

PROTOCOL

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Optimising the impact of health services research on the organisation and delivery of health services; a study of embedded models of knowledge co-production in the NHS ('Embedded')

Summary

Managers and clinicians in the NHS are under growing pressure to improve and redesign services in a way that optimises health outcomes and controls costs. There is huge potential for health services research to make a larger contribution to this process but there is a disconnect between the theory and empirical evidence underpinning how best to design and deliver high quality health services, and what actually happens in practice. This has challenged policy makers, academics and front-line staff for decades.

This 30 month multi-method study builds on previous knowledge mobilisation research funded by the HS&DR programme. It aims to increase the influence of health services research on decisions about the improvement and redesign of NHS services in two key ways. First, we will substantially develop the evidence base underpinning the nature and effectiveness of models of knowledge mobilisation specifically where researchers operate (or are 'embedded') within NHS service settings and evidence is created in partnership (or is 'co-produced') by researchers, practitioners and people who use services. Second, we will develop practical guidance on the design and implementation of co-production models for managers and clinicians in the NHS, its academic partners and people who use services.

We propose four inter-linked work streams: work stream 1 comprises a critical narrative review of the literature in the fields of co-production and embedded research; work stream 2 comprises an environmental scan including a scoping review of up to 12 NHS embedded research initiatives; work stream 3 comprises four in-depth qualitative case studies of NHS embedded researchers and their associated networks, activities and impacts; and work stream 4 comprises a concurrent active engagement and influencing programme to ensure that the study achieves maximum impact in the NHS. Data collection and analysis will be informed throughout by methodological best practice, underpinned by the principles of co-production through engagement of stakeholders and supported by an international project advisory group.

We will produce the following outputs:

- Guidance for NHS organisations who want to use an embedded researcher to help them to improve their services;
- Guidance for researchers who want to pursue a career as an embedded researcher;
- Guidance about how best to involve members of the public in embedded researcher initiatives;
- A job description for an embedded researcher and a description of the attitudes, skills and knowledge required to be effective;
- A series of case studies and an animation to explain how the embedded role works in practice;
- A network of people interested in developing the idea of bringing researchers and practitioners closer together;
- A social media presence using blogs and tweets to raise the profile and potential of embedded research;

- A series of publications in professional and academic journals, and presentations at conferences/seminars in the UK and internationally, to help disseminate the project learning.

The NHS will gain the following benefits from the project:

- The NHS and its partner organisations that are currently using embedded knowledge co-production approaches will be able to use the evidence-based guidance, person specifications, training templates and training resources that we produce in order to optimise the effectiveness of their work and its timely impact on patient care;
- NHS organisations that have not yet considered models of embedded co-production will be stimulated to explore how they could use this approach to improve decisions that impact on service delivery and will be given the tools to enable them to do so rapidly;
- The NIHR HS&DR programme will have a better understanding of the potential benefits and risks of embedded co-production and related models of research, and will therefore be in a position to commission more impactful and timely research for the NHS.

The 30 month study involves leading researchers, practitioners and service users in the field and will cost £664.4k. It has been designed in a way that allows learning to be shared with the NHS and with people who use health services from early on in the project.

Background, rationale and theoretical basis for the proposal

Rethinking how research influences practice

Managers and clinicians in the NHS, as in all healthcare systems, are under growing pressure to improve and redesign services in a way that both optimises health outcomes and controls costs. The research community has great potential to contribute to this process but the disconnect between the theory and empirical evidence underpinning how best to design and deliver high quality health services, and what actually happens in practice, has challenged policy makers, academics and practitioners for several decades.

How people respond to this challenge depends upon whether they perceive the problem to be one of how academic knowledge is conveyed from researchers to practitioners ('knowledge transfer'), or one relating to the fundamental nature of knowledge and how it is produced ('knowledge co-production') (Lomas, 2000; Rycroft-Malone et al., 2013; Davies, Powell and Nutley, 2015).

When framed as a knowledge transfer problem, researchers are seen as having expert knowledge and the task is to transmit that knowledge to decision makers in the health service in an accessible and timely fashion. Knowledge is regarded as a product and the decision-making process as time-limited, linear and rational. Research evidence, perceived as the most rigorous form of knowledge, is 'pushed' from the research community, using guidelines or evidence summaries, or 'pulled' by practitioners who are well-informed about the research process. The emergence of sophisticated informatics and communication technologies in recent years, and their use by NICE and others, has helped to reinforce a view that the knowledge transfer model is the most appropriate way of closing the so-called 'know-do gap' (Greenhalgh and Wieringa, 2011). This may be a reasonable assumption in situations where scientific knowledge is relatively easy to interpret and uncontested, such as is the case for some of the clinical evidence underpinning the practice of Evidence Based Medicine. The transfer approach is more troublesome in the field of health services improvement or service redesign, where the issues that research attempts to address are more complex and the nature of the social science evidence is less certain.

Recognition of the limitations of the knowledge transfer model has resulted in a reframing of the challenge of integrating research and practice as one requiring more sophisticated approaches (Ferlie et al, 2012; Davies et al, 2015). Rather than being separate processes, the production and utilisation of research evidence merge as complex, iterative and social processes (Nutley et al, 2007; Bullock, 2012; Soper et al, 2015; Salter and Kothari, 2016). Decision-making by practitioners is regarded as a process, not as a one-off event (Greenhalgh and Wieringa, 2011; Salter and Kothari, 2016), and rather than research evidence needing to be fed into this in a linear and rational way, the emphasis is on productive ongoing relationships, effective systems and a conducive organisational context (Currie et al, 2008; Best et al, 2012).

This reframing suggests that the relationship between research producers and users should be one focused on 'co-production' of knowledge (Greenhalgh, 2010; Rycroft-Malone et al, 2013; Wehrens, 2014; Davies et al, 2015; Jackson and Greenhalgh, 2015; McCabe et al, 2015). Researchers, using the scientific method as their predominant way of knowing, are not seen to have a monopoly on expert knowledge. Instead, they need to be willing to actively negotiate their expert knowledge ('a meeting of experts'), to recognise and act upon power differentials in who dictates how knowledge is defined, and to adopt a more pluralistic orientation to knowledge in order to achieve change (Duijn et al, 2010; Beebejaun et al, 2015). Co-production models of knowledge mobilisation are based on the assumption that knowledge created by researchers needs to change in some way if it is to be impactful. Indeed, for knowledge to have impact, all participants need to be involved in its creation and its use.

Developing the concept of co-production

Broadly defined as joint working between people or groups who have traditionally been separated into categories of user and producer, the term co-production came to prominence in the 1970s (Ostrom, 1996) and has gained much currency in public service discourse since (Boyle and Harris, 2009; Osborne and Stokosch, 2013). In applied health services research, it is increasingly used as a term to describe the co-production of research knowledge through the engagement of policy makers and practitioners with researchers (Orr and Bennett, 2010, 2012; Heaton et al, 2016; Flinders et al, 2015).

The principle of co-production has been gaining currency in public services on the basis of promising but far from complete evidence (Brandsen et al, 2012; Verschuere et al, 2012; Osborne and Stokosch, 2013; Durose et al, 2015). Emerging studies point to a range of dilemmas and challenges that need to be explored more fully: is it desirable or feasible to bring researchers and practitioners together in these ways or might the logistical challenges and potentially greater costs compared to traditional research approaches outweigh the benefits (Hewison et al, 2012; Heaton et al, 2016)? Should greater attention be paid to the political dimensions of co-production (e.g. the different interests, power and expectations of the parties) (Orr and Bennett, 2010; 2012)? Might co-production lead to a narrowing of focus towards problem-solving dimensions of research use (Weiss, 1977) rather than encouraging important broader perspectives (McCabe et al, 2015)? Should the boundaries between researchers and practitioners be firmly drawn or are there advantages in flexibility and in the blurring of boundaries (Nutley and Davies, 2007; Wehrens, 2014)? In what ways can researchers get involved in the co-production of service redesign or improvement and can health care research that is co-produced in one location be translated effectively to other settings (Heaton et al, 2016)? Thus there is a rich research agenda around co-production and an urgent need to develop a better theoretical and empirical basis for its use in the NHS (Flinders et al, 2015; Heaton et al, 2016). The current study aims to contribute to addressing that gap.

Examples of co-production in practice

A range of research models aligned to a greater or lesser extent to the theory and principles of knowledge co-production and embeddedness are being, or have been used in the NHS over the last two decades, as well as in the in health systems of Canada, Australia and the US. Different terms are used to describe these models including Knowledge Brokers (e.g. Glegg & Hoens, 2016; Hoens et al, 2013; Ward et al, 2012; Wright, 2013; Chew, 2013; Frost et al, 2012; Booth, 2011), NHS Management Fellows (Bullock et al, 2012), Health Foundation Improvement Science Fellows, NIHR Knowledge Mobilisation Research Fellows, and Researchers-in-Residence (Marshall, 2014; Marshall et al, 2014; Eyre et al, 2015; Marshall et al, 2016). Examples of the latter model, which is spreading around the UK, include an anthropologist working in an acute hospital on the design and delivery of new models of clinical leadership, a political scientist helping practitioners working on an integrated care programme to interpret the international evidence, and operational researchers working in a children's hospital to improve patient flow through a paediatric cardiac surgery unit.

Whilst each of these models attempt to mobilise knowledge by closing the gap between the researcher and practitioner communities, the individuals involved (e.g. researchers, health professionals, managers), the level of embeddedness of individuals in the practice (and/or research) setting, the nature and degree of co-production and the type of activities that take place are highly variable and not well described. The different models are emerging largely independent of each other, with little evidence of shared learning and only a few examples of formal evaluation. What has been

published mostly comprises descriptions of isolated initiatives but little in the way of deep analysis and interpretation and even less in terms of practical guidance.

What is currently known about co-production and embedded models of research

Much of the literature is unclear about the relationship between co-production as a generic concept, 'brokerage' (the process by which knowledge is shared across boundaries) and 'embeddedness' (where researchers are, to a variable extent, located within practitioner teams). A recent review of the field commissioned by the NIHR HS&DR funding stream highlighted an important challenge: *'There is a significant gap between the articulation of a process for knowledge mobilisation (models, theories and frameworks) and the translation of these accounts into workable, practicable and properly resourced strategies'* (Davies et al, 2015). This may be one of the reasons why much of this work has had little impact so far on the managers and clinicians responsible for making complex decisions in the health service. The following section briefly summarises the literature in the field.

Several authors have reviewed the literature on partnerships between researchers and practitioners. Ovretveit et al (2014) defined partnered research as *"an activity where researchers and practitioners work together, with different roles, to use research both to solve practical problems and to contribute to science"*. From the literature they derived five categories of research-practice partnerships and suggested key features that differentiate such partnerships from other ways of conducting research. The review concludes that it is not yet possible from the available evidence to assess when such partnerships are most likely to be effective and the circumstances in which they may be more effective than conventional research.

Empirical work on partnerships that had been funded by a major research funder in Canada (Sibbald et al, 2014) identified three major partnership types: token, asymmetric and egalitarian. The challenges of partnership working were highlighted by empirical work in public health in the UK (McCabe et al, 2015). The authors found that even when partnerships were specifically designed to foster collaboration and co-produce knowledge there were significant challenges. They suggested that an 'insider' role for researchers is unlikely to be the norm within a complex sector like public health and that a 'negotiator' role requiring a range of complex skills is more likely to be effective. Other dimensions of effective research partnerships which have been highlighted in the literature include: a sharing of power and influence within the partnership; relationships based on strategic programmes rather than individual projects; the desirability of working on common areas of interest; the need for early demonstrable advantage to the partners to justify their efforts; the importance of demonstrating a genuine commitment to partnership over time; the importance of researchers valuing a broad notion of 'knowledge' and 'evidence'; and the need for practitioners to value scientific evidence (Antil et al, 2003; Walter et al, 2003; Chafe and Dobrow, 2008; Bammer et al, 2010; Mitchell et al, 2009; Campbell et al, 2009).

Reviews by Bullock et al (2012) and Phipps and Morton (2013) have considered the characteristics of individuals who seem to be effective at working across the academic/practitioner boundary. These include good communication and negotiation skills, flexibility, the ability to engender trust, entrepreneurship, creativity and a sensitivity to context. Much of the literature (e.g. Chew et al, 2013; Lomas, 2007) has focused on the attributes needed for such roles and on the consequences for individual post-holders rather than on specific models or on the contribution of such roles to co-production. Indeed the first known review of the embedded researcher role in health care and other settings was only conducted recently, led by one of the co-applicants of this proposal (Vindrola-Padros et al, 2016). This identified four typical characteristics of embedded researchers: they are affiliated to both an academic institution and the host organisation (e.g. a health care organisation); they develop long term relationships with staff in the host organisation and are seen as members of the team; they co-produce with local teams knowledge that responds to the needs of the host organisation and they build research capacity in the host organisation. Among the challenges the review identified were: the problems of dual identity/affiliation and the potential for conflicting objectives between the two institutions and the challenge for the embedded researcher of retaining a 'critical' academic perspective. In common with other reviewers in the knowledge mobilisation field (e.g. Fazey et al, 2014) the authors noted the paucity of robust empirical studies focusing on the benefits and costs. Bullock et al (2016) in a recent study funded by NIHR of Knowledge Into Transfer (KIT) agents working within Academic Health Science Networks in England and Wales highlights the need for longitudinal studies and a better understanding of how the success of these roles might be measured.

Why this research is needed now

For the following reasons we believe that the time is now right to carry out a critical examination of embedded models of knowledge co-production in health service settings:

- There is a growing interest amongst health service managers and clinicians, policy makers and academics in working *together* in order to use research evidence to improve the organisation and delivery of health services;
- There are enough examples of embedded models of co-production currently in operation around the UK to produce useful generalisable learning and practical guidance for NHS organisations wishing to implement or further develop the models in their localities;
- The principle of co-production has been gaining currency in public services on the basis of little formal evidence and there is an urgent need to develop a better theoretical and empirical basis for its use in the NHS;
- The existing literature in the field summarised in the previous section highlights a number of significant gaps in our knowledge, including which models of co-production and embedded research are currently being adopted, why and how; the merits and disadvantages of different models; and their effectiveness, unintended consequences and costs;
- Academic institutions are becoming increasingly interested in the impact agenda, driven in part by changes to the Research Excellence Framework;

This proposal therefore addresses an important gap in the field of knowledge mobilisation and just as importantly will be of practical use to the growing number of practitioners and managers who can see value in designing and testing co-production models in their localities.

Study aims and objectives

This proposal aims to increase the influence of health services research on decisions about the improvement and redesign of NHS services by:

Aim 1: Developing the evidence base underpinning the nature and effectiveness of co-production initiatives in which researchers are embedded within service settings and;

Aim 2: Producing practical guidance on the design and implementation of embedded models of co-production for managers and clinicians in the NHS, their academic partners and people who use services.

In addressing these aims the proposal will focus on the following research question: *What contribution can embedded models of knowledge coproduction make to improving the delivery of high quality, safe and effective care in the NHS?*

The objectives of the study are:

Objective 1: To review the theoretical and empirical health services, management and organisational literatures relevant to embedded research initiatives and knowledge co-production and identify the relationship between the two (work stream 1);

Objective 2: To scope examples of both co-production and embedded models in operation around the UK's health services and public health sectors, focusing on examples where coproduction and embeddedness co-exist, and to describe the features of these models, including their history, context, participants, scale, scope and content (work stream 2);

Objective 3: To undertake in-depth case studies in four of the examples identified, in order to understand their mechanisms, effectiveness and challenges (work stream 3);

Objective 4: To provide recommendations, guidance and training templates of the different ways in which embedded co-production may be framed and specified, in order to allow those interested in developing and using such approaches to understand the design choices they face (work stream 4).

Research plan

We propose a multi-method study comprising four inter-dependent work streams, each delivering one of the project objectives. Work stream 1 will identify and describe the principles and practices of knowledge co-production and of embedded research initiatives. The results will be used to develop emerging typologies of knowledge co-production and embedded research. Work stream 2 will identify and describe the breadth and scope of embedded researcher initiatives in operation in health settings across the UK and how these are designed to enable knowledge co-production. The results will be used to further develop the typologies of knowledge co-production and embedded research and identify candidate case studies of embedded researcher initiatives designed to achieve knowledge co-production for further in-depth examination during work stream 3. Taken together the results of work streams 1 and 2 will be used to develop an initial framework for planning embedded researcher initiatives that enable knowledge co-production. Work stream 3 will build on the work undertaken in the first two work streams by developing an in-depth understanding of how embedded models of knowledge co-production work. Work stream 4 will use a range of approaches to engage stakeholders with the findings of the project, including developing, testing and disseminating practical guidance for managers, clinicians and academics.

The theoretical basis of our approach is described in the *Background, rationale and theoretical underpinning* section above. The choice of the specific theoretical framework that will be used to guide work stream 3 will be agreed by the team based on the output of work stream 1. The following sections describe the objectives, methods and outputs for each of the work streams.

Work Stream 1: Narrative review of the literature

Leads: Vicky Ward, Huw Davies

Objectives

In the background section we describe a number of literature reviews which have already been conducted relevant to the field of knowledge mobilisation but we have been unable to identify any that specifically explore the relationship between embedded researchers and knowledge co-production. Nor do they shed light on how embedded initiatives can be designed in a way that supports the co-production of knowledge, by which we refer to both the creation of new knowledge through locally-situated research *and* the mobilisation of established research knowledge of various kinds into new contexts, for example, in pursuit of service redesign and service improvements.

The objectives of this work stream are therefore to:

- Review the theoretical and empirical literatures on knowledge co-production to identify and describe the principles and practices associated with knowledge co-production;
- Review the theoretical and empirical literatures on embedded research to identify and describe the principles and practices associated with embedded research initiatives;
- To uncover and collate any evaluative research that explores the processes and outcomes of embedded research initiatives;
- Develop initial typologies of knowledge co-production, embedded research and the relationships between the two.

Methods

We will carry out a critical narrative review (Mays et al, 2001; Grant and Booth, 2009) of the international knowledge mobilisation literature relevant to embedded models of knowledge co-production. The literature review will be divided into two interlinked areas, each of which will address one part of our objectives. To identify the principles and practices of knowledge co-production we will search for literature that outlines the theoretical basis of and practical approaches to knowledge co-production together with any empirical evaluations. Where we find evaluative studies we will tag outcomes evaluations separately and analyse any quantitative data that is available as well as synthesising any qualitative insights. In line with our focus on embedded researchers, we will include all co-production configurations that involve researchers. We will adopt an inclusive definition of co-production, encompassing the co-production of research knowledge and the co-production of service improvement. To identify the principles and practices of embedded research we will search for theoretical and practical examples of embedded research together with any empirical evaluations. In this part of the review we will particularly focus on the knowledge that researchers contribute to co-

production. This will include subject-specific research-based knowledge relevant to the service setting and the researchers' broader research skills. For both parts of the review we will focus on identifying international examples from a range of fields (i.e. not limited to health) since this will enable us to build a broad picture of the principles and practices of these two approaches. In reviewing the published empirical evaluations, we will be seeking to understand what is already known about the effectiveness of co-production approaches and of embedded approaches.

The challenges of reviewing the literature in the knowledge mobilisation field with its diverse terminology and broad range of contributing disciplines have been well described by previous authors (e.g. Mitton et al, 2007; Contandriopoulos et al, 2010). We will therefore employ a range of strategies to search for relevant material in both the peer reviewed and grey literatures (Arksey and O'Malley, 2005; Van Eerd et al, 2011) and to make the review comprehensive but manageable.

To identify relevant literature on co-production we will use a citation tracing approach (Field et al, 2014). We will begin by identifying core early papers on co-production to give us an overview of the principles that underpin co-production approaches. We will do this in two ways. First, we will seek advice from our existing network of national and international experts and from relevant email discussion lists. Second, with assistance on search terms from an expert librarian, we will conduct bibliographic database searches (Business Source Premier, Embase, HMIC, Medline, Science Direct, Web of Science) to identify recent papers on co-production situated within the knowledge mobilisation literature (e.g. Beebeejaun et al, 2015; Durose et al, 2015; Flinders et al, 2015). We will use the reference lists of these papers to identify the most commonly-cited early literature on co-production (e.g. Ostrom, 1993; Ostrom, 1996). Having identified and reviewed this early literature on co-production, we will then use forward citation tracing to identify a coherent body of literature (including reviews, theoretical and empirical literature) relevant to the core concepts of co-production.

To identify relevant literature on embedded research we will build on earlier review work conducted by members of our team (Vindrola-Padros et al, 2016). This will involve using the search terms and strategy from this earlier work to identify the most recent literature on embedded research. We will conduct a bibliographic database search of Medline, Web of Science, PsychInfo, ProQuest Social Science and CINAHL Plus together with a hand search of the following journals: *BMJ*, *BMJ Quality and Safety*, *Anthropology in Action*, *BMC Health Services Research* and *Implementation Science*. We will combine the results of this search with the literature identified in the initial review. We will also examine the references of all of the retrieved papers to identify other literature (including reviews, theoretical and empirical literature) on embedded research.

Using a critical narrative review approach (Mays et al, 2001; Grant and Booth, 2009) we will analyse the literature we have identified to explore the theoretical basis of knowledge co-production and embedded research and determine what is known from existing empirical work on the use of such approaches. We will produce a descriptive synthesis of the material that focuses on the key principles and practices of knowledge co-production and embedded research approaches. We will use this to develop initial typologies that outline the range of knowledge co-production and embedded research approaches relevant to the NHS. We expect the typologies to include such dimensions as the type/s of knowledge being created and/or used, the types of actors involved, the nature of any governance arrangements, the overall purpose or aim of the initiative and the activities and mechanisms used. These typologies will be developed and extended further through the environmental scan of embedded researcher initiatives and the detailed interviews with key participants in work stream 2.

Outputs

- Initial typologies of knowledge co-production and embedded research which will (i) guide the identification and categorisation of embedded research initiatives in operation in UK health settings during work stream 2; (ii) form the basis of a framework for those considering commissioning or implementing embedded researcher initiatives as described in work stream 2 and (iii) form the basis for identifying and describing how embedded research initiatives achieve knowledge co-production during work stream 3.
- A peer-reviewed publication based on the narrative literature review to contribute to the international literature on knowledge co-production and embedded research in health settings.

Work Stream 2: Scoping embedded researcher initiatives in health settings in the UK

Leads: Vicky Ward, Huw Davies

Objectives

There are a range of embedded research models which are being, or have been used in the NHS including knowledge brokers (Ward et al, 2012; Wright, 2013; Frost et al, 2012), Knowledge and Innovation Transfer (KIT) agents (Bullock et al, 2016), knowledge mobilisation research fellows and researchers in residence (Marshall et al, 2014; Eyre et al, 2015). Whilst all of these models attempt to mobilise knowledge by closing the gap between the researcher and practitioner communities, there is great variation and a lack of clarity about the individuals involved (e.g. researchers, health professionals, managers, service users), the level of embeddedness of individuals in the practice setting, the nature and degree of co-production and the type of activities that take place. The objectives of this work stream are therefore to:

- Identify embedded researcher initiatives in operation in health settings across the UK;
- Describe the features of these initiatives including their aims, objectives, rationale, structure, content and outcomes;
- Identify those initiatives which are designed to achieve knowledge co-production.

Methods

We will carry out an environmental scan to identify and describe the range of embedded researcher initiatives in operation in health settings across the UK (Légaré et al, 2012). We will focus particularly on initiatives which embed researchers into health service settings (rather than those which embed health service staff into research settings). These settings will include public, private and voluntary sector organisations with a role to play in commissioning and/or delivering health services.

We will begin by searching for initiatives which meet these criteria. Between us, the project co-applicants have an extensive network of contacts with knowledge mobilisation experts (both researchers and practitioners) including people involved in all of the major health-related knowledge mobilisation schemes in the UK (Collaborations for Leadership in Applied Health Research and Care (CLAHRCs), Academic Health Science Networks (AHSNs), knowledge mobilisation research fellowships). We will therefore use email exchanges with our network of contacts, requests through other online media (Twitter, bulletin boards), snowballing techniques and general web searches to generate a database of current or planned embedded researcher initiatives in UK health settings. The project PPI group will utilise their networks to ensure that all examples are captured.

We will then use a targeted approach to gathering data about each of these initiatives. Previous work (including our own and that of Bullock who studied the use of knowledge and innovation transfer agents in AHSNs) has shown that it is often difficult for those employing knowledge mobilisation initiatives to categorise their approach and/or underlying rationale and principles (Bullock et al, 2016). As such, a survey-based approach is unlikely to be useful for our purposes. Instead, we will take a two-stage approach to gathering data, both of which will be carried out in partnership with the PPI group.

First, we will focus on gathering documents about each of the initiatives included in our database. This will involve identifying publicly available material (websites, reports) and making contact with an individual from each initiative to request any further documentation (e.g. job/role descriptions for embedded researchers). We will review these materials in order to identify the key components of each initiative and how it compares with the literature reviewed during work stream 1. This will give a clearer overview of the different types of embedded researcher initiatives in operation across the UK.

Second, we will select up to 12 embedded research initiatives and conduct short telephone interviews to explore these in more detail. At this stage, the initiatives we select will not be limited to those which seem to be designed to achieve knowledge co-production. Instead, our focus will be on gaining a more detailed understanding of the full range of embedded research initiatives in operation in order to provide a better picture of the options available to those wishing to commission or implement different types of embedded researcher initiatives. Our interviews will focus on the genesis, structures, rationale, aims and objectives, working processes, facilitators & barriers and outcomes of each initiative. The PPI group will lead on exploring the PPI elements of the initiatives. Where possible we will interview an individual who has an overview of the initiative and someone who is performing an

embedded researcher role. Those with an overview are more likely to be able to provide information about the genesis and rationale of the initiative whilst those performing an embedded researcher role are more likely to be able to provide information about the working processes of the initiative. We expect to conduct up to 24 interviews augmented by follow-up conversations and email dialogue where necessary. Interviews will be taped and transcribed.

We will analyse interview data using the emerging typology of embedded research developed during work stream 1 as a framework. Our initial focus will be on testing and refining the categories in the typology and adding practical, real-world examples. This material will be used during a workshop with key stakeholders, including the PPI group, (see work stream 4) where we will co-produce a framework of design options for those considering commissioning or implementing embedded researcher initiatives. We will also focus on drawing comparisons between the interview and documentary data and our emerging typology of knowledge co-production with the aim of identifying the types of embedded research initiatives which are designed to achieve knowledge co-production. We will use these insights to return to our initial database of embedded research initiatives and identify those which seem most likely to achieve knowledge co-production and could therefore be case studies for work stream 3.

Outputs

- The results will be used to refine and extend the typologies of embedded research and knowledge co-production and to produce a framework which outlines the different types of embedded research initiatives currently being used. The typologies will be a resource for work stream 3, whilst the framework will be a resource for those considering commissioning or implementing embedded researcher initiatives.
- A peer-reviewed publication contributing to the international literature on knowledge mobilisation outlining the range of embedded research initiatives in operation in health settings across the UK, using the typology developed in work stream 1.

Work Stream 3: In-depth case studies

Leads: Justin Waring and Naomi Fulop

Objectives

The objective of this work stream is to produce an in-depth qualitative appraisal of the contributions that different embedded researchers, together with their particular network of research and practice partners, make to the co-production and translation of research.

Building on the preceding work streams, this work stream will:

1. Purposively select four exemplar embedded researchers reflecting anticipated typographical differences, e.g. in their affiliations, project characteristics, relational networks, and funding;
2. Describe each embedded researcher's career history, motivations and network of research (university) and practice (NHS) partners, including changes over time in relationships; tasks and activities; and pattern of interactions;
3. Understand how embedded researchers, and members of their network, mediate different forms of knowledge, cultural and social boundaries to promote co-production
4. Appraise the contribution of each embedded researcher and their network to knowledge co-production, including detailed illustrative case examples within selected NHS settings.

Methods

Sampling and selection

This study adopts a relational understanding of knowledge mobilisation (Crossley, 2010) in which the unit of analysis is not the embedded researcher, but rather the network of relations and interconnected practices through which knowledge is co-produced, including partners based in both research (university) and practice (NHS) settings.

The work stream therefore proposes to focus on four embedded researchers/teams and, importantly, the network of other stakeholders who are involved in co-producing knowledge within the service

setting. We anticipate approximately 15-20 core individuals or groups for each embedded researcher/team, based upon previous CLAHRC research (Waring is leading a project on CLAHRC knowledge brokers) and from our experience of embedded researcher roles (Fulop leads an embedded research team at UCLH and Marshall leads embedded research initiatives across UCLPartners). These stakeholders are likely to include, depending on the context, practitioners, managers, commissioners, patients and the public.

The selection of the four different embedded researchers and networks will be informed by the findings of work streams 1 and 2. Using the typologies developed in these work streams, and drawing on the database of embedded researcher initiatives developed in work stream 2, we will identify initiatives which seem most likely to achieve knowledge co-production. We will review these to identify four exemplar cases from which to make distinct observations, draw comparison and elaborate general themes (Yin, 2009). It is anticipated that the typology will include differences in: (i) affiliation and contractual status; (ii) funding; (iii) individual/team approach; (iv) disciplinary expertise; (v) methodological expertise, and (vi) contractual arrangements. In addition, we expect contextual differences between embedded researchers embedded in primary and secondary care settings, and those between health and social care. A key consideration is that at least two of the selected embedded researchers will be at the early stages of their role (within first six months) so as to enable analysis of change over time.

The four identified embedded researchers, together with up to five key stakeholders and partners, including PPI partners, will be invited to a half-day workshop to further explain the purpose of the research, and to co-design data collection methods, e.g. interview questions, diaries and social media. The involvement of key stakeholders is important to ensure the 'buy-in' of each embedded researcher's wider relational network, which as outlined above is the primary unit of analysis. As the study progresses additional snowball sampling will enable the identification of additional actors and groups who work with the embedded researcher. It is anticipated that for each embedded researcher around 15-20 related actors or groups will be sampled (circa 80-85 participants: 4 embedded researchers/teams, plus up to 20 connected stakeholders each).

Within each exemplar case of embedded researcher/team, through initial interviews, we will identify potential illustrative sub-cases of the contribution (to a greater or lesser extent) of the embedded research model to the co-production of knowledge and service change. We propose to study two of these sub-cases per exemplar case, selected to include one sub-case where there is perceived (by a range of stakeholders) a higher level of influence/contribution and one where there is a perceived low level of influence. This will enable greater understanding of the activities, behaviours and contexts which support embedded researchers/teams to make a greater contribution.

Data collection

Three linked data collection activities are proposed: i) interviews with embedded researchers and up to 20 of their partners and stakeholders, ii) focused observations, and iii) diaries

Interviews: All interviews will follow a narrative approach, which allows participants to develop rich accounts or 'stories' of their knowledge co-production activities. This narrative interview approach will examine the backgrounds, motivations, and changing experiences of each embedded researcher, and the parallel motivations, experiences and beliefs of other actors and stakeholders. The interviews will also seek to elaborate how different actors understand and experience the epistemic, cultural and social boundaries that promote or facilitate knowledge co-production.

The interviews will allow in-depth study of embedded researchers and their relationships to determine the meanings, processes and boundaries that characterise these relationships. Participants will be asked to identify their 'key relationships' in the research-practice environment, to describe the character of their relationships in terms of shared knowledge, cultures and social process, and to explore how their relationships have changed over time. It will also ask for detailed examples of how these relationships impact on knowledge co-production. Asking participants to identify significant relationships will allow for the identification and sampling of additional participants.

As above, initial interviews will enable identification of potential illustrative sub-cases of the contribution of the embedded research model to knowledge co-production and service change.

Qualitative interviews will be undertaken with embedded researchers and their identified collaborators and stakeholders at two time points. At time point one, each embedded researcher will be interviewed about their career background, their understanding of the embedded role, their motivation and their specific project or organisational context. At this time, additional participants will be asked about their understanding of the embedded roles, the local organisational context, and the significance of the projects to which embedded researchers are contributing their knowledge.

The second interviews will be organised at 12-14 months to explore how these roles and relationships have changed, to understand how the co-production of knowledge might have developed, and how they are impacting upon service change. These interviews will be shorter in length (c30-40mins) and focused on the specific activities and outcomes of co-production. Additional ethnographic interviews will be undertaken with participants as part of the observational research, to explore changes in roles and relationships and to clarify emergent issues (see below).

Diaries and social media: Each embedded researcher will be asked to keep a reflective diary of their daily activities, focusing in particular on key activities, types of knowledge, changing relationships, as well as the challenges and issues faced in their role. These diaries will be semi-structured with a template, but will record free text under common headings, such as daily activities, key people, knowledge influence/impact. It is common practice for qualitative field research to keep a reflective journal to inform subsequent interpretation so it is not anticipated that doing so for the purpose of this study will be problematic for the four embedded researchers. Participants will be asked to reflect upon their diaries as part of the interviews.

Observations: Through the interviews and diaries, participants will be asked to identify key activities or settings where they facilitate knowledge co-production. A selection of these settings will be observed, following a semi-structured format, to further describe and understand the practices of embedded researchers. It is anticipated that up to five settings will be identified for each embedded researcher, each being observed at least three times. These might include meetings, workshops, dissemination events and training activities. In addition, each embedded researcher will be shadowed twice for a period of one week on each occasion, with one arranged for the beginning or middle of their embedded role, and the second towards the end. The purpose of the shadowing is to understand how embedded researchers interact and relate to their wider research-practice network in the course of their day-to-day activities and to see how these relationships change over time. During these periods of observation, participants will be asked to elaborate their activities and clarify emergent issues. All observations will be hand written in a field journal and typed up electronically as a thematic summary.

Data Analysis

The data will be managed and analysed using qualitative data analysis software (nVivo). Analysis will involve descriptive and explanatory interpretation of the qualitative data: the research team will code, categorise and theme data in relation to both emergent issues and accounts, and prevailing research objectives, concepts and theoretical frameworks, e.g. for knowledge sharing and boundaries, following established qualitative procedures (Corbin and Strauss 1992; Miles and Huberman 1994; Silverman 1997). This will involve clarification of the analytical strategy with research partners and advisors; familiarisation and review of data samples; review of emergent codes and issues to develop common coding strategy and frames; systematic coding of data and interpretation of data; constant comparison and recursive abstraction of coded data to determine conceptual boundaries and thematic relationships; on-going reflection on coding and interpretation, including inter-coded comparison; and relation of codes and themes to the wider literature.

As part of this process, two specific data analysis procedures will be followed. Following a narrative approach (Elliott 2005), participants' interview transcripts, diaries and social media records will be analysed, both independently and collectively, with the aim of developing temporal accounts of how embedded researchers contribute to the co-production and exchange of knowledge. This will involve rich accounts or 'stories' of how actors make sense and give meaning to events or activities, and how they relate to each other or change over time. The analysis will also specifically focus on data from the illustrative sub-cases of influence/impact on knowledge mobilisation processes and potential service change.

Outputs

This work stream will produce:

- A detailed analysis of how and why embedded researchers develop their role and influence within and between research and practice communities, to develop the findings of work stream 2;
- An analytical and explanatory account of how research-practice networks evolve over time, with a particular focus on the role and influence of the embedded researcher to build relationships and bridge boundaries;
- A descriptive and theoretical analysis of the strategies used by embedded researchers to mediate, broker and span epistemic, cultural and social issues;
- An appraisal of how embedded researchers contribute to knowledge co-production, including detailed illustrative cases on the co-production journey with key lessons identified for use in future dissemination, education, and knowledge sharing activities

Work stream 4: Stakeholder engagement and influencing

Leads: Martin Marshall, Liz Mear, Breid O'Brien

Objectives

This work stream focuses on objective 4 of the proposal and aims to engage and support stakeholders by providing a clear set of co-produced recommendations, guidance and training templates which describe the different ways in which co-production and embedded activities may be specified. This will allow those interested in developing and rolling-out such approaches across care systems to see more clearly the design choices for running effective approaches.

As a consequence of undertaking the project we would expect to see the following:

- Organisations that are currently using the principles and practices of knowledge co-production will make use of the evidence-based guidance, personal specifications, training templates and training resources that we produce in order to optimise the effectiveness of their work;
- Organisations that have not considered co-production models of knowledge mobilisation are stimulated to explore their potential use in improving decisions that impact on service delivery;
- Future work is commissioned to explore the effectiveness, costs and value of those co-production models of knowledge mobilisation identified in this project as having greatest potential for improving service.

Approach

The emphasis of the proposal is on developing practical ways of mobilising research knowledge, within the context of other forms of knowledge, so that Health Services Research has a greater influence on decisions made by leaders, managers and clinicians about how to organise, deliver and improve services. Engaging and influencing key stakeholders are therefore core elements of the proposal.

The principles underpinning our approach to stakeholder engagement and influencing are aligned to the theory and practice of co-production models of knowledge mobilisation and to the principles of participatory research. To that end, the influencing plan has been co-produced by practitioners, service users and academics and utilises approaches which focus on social interaction, as well as more traditional academic approaches to dissemination.

Target audiences

We have identified the three target audiences which we think are most likely to ensure that the project outputs have maximum influence. The primary target audience is NHS and local government leaders, both managers and clinicians, whose provider and commissioning decisions could be improved by making better use of Health Services Research evidence. The secondary target audience is the academic community, both to encourage researchers to explore the benefits and risks of engaging in embedded models of knowledge co-production, and to contribute theoretical and empirical knowledge to the field. The third target audience is front line staff and service users because their interaction with the embedded researchers is at the heart of the model.

Influencing mechanisms and outputs

We propose a range of approaches to engaging, co-producing and influencing stakeholders in order to maximise the impact of the thinking and outputs of work streams 1-3:

Workshops: We will host three participatory workshops during the study, each of which will enable us to co-produce practical outputs and raise the profile of the project with target audiences. The first workshop will co-produce a framework of design options for embedded researcher initiatives. The second will co-produce visual representations of our case study findings. The third will co-produce practical guidance and tools for the design and implementation of embedded models. In each we will consult with our stakeholders on the activities taking place in the work streams and on ways of increasing the influence of the findings. Invitees will include members of the project steering group plus on-the-ground knowledge users and brokers, potential beneficiaries of more effective knowledge mobilisation activities, and organisations working in the knowledge mobilisation field, such as CLAHRCs, AHSNs and foundations. PPI representatives will be invited from the advisory group and from established PPI groups of interested parties. The workshops will be facilitated by the academic, practitioner and patient co-applicants. In line with participatory best practice, creative design methods will be used to optimise engagement and to promote innovative thinking.

Tools: Working in partnership with the stakeholders we will co-produce a series of specific outputs designed for use by health service and academic organisations to encourage and support the practical implementation of the learning from work streams 1-3. These will include:

- Detailed guidance on the design and implementation of the most effective co-production model/s of knowledge mobilisation, presented in the form of accessible multi-media case studies;
- An animation to describe the role of embedded researchers in a popularist and accessible way;
- Job descriptions and person specifications to support the recruitment of new embedded research posts;
- Guidance on how these posts might be advertised and appointed;
- A description of the knowledge, skills and attitudes required of embedded researchers, and the different career pathways that could be pursued;
- An outline training programme and resources that could be used by co-production knowledge mobilisers;
- An outline of how embedded researchers might prepare for their role and how organisations can create a conducive environment for them to thrive;
- Guidance for organisations on how they might maintain and build on any benefits achieved by an embedded researcher once the funding comes to an end.

Learning sets: We are aware of a number of local, regional and national learning sets of embedded researchers that are operating around the country. They appear to benefit the researchers by providing an opportunity to share learning and challenges amongst peers, support professional development and help embedded researchers to develop as champions and future leaders of co-production models of knowledge mobilisation. We will contact the leads of the established learning sets and use our networks to identify ones that we are currently unaware of or are in the process of being established. Working with these learning sets will provide a rich opportunity for us to engage the embedded research community with this proposal and to get members input into the typology, emerging learning and influencing activities. In addition to attending some of the learning set meetings, we will invite members to the workshops mentioned above.

Publications and reports: To engage public sector leaders and managers we will publish articles in professional journals and on-line media such as the HSJ and Local Government Chronicle. We expect the outputs of the programme to contribute to both service development and to the academic literature in the field. To this end, in addition to the final report for NIHR, we will publish our findings in the form of at least four publications in highly ranked international peer reviewed journals. These are likely to focus on the findings of the critical narrative review; a description of the range of embedded research initiatives in operation in health settings across the UK; an appraisal of how embedded researchers contribute to the co-production and translation of research into practice, including detailed case studies on the research into practice journey with key lessons identified for use in future

dissemination, education and knowledge sharing activities; and a description of the emerging typology of knowledge co-production and embedded research initiatives.

Presentations: We will present the work at national and international conferences and seminars for service leaders and managers, such as the NHS Confederation Conference, NHS Providers conference, HSJ events, Medical Royal College events and the NICE annual conference. In addition, we will focus on the main international research conferences in the field, such as the Canadian Knowledge Mobilisation Forum, the British annual HSR UK symposium and the American Academy conference. Given the professional profile of the lead applicants, we would expect opportunities to present the work in keynote and plenary presentations.

Social media: We will use social media to blog and tweet about our emerging ideas, findings and publications and will produce an animation illustrating the key issues.

Networks: The application team has extensive personal and professional networks in the field of NHS service management and knowledge mobilisation, in the UK and internationally. We will utilise the team's wider local and national networks in local health economies, CLAHRCs, Academic Health Science Networks and HEI networks to ensure that the outputs of the project have maximum impact

Dissemination and project outputs

The influencing activities are an integral part of this proposal and are described in detail in work stream 4, above.

Maintaining a critical distance

The Embedded team is sensitive to the potential biases associated with evaluating a model with which they have a vested interest. In this application we describe how the deep and practical understanding of the field of the work stream leads is one of the strengths of the proposal but at the same time we recognise the impact this might have on maintaining critical distance. We plan to address this in the following ways.

First, we acknowledge the personal interests of the project applicants. Professor Davies is the only applicant who does not manage a team of embedded researchers so we will be explicit that he plays an important role in challenging team assumptions, searching for disconfirming data and maintaining objectivity. Second, our starting point is that there is good theory and some evidence to suggest that the models may add value and our critical stance is to understand how this might happen, rather than attempting to prove that it does not. This stance is illustrated and reinforced by one of the key aims of the proposal, namely to develop practical tools for practitioners to use. Third, the project leads have different views about the balance of pros and cons of the model and each of them have expressed some scepticism about the disadvantages and risks of embedded models of research. Fourth, the applicants are experienced researchers who have a track record of independently evaluating interventions in which they have a personal interest, so this is not new territory for us. Finally, the Study Steering Committee will play an important role in challenging the research team to maintain critical distance.

Plan of investigation and timetable

We are proposing a 30-month project starting in January 2018.

WORK PHASE	DESCRIPTION	YEAR ONE												YEAR TWO												YEAR THREE												
		Q1			Q2			Q3			Q4			Q1			Q2			Q3			Q4															
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J							
Project management																																						
	Ethics approval																																					
	Project leads meetings																																					
	Advisory grp meetings																																					
Work stream 1																																						
	Develop search strategies																																					
	Implement search strategies																																					
	Retrieve and screen papers																																					
	Extract and analyse data																																					
	Produce typologies (V1)																																					
Work stream 2																																						
	Environmental scan/gather documents																																					
	Select initiatives for interviews																																					
	Telephone interviews																																					
	Analyse interviews																																					
	Produce typologies and framework																																					
Work stream 3																																						
	Selection of case studies																																					
	Preparatory workshop																																					
	Data collection																																					
	Data analysis and interpretation																																					
	Write up case studies																																					
Work stream 4																																						
	Expert workshop 1																																					
	Expert Workshop 2																																					
	Expert Workshop 3																																					
	Development of multimedia case studies																																					
	Development of Job description and person spec																																					
	Curriculum for embedded researchers																																					
	Guidance on sustainability																																					
	Work with learning sets of embedded researchers																																					
	Publications and reports																																					
	Presentations																																					
	Social Media dissemination																																					

Project management

The project will be coordinated and led by Martin Marshall as PI from UCL (0.2 WTE), supported by a project manager (0.3 WTE) who will organise team meetings and workshops, manage the budget on a day-to-day basis, provide general administrative support and mediate communication across the team. Each of the work streams has one senior and experienced lead supported by another senior researcher and, in the case of work stream 4, by senior NHS managers (work stream 1 Vicky Ward from Leeds (0.4 WTE for 12 months, then 0.2 WTE for 18 months) with Huw Davies (0.1 WTE); work stream 2 Vicky Ward (as above) with Huw Davies; work stream 3 Justin Waring from Nottingham (0.1 WTE) with Naomi Fulop (0.075 WTE); and work stream 4 Martin Marshall from UCL with Liz Mear and Bried O'Brien (both paid as consultants)).

The research associates will each contribute to work streams 1 and 2 (employed 0.8 WTE for 12 months by the University of Leeds, supervised by Vicky Ward), work stream 3 (employed by the University of Nottingham 1.0 WTE for 18 months, supervised by Justin Waring) and work stream 4 (employed by UCL 0.5 WTE for 30 months supervised by Martin Marshall), though they will work flexibility across all work streams as required.

All of the work stream leaders will work together on the design and delivery of the work shops for work stream 4. All co-applicants will contribute to the project reports, academic publications and conference presentations.

The central project team comprises these individuals plus four collaborators (Peter Brindle, Rosemary Rushmer, Richard Parnell, Mike Cooke) who bring additional expertise in PPI, health services and policy. This team will meet on average every 6 weeks throughout the project, alternating between face-to-face meetings in London and social media-enabled video conferences.

A Study Steering Committee has been provisionally established comprising UK-based experts in the field of knowledge mobilisation (Martin Utley from UCL, Lesley Wye from Bristol and Kevin Orr from St Andrews) plus international experts in the field (Barbara Riley (Executive Director, PROPEL Centre for Population Health Impact, Waterloo, Canada); Andrew Bindman (Previous Director of the US Agency for Research and Quality, Professor of Medicine and Epidemiology, Lee Institute for Health Policy Studies, UC San Francisco); John Ovreteit (Director of Research, Karolinska Institute, Stockholm, Sweden), plus PPI experts as described below. This group will meet with the central project team three times during the 30 month project, with the international members joining by video link. It will have a key role in highlighting national and international policy and practice in the field, ensuring that the work streams are integrated and on track, ensuring that the work stream leads maintain critical distance, and advising on how to maximise the impact of the interim and final findings.

Ethics approval

In line with guidance from the Health Research Authority, NHS Research Ethics Approval will not be required for this study. Given the involvement of health and care organisations in work streams 2, 3 and 4, we will seek research ethics approval from UCL, the host institution of the PI, during the preparatory period and the first 3 months of the project. We will ensure that this approval is acceptable to the host institutions for work streams 2 (University of Leeds) and 3 (University of Nottingham). We will seek research governance approval from the local NHS R&D Offices for the NHS, and separately for any non-NHS sites (e.g. local government premises), for organisations involved in field work in work streams 2 and 3, though it will not be possible to select these sites at the time of seeking approval. This local approval will clarify the requirements and relative responsibilities of relevant HEIs and local sites. To support this process we will make use of approved governance templates for CVs, model agreements, research passports and honorary contracts/letters of access. Informed consent will be gained from all interviewees and we will adhere to current data protection guidance for all data being collected.

Patient and public involvement

Whilst progress is being made in involving patients and the public in the provision of their clinical care, involving them in the broader issues of health service improvement and service redesign has proved considerably more challenging. Experience-based codesign (EBCD) is a rare example of a specific

methodology which brings service users and staff together to develop simple solutions to improve patients' experiences of care (Bate and Robert, 2006). Moving the agenda from highly tangible initiatives such as EBCD to broader issues such as how research-based knowledge can be used more effectively has proved to be particularly problematic (Snape et al, 2014). Indeed, the field of knowledge mobilisation appears to have not yet been successful in finding a place for the patient voice (Boaz et al 2015; Davies et al 2015).

If the literature reviews and empirical work in this study confirm this view then we will highlight the problem and explore the possible reasons. If, as we scope the field, we find examples of good practice in involving patients in embedded knowledge co-production initiatives, we will examine and describe these in detail.

In addition, we want to seize the opportunity provided by this proposal to involve patients and the public more substantively in knowledge co-production and to understand how to make an effective case for greater user involvement in this field. To achieve this we conceptualise patients as the main beneficiaries of a more evidence-informed health system. Indeed, patients are central because it is primarily they who are disadvantaged when research-based knowledge is not used by health professionals and managers. We frame the effective co-production of knowledge as being dependent on a number of different relationships. The relationship between practitioners and service users has been the subject of most attention to date. The relationships between researchers and service users, and between researchers and practitioners are less well understood. The primary focus for this proposal is on how researchers can build effective relationships with practitioners in order to co-produce knowledge and improve services. We see service users as a key element of the context within which this relationship is enacted, as stakeholders and as important motivators for change.

To that end, the patient and public voice was included from the early design stage of the proposal. Richard Parnell, who has great experience as a PPI advisor to NIHR and as a member of the NIHR Knowledge Mobilisation Research Fellowship selection panel, is a collaborator with an explicit responsibility for challenging any tendency for service-centricity in the design and delivery of the proposal. In addition, the service co-applicants and collaborators have been chosen because of their commitment to patient and public involvement and because of their extensive contacts with patient groups, including user advisory groups which have been established specifically for knowledge mobilisation initiatives run by CLAHRCs, AHSNs and specific knowledge mobilisation roles.

Richard will bring a user voice to all project team meetings. In addition, we have provisionally established a project PPI group comprising three additional lay members (Holmes, Woodcock and Bolland), two of whom already work closely with the lead for work stream 2 and the other with the lead of work stream 4. This group will be core members of the project advisory group, joining in person or on a video link, and they will join the workshops in work stream 4. They will also be available as a separate resource for the work stream leads to draw upon as required. For example, work stream 2 will seek PPI input into identifying voluntary sector organisations that might be using embedded researchers and into the features of examples of co-production which might benefit from a patient perspective. All PPI input has been costed in the budget in line with NIHR guidance.

Expertise and justification of support required

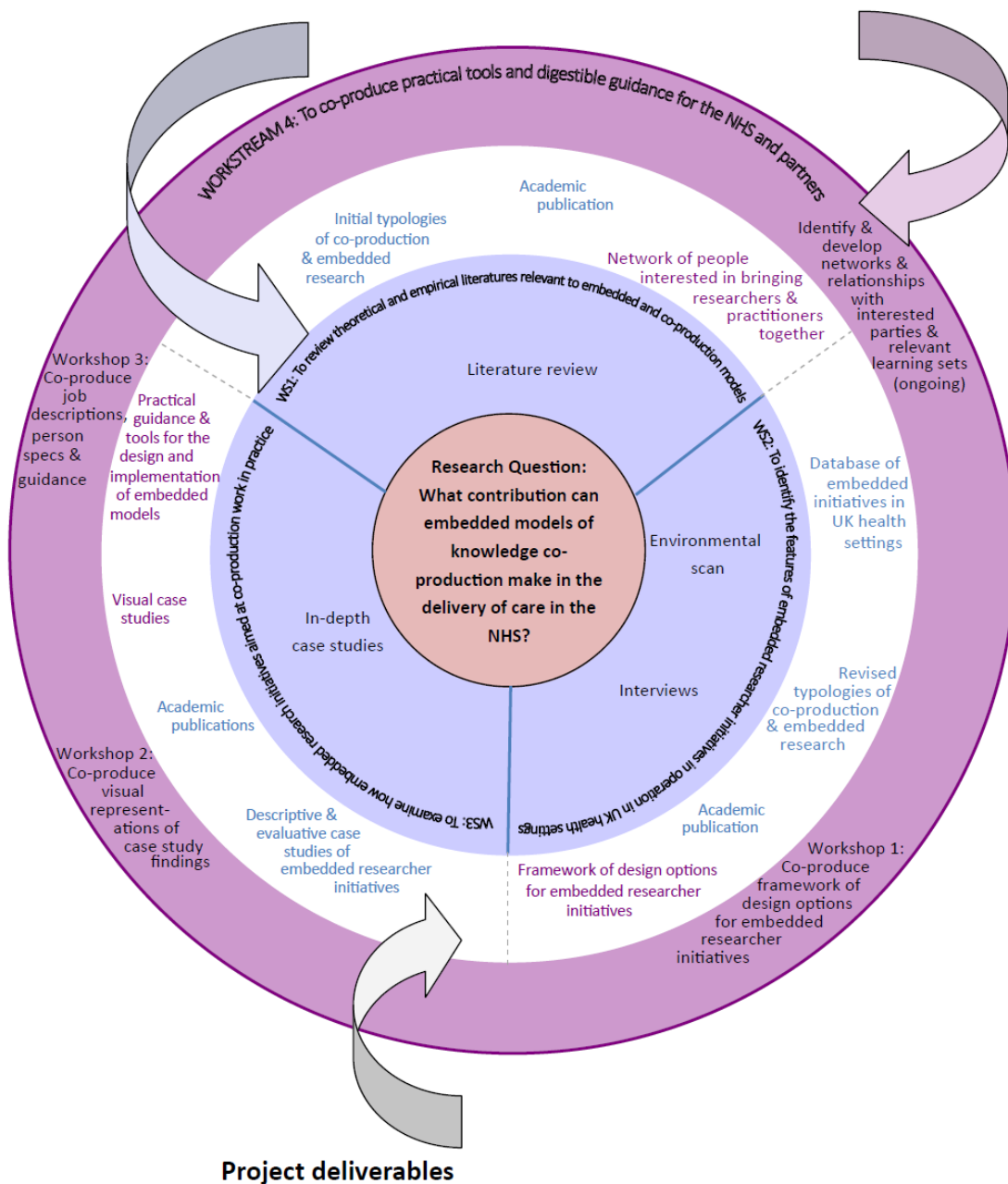
Marshall is the Principle Investigator and the lead for work stream 4. With a background in improvement science, clinical practice, health service improvement & policy he brings expertise in the field of knowledge mobilisation and the interface between academia & practice. Davies co-leads work streams 1 and 2. With a background in health services research, management studies & health policy, he brings an international reputation in the field of knowledge mobilisation and has chaired a number of NIHR initiatives involving the CLAHRCs & NIHR Knowledge Mobilisation Research Fellowships. He has recently completed a major study on knowledge mobilisation for HS&DR. Ward co-leads work streams 1 and 2. She leads an innovative knowledge mobilisation research programme and is a current NIHR Knowledge Mobilisation Research Fellow. Mear and O'Brien co-lead work stream 4 and are experienced senior NHS managers with long experience of supporting practice-based research activities. Mear is Chief Executive of the Innovations Agency and currently chairs the national AHSN network. Waring co-leads work stream 3. He has a background in organisational and medical sociology and improvement science and expertise in the socio-cultural study of real world practice. Fulop co-leads work stream 3. She has an international reputation in the study of change and improvement in health care, both at different levels of the system as well as locally, nationally and

internationally. As collaborators, Cooke and Brindle bring extensive experience as practitioner users of research evidence, a deep understanding of HSR and knowledge mobilisation and both have extensive experience as advisors for national NIHR programmes. Parnell brings PPI expertise to the team. Rushmer brings a track record of research in knowledge mobilisation and runs an embedded research programme. Marshall, Ward, Fulop, Waring, Mear and O'Brien are all involved in local 'in-residence' or similar embedded researcher programmes with elements of knowledge co-production.

Flow diagram

Aim 1: Develop the evidence base underpinning the nature and effectiveness of embedded models of co-production

Aim 2: Produce practical guidance on the design and implementation of embedded models of co-production



References

- Antil T, Desrochers M, Joubert P, Bouchard C. Implementation of an innovative grant programme to build partnerships between researchers, decision-makers and practitioners: The experience of the Quebec Social Research Council. *JHSRP* 2003;8(supplement2):35-43
- Arksey, H, O'Malley, L. Scoping studies: towards a methodological framework, *International Journal of Social Research Methodology: Theory & Practice*, 2005; 8, 19-32
- Bammer G, Michaux A, Sanson A. Bridging the 'know-do' gap: Knowledge brokering to improve child well-being. Canberra ANU E Press; 2010
- Bannister J, Hardill I. Knowledge mobilisation and the social sciences: dancing with new partners in an age of austerity. *Contemporary Social Science*, 2013; 8: 167-175.
- Bate P, Robert G. Experience-based codesign; from redesigning the system around the patient to co-designing services with the patient. *Qual. Saf. Health Care* 2006;15;307-310
- Beebejaun, Y., Durose, C., Rees, J., Richardson, J., & Richardson, L. Public harm or public value? Towards coproduction in research with communities. *Environment and Planning C: Government and Policy*, 2015; 33, 552-565.
- Best A, Greenhalgh T, Saul J, Lewis S, Carroll S, Bitz J. Large system transformation in health care: A realist review and evaluation of its usefulness in a policy context. *Milbank Quarterly* 2012; 90(3);421-456.
- Best, A, Holmes. Systems thinking, knowledge and action: towards better models and methods, *Evidence & Policy*, 2010; 6, 145-159
- Boaz, A., Locock, L. and Ward, V.L. "Whose evidence is it anyway?" *Evidence & Policy* 2015; 11 (2): 145-148.
- Booth, A. "Bridging the Know-Do Gap': a role for health information professionals?" *Health Information and Libraries Journal* 2011; 28(4): 331-334.
- Boyle, D., & Harris, M. The challenge of co production: how equal partnerships between professionals and the public are crucial to improving public services. London: New Economics Foundation, 2009
- Brandsen, T., Verschuere, B. and Pestoff, V. 'Conclusion: Taking research on co-production a step further', in V. Pestoff, T. Brandsen and B. Verschuere (eds.), *New public governance, the third sector and co-production*, New York, Routledge, 2012
- Bullock A, Morris ZS, Atwell C. A formative evaluation of the Service Delivery and Organisation (SDO) Management Fellowships. 2012; National Institute for Health Research.
- Bullock A, Barnes E, Morris ZS, Fairbank J, de Pury J, Howell R, Denman S. Getting the most out of knowledge and innovation transfer agents in health care: a qualitative study. *H Serv Deliv Res* 2016;4(33) Published by NIHR Journals Library <https://www.ncbi.nlm.nih.gov/pubmed/27905805>
- Campbell D, Redman S, Jorm L, Cooke M, Zwi A, Rychetnik L, Increasing the use of evidence in health policy: Practice and views of policy makers and researchers. *Australia and New Zealand Health Policy*. 2009;6(1):21-32
- Chafe R, Dobrow M. Health services researchers working in healthcare organisations: The intriguing sound of three hands clapping. *Healthcare Policy*. 2008;4(2):37-45
- Chew, S., N. Armstrong and G. Martin. "Institutionalising knowledge brokering as a sustainable knowledge translation solution in healthcare: how can it work in practice?" *Evidence & policy* 2013; 9(3): 335-351.
- Contandriopoulos, D, Lemire, M, Denis, J-L, Tremblay, E. Knowledge exchange processes in organizations and policy arenas: a narrative systematic review of the literature, *Milbank Quarterly*, 2010; 88, 444-483
- Crossley N. *Towards relational sociology*. London, Routledge, 2010
- Currie G, Waring J, Finn R. The limits of knowledge management for UK public services modernization: the case of patient safety and service quality. *Public Administration*. 2008; 86(2), 363-385
- Dagenais, C., M.-C. Laurendeau and M. Briand-Lamarche. "Knowledge brokering in public health: A critical analysis of the results of a qualitative evaluation." *Evaluation and Program Planning* 2015; 53: 10-17.
- Davies HTO, Powell AE, Nutley SM. Mobilising knowledge to improve UK health care: learning from other countries and other sectors - a multimethod mapping study. *Health Services and Delivery Research*, 2015; 3.
- Duijn, M., Rijnveld, M. and van Hulst, M. "Meeting in the middle: joining reflection and action in complex public sector projects". *Public Money & Management* 2010; 30 (4): 227-233.
- Durose, C, Needham, C, Mangan, C, Rees, J. Generating 'good enough' evidence for co-production, *Evidence & Policy* 2015, <http://dx.doi.org/10.1332/174426415X14440619792955>

- Elliott, J., 2005. Using narrative in social research: Qualitative and quantitative approaches. Sage.
- Estabrooks, C A, Thompson, D S, Lovely, J E, Hofmeyer, A, 2006, A guide to knowledge translation theory, *The Journal of Continuing Education in the Health Professions*, 26, 25-36
- Eyre L, George B, Marshall M. Protocol for a process-oriented qualitative evaluation of the Waltham Forest and East London Collaborative (WELC) integrated care pioneer programme using the Researcher-in-Residence model. *BMJ Open* 2015;5:e009567. doi: 10.1136/bmjopen-2015-009567
- Fazey, I., Bunse, L., Msika, J., Pinke, M., Preedy, K., Evely, A.C., et al. Evaluating knowledge exchange in interdisciplinary and multi-stakeholder research. *Global Environmental Change-Human and Policy Dimensions*, 2014; 25, 204-220.
- Ferlie E, Crilly T, Jashapara A, Peckham, A. Knowledge mobilisation in healthcare: A critical review of health sector and generic management literature. *Social Science & Medicine*, 2012; 74: 1297-1304.
- Field, B, Booth, A, Ilott, I, Gerrish, K. Using the Knowledge to Action Framework in practice: a citation analysis and systematic review, *Implementation Science*, 2014; 9
- Flinders, M, Wood, M, Cunningham, M. The politics of co-production: risks, limits and pollution, *Evidence & Policy*, 2015, <http://dx.doi.org/10.1332/174426415X14412037949967>
- Frost, H., R. Geddes, S. Haw, C. A. Jackson, R. Jepson, J. D. Mooney and J. Frank. "Experiences of knowledge brokering for evidence-informed public health policy and practice: three years of the Scottish Collaboration for Public Health Research and Policy." *Evidence & Policy: A Journal of Research, Debate and Practice* 2015; 8(3): 347-359.
- Glegg, S. M. and A. Hoens. "Role Domains of Knowledge Brokering: A Model for the Health Care Setting." *Journal of Neurologic Physical Therapy* 2016; 40(2): 115-123.
- Grant, M J, Booth, A. A typology of reviews: an analysis of 14 review types and associated methodologies, *Health Information & Libraries Journal*, 2009; 26, 91-108
- Greenhalgh, T. and Wieringa, S. "Is it time to drop the 'knowledge translation' metaphor? A critical literature review". *Journal of the Royal Society of Medicine* 2011; 104: 501-509.
- Greenhalgh T. What is this knowledge that we seek to 'exchange'? *Milbank Quarterly*, 2010; 88: 492-499.
- Jackson CL, Greenhalgh T. Co-creation: a new approach to optimising research impact? *The Medical Journal of Australia*, 2015; 7: 283-284.
- Heaton, J., Day, J., & Britten, N. Collaborative research and the co-production of knowledge for practice: an illustrative case study. *Implementation Science*, 2016; 11, 1-10.
- Hewison, A., Gale, N. and Shapiro, J. "Co-production in research: some reflections on the experience of engaging practitioners in health research". *Public Money & Management* 2012; 32 (4): 297-302.
- Hoens, A. M., W. D. Reid and P. G. Camp. "Knowledge brokering: An innovative model for supporting evidence-informed practice in respiratory care." *Canadian Respiratory Journal* 2013; 20(4): 271-274.
- Légaré F, Politi M.C., Drolet R, Desroches S, Stacey D, Bekker H. Training health professionals in shared decision-making: An international environmental scan, *Patient Education and Counseling*. 2012;88(2):159-169
- Lomas J. Using linkage and exchange to move research into policy at a Canadian foundation. *Health Affairs* 2000; 19(3):236-40.
- Lomas J. The in-between world of knowledge brokering. *BMJ* 2007;334(7585):129-132.
- Marshall, M. "Bridging the ivory towers and the swampy lowlands; increasing the impact of health services research on quality improvement ". *International Journal for Quality in Health Care* 2014; 26 (1): 1-5.
- Marshall M, Pagel C, French C et al. Moving improvement research closer to practice; the Researcher in Residence model. *BMJ Quality and Safety* 2014, doi:10.1136/bmjqs-2013-002779.
- Marshall M, Eyre L, Lalani M, et al., Increasing the impact of health services research on service improvement: the research in residence model. *JRSM*, 2016; 109: 220-225
- Mays, N, Roberts, E, Popay, J. Synthesising research evidence. In Fulop, N., et al. (eds), *Studying the organisation and delivery of health services: Research methods*. London: Routledge, 2001; pp. 188-220
- McCabe, K.E., Wallace, A., & Crosland, A. A model for collaborative working to facilitate knowledge mobilisation in public health. *Evidence & Policy*, 2015; 11, 559-576.
- Miles, M.B. and Huberman, A.M. *Qualitative data analysis: A sourcebook*. Beverly Hills: Sage Publications, 1994.
- Mitchell P, Pirkis J, Hall J, Haas M. Partnerships for knowledge exchange in health services research, policy and practice. *JHSRP*. 2009; 14 (2):104-111
- Mitton, C, Adair, C E, McKenzie, E, Patten, S B, Wayne Perry, B. Knowledge transfer and exchange: review and synthesis of the literature, *The Milbank Quarterly*, 2007; 85, 729-768
- Nutley SM, Walter I, Davies HTO. *Using Evidence*. Policy press (Bristol), 2007.

- Orr, K. and Bennett, M. "Editorial". *Public Money & Management* 2010; 30 (4): 199-203.
- Orr, K. and Bennett, M. "Public Administration Scholarship and the Politics of Coproducing Academic-Practitioner Research". *Public Administration Review* 2012; 72 (4): 487-496.
- Osborne, S.P., & Stokosch, K. It takes Two to Tango? Understanding the Co-production of Public Services by Integrating the Services Management and Public Administration Perspectives. *British Journal of Management*, 2013; 24, S31-S47.
- Ostrom, E. "A communitarian approach to local governance". *National Civic Review* Summer 1993: 226-233.
- Ostrom, E. "Crossing the great divide: coproduction, synergy and development". *World Development* 1996; 24 (6): 1073-1087.
- Ovretveit, J., Hempel, S., Magnabosco, J.L., Mittman, B.S., Rubenstein, L.V., & Ganz, D.A. Guidance for research-practice partnerships (R-PPs) and collaborative research. *Journal of Health Organization and Management*, 2014; 28, 115-126.
- Phipps, D. and Morton, S. "Qualities of knowledge brokers: reflections from practice". *Evidence & Policy* 2013; 9 (2): 255-265.
- Rycroft-Malone J, Wilkinson J, Burton CR et al. Collaborative action around implementation in Collaborations for Leadership in Applied Health Research and Care: towards a programme theory. *Journal of Health Services Research and Policy*, 2013; 18 (Suppl3): 13-26.
- Salter, K.L., & Kothari, A. Knowledge 'Translation' as social learning: negotiating the uptake of research-based knowledge in practice. *BMC Med Educ*, 2016; 16.
- Sibbald, S.L., Tetroe, J. and Graham, I.D. "Research funder required partnerships: a qualitative inquiry". *Implementation Science* 2014; 9 (176).
- Silverman, D. *Qualitative Research: theory, method, practice*. London, Sage, 1997
- Snape, D., Kirkham, J., Preston, J., Popay, J., Britten, N., Collins, M., et al. "Exploring areas of consensus and conflict around values underpinning public involvement in health and social care research: a modified Delphi study". *BMJ Open* 2014; 4 (e004217).
- Soper B, Hinrichs S, Drabble S, Yaqub O, Marjanovic S, Hanney S, et al. "Delivering the aims of the Collaborations for Leadership in Applied Health Research and Care: understanding their strategies and contributions". *Health Serv Deliv Res* 2015; 3 (25).
- Strauss, A. and Corbin, J. *Basics of qualitative research (Vol. 15)*. Newbury Park, CA: Sage, 1990
- Van Eerd, D, Cole, D, Keown, K, Irvin, E, Kramer, D, Brenneman Gibson, J, et al. *Report on Knowledge Transfer and Exchange Practices: A systematic review of the quality and types of instruments used to assess KTE implementation and impact*. Toronto: Institute for Work and Health, 2011
- Verschuere, B., Brandsen, T. and Pestoff, V. "Co-production: The state of the art in research and the future agenda". *Voluntas* 2012; 23: 1083-1101.
- Vindrola-Padros, C., Pape, T., Utley, M. and Fulop, N.J. "The role of embedded research in quality improvement: a narrative review". *BMJ Quality and Safety*, 2016
- Walter I, Davies H, Nutley S. Increasing research impact through partnerships: Evidence from outside health care. *JHSRP*. 2003;8:58-61
- Ward V, Smith S, House A, Hamer S. Exploring knowledge exchange: A useful framework for practice and policy. *Social Science & Medicine* 2012; 74:297-304.
- Waring J, Marshall F, Bishop S. Understanding the occupational and organizational boundaries to safe hospital discharge. *Journal of Health Services Research & Policy*, 2015; 20(1 suppl), 35-44.
- Wehrens, R. Beyond two communities - from research utilization and knowledge translation to co-production? *Public Health*, 2014; 128, 545-551.
- Weiss CH. Research for policy's sake; the enlightenment function of social research. *Policy Analysis* 1977; 3:531-45
- Wright, N. "First-time knowledge brokers in health care: the experiences of nurses and allied health professionals of bridging the research-practice gap." *Evidence & Policy: A Journal of Research, Debate and Practice* 2013; 9(4): 557-570.
- Yin, R.K. *Case study research: design and methods (Fourth edition)*. London, Sage, 2009