheimer's Society who have funded the second stage of our IDEAL programme as an Alzheimer's Society Centre of Excellence. Our particular focus is on interventions aiming to improve functional capacity and quality of life and on increasing trial activity, particularly through the use of novel platforms such as the PROTECT study.

Our work complements and builds the programme of research within the Centre for Research in Ageing and Cognitive Health led by Theme Lead Clare.

### **Major grant awards**

Highlights include:

- Evaluation of Dementia advisor service expansion North Devon. £20k **Devon Partnership Trust**
- EXCHANGE – Network of Care Homes and academics to generate relevant research and research questions. £99k **Alzheimer's Society**

### **Highlights of research and implementation activities:**

- The <http://www.idealproject.org.uk/> IDEAL programme of work (funding from NIHR, ESRC, Alzheimer's Society) aims to improve the experience of people living with dementia and enhance active living. The close interaction with people with the condition and their carers has substantially advanced our understanding of their needs and, for instance, helped us rapidly produce [guidance](#) related to COVID-19 in this group.
- The ESRC-funded APPLE-Tree project is developing and testing a prevention programme to lower older people's chances of getting dementia. The aim is a relatively low cost intervention that targets well-established risk factors.
- The [D-PACT](#) (NIHR Programme Grant) is developing, implementing and evaluating an intervention based on the use of a dementia support worker.
- The "GREAT into Practice" study (Alzheimer's Society funded) is taking an evidence-based programme of **Cognitive Rehabilitation** which provides an individual problem-solving approach to enabling people living with dementia, into widespread use, working with NHS Trusts, Local Authorities and private care providers.
- The NIHR-funded WHELD study developed and evaluated a staff training intervention, which was demonstrated to increase person centered care and activities in care homes, delivering improvements in wellbeing, care and neuropsychiatric symptoms for people with dementia. We are currently developing new methods for delivery without the need for face-to-face training
- The PROTECT programme (funded by multiple organisations and philanthropists) is an online cohort study for people over 50 focusing on cognitive and mental health, with opportunities to participate in nested clinical trials. There are currently >25,000 participants with multiple trials of interventions aiming to maintain cognitive health running
- With colleagues from the Centre for Research Excellence in Cognitive Health we seek to understand how we can support middle aged and older individuals to adopt a healthy lifestyle,

e.g. exercise regularly, eat healthily and engage in social and cognitive activities which have been shown to reduce the risk of dementia.

## **Mental Health Theme**

### **Leadership of the theme:**

- Prof Dickens remains theme lead.

### **Progress of the strategy:**

The short term aims of this theme were: to develop and evaluate interventions to reduce the risk of mental health problems and manage established conditions; maximise the impact of existing research by facilitating evidence-based service improvement; develop robust measures of patient experience and outcomes; and, build capacity of staff in mental health to generate and use research.

We continue to be driven by the needs of our partner organisations in health and social care. Particular areas of activity have been facilitating the implementation of psychological interventions amongst people being treated in acute care; developing and evaluating preventive interventions related to the mental health of children and young people and methods for intervening with the group of children exposed to domestic violence who are at high risk of adverse mental health outcomes (jointly with Complex Care theme); and working with marginalised groups such as people involved with the criminal justice system and those living in deprived communities.

Our team was actively involved in the development of the bid lead by ARCs East of England and South London for the national priority area in mental health.

### **Major grant awards**

Highlights in the period include:

- Promotion (Systemic prevention of poor adolescent mental health and promotion of social connection and wellbeing) £50k **UKPRD Development Grant**
- The feasibility and pilot evaluation of a transition hub for looked after children and those on the edge of care. £ 158k **Youth Endowment Fund**
- ATTEND - A combined mindfulness-based approach for adolescent non-responders to first-line treatments of depression and their carers: establishing feasibility of implementation and delivery. £100k. **NIHR PDG**

### **Highlights of research and implementation:**

- PenARC is supporting the development and evaluation of an Integrated Psychological Medicine service (IPMS) identifying psychological needs in patients within a local acute Trust. This service will be evaluated by a PenARC PhD studentship.
- The [Partners2](#) intervention was delivered in four health systems across England during the reporting period. Care Partners provided support to individuals with psychosis in primary care settings, providing key components of NHSE personalised care policy (shared decision making, personalized support and care planning, supported self care by coaching, social prescribing).
- The Stand Together Trial is a large RCT evaluating whether a school based anti-bullying programme (KiVa) reduces levels of bullying in UK primary schools and results in improvements in children's mental health and school attendance.
- The NIHR funded FreDA (Family Recovery after Domestic Violence) study is examining the feasibility of a rigorous experimental study of the Community Group Programme, which aims to improve mental health of children exposed to DV.
- The ESRC funded DESTRESS project examined the inter-relationship between diagnoses of depression, prescription of anti-depressant medication and poverty. Training materials from this project are being developed for use with primary care staff in collaboration with the AHSN.

- In a study of acute paediatric admissions, clinicians suggested that increasing mental health related admissions are an issue and we are currently using routine data to investigate secular trends.

## **Public Health Theme**

### **Leadership of the theme:**

- Prof Stein remains theme lead with Prof Wyatt as deputy.

### **Progress of the strategy:**

The short-term aims of this theme were: to maximise the impact of existing research and work with local partners to appropriately contextualise interventions developed elsewhere; develop and evaluate public health interventions; and, increase engagement with local public health practitioners through development of the SW Public Health Research Action Group (PHRAG).

We have continued to work across a number of areas but, as envisaged in our application, major areas include continuing work on social prescribing, identified by our local partners as a priority interest, and on childhood obesity, particularly related to schools. In addition, jointly with our mental health theme, we have developed and are evaluating public health interventions related to mental health in children and young people.

Early moves to establish PHRAG have been put on hold due to the pandemic but close relationships with Public Health colleagues have been key in modelling work conducted to inform organisational responses to Covid-19.

### **Major grant awards**

Highlights include:

- **Devon STP Social Prescribing Evaluation and Research (DESSPER) initiative.** £100k **STP/Devon CCG**
- **STOPDRV-GBV (School-based interventions TO Prevent dating and relationship and gender-based violence. A systematic review to understand characteristics, mechanisms, implementation and effectiveness)** £233k **NIHR PHR**
- **Promotion (Systemic prevention of poor adolescent mental health and promotion of social connection and wellbeing)** £50k **UKPRP Development Grant**

### **Highlights of research and implementation activities:**

- There is increasing evidence that social prescribing can be a powerful intervention to improve wellbeing for some people. Our team led a widely cited systematic review of evidence (Husk K, Blockley K, Lovell R, Bethel A, Lang I, Byng R & Garside R 2019 'What approaches to social prescribing work, for whom, and in what circumstances? A realist review' Health and Social Care in the Community 28, (2) 309-324) and have subsequently attracted further funding from the Devon CCG/STP to examine current practice within the region and help them develop widely applicable interventions for use in primary care and community services.
- Joint work with the Mental Health Theme seeks to understand depression in disadvantaged communities in the context of their lives. (<https://www.arc-swp.nihr.ac.uk/research/de-stress>). This innovative work has received widespread media coverage and forms the basis for a training package for Primary Care produced with the AHSN.
- The C2 Connecting Communities organisation (<https://www.c2connectingcommunities.co.uk/>), based on research conducted by Wyatt et al, aims to improve health by breaking barriers between disadvantaged communities and health and local government. The organization has hubs in multiple sites across England.
- As part of our programme of mental health promotion in children the Supporting Teachers And childRen in Schools (STARS) 2 study is a large cluster randomised controlled trial funded by the [Education Endowment Foundation \(EFF\)](#) examining the impact of the Incredible Years

Teacher Classroom Management (IY-TCM) course on primary school children's classroom behaviour and mental health.

- Funded by the ALL Saints Saxton Fellowship we are working in secondary schools in deprived areas to explore acceptable approaches to health promotion.

### **Methods for Research and Improvement**

#### **Leadership of the theme:**

- Prof Logan remains Theme Lead

#### **Progress of the strategy:**

The short-term aims of this cross-cutting theme were: to provide the methodological underpinnings for ARC research and service improvement; and, contribute to building capacity in the local health economy to generate and use evidence. Staff associated with the theme have contributed to numerous grant applications, providing methodological input, including provision of expertise in PPIE, in studies from within and beyond our region and provided an extensive capacity building programme to local partners.

#### **Major grant awards**

Highlights include:

- This Institute Fellowship (Sean Manzi). Using mathematical modelling to improve mental health services. £196k. **THIS Institute**
- Geographical distribution of specialized stroke services in Scotland. £29k. **NHS Scotland**
- Ambulance response forecasting. £20k. **SWASFT**
- Police Service Modelling Associates (PSMA) programme. £19k. **Policing Laboratory.**

#### **Highlights of capacity building**

- Building on the Health Service Modelling Associates programme, we have established a similar programme, PSMA, to train members of the police service in the use of operational research modelling in response to a request from the Devon and Cornwall Police with whom we had previously worked to provide training in the use of research evidence.
- The Making Sense of Evidence (MSE) programme offers training to health and social care staff and PPIE group members in how best to find, appraise and apply evidence. In this period we provided training for a total of 260 individuals.
- Each of our methodological groups offers a "clinic" service where members of partner organisations can book slots to discuss relevant methodological problems.

#### **Highlights of research and implementation activities:**

- PenCHORD, the modelling group have a major programme in the area of stroke care including work in the following areas:
  - A series of projects working with national and regional partners examining optimal solutions for location of specialist services such as thrombectomy.
  - Working with the National Stroke Audit system to investigate optimal interventions to increase the appropriate use of thrombolysis. This comprises the use of AI to investigate possible patterns of and barriers to use and an implementation study to aid improvements in practice.
- Other PenCHORD projects include:
  - Modelling need for end of life care (extended during the pandemic to examine changing demand)
  - Modelling potential approaches to providing dialysis services in the light of COVID-19. (Begun during the reporting period with reporting in April and May)
  - Work with the local Ambulance Trust (SWASFT) and Devon Air Ambulance to forecast need and decision-making.



- Developing methods to improve communication between analysts and decision makers in healthcare settings.
- “Researcher in Residence” programme with South Devon and Torbay Trust. Amongst other achievements this programme led to a successful bid for £11.8m to develop new inpatient mental health facilities
- CHIK-P, the Care Homes Implementation and Knowledge Mobilisation Project sought to systematically review evidence and work directly with care home staff to better understand effective methods for knowledge mobilisation in this sector. This work underpinned the successful bid to the Alzheimers Society for the EXCHANGE project with care homes (see Dementia Theme).

### 3. Impact on Healthcare Provision and Public Health

The impact of the work we do is both direct, working with partners to improve services, and indirect, through producing evidence that may be used without our involvement or through the effects of capacity building on increasing the ability of staff to use evidence effectively.

Examples include:

#### **Engaging parents in children’s learning**

Parent engagement refers to parents’ participation in supporting their child’s learning, at home, in school or via home-school connections and wider community collaborations. This project synthesised the best evidence on (i) effective parenting practices associated with positive learning outcomes, and (ii) what schools and early years settings can do to promote and support these activities, particularly for children from disadvantaged backgrounds. Additionally, it surveyed leaders in >150 English schools and interviewed 20 school leads about how they support parents with their children’s learning. The study contributed to guidance for schools and early years settings, co-authored with and published by the Education Endowment Foundation. The guidance on the EEF website is amongst resources they promoted to schools from the early days of the COVID-19 lockdown: <https://educationendowmentfoundation.org.uk/tools/guidance-reports/working-with-parents-to-support-childrens-learning/>

#### **Criminal justice / health**

Two projects evaluated initiatives involving Devon and Cornwall Police, Devon Partnership NHS Trust and Cornwall Partnership NHS Foundation. One focused on [street triage](#), and sought to ensure that people who need mental health treatment receive it as quickly as possible (particularly those not previously known to services). The other, referred to as [Neighbourhood Liaison and Diversion](#), takes referrals from court or custody staff if they are concerned that someone they are in contact with has mental health, learning disability, alcohol or substance misuse issues, carries out assessments and provides advice on how to support people, makes recommendations about the best course of action and refers or signposts people according to their needs. Both underwent mixed methods formative evaluations, co-developed with project partners, focusing on how they were implemented, which mechanisms were most effective, and how the services could be improved.

#### **Partners2**

The [Partners2](#) project aims to help primary care and community based mental health services work more closely together by developing a system of collaborative care based in GP surgeries for people with schizophrenia and bipolar disorder. The intervention was delivered in four health systems across England during the reporting period. Care Partners provided support to individuals with psychosis in primary care settings, providing key components of NHSE personalised care policy (shared decision-making, personalized support and care planning, supported self-care by coaching, social prescribing). This is a continuing research projects but within the project has led to significant changes in service delivery.

#### **Capacity building in operational research modelling (HSM/PSMA)**

The indirect effects capacity building are best illustrated by our Health Service Modelling Associates (HSM) and Police Service Modelling Associates (PSMA) Programme, established in 2016, which supports NHS and Police service staff in developing and applying skills in computer simulation modelling. Alumni from this programme form a network supporting each other and working with our team. Graduates of the programme have achieved multiple impacts on service provision <https://www.arc-swp.nihr.ac.uk/health-service-modelling-associates-programme>.

#### **4. Patient and Public Involvement, Engagement (PPIE)**

The PPIE strategy of PenARC is in the process of being reshaped to align with the new ARC and developments within the NIHR's involvement approach. The PPI Lead met with PenARC's directors in October 2019 to start this process, followed by a joint celebratory event for public contributors and researchers in January 2020. At this event we ran several workshop activities, and we are using outputs from these to inform our new strategy which is due for completion in March 2021.

The PenARC PPI team has worked actively with public partners to implement the UK Standards for Public Involvement into our work. In December 2019 we met as a team to identify local activities that should be initiated in order to make the standards happen within this ARC and more widely in the participating universities. With North West Coast ARC's Public Reference Panel, the PenCRU Family Faculty, and PenPIG, we published an article (2020) on activities that support 'good' public involvement, mapping these against values and standards for involvement identified in the literature <https://doi.org/10.1186/s40900-020-0183-x>. This work will also help to inform our new strategy.

We are expanding our involvement work beyond the established groups, working more closely with groups in their own communities. This includes a longstanding partnership with service users to develop a Tier 3 intervention for severe obesity <https://www.plymouth.ac.uk/research/primarycare/obesity/progroup>, funded by NIHR. A mindfulness intervention for young people and their carers successfully received an NIHR development grant during the reporting period based on work we have conducted in a mindfulness partnership with young people (now young adults) and their parents that has been ongoing since 2017.

Longstanding work with a refugee group in Plymouth led to a co-produced application to NIHR HS&DR, which subsequently went through to stage 2. Work with a community group of young parents has informed several bids into maternal health, and on initiative from the parents also expanded to include undergraduate students. Our work with nursing home residents was active during the reporting period, with this characterised as one-to-one involvement rather than the traditional group approach. These activities all speak to our strategic aim of embedding involvement in PenARC.

We work broadly with several different groups related to specific projects or services, our core partner group continues to be PenPIG. Having a long-standing group, with continuously new influx of members, is particularly helpful in involving people in research governance, including as co-applicants on research funding applications. One activity that has been identified as helpful to implementing the NIHR standards, is to initiate a buddy system where PenPIG members are part of introducing new public partners to research involvement.

We were fortunate to have a BMedSci student spend their "practice placement year" with the PPI team. She analysed data (observational and audio recorded) of involvement of young people in a study on relationships. This has been successful in helping us work to our strategic aim of developing PPI through research and theory building. Working with the student in relation to

young people's involvement was particularly pertinent, seeing as this was a young undergraduate student.

We continue to be actively involved in research about methods to facilitate meaningful engagement and to analyse its impact. Outputs from this research include the paper cited above on activities to produce good involvement, and a paper by Cockcroft et al (2020) <https://dx.doi.org/10.1111%2Fhex.13001> which examined public involvement in a complex HTA assessment of lung cancer screening and suggested approaches that may be helpful in this context. Current research focuses on the process of involvement, so that we can identify mechanisms for impact. We continue to use a feedback tool for capturing influence on researchers, developed by ARC East of England, and the report cards developed by the PiiAF study <http://piiaf.org.uk/>.

Members of PenPIG and the Family Faculty contributed to capacity building including teaching on PPI, supported by members of the ARC PPIE team. Undergraduate students on the Medical Sciences degrees gave enthusiastic feedback on these lectures and the ARC PPIE team continues to have interest from students wanting to do research projects related to involvement. We see this as sowing the seeds for future impact from involvement on research, through informing future researchers' knowledge of public involvement. PenPIG and the PPIE team are also developing a training course for PhD students in partner organisations on how to involve members of the public in doctoral research.

Our co-production work has highlighted the tensions between the fast pace of the third sector, and the slow pace of research. By the time we received notification of our refugee research bid going through to stage 2, a key refugee collaborator who might have had a paid role on the study, had engaged in full-time education. This is of course a fabulous outcome for her, but it illustrated one challenge of co-production and creating lasting relationships within an uncertain and slow-moving funding environment. Furthermore, co-production work highlights the inequality between large universities and small third sector organisations. This is particularly evident on the finance spreadsheet where universities' proportions are very high due to the FEC, exacerbating the inequalities already existing between the partners.

Another challenge is to establish sustainable support for PPIE within the wider universities. Patient and public involvement and engagement facilitator roles are not naturally included in research funding, but important to the implementation of the NIHR standards. We have seen some reduction in these roles within the wider university, and this impacts on our own work too since our internal support network becomes smaller. As a team within the ARC we are lucky to be able to draw on the ARC PPIE network. At present this is a self-organised group that used to have some administrative support from INVOLVE, which is now sorely missed.

## 5. Training

### **Research capacity building**

We are keen to work with groups of clinicians who wish to increase capacity in their areas as we see this as the basis for future productive research and service improvement. We have fostered a relationship with the South West Anaesthesia Research Matrix (SWARM) and have jointly supported a number of Research Fellows. Currently the SWARM Fellow is Dr Rachel Revenant who is conducting research into cognitive function testing pre- and post-op for elderly patients ([COMPASS](#) study).

"Making Sense of Evidence (MSE)" Workshops in a wide variety of formats covering introduction to research, literature searching and critical appraisal skills in relation to trials, systematic reviews, and diagnostic and qualitative studies (14 workshops for 260 delegates). Having two dedicated GPs funded a day per week has helped to increase our reach with workshops being held in Devon, Somerset and Cornwall. We regard these workshops as a key activity to help staff

get onto the first rung of the “research escalator” as well as providing applicable skills for everyday practice. Formats include both general training and bespoke courses for teams working in a particular area or for single discipline groups who express a need to get basic training before joining open programmes. This is an area of particular strength in PenARC and course materials from our MSE training are made freely available to any NHS or University staff and wide dissemination is encouraged. Feedback from the workshops is very positive.

We run advice clinics for academic and healthcare staff on “Search and Review” (fortnightly), PPI (fortnightly), Statistics (three per term) and Qualitative Research (three per term).

Our ‘[Researchers in Residence](#)’ model embeds researchers in a non-research organisation, leading to a broad range of engagement, knowledge mobilisation and evaluation opportunities which can be carried out by and with the host organisation’s workforce. As part of the PenARC co-funding agreement with Torbay and South Devon NHS Trust, two university-employed researchers are hosted by the Strategy and Improvement Directorate. The role has resulted in two publications during the reporting period and funding to ‘Understand the high numbers of children in statutory care in Torbay: an engaged and embedded approach to supporting families and communities’.

Police Service Modelling Associates (PSMA) is a programme working with Devon and Cornwall Police to support ten analytical staff to undertake modelling or data science projects. The pilot programme commenced in January 2020, but has been postponed until October 2020. It is based on our hugely successful Health Service Modelling Associate programme.

### **NIHR Academy members**

Each of our five themes has a linked PhD student and four commenced their studies between Sept 19 and March 20. As part of our TriARC network we funded an additional two PhD students who are co-supervised by colleagues from Y&H ARC (Ageing) and North Thames ARC (Child Health). Reciprocal studentship have been funded by Y&H and NT with supervisors from PenARC.

One PhD student commenced in Oct 2019 but left her studies shortly after. A new student was recruited and is due to start in June 2020.

### **Impact**

*Supporting Fellowship applications:* Our academic career development lead and ARC staff have supported the development of applications for NIHR Fellowships. ‘Pitch and putt’ sessions where potential proposals are presented to an expert panel after which they receive tailored advice and support. We also run mock fellowship interview panels. We have supported fellowships across the NIHR Academy programme including internships, pre-doctoral, Development and Skills Enhancement (DSE), post-doctoral bridging and advanced fellowships. Successes include ICA Internship (Goldsmith), post-doctoral bridging fellowship (Hall) and Advanced Fellowship (Russell). Manzi was supported in his successful application for a THIS post-doctoral fellowship. Outcomes due later in 2020 for recently submitted applications.

### **Collaborations**

We plan to run 3-monthly collaborative workshops with ARC West for the successful regional NIHR ICA Internship and bridging fellowship Academy Members, starting in December 2020. This will involve providing mentoring and support to prepare for future fellowship applications as well as allowing the Academy Members to present their research.

ARC staff are supporting Dr Maggie Shepherd, an NIHR 70@70 nurse in delivering training and support to five Chief Nurse Research Fellows at the Royal Devon and Exeter NHS Foundation Trust.

Our Health Service Modelling Associate programme launches its third cohort in autumn 2020.

### Sharing best practice

The aim of our training is both developing the researchers of the future and increasing the capacity within the health economy to use and generate evidence. We have well-supported PhD students and an active programme in the ARC and partner organisations to provide staff with research training and to help them achieve post-doctoral fellowships. Our trainees have the opportunity to work with others in the Tri-ARC collaboration and are encouraged to make the most of opportunities in the NIHR Academy. We offer a range of opportunities for staff and members of our PPIE groups to develop their skills from regular methodology “clinics”, to short courses such as “Making Sense of Evidence” to longer secondments such as the HSMA/PSMA programme in OR modelling. These activities are both valuable in themselves but also provide the basis for long term relationships which help to support impact.

## 6. Links with NIHR Infrastructure and the wider innovation landscape

PenARC continues the work of PenCLAHRC with strong links across NIHR infrastructure. We are heavily involved in cross-ARC activities generated through common methodological or subject interests including PPI, Health economics, Child Health, OR Modelling, Stroke, Older Peoples Care and Mental Health.

A range of projects generated within PenARC are being further developed through collaboration with other ARCs. Examples of collaborations include the [HERO](#) (NIHR HTA) trial of extended rehabilitation in older people with colleagues from Yorkshire and Humber, and [MYRIAD](#) (MRC) trialling promotion of positive mental health and resilience in Adolescence with Oxford, the ESEE trial (Enhancing Social and Emotional health and wellbeing in the early years), led from Yorkshire and Humber ARC (Berry as co-investigator). The South West Peninsula CRN has led pilot site development alongside Yorkshire and Humber CRN and North West Coast CRN.

Our association with Yorkshire and Humber and North Thames ARCs, formalised as a TriARC partnership, brings together a complementary balance of research skills and population characteristics over a large range of service types. Most notably this has led to the successful bid to lead the Children’s Health and Maternity national priority area in which ourselves along with Yorkshire and Humber are the key ARCs. Additionally we have been closely involved in the successful bid by ARC Wessex for Ageing, Frailty and Dementia, as well as contributing to Inequalities and Health Promotion.

Our collaboration with the South West Academic Health Science Network (AHSN) remains a cornerstone of our regional network. The AHSN has had a dynamic period of development and consolidation and we remain closely involved at Board level (Logan, Stein), and more junior levels. The AHSN’s work on spread and adoption links to our work on Improvement and Implementation in several key areas including innovation in care homes, digital technology and justice health.

The SW AHSN, PenARC and the Association of Healthcare Analysts continue to support the regional network of business intelligence analysis – the Regional Information Analysts Network. This links with the Health Service Modelling Associates programme part-funded by the AHSN and relaunched for the ARC.

We have ongoing strong links with other elements of NIHR infrastructure, including:

- **NIHR Research Design Service (RDS) South West.** PenARC and the RDS work closely together supporting applications through ARC stakeholder engagement. The RDS Director, Prof Gordon Taylor, works in close association with ARC staff in Exeter and Plymouth.
- **NIHR Clinical Research Network (CRN) South West Peninsula.** As well as supporting promotion of recruitment we work closely with the CRN leadership for example in promoting development of Principle Investigators (e.g. allied health, public health, primary care), and

also in capacity development for specific areas (e.g. recent stage 2 bid for social care research across our five local authorities, and in development of public health research)

- **NIHR Exeter Clinical Research Facility.** We have developed shared standard operating procedures, joint training, and collaboration between methodologists
- **Peninsula Clinical Trials Unit (PenCTU) and Exeter Clinical Trials Unit.** We work closely with both local CTUs and share methodological expertise and standard operating procedures.

## 7. Links with Industry

### **Progress against strategy for engaging with industry**

We continue our strategy of working with as wide a range of industrial partners as feasible within our themes and context. In the six month start up period covered by this report we have actively pursued new relationships that will enable us to achieve the ends set out in our strategy.

Again, our close working relationship with the South West Academic Health Science Network (SW AHSN) has played an important role in this. We continue to work productively with our AHSN colleagues on both general capacity building and generic development and on engagement with specific companies. This includes activities to support innovations identified through the NHS-England supported Small Business Research Initiative for Healthcare (SBRI Healthcare), with which the AHSN is closely involved.

The nature and scope of industry in the South West Peninsula means that we more often engage with industry around social and economic issues rather than, for example, pharma or biotech but we have also found it profitable to engage with organisations and commercial entities from further afield. Our [VSimulators](#) project provides an apt example. This project centres on the development of a facility to explore how people experience motion and vibrations in the built environment as well as design of a rehabilitation programme for people with problems with movement. It has involved collaboration both with local partner organisations and with larger multinationals such as WSP Group PLC UK (Parsons Brinckerhoff), Foster and Partners, and Emirates DNEC Engineering Consultants.

### **Engagement with UK Small and Medium Enterprises (SMEs)**

We have actively sought to build, develop, and extend our engagement with SMEs and this is a core element of our strategy for working with industry. In this reporting period we have worked with 42 SMEs. We have strengthened existing collaborations and also sought to work with SMEs whose activity is aligned with our aims. Our engagement with SMEs covers a wide range of activity but there are three areas particularly worth highlighting because of either our strong track record or because they represent areas of important growth and development for us.

First, we continue working with an increasing number of SMEs in the technology and IT sector; this represents an area of growth for us. For example, through our embedded researcher-in-residence model, a collaboration with Torbay and South Devon Foundation Trust, we have worked with spin-off enterprises such as the NHS Quicker app and Health & Care Videos Ltd. Our VSimulators project, which centres on the development of a facility to explore how people experience motion and vibrations in the built environment as well as design of a rehabilitation programme for people with problems with movement, has involved collaboration with two new partner organisations: E2M Technologies (an electric motion technology company best known for its work in control loading systems and custom electric actuator solutions such as those involved in pilot-training simulators) and Holovis (an experiential design and immersive and mixed reality specialist) (see below for details of strategic partnerships with these two companies). Our work with the SW AHSN around policing and mental health has led to a collaboration on a funding bid with Flowmoco, a Cornwall-based Drupal specialist provider that delivers web sites and mobile apps for enterprise clients using agile techniques.

Second, we remain actively engaged with SMEs active in the long-term care sector. We have a number of related projects related to research, implementation science, and capacity development in this sector and we are actively building collaborative work with a number of organisations and key individuals. Our range of collaborations in this sector includes small homes and larger providers of multiple homes and the domiciliary care market. The [EXCHANGE](#) project actively engages care homes as collaborators in research. Our COVID-19 responsive project engaged care homes in a rapid exercise in understanding the experience of the pandemic from care home perspective. Our recent Social Care Research capacity building bid involved the wider care sector.

Thirdly, we continue to work with general practices many of which are transforming from small to medium size businesses, and alongside that with an interest in the value of R&D. In our recent ESRC-funded work on [Remote by Default](#) (primary care digital) we are partnering with the 'Deep End' group of practices in Plymouth to examine impact of digital roll out on inequalities.

#### **Strategic partnerships with industry**

We are continuing our ongoing partnership with Network Canvass as part of the C2: Connecting Communities project. We have started a new strategic partnership with Livewell Avon and Wiltshire Partnership Trust as part of the Partners2 integrated care in primary care for people with mental illness. This is part of a wide network of GP surgeries involved in this study and continue to provide substantial mutual benefit.

#### **Contract commercial trials, Industry collaborative research studies, and other academic commercial research**

We were not engaged with any contract commercial trials or other academic commercial research during this period.

#### **Partnerships or studies with industry leading to further funding**

n/a

#### **Key examples of agreements signed with industry including Non-Disclosure Agreements and Model Trial Agreements**

We have not signed any new Non-Disclosure Agreements or Model Trial Agreements during the period covered by this report.

## **8. Forward Look**

This report is being submitted in October 2020 and it would be artificial to ignore the effects of the pandemic in this section. Clearly what we have been able to achieve has varied during the period as advice and regulations changed and we anticipate that, if the number of infections continues to rise, the balance of activities will change again. In accordance with NIHR guidance we have sought to do three things: to offer staff with clinical or other skills directly relevant to the delivery of services to prioritise NHS work; to seek to continue as much existing research as possible where this can be carried out in accordance with rules, making adjustments where appropriate; and, to seek to work with our partner organisations to use our skills to help them organise and deliver effective services.

Relatively few of our employed staff are in directly patient facing roles and few were primarily diverted to clinical roles. However, many of those who work with us in partner organisations were diverted between April and June with significant implications for many activities.

We have been forced to make significant changes to both research and capacity building activities, wherever possible moving them online. Our entire Health Service Modelling Associates programme for instance has been successfully moved online and has actually allowed us to increase the number of places available on the first section of the training. We are currently re-

designing our Making Sense of Evidence programme for online delivery although this is challenging given the highly interactive nature of the learning process. Perhaps most challenging has been the attempt to maintain PPIE activities without in person contact. Many of those members of the public who are most valuable to inform our work either lack easy access to online spaces or have communication challenges, which hinder participation. Nonetheless we believe that the lessons we are learning here will strengthen our ability to deliver meaningful involvement in the future.

Our responsive structure has enabled us to respond to requests for assistance from our partners in dealing with the pandemic. This has included rapid reviews of evidence, the establishment of longer term research projects and particularly the use of modelling both to help predict need for staff and equipment and to underpin redesign of services to cope with pandemic demands. We anticipate that these activities will form an increasingly large proportion of our work during the winter. The positive aspect has been the facilitation of links between academics and the services and the reduction in bureaucracy, especially with regard to availability of data. We hope to be able to maintain these systems after the pandemic.

## 9. Added Value Examples: outcome, actual impact, or potential impact

### Care Homes

Collaborative research conducted by NIHR PenARC at the University of Exeter with care home providers, charities and the public has demonstrated the evidence for interventions to improve the health and wellbeing for people living in care homes, co-produced ways of applying knowledge into care home practice and progressed the care home research agenda ensuring it is informed by what matters to those living and working in, and those visiting, care homes. Two examples are provided from our programme:

1. Evidence syntheses were undertaken by the European Centre for Environment and Human Health, PenARC and the Sensory Trust on the impact of outdoor spaces on the physical and mental wellbeing of people with dementia living in care homes. This research was used as the basis for a dissemination event for care home staff in the South West. Following this, a funded project was undertaken to develop evidence-based information and activity training toolkit *My Nature* in collaboration with the Sensory Trust. This was trialled in two care homes in Cornwall to support care home staff to maximise nature contact for residents. This led to two training packages, provided by the Sensory Trust, for use by care home activity coordinators, residential staff, care managers/owners as well as more widely for day centre staff and managers.
2. The nutrition for the health and wellbeing of older people living in care homes is critically important and undernutrition can lead to poorer quality of life, increased morbidity and risk of mortality. Mealtimes play a crucial role in the care of older people to ensure adequate nutrition and promote broader health and wellbeing. Evidence syntheses by ARC researchers showed simple changes to the mealtime environment can positively influence nutritional outcomes and the behavioural and psychological symptoms of dementia. PhD research was undertaken to enhance the mealtime experience co-designed with care home residents and staff and experts to develop a practical guide to translate this research knowledge into practice. The Care Quality Commission recognised this research as a contributor to an 'Outstanding' rating awarded to a participating care home.

The ARC programme of research and researchers involvement in the cross-ARC care homes workstream (led by C Goodman ARC East of England) has informed the care home research agenda and enabled ARC researchers to successfully obtain grant funding including:

- NIHR HS&DR (PI C Goodman ARC East of England) Developing research resources And minimum data set for Care Homes' Adoption and use (the DACHA study). ARC Co-Is include I Lang, S. Brand.



- MRC (PI C Ballard) Evidence-Based Supported Digital Intervention for Improving Wellbeing and Health of people living in Care Homes (eWHELD) During COVID-19. ARC Co-Is includes L. Clare, S. Brand.
- NIHR RfPB (PI K Warmoth) Understanding stakeholders' perspectives on implementing deprescribing in care homes (STOPPING). ARC Co-Is include K Stein, J Day, E Cockcroft, N Reed.
- The Alzheimer's Society and the Dunhill Medical Trust (co PIs I Lang & J Day) The Exeter Care Homes and Knowledge (ExCHANGE) Collaboration. ARC Co-Is include J Thompson-Coon, V Goodwin, K Liabo.

### **Health Service Modelling Associates Programme**

The Health Service Modelling Associates (HSMA) programme, established in 2016, supports NHS staff in developing and applying skills in computer simulation modelling. These techniques are used to explore the consequences of a wide range of potential service changes including new treatment pathways and changing location of services. Projects have resulted in significant service improvements.

We have built on the success of the HSMA programme, and are expanding its reach:

**The Police Service Modelling Associates (PSMA) Programme:** In December 2019, in partnership with Devon and Cornwall Police we secured £20,000 of local funding to deliver a pilot PSMA programme for 11 policing staff from across four regional forces and the College of Policing. The aim of the PSMA programme is to apply the principles of the HSMA programme to issues in policing.

We see the PSMA programme as a means of expanding the potential impact of Operational Research (OR) and Data Science approaches into some of the wider system issues in health and social care, such as mental health support. We began the programme in January 2020, delivering over 50 hours of training content, and continued until March 2020, at which point the programme was put on hold due to the COVID-19 pandemic and the national lockdown. The programme is due to resume as an online programme alongside a significantly expanded HSMA 3 programme in October 2020, and policing associates will be working directly alongside those from health and social care organisations.

**Working with HSMA Alumni:** We have built up an ongoing and supportive community of alumni from the programme. From October 2019 to March 2020 we worked with alumni on a number of projects, including using Natural Language Processing methods to extract information and sentiment from patient notes and surveys to improve service delivery at Devon Air Ambulance, University Hospitals Plymouth and in the Devon Partnership Trust. We also directly supported a highly impactful piece of work with NHS Devon Clinical Commissioning Group (CCG), in which an alumnus of the HSMA programme developed a highly accurate computer simulation to predict local COVID-19 hospital admissions and resource requirements. This model was developed within a week of the national lockdown, and successfully predicted local surges in COVID-19 cases. The model has been presented to local MPs to demonstrate the power of OR methods to provide rapid, evidence-based planning support for the NHS.

We continue to work closely with one of our alumni at University Hospitals Plymouth, who has taken on a new OR-based role created specifically in response to the organisation's engagement with the HSMA programme. Together, and alongside representatives from our PenPIG patient involvement group, and the hospital's own patient involvement group, we developed a funding bid to the Health Foundation at the end of 2019, part of which included plans for an ad hoc iteration of the HSMA programme. Whilst the funding bid was unsuccessful, this initial planning work formed the basis for HSMA 3, which launches on 1<sup>st</sup> October 2020.

## Social Prescribing

Social prescribing, the linking of individuals to existing community-based activities for health and wellbeing, has seen significant policy and funding attention in recent years. This programme of work (<https://www.plymouth.ac.uk/research/primarycare/social-prescribing>) seeks to develop a robust evidence base for what works in social prescriptions, as well as working with a broad range of stakeholders to get evidence into practice and practice into evidence.

Initially, the research centred on the development and implementation of nature-based interventions, however given the increased policy, funding and service interest in social prescribing, this rapidly broadened. We conducted a well-cited realist review of the social prescribing process, published in *Health and Social Care in the Community*, one of the top-accessed papers of 2019. Our current work spans the full breadth of social prescribing approaches, and seeks to have impact across practice, policy, and research.

**Impact on practice:** we are currently working with sites in Cornwall, Plymouth, Torbay and across the Devon STP footprint to undertake collaborative 'researcher-in-residence' style implementation research. This work aims to rapidly feed practice knowledge into the academic literature, and also cycle learning back into practice as robustly and quickly as possible. A new MRC-funded intervention development programme (with colleagues from ScHaRR), aims to produce whole-systems guidance for community referral routes (rather than health-service routes) into social prescribing. Lastly, we are in the final stages of agreeing NIHR HSDR funding with our Oxford collaborators to examine the link-worker rollout nationally.

**Impact on policy:** we recently completed two projects for DEFRA, both helping to understand what works in, and supporting provision of, nature-based therapeutic interventions for people with an identifiable mental illness, which fed into the DEFRA 25-year plan. During the pandemic, we secured AHRC funding with Oxford colleagues to examine how cultural institutions were using social prescribing as a vehicle to deliver health interventions under COVID. Our team also fed into guidance commissioned by NHSE relating to how social prescribing is to be rolled out for children and young people. We anticipate this guidance going to all newly formed PCNs soon.

We recently led a successful bid to the National Academy for Social Prescribing, to lead their development of an Academic Collaborative, which will pull together researchers across the UK and produce a suite of policy-friendly evidence summaries. Linked to this, members of the PenARC SP team are working with NHSE/I on their national evaluation for social prescribing.

**Impact on research environment:** our overall programme of research is orientated not to make the case for social prescribing, but to generate high quality evidence that relates to the effectiveness and implementation of such approaches, helping to build a research-oriented approach to social prescribing. We have now submitted a large programme grant to the MRC's Adolescent Mental Health call, to examine the use of social prescribing with young people. This builds on the guidance commissioned by NHSE mentioned previously and would be a real step forward in understanding how these approaches might benefit those most in need.

## Stroke Programme

**Revascularisation after stroke:** We have continued our work from PenCLAHRC in modelling acute revascularisation after stroke. This is a key NHR priority as the UK has amongst the lowest rates of revascularisation, particularly using mechanical thrombectomy (MT) in Europe. NHS England is driving the reconfiguration of stroke revascularisation services and addressing the need to balance MT and thrombolysis services. The implementation of service planning is challenging because of different commissioning approaches for thrombolysis and MT, leading to potential suboptimal service configuration, which has slowed change in the NHS (Allen, M. et al. 2019, <https://doi.org/10.3389/fneur.2019.00150>).

Our modelling work on revascularisation, in which we have also collaborated with colleagues in Calgary, Canada has continued to inform service development in Northern Ireland, Wales and a new project for Scotland. The PenCHORD team has carried out iterative modelling work to inform the shape of services throughout the UK and moved to incorporate likely population outcomes between different configurations. This will give an indication to service commissioners and patients of the relative “returns” in health terms from different service configurations to deliver technological developments in acute stroke care.

We signalled moving to more system-wide approaches in modelling services to inform commissioning and delivery in our bid for the PenARC and this work will commence with stroke. It has already started in a collaboration with London NHS services. The scope includes rehabilitation services as well as acute management and builds on work we carried out on rehab services in Cornwall and Devon. Bringing different service elements is not straightforward and is already demonstrating important challenges in data availability and quality. This work stream will develop further in the South West with a system-wide modelling project in Somerset. Our ambition is to bring social service provision into the model to understand the reach and impact of service changes and assist in multiagency planning and service delivery.

**Using routine data and machine learning for audit:** Our work on using machine learning to support development in the National Sentinel Stroke Audit Programme has been proceeding through a £300k NIHR HSDR grant and this is progressing well. We are planning further development of this work, probably through an NIHR Programme Grant, which would incorporate evidence synthesis and use of brain scan data to develop a decision support intervention. That is, the work will move from retrospective audit towards supporting active management with artificial intelligence methods. PenARC staff are working in collaboration with the Institute for Data Science and Artificial Intelligence in the University of Exeter.

**Cross ARC working in stroke:** PenARC staff remain committed to working in collaboration with researchers in other ARCs in stroke. We have contributed to the initial cross-ARC workshops in stroke and look forward to this network including new ARCs. We have particularly close links with ARC North East, with whom we have already developed a Programme Grant application taking forward our joint work on MT and including implementation science.

We are also the ARC lead for the cross-ARC Operational Research area.