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The views expressed are those of the author(s) and not necessarily those of the NHS, the NIHR or the Department of Health and Social Care.

Detailed project description**An investigation of the scale, scope and impact of skill mix changes in primary care****SUMMARY OF RESEARCH**

Many factors have contributed to increasing and unprecedented pressures facing primary care across the UK. Whilst growth in GP numbers has lagged behind other clinical staff, altered population demographics mean that levels of multi-morbidity have increased, and consultations have become longer and more complex as healthcare has shifted from hospital to community settings (Dayan M et al., 2014, Hobbs et al., 2016). Unfilled GP vacancies, increased workloads and patients experiencing difficulty in obtaining appointments (Lambert et al., 2017, Lane, 2014), have been linked with a decline in the attractiveness of GP careers.

It has been suggested that diversification of the primary care workforce to include more non-GP practitioners could offer an effective and efficient solution to the imbalance of supply and demand (Addicott and Ham, 2014, Primary Care Workforce Commission, 2015). Implementation of this entails a change in the combination of disciplinary groups involved in care delivery, often described as a change in “skill mix” (Branson et al., 2003 p330), and a range of innovative schemes has been developed, locally and nationally (NHS England, 2015, Drennan et al., 2017).

Although employment patterns in primary care are already changing, there are limited published data about wider and longer-term effects which may be linked with changes in skill mix. Research suggests that it is important to ensure that the introduction of new roles translates into increased capacity without duplication, fragmentation or increasing costs whilst retaining the confidence of patients (Imison et al., 2016).

A comprehensive investigation of the effects of a widening range of staff in primary care ought therefore to capture the scale of new patterns of skill mix; to analyse trends; and to examine the organisational changes necessary to accommodate a more diverse team of practitioners. It should also consider how changing skill mix is associated with outcomes for practitioners, patients and the impact on the health economy.

This investigation responds to this need and findings will inform policy makers, commissioners and practices of the structures, contexts and processes that appear most supportive of sustainable skill mix change and of any adverse consequences of change that might need to be addressed.

AIMS:

This study aims to investigate evolving patterns of skill mix in primary care, examine how and why skill mix changes are implemented, explore practitioner and patient experiences of these changes, and estimate the overall impact on outcomes associated with the employment of a broader spectrum of practitioner types.

RESEARCH QUESTIONS:

We have identified 3 research questions (RQs) and linked Work Packages (WPs) to address these aims:

RQ1 What is the scale and distribution of skill mix change in primary care and how are skill mix changes associated with outcomes and costs?

WP1 Workforce data supplied by GP practices have become more detailed, making it possible to examine national datasets for longitudinal trends in the employment of different healthcare professionals. These data will be linked with outcome data from individual practices to examine associations between changes in employment patterns and subsequent changes in healthcare activity, performance and costs.

RQ2 What motivations drive skill mix change at practice level and what is delivered by deployment of different practitioners?

WP2 We will undertake a survey of Practice Managers to obtain data not available in national datasets on motivation and duration of non-GP practitioners' employment and specific strategies to coordinate implementation of skill mix change. Data about types of tasks that practitioners can/do perform will indicate the extent to which the deployment of GP and non-GP practitioners match operational categories of substitution, delegation, enhancement or innovation (Sibbald et al., 2004), as each has different service and cost implications.

RQ3 (WP3) How do skill mix changes affect the experiences of employers, practitioners and patients?

WP3 Six GP practices will be studied in depth to explore how changing skill mix affects the experiences of clinical and non-clinical staff, and patients. Sites will be selected for variety across 2 dimensions; duration of skill mix implementation and diversity of practitioners employed. We will examine how practices and staff accommodate the changes in skill mix and negotiate professional boundaries (Currie et al., 2009), and explore patients' views on the contribution of skill mix change to providing accessible and high quality care (Branson et al., 2003).

WP4 We will synthesise the multiple sources of data from WP1-3 to set the findings from the quantitative data in context and investigate mechanisms which may be driving the changes in employment patterns and outcomes.

Excellent access to relevant networks and the participation of a broad range of relevant professional groups and commissioning organisations through an active External Advisory Group, will facilitate wide dissemination of findings to inform policy makers, commissioners, and practices and to support optimisation of patient experience and care.

Background and rationale

Difficulty in the recruitment and retention of GPs has led to concern that primary care services could reach saturation point (Hobbs et al., 2016) unless there is more extensive employment of non-GP practitioners to take on some GP tasks (Primary Care Workforce Commission, 2015). A national vision for a transformed NHS based on new models of care was set out in Five Year Forward View (NHS England, 2014), and alongside the Primary Care Workforce Commission Report (2015), recommended the redesign of primary care services to support the development of teams of highly-skilled, multi-disciplinary healthcare staff. In addition, the General Practice Forward View (NHS England, 2016) proposed the creation of a minimum of 5,000 new non-medical roles in general practices to refashion them as workplaces where; *'wider members of the practice-based team will play an increasing role in providing day-to-day coordination and delivery of care.'*(p.7). Further endorsement for a flexible approach to the inclusion of non-medical workforce within new models of care, emerged in a House of Lords Select Committee Report (House of Lords Select Committee, 2017).

These recommendations are reflected in changes in 'skill mix' in primary care as the proportion of non-GPs to GPs in the workforce has been increasing in recent years (National Audit Office, 2017). A clear understanding of the effects of these workforce changes requires clarity on what changing skill mix is and what factors affect its uptake and impact.

Our study builds on a definition of skill mix from Richardson et al. (1998) and Sibbald et al. (2004):

- 1) the **range of competencies** possessed by an individual healthcare worker;
- 2) the **ratio** of senior (supervisory) to junior (supervised) staff within a particular discipline or;
- 3) the **mix of different types** of staff in a team/healthcare setting

The study further draws on Sibbald et al. (2004), whose widely-cited classification considered skill-mix change as occurring at the *role* level and at the *service interface* level. In the context of this primary care-based project, our focus is upon role level changes: which may entail *enhancement*; *substitution*; *delegation* and/or *innovation*. Each of these is a different way in which tasks are transferred across professional boundaries. For example, nurses may extend their skills and lead clinics (*enhancement*) or may become non-medical prescribers and thereby enabling the transfer of some core GP tasks to nurses (*substitution*). Nurses may hand on some of their nursing tasks to health care assistants (HCAs) (*delegation*), while the introduction of physician associates (PAs) is an example of *innovation* as, in the UK primary care; it is a new role with a distinct training programme.

Whilst such classification is a useful starting point, an output of this project will be the clarification and refinement of this classification. For example, attention will be paid to the most appropriate classification of 'new practitioner' roles identified as such by some practices, but with a lengthier history of implementation elsewhere.

Our RQs are informed by three sets of issues that can undermine the spread and sustainability of skill mix change in GP practices.

The challenge of re-negotiating professional boundaries in primary care

Whilst some research indicates that clinicians are willing to transfer tasks in a number of circumstances (Dini et al., 2012, Delamare and Lafortune, 2010), other studies have drawn attention to potential problems (Dowling et al., 1996, Birch, 2001). Literature has long highlighted the issue of inter-professional competition and professionals' attempts to protect occupational jurisdiction in the course of their work (Abbott, 1988, Nancarrow and Borthwick, 2005, Currie et al., 2009, Quinlan and Robertson, 2010). Studies have also revealed tensions between staff relating to authority, legitimacy, expertise and efforts made to gain professional recognition (Jakimowicz et al., 2017, Lindblad et al., 2010, McMurray, 2010, Rashid, 2010).

Within primary care, we know that, when doctors' expectations of a new role are not met (for example, an expectation that non-GP autonomous practitioners, such as PAs, would reduce their workload), then they are less inclined to accept other professionals as part of the primary care team (Lindblad et al., 2010, van der Biezen et al., 2017). Others note that the concept of the PA role affects acceptance of such staff (Drennan et al., 2017) and Hazen et al. (2016) identify the need for a 'paradigm shift' for primary care staff to accept pharmacists extending their role beyond dispensing.

The distinctive context of primary care will provide new evidence about how professional boundaries are re-negotiated without the organisational resources associated with secondary-care skill mix changes (Hyde et al., 2005) and with GPs acting as lead clinicians and owner/employers (Rivett, 1998).

Acceptability of skill mix change for practices, practitioners, and patients

As indicated above, whilst the employment of more non-GP practitioners may be a solution to workforce shortages, the outcomes associated with these changes need to be carefully examined as this may affect their acceptability. The literature provides evidence of increased costs, lower productivity and adverse consequences for practitioners, such as increased workload for those taking on new tasks and lower staff morale (Sibbald et al., 2011). There needs to be more research on these issues in the primary care setting.

There is also limited evidence about the consequences of skill mix change for patients. Studies of the impact of skill mix on patients have generally focused on analysis of how patterns of care and service utilisation have been affected by the availability of a new type of practitioner in primary care, alongside investigation of patient attitudes to particular service innovations (Bornhoft et al., 2015, Desjardins-Charbonneau et al., 2016, Haggerty et al., 2003), or consultations with single practitioner types (Halter et al., 2017).

The design of this study will enable insights into how patients deal with choosing from a growing list of practitioner types, the extent to which they are satisfied with a team-based approach to continuity of care, and

whether they prioritise long term relationships with particular practitioners. The optimal approach to informing and guiding patients to a suitable practitioner is an additional area that warrants further investigation.

The challenge of replicating skill mix changes at scale, and without incurring or transferring costs

Research evidence has revealed the challenge of replicating skill mix change at scale, noting that it may arise from the nature of the context (Hyde et al., 2005), the wide diversity of tasks associated with the same role titles in different settings (de Bont et al., 2016, Hastings et al., 2014) or ambiguity related to newly introduced roles and leading to inappropriate use of the worker (Dini et al., 2012, Fletcher et al., 2008). The extent to which skill mix change leads to task transfer will be influenced by, and in turn will influence, working practices, health outcomes and costs (Heimeshoff et al., 2014) and therefore requires a detailed understanding of the service context (Buchan and Dal Poz, 2002).

Of particular note for sustainability is the key message from Richardson et al. (1998) (reinforced in studies of new professional roles developing across Europe (Bond et al., 2016)) that cost savings from skill mix change requires substitution, in effect replacement, of a higher paid practitioner and facilitates a subsequent decrease in their headcount. Even when there is replacement, it is necessary for the less expensive worker not to take significantly longer to carry out the tasks, otherwise the savings will be lost (Sibbald et al., 2011, Birch et al., 2017). It is also possible that a 'new' role may in effect extend the scope of general practice, generating additional work that may not be fully compensated (Ferrante et al., 2010). There may also be financial disincentives for practices to introduce particular roles (McDonald et al., 2008, Freund et al., 2015).

This research will aid our understanding of how GP practices are meeting these challenges and how choices are made about which tasks are transferred, to which practitioners and under what conditions. Important insights will be obtained about the conditions in which savings or costs are associated with skill mix change in primary care, how changes are being incorporated into workforce planning and how skill mix changes might be replicated at scale.

Why this research is needed now

Several factors make it imperative to research current changes in skill mix in primary care.

Firstly, changes in skill mix are occurring at a rapid pace but have undergone limited evaluation. It is therefore vital that an early evaluation of the direction in which skill mix change is driving outcomes, costs and experiences of healthcare in the UK should be undertaken. The involvement of multiple organisational structures, broad variation in how GP practices make and implement local managerial decisions, a wide range of clinically active professionals, and the vital interests of patients experiencing healthcare, means that a multi-disciplinary approach is necessary to generate coherent and useful information (WP1).

Secondly, improvements in data collection (e.g. NHS Digital, workforce Minimum Data Sets) mean that data is now available for a detailed analysis of changes to workforce composition. This will provide a platform on which to estimate staff costs and look for associations between skill mix changes and multiple outcomes (WP1).

Thirdly, there is a lack of evidence about factors motivating changes in skill mix. GP practices have traditionally been independently owned and operated businesses, with responsibilities to deliver services according to the terms of their current NHS contract. They are subject to scrutiny from the Care Quality Commission but management styles and structures are not standardised and organisational arrangements are in transformation in many areas with the emergence of new models of care (NHS England, 2014). Given this diversity and current period of change, is important to find out about GPs' and Practice Managers' perceptions of what different practitioners can bring to primary care and to ask their views on how this fits with strategies for building and maintaining sustainable practices in this context (WP2&3).

Fourthly, there can be ambiguity about which practitioners perform which roles in general practice. During the MUNROS study (Bond et al., 2016), we observed variation in the scope of practice of individuals within the same practitioner type which, together with lack of clarity about practitioner roles, can impede smooth transfer of work and add confusion for patients seeking care. This is therefore an area in which this research can reduce ambiguity and potentially increase acceptance and operational efficiency (WP2&3).

In summary, we know that the implementation of skill mix change which has already occurred is not unproblematic and there may be unintended adverse consequences such as increased workload for practitioners taking on new tasks, higher costs, lower staff morale and productivity, and concern about continuity of care for patients (Drennan et al., 2017, NHS England, 2015, Sibbald et al., 2011, National Audit Office, 2017) (Drennan et al., 2017, NHS England, 2015). Variation in approaches to skill mix change across the primary care providers and in what different types of practitioner contribute in general practice settings can now be evaluated using more detailed national data and practice level data about the scale of skill mix deployment, its effectiveness and impact on costs, and about quality and patterns of care. These data are urgently needed to inform future workforce and resource plans. Further, since access to timely and safe healthcare is vital for patients, new information emerging from this research is needed to provide patients with more useful and locally relevant guidance about making best use of the options available.

Aims and Objectives

This study aims to investigate evolving patterns of skill mix in primary care, examine how and why skill mix changes are implemented, explore practitioner and patient experiences of these changes, and estimate the overall impact on outcomes associated with a broader spectrum of practitioner types.

We have identified 3 research questions to address these aims:

RQ1 (WP1) What is the scale and distribution of skill mix changes in primary care and how is skill mix change associated with outcomes and costs?

- i) How has the workforce changed and where has any change occurred?
- ii) How are compositional changes to the workforce associated with later changes in a range of outcomes, including patient and practitioner satisfaction?
- iii) How are workforce changes associated with later changes in costs and practice efficiency?

RQ2 (WP2) What motivations drive skill mix deployment at practice level and what is delivered by deployment of different practitioner types?

- i) What motivates practices to choose/not choose increased skill mix deployment?
- ii) Which aspects of healthcare are undertaken by different practitioner types?

RQ3 (WP3) How do skill mix changes affect the experiences of employers, practitioners and patients?

- i) How are new ways of working being negotiated in general practices where skill mix changes have occurred?
- ii) How is implementation of change in skill mix associated with achievement of organisational objectives at practice level?
- iii) How does increased skill mix affect patients' experiences when accessing primary care services?

A fourth Work Package (WP4) will draw together data from all WPs to develop a comprehensive understanding of the implementation of skill mix changes in general practices and the consequences of these changes. Networks already established by members of the research team studying primary care workforce and skill mix implementation, together with collaborative work involving Expert Advisory Group (EAG) members will inform this synthesis of findings across all WPs. (See **Table 1** below for details of EAG membership)

Research plan/methods

Methodology

A study that can capture the extent and impact of skill mix changes requires the quantitative analysis of national datasets alongside analysis of non-routinely collected data from a structured sample. However, the issue of definitional ambiguity in roles, and the variation in how the same role is implemented in different settings, requires a methodological approach that interrogates roles and settings in depth and in situ. This suggests the need for a complementary, comparative case study approach that is able to examine conduct and practice using in-depth qualitative methods in a way which is sensitive to important differences in context. The comparative case study approach has proved to be a powerful methodology, particularly for allowing the generation of rich

research findings in their practical context and also for enabling an understanding of issues where there is limited prior knowledge and/or complex organisational conditions (Yin, 2013, Eisenhardt and Graebner, 2007).

The different methodological approaches in the project will therefore be combined on the principle of 'triangulation' which uses "multiple observers, theoretical perspectives, sources of data and methodologies" (Denzin, 1970:310). The qualitative and quantitative data will not simply be used to cross-corroborate findings (for instance, to confirm descriptions of how particular roles are implemented), but also to complement the quantitative analysis. The qualitative elements of the research will in this way inform the measurement undertaken in the quantitative elements, while at the same time inductively generating insights into the way in which phenomena are related in practice (Bryman and Bell, 2007). In this way, the case study work can facilitate a richer understanding of phenomena and produce a fuller portrayal of a complex social situation (Hammersley, 1995). The combination of research methods and range of data therefore allows for attention to the 'big picture' of national change in primary care skill mix alongside greater understanding of the complex challenges of local implementation.

More detail for each Work Package is provided below:

Work Package 1

Objectives

RQ1 (WP1) What is the scale and distribution of skill mix changes in primary care and how is skill mix change associated with outcomes and costs?

- i) How has the workforce changed and where has any change occurred?
- ii) How are compositional changes to the workforce associated with later changes in a range of outcomes, including patient and practitioner satisfaction?
- iii) How are workforce changes associated with later changes in costs and practice efficiency?

We will use data about the range of practitioners employed in practices across England available from NHS Digital. Using panel data regression techniques, we will estimate practice-level associations between changes in patterns of skill mix and later changes in costs and outcomes measured using national datasets.

The range of different workforce professionals employed by practices has grown considerably over recent years and decades (Freund et al., 2015). This has facilitated new ways to deliver services for patients and offered the potential to lower costs and improve outcomes. As practices are mostly small, employee-owned enterprises, they are likely able to respond to these changing possibilities more rapidly than larger organisations, such as hospitals, to contain costs and prioritise specific outcomes.

In addition, this work package will build on the work of Griffiths et al. (2010) who examined the correlation between nurse staffing and a range of indicators from the Quality and Outcomes Framework (QOF) using data from 2005/2006 (Griffiths et al., 2010). They found that a high level of nursing staff was associated with better performance on several clinical domains of the QOF. We will build on this work by using more recent data, including a wider range of staff, analysing a wider range of outcomes, and utilising longitudinal analysis. We will also employ a methodology that is consistent with economic theory (cost function estimation). Examples of studies that have used a cost function or cost frontier methodology include Kwietniewski et al. (2017), Gunning and Sickles (2011), Giuffrida et al. (2000) and Heimeshoff et al. (2014). These studies examine the relationships between organisational factors, inputs, outputs and costs. We will use production functions and cost functions to examine the relationships between changes in workforce composition and subsequent changes in the healthcare delivered to patients and the costs of the practice to the NHS.

Methods

We will create and analyse a longitudinal practice-level workforce dataset using the practice-level workforce Minimum Data Set (wMDS) available from NHS Digital. Detailed workforce data, both headcount and Full-Time Equivalent, as at 31st March on the year of collection, are presently available for 2015 and 2016. By the final year of the project, the longitudinal dataset will cover the years 2015-2019.

Using these data, we will summarise practice workforce composition by year, by practice size and region.

The available data demonstrate substantial changes in workforce composition over time. For example, the proportion of practices that employ pharmacists has increased from 3% (228 practices out of 7,469) to 6.7% (500 practices out of 7,469) between 2015 and 2016. 31 practices have changed from employing at least one pharmacist in 2015 to not employing any pharmacists in 2016. 303 practices have moved from employing no pharmacists in 2015 to employing at least one in 2016. This highlights the temporal variation within the practice workforce compositions.

We will use this dataset to provide a detailed examination of recent workforce changes and potential substitution between the staff groups, both in terms of headcount and full-time equivalents. We will create summary measures of skill mix for each practice in each year. These will include the numbers of different types of staff employed or binary variables indicating whether any 'new' professional groups are employed.

To investigate the impacts of skill mix and skill mix change on a range of outcomes, the workforce dataset will be linked with the following datasets at practice level:

- Hospital Episode Statistics¹
 - GP Worklife Survey²
 - GP Patient Survey³
 - Quality and Outcomes Framework⁴
 - Prescribing Data⁵
 - NHS Payments to General Practice⁶
- (Details of Data Sources and Outcome Measures uploaded as additional documentation)

We are responsible for running the GP Worklife Survey and therefore have direct access to these data. Furthermore, all of these data sources are already in the process of being linked as part of a Manchester-based School for Primary Care Research funded project, 'Using national administrative data to evaluate new models of primary care'. These data sets will be linked to the workforce data using practice codes and a range of outcome measures will be constructed for each domain of interest.

Since analysis of individual QOF clinical indicators would pose a significant risk of finding spurious correlations we will draw on previous work in which indicators have been combined in a variety of ways. Furthermore, we will select and compare a set of which are likely to be skill mix sensitive, with a set that are not likely to be skill mix sensitive.

Factors other than broadened skill mix, but correlated with it, may account for changes in outcomes. Such confounding factors are a common problem with non-experimental studies and one to which we will devote considerable attention. We will draw on the substantial and continually developing literature on methods for establishing causality from non-experimental situations (Athey and Imbens, 2017). By constructing a bespoke longitudinal, panel dataset we can avoid issues with reverse causality and control for other time-variant factors. A range of supplementary analyses will be applied to test the underlying assumptions of the analysis, as is now becoming more commonplace (Athey and Imbens, 2017).

There are potential problems with endogeneity if practices that broaden skill mix also take other actions to improve outcomes. To address this issue, we will experiment with an instrumental variable approach. As instruments, we propose to use CCG-level initiatives (for example, whether the CCG has offered incentives to employ new staff types) and local labour and housing market conditions (which could affect the ease of recruiting medical and non-medical staff).

¹ <http://content.digital.nhs.uk/hes>

² <http://www.prucomm.ac.uk/resources/our-publications/>

³ <https://gp-patient.co.uk/>

⁴ <http://content.digital.nhs.uk/qof>

⁵ <https://www.nhsbsa.nhs.uk/prescription-data/prescribing-data>

⁶ <http://content.digital.nhs.uk/catalogue/PUB21318>

We will estimate production functions, and multi-output equivalents such as distance functions (Malmquist, 1953, Shepherd, 2015), to relate these dependent variables in panel data regression models to skill mix and time varying control variables such as the size and demographic composition of registered populations, Clinical Commissioning Groups (CCGs), local area characteristics, and organisational characteristics (including ownership type). Such an analysis will allow the identification of the impact of a changing workforce composition on a range of outcomes. We will also estimate production frontiers so that we can explore differences in technical efficiency between the practices with different workforce compositions.

We will use a flexible function such as the transcendental logarithmic (translog), which is consistent with theory and offers greater flexibility over simpler functions such as Cobb-Douglas (Coelli et al., 2005), to estimate the production relationships.

We will also create the total cost of each general practice as the sum of payments made to practices, prescribing costs, and costs of the different forms of secondary care utilisation (referrals, admissions and A&E attendances, using NHS tariffs).

We will estimate cost functions and cost frontiers to identify the effects of skill mix on costs and efficiency. Cost functions relate total costs to outputs and input prices, along with a set of organisational and environmental variables that affect costs. Where prices are not available, papers such as Kwietniewski et al. (2017) have used data on expenses which are more readily available.

The estimation of cost functions will show how overall costs for individual practices are affected by the organisational structure, for example if the practice is an employer of roles such as PAs. The coefficient(s) for skill mix or labour inputs will show the relationship between extent of skill mix and total practice costs.

Work Package 2

Objectives

RQ2 (WP2) What motivations drive skill mix deployment at practice level and what is delivered by deployment of different practitioner types?

- i) What motivates practices to choose/not choose increased skill mix deployment?
- ii) Which aspects of healthcare are undertaken by different practitioner types?

This work package will build on the experiences of team members (Sutton, McBride and Gibson) on the MUNROS project, which investigated the impact of new professional roles in nine European countries and developed a healthcare managers' and healthcare professionals' questionnaire to identify important motivating factors (Bond et al., 2016).

Methods

WP2 will focus on practice level data, exploring what types of work practitioners are undertaking within practices and the motivating factors behind their initial employment. The construction, distribution and analysis of a national survey of practice managers will form the basis of WP2. This will be sent to all practice managers in England⁷ and will collect data not available from secondary sources. Most of the data will be readily accessible to Practice Managers, however, in recognition of the possibility that a Practice Manager may feel they cannot respond meaningfully to some questions in the WP2 survey, we will include an instruction that they may seek the assistance of a senior doctor/senior GP partner to improve the accuracy of their response to those questions.

The proposed questionnaire will be developed with broad input from the advisory group, which will contain a practice manager, and will be piloted prior to distribution with a small number of practice managers. It is envisaged that it will contain questions under the following sections:

A) Practice manager details

⁷ The epracur database of practices, available from NHS Digital, will be used to identify practices and their address for the mail out.

A short section to capture the details of the respondent. Questions will focus on the responsibility the manager has and how long they have been in their post.

B) Current practice workforce composition

This section will capture data about which professional types are employed in the practice, their experience in that role and levels of FTE, the duration of their employment, their patient-facing activity and whether additional income streams contribute to labour costs (e.g. incentives and conditional funding opportunities)

C) Objectives behind employment decisions

This section will ask questions to identify the factors behind the decision to employ a more diverse range of professionals. These may include cost reductions, freeing up GP time or allowing additional services to be offered to patients.

D) The tasks of non GP staff

A small group of task types will be assigned to generic categories of work that may be undertaken by different practitioner types and the managers will be asked to indicate which professionals participate in these tasks; e.g. these might include making home visits or prescribing medications. A key outcome of interest is the extent to which deployment of different practitioner types is characterised by task substitution, task complementation or delegation.

E) Satisfaction with current workforce composition

Questions related to the satisfaction of the practice management with the current composition of the workforce and the performance of the different professional roles will be asked. For example, have the objectives behind the employment of the different roles been met, exceeded or not achieved?

F) Barriers and facilitators of skill mix change

Practices which do and those who do not employ a wide range of different types of professionals will be asked follow-up questions to identify why this is the case.

G) Future skill mix changes

The questionnaire will conclude with a section related to future employment decisions for the practice. For instance, do they intend to hire more staff of the practitioner types that they currently employ, do they intend to hire practitioner types other than those that they currently employ, or do they wish to reduce or end their deployment of specific professional roles in the practice? There will be an opportunity to indicate known reasons for these intentions.

The questionnaire will be addressed to the practice manager and An invitation letter will include a link to an online version of the questionnaire which we will encourage the manager to use. To maximise response rates, any non-responding practices will receive a follow up questionnaire, up to a maximum of three times. Questionnaires will be scanned and/or data will be captured electronically and any missing data will be appropriately coded. Data will be kept on secured university servers and will be analysed using the econometric analysis software, Stata.

Based on our experience with the distribution of the 2015 GP Worklife Survey, a response rate of 35% might be expected from this distribution strategy. This equates to 2,554 completed questionnaires from the mail outs to 7,401 practices. Only practices with a list size greater than 1,000 patients will be targeted.

The data will be used to:

- summarise the responses at national level
- examine what practice characteristics are associated with responses to the questions
- evaluate the extent to which the deployment non-GP practitioners may facilitate operational changes i.e. substitution, delegation, enhancement or innovation
- look for an association between quality markers and relative experience and FTE
- compare the information to the national data in WP1
- include the data on labour prices in the cost function analysis proposed in WP1

Work Package 3

Objectives

RQ3 How do skill mix changes affect the experiences of employers, practitioners and patients?

WP3 is designed to investigate practice-level implementation of changes in skill mix. The main objectives are to examine how different and novel working arrangements have been introduced by employers and practitioners and how patients and staff experience service delivery using a broader range of diverse practitioner types. In this WP, our focus will be upon understanding both the aspirations held by the practice for the work done by new types of practitioners, and how these aspirations translate into practice. We will draw on Sibbald et al.'s (2004) skill mix framework to explore whether practices are seeking enhancement, substitution, delegation or innovation, and to examine how far this is being realised. Areas for investigation include:

- i) How are new ways of working being negotiated in general practices where skill mix changes have occurred?
- ii) How is implementation of change in skill mix associated with achievement of organisational objectives at practice level?
- iii) How does increased skill mix affect patients' experiences when accessing primary care services?

This in-depth study will examine the programme theories underpinning the implementation of skill mix changes in general practices and evaluate how far the espoused programme theories are realised in practice. We will also explore challenges encountered during implementation of skill mix changes, and how these challenges are addressed.

Methods

We will conduct in-depth case studies of six purposively selected GP practices using an appropriate mix of qualitative methods including 60 interviews with staff members and observational studies. In case study research, the decision as to how many cases to include represents a compromise between the need to limit the number of sites in order to be able to collect data in sufficient depth to ensure a full understanding of the site, and the need to recruit enough cases to make sure that there is the requisite variety between the cases to capture the phenomenon of interest. In this study we are interested in the experiences of practices which have made the choice to diversify their skill mix. In particular, we are interested in comparing the experiences of practices which have a wide range of practitioner types with those which have a narrower range, and comparing those which have had a long experience of skill mix diversity with those who have made a change relatively recently. Given the very wide range of skill mix configurations available it would not be practicable to recruit practices representing all of the possible variations. Moreover, our understanding of the relevant theory relating to changes in skill mix suggests that type of practitioner recruited is likely to be less important than degree of diversity in skill mix present. Our experience of similar studies in the past suggests that 6 case studies represents a broad enough sample to capture variation across the key dimensions of interest, whilst at the same time ensuring that we can undertake the requisite data collection to ensure an in depth understanding of the detailed local context and experiences of the full range of relevant staff as well as patients (Segar et al., 2015, McDermott et al., 2017, Checkland et al., 2016).

In addition, our claims to generalisability from the case studies will rest upon theoretical generalisation rather than on representativeness. In other words, our use of theory to structure both site selection and data collection will allow us to further refine and develop theory in this area, providing the opportunity for generalisation beyond the cases studied (Stake, 1995).

Site selection

Sampling will be informed by data from WP1 (i.e. data on employment of different practitioner types) and insights from EAG members. Practices will be chosen for variation on two principal dimensions: the duration for which wider skill mix has been in place, and the diversity of practitioner types employed. In terms of diversity, we aim to include practice/s employing newer roles of physician associates and care navigators, which are less common and therefore under-researched in UK primary care contexts. In addition, we will ensure that we recruit practices which have employed similar staff at different grades. In terms of length of employment of new types

of practitioner, we aim to include practices which implemented changes at least a year prior to the research starting, as well as those with more recent changes in skill mix.

In order to facilitate site selection, a matrix of required practice characteristics will be constructed and we will ensure that we recruit practices exhibiting each of these desired characteristics. Thus we will ensure that we recruit:

- Three practices which have long established diversity of skill mix (i.e. >1 year)
- Three practices which have recently diversified their skill mix

Within each of these groups, we will recruit at least one practice with multiple different types of new practitioner, and one with just one type of non-traditional practitioner. In addition, we will ensure that our sample includes two practices which have employed similar types of practitioner at different grades (e.g. pharmacists) and make sure that we include at least one practice employing physician associates and care navigators. This will ensure that our sample covers a broad range of different workforce configurations, allowing us to explore in depth how changes are achieved, how work is distributed, and how professional identities are negotiated, whilst also capturing how this changes over time, and whether what happens is affected by issues such as a grade of staff and overall skill mix diversity in the practice. We are confident that recruiting along these dimensions will also provide relevant diversity between full-time/part-time employment.

Interviews with clinical, administrative and managerial staff

We will utilise a range of qualitative methods to explore practitioners' experiences of working in primary care, their perceived roles, scope of practice, and how they work with colleagues. Individual interviews will be conducted with practice managers and GPs to gather information about the programme theories underlying the decision to employ new types of practitioners. We will classify these theories according to our skill mix framework, identifying the extent to which the practices are seeking substitution, enhancement, delegation etc. We will also explore the organisation and management of the practice and the approach taken to implementing changes, with particular focus on understanding how newer types of practitioners have been incorporated into practice routines. GPs, managers and all other practitioners (including those in both newer and traditional roles) will be asked about how they have adjusted their roles and duties in response to the employment of a wider range of practitioner types. This will allow us to begin to unpick the extent to which true substitution of work is possible.

For each role, new and established, we require data that captures evidence of the overall contribution achieved by altered working arrangements across the range of duties carried out by practitioners. These data will inform analysis of their potential to influence outcomes and may be associated with willingness to transfer tasks. Important questions therefore include: detail on clinical independence, including, but not limited to: independent prescribing; making referral to external services; clinical supervision of diagnoses and treatment plans; restricted case selection (e.g. minor illnesses, chronic disease management, protocol-guided reviews, face-to-face work with patients, and balance of individual responsibility and accountability). New types of practitioner and staff who have been upskilled from previous roles will be asked to describe their experiences in establishing themselves in their new roles, including challenges and approaches to overcoming these.

Interviews with PPG members

At the 6 practice sites, we will liaise with members of the Patient Participation Group (PPG) and seek to recruit them for a group interview (4-8 PPG members per group). Their interview data will inform development of questions included in the Patient Survey, which in turn will provide a broader range of views from patients accessing health care from a range of practitioners.

Patient survey and patient interviews

Based on contributions from engaging with PPI members, we anticipate that patients may report positive experiences; e.g. more rapid access to appointments, longer appointment times with non-GP practitioners, more varied consultation styles. We also expect that they could report difficulty with, for example, knowing which type of practitioner will be able to deal with their needs, added delays with dealing with all aspects of complex healthcare needs, and concerns about having an opportunity to speak to a practitioner of their choice.

Following the PPG group interviews, we will have better insight about the topics and concerns expressed by patients and will use this information to design a series of questions to capture important aspects of patient experience which may be affected by changes in skill mix.

We will ask local Patient Participation Groups (PPGs) for support with distribution of a single-sheet survey for completion by patients at study practices when they are accessing healthcare from a full range of practitioners. The patient surveys will be distributed to patients when attending the practice and collected on-site immediately after attendance. For ease of completion and convenience, the survey will focus on structured responses (i.e. tick box/Likert scale), but will include a free text box.

As indicated above, we anticipate that this will ask about their experiences on topics such as; availability of preferred practitioner or practitioner type; ability of the practitioner to deal with their problem/s; views on benefits/challenges of choosing from multiple practitioner types; level of information received to guide choices, importance of practitioner continuity vs continuity of care received.

The research team has a wealth of experience in designing and analysing survey data of this nature. A combination of appropriate quantitative and qualitative analyses will be conducted in conjunction with analysis of data from practitioner and staff interviews.

The Patient Survey sheets will include an invitation to volunteer to be contacted for an individual interview. Therefore, if any issues arising from the PPG and/or patient survey responses appear anomalous or in need of further exploration, we will then invite 4-6 of the patients who agreed to be interviewed at that site for interview in order to tease out those issues.

Site observations

Structured observations within GP practices will be tailored to suit each site. Building on our own experience and knowledge of primary care research, we propose to directly observe practitioners by shadowing them during their working day (Kreiner and Hunt, 2014, Sanders et al., 2010, Swinglehurst, 2014). Details of how we will accommodate the ethical issues affecting this aspect of the research will draw on prior experience of, for example, gaining informed consent and maintaining privacy and confidentiality of staff members and patients during observational work, and will be clarified during the preparation of documentation for ethical approval (HRA).

Observations will focus upon how different practitioners approach their working relationships. We will look at interactions within and across professional boundaries by examining when and why they interact with each other to deal with specific aspects of work; e.g. the frequency and outcomes of supervision and second-opinion requests, and how shared decision-making is negotiated.

Analysis

Analysis will run concurrently with data gathering and facilitate iterative development of topic guides for interviews and adaptation of field observations. Transcripts and observational fieldnotes will be coded using NVivo software allowing us to develop themes. An initial coding framework will be developed based around our understanding of the relevant literature and theory. These a priori codes will be supplemented with additional codes arising from the data, ensuring that we capture unexpected phenomena and issues. Emerging findings will be discussed at team meetings, and analytic memos will be written to capture developing theoretical ideas. These will be used to develop a second order analysis which supports theoretical generalisation from our data to provides a broader understanding of the factors affecting skill mix diversity in primary care, and the way in which these might affect relevant outcomes as explored in the quantitative study.

Analysis of the patient survey and interviews will complement interview and observational data gathered at each site, allowing us to understand in more detail how skill mix diversity is likely to be experienced and how patients respond to any changes. We will share our findings with members of local PPGs to gain an overview of their contextual significance and to inform further data collection.

These multi-level perspectives at each practice site will be synthesised to generate 'thick descriptions' of each case study site. This will allow cross-case analysis, supporting the identification of generalizable principles

about the factors affecting changes in skill mix diversity, and how changes in skill mix affect individuals who are implementing new working practices as well as subjective and objective outcomes.

Work Package 4

Data synthesis

WP4 will draw together findings from all WPs to develop a comprehensive understanding of the implementation of skill mix changes in general practices. WP1-3 will generate data from a wide variety of sources, each informing on particular aspects of scale, scope and impact associated with skill mix. Beyond simply cross-corroborating findings of quantitative and qualitative data, each will serve to complement the other, generating new insights on relationships between phenomena and to generate multi-perspective constructs. This sort of synthesis will draw on our analysis of findings (national datasets, practice staff and patients' data) and the perspectives of EAG members in preparation for study outputs and dissemination.

The synthesis will be structured around the over-arching research questions, seeking to elucidate, for example:

- The scale of skill mix changes in England, and outcomes associated with these changes, including estimations of cost-effectiveness
- The programme theories underlying skill mix changes, including aspirations about work substitution, delegation etc. and the extent to which these may be achievable
- The practicalities associated with implementing such changes, including negotiation of professional boundaries and incorporation into practice routines
- Patient experiences of the changes, including satisfaction and impact upon care-seeking behaviour

Our multiple data sources will support this synthesis and a particular focus will be upon seeking causal explanations within the qualitative case studies to provide evidence of potential mechanisms underlying any associations found in the quantitative analysis. In particular, our detailed exploration of the realities of skill mix change, focusing upon the achievability of substitution, delegation etc. will contextualise and support our analysis of the effects on outcomes and costs, whilst our inclusion of the patient voice will help us to understand how patients respond to new types of service.

Expert Advisory Group; composition and roles which will guide and support study

In addition to their advisory roles throughout the study, engagement with the EAG during work on WP4 will ensure that our evidence is informed by practice, is able to keep pace with current and imminent initiatives, and supports commissioners and managers seeking to implement skill mix changes.

We have identified 11 Advisory Group Members from across a wide range of relevant roles; CCG Commissioners, NHS England, Health Education England, Paramedic practitioner, Physician Associate training, CCG Workforce Planning, Clinical pharmacy, Practice Managers' organisations and Public Patient Involvement.

Study Steering Committee (SSC)

To provide overall supervision for a project on behalf of the NIHR we will set up a Study Steering Committee who will liaise with us and the NIHR according to arrangements set out under the NIHR Research Governance Guidelines.

We intend that the SSC will consist of the PI and 3 nominated members who are independent of the research project and will include a Chair, a Health Economist and a member of the public/PPI.

Nominees for SSC roles have been selected because of their relevant experience, expertise and interest in delivery of primary health care. We believe that a small but well informed SSC will not only limit costs, but be better able to engage closely with the wider EAG - the majority of whom are also not employed by the university or closely linked to the research team.

Minutes of EAG meetings will be available to the SSC and where possible, we propose to arrange that meetings of the EAG are held at adjacent times and on the same date as those of the SSC. This will allow the SSC to formally or informally engage with the EAG group, according to their preference.

We propose that the SSC will meet during the 6th and 18th months of the project to review progress as reported by the PI and members of the research team. Where necessary, members may use video conferencing to conduct SSC business.

We have included costs to cover SSC members' travel expenses, refreshments and recommended PPI payments for attendance at 2 meetings. We anticipate that at intervals between formal meetings, SSC members will maintain contact with the research team or EAG members through email, telephone calls, or other means of communication which do not directly incur additional costs.

Dissemination and projected outputs

This study will provide evidence of how a broad range of healthcare outcomes and costs are associated with an evolving primary care workforce which will be of interest to those responsible for workforce planning and management (e.g. NHSE), configuration of primary care services (e.g. CCGs), and practitioner training programmes (e.g. HEE). Furthermore, we will reach GPs (via RCGP), practitioners (e.g. Faculty of Physician Associates), practice managers (e.g. PMA, AMSPAR), and generate information for patients (with PRIMER engagement) about ways in which skill mix changes are being implemented and how this impacts on everyday delivery of primary care.

During the study, our research questions will drive how we will access, link, gather and analyse complementary data. By undertaking a synthesis of our findings, we will construct and interrogate new perspectives of what happens in primary care settings during changes in skill mix deployment using data which are disconnected or absent from existing publications. We will use a range of approaches to disseminate our findings to a broad range of organisations and professional groups. Our partnership with PPI members will also facilitate identification of what sort of information about skill mix would be useful for patients.

Outputs

- We will share **interim and final reports** with key NHSE staff to inform ongoing development of a diverse primary care workforce.
- **Brief reports and a PowerPoint slide set** will be prepared to assist CCGs in linking skill mix changes with prioritised outcomes
- We will liaise with different professional groups represented in our EAG to access networks involved with education and training. These will facilitate **face-to-face discussion** about the utility of research findings in practical settings in general practice.
- We plan to reach **GP audiences** through links with the workforce team at RCGP and will also seek to present our findings to delegates at the RCGP annual conference.
- We will prepare **academic papers** for a wide range of high impact journals; primary care, health economics, health policy, professional work and identity, workforce dynamics, workforce planning and organisational studies.
- **Fact sheets** and a **webinar/podcast** will be effective ways of disseminating findings to practice managers. EAG members include representatives of 2 practice managers' organisations who can assist in dissemination of these nationally in addition to local CCG networks.
- In response to concerns raised by **PRIMER members** (PPI), we will meet them to talk through patient experience of skill mix change in general practice.
- Public dissemination of key findings via **social media** and Twitter to drive readers to established **blog** sites (e.g. Policy@Manchester, Primarycare@Manchester).

Finally, we will organise and host a Seminar at a city-centre venue during which a series of presentations and workshops will set out our findings and facilitate open discussion about how practices, practitioners and policy makers can improve patients' health outcomes and experiences. Details of this event will be determined by our findings; we anticipate a broad range of topics and applications which will interest academics and medical professionals.

We have identified 4 National (UK) conferences to which we will submit abstracts for oral presentations;

- Health Economists- HESG June 2019, GP - RCGP October 2019, Practice managers - Management in Practice (held quarterly), Healthcare Researchers - HSRUK (July 2020 preferred).

Opportunities to present at two international conferences would extend the reach of this research;

- Primary Care - NAPCRG Nov 2019, Management - EURAM (June 2020 preferred)

Plan of investigation and timetable

The Gantt chart indicates in detail how each of three Work Packages is designed to proceed simultaneously with minimal dependence on each other and therefore at reduced risk of compounding any unanticipated delays.

Staff recruitment and preparatory work on documents to be submitted for ethical approval will begin before the formal starting date of the study in order to minimise the impact on those aspects of work which require ethical approval.

Activity for WP1 can proceed from month one of the study period by accessing data available from NHS Digital and preparing it for analysis. During the following months, researchers will link these data with other datasets and model predictors of variations in skill mix as a precursor to deeper analysis of associations between changes in skill mix and outcomes. As additional data is progressively released, this will be included in models to inform analytical revisions until month 21.

Development of the survey for practice managers (WP2) requires input from the practice manager and other EAG members. New literature and their collective insights will allow refinement of the topics of questions suggested in the above description, as will evaluation of a pilot survey in month 5. After adjustments, mailings and return of completed surveys is expected to continue for 4-5 months with data analysis continuing to month 16.

Early work in WP3 begins with design and testing of the patient survey which will be ready for distribution once ethical permissions have been confirmed and fieldwork commences in month 4. During these months, we will be working with the EAG and related networks to purposively select and recruit practices which fit our selection criteria. A qualitative Research Associate (RA) will support the most active phase of WP3 to facilitate both analytical work and continuing fieldwork with the aim of completing this in preparation for drawing together all data from this WP by the end of month 20.

The research team will continue working together on a synthesis of the above WPs, and on preparing papers, presentations and reports prior to completion of the study.

Table 2 Outline of key research activities

	Project management and research activities	Starting month	Finishing month	Duration (months)
	Preparation for Ethical Review	T-3	2	5
	Research staff recruitment	T-3	6	9
WP1	Obtain NHS Digital and other data, link and clean datasets	1	2	2
	Model predictors of variations in skill mix	2	5	3
	Analyses: associations between changes in skill mix, and outcomes salary and total care costs	2	21	19
WP2	Prepare, pilot and circulate Practice Manager Survey	3	12	9
	Collate and analyse	9	16	7
WP3	Prepare patient survey, identify and recruit practices	1	6	5
	On-site interviews, observations and patient survey and patient interviews	4	18	14
	Analysis qualitative WP3 data	5	20	15

	Collate and analyse patient survey and interview data	11	17	4
	Integrate WP3 analyses	17	22	5
WP4	Synthesise Analyses across WPs 1-3	13	22	11
	Prepare outputs and active dissemination	12	24	12

Project management

The project is a complex undertaking which will require rigorous project management to ensure the research is delivered on time, to plan and within the budget. To that end, an experienced project manager will be employed to support the PI and the research team.

The project manager will be an NHS appointment and, as part of the wider [National Institute for Health Research](#) Collaboration for Leadership in Applied Health Research and Care (NIHR CLAHRC) project management team, will benefit from the accrued experience and insight of the cadre of project managers within NIHR CLAHRC and ensure sharing of best practice and experience and to provide support for the role. S/he will be responsible for monitoring progress against targets embedded in the research timetable, identifying project risks, managing the process of applying for ethics and other approvals, coordinating communications between researchers and research sites, coordinating communications with the EAG, and managing essential data for reporting to the NIHR HS&DR.

Project management meetings will occur monthly, chaired by the PI and attended by the project manager and the research team. Progress with key activities as listed in the timetable and project risks will be discussed and actions agreed to ensure smooth running and coordination of the project.

The PI will receive ongoing guidance from Hodgson and Checkland who have extensive experience of leading large and complex research projects within NHS contexts and will offer advice on routine project management and overall project governance, including identifying and overcoming any risks and barriers to the project.

During its active period, each work package will hold regular meetings for all involved including appointed research staff, project manager, Co-Investigators and PI as appropriate.

The Project Manager will take the administrative lead in liaising with members of the EAG regarding interim communications and to arrange meetings and minutes for circulation. In addition, they will make arrangements with PPI contributors and Patient Participation Groups to co-ordinate the steps involving these groups.

Meetings for the entire project team will be arranged as appropriate throughout the study, to assess progress, share work stream activity and ensure that research and findings are actively disseminated throughout.

Approval by ethics committees

We have confirmed that WP2 and WP3 of this study will require HRA and REC Approval and to minimise delays, work to prepare documents for ethical approval for the entire project will begin prior to the start of the study.

Research which involves patients falls under WP3 and takes two forms:

1. We will invite patients accessing primary care services to complete a single-sheet survey about perceptions and experiences related to changing skill mix in their GP practice. . A small number of those who indicate their agreement will be interviewed about their experiences of how change in skill mix affects their care.
2. We plan to observe a range of administrative staff and practitioners as they interact with patients or conduct consultations.

Information will be available for patients when they are invited to complete the survey and only those who confirm their consent will do so. No personal or identifying details will be recorded in the process of gathering information via the patient survey.

Similarly, patients whose consultations are observed by a researcher will first receive information about the research activity and their consent requested in advance. As before, no personal or identifying details will be recorded, and information about their clinical condition or treatment will be noted as field notes which are limited to the general context or purpose of the consultation and how the practitioner deals with this and any further actions related to the consultation.

Direct contact with potential patient participants will allow researchers to ensure that they receive information and have opportunities to have questions answered before considering whether to participate. They will also be informed about how they can withdraw from the study. We do not anticipate that this level of activity involving patients will give rise to significant ethical difficulties.

Research involving staff similarly falls into two categories:

1. A survey to supply details about the practice workforce, working commitments and general information about the sort of work they do.
2. Interviews and observations of staff during their normal duties, including individual interviews, informal conversations and observations of consultations.

Practice managers will receive information about the study and how data requested in the survey contributes to our investigations. No personal or identifying information about practice staff is requested in the survey or about the practice manager.

At the study sites, all staff will receive information about the study. Individual consent will be requested from those who participate on an individual level – through interviews, conversations and as observed subjects. We will not require any personal or identifying information to be shared and the identity of study practices will remain confidential.

We do not anticipate that these activities will cause ethical concern.

All data will be securely stored in accordance with the Data Protection Act.

Measures will be put in place to direct any participants who experience distress or difficulty related to their participation in the study to appropriate support services. Researchers will undertake risk assessments and where necessary operate according to standard lone worker procedures.

Patient and Public Involvement

Comments on our developing proposal were contributed by members of Primary Care Research in Manchester Engagement Resource (PRIMER), and a Patient Participation Group who liaise with their practice team on matters related to GP services.

They perceived that workforce changes which add new skills and knowledge in GP practices could bring benefits for patients and identified several 'unknowns' about changes involving skill mix:

- How will patients know which practitioner can effectively deal with their problem?
- Will patients have free choice or be pushed to consult non-GP practitioners?
- What happens if different practitioners give conflicting advice?
- Will patients be willing to share personal details with administrative care navigators?
- Will new non-GP roles increase the number of appointments needed to assess health problems and therefore delay access to appropriate treatment?
- Will patients always accept non-GP consultations?
- Will the addition of new roles prevent patients seeing the same practitioner?
- Will transfer of clinical information be less effective?

This has influenced the research design; case studies and the patient survey will investigate these concerns by exploring patient experiences of care navigation, choice, confidence and understanding practitioner roles.

PPI collaborators with continuing roles during study

Two PRIMER representatives will be invited to join the EAG, contributing PPI perspective in all aspects of the group's work. They will also comment on emergent patient survey findings.

We will specifically seek PPI feedback during the development of the patient survey and participant information materials and, where necessary, ask their advice about boosting recruitment of Patient Participation Groups at study sites.

Dissemination of research findings

We will share our emerging findings with PRIMER as a valuable forum for discussion about how the study findings could be developed to guide patients' decision-making through better understanding of how to gain benefits from wider skill mix. We will seek their ideas about addressing concerns linked to continuity, communication, and conflicting advice.

Support

Anne McBride will meet PRIMER representatives before/after meetings to enable full involvement, acting as mentor and providing training as appropriate.

Funding PPI activities has been costed into the project according to *INVOLVE* guidance and detailed in the research costs.

Funding for incentive payments has been costed into the project and detailed in the research costs.

Expertise and justification of support required

This comprehensive study requires strong academic support to underpin gathering and analysing both quantitative and qualitative data. Co-applicants bring extensive background knowledge and expertise along with existing working relationships which will facilitate completion of the study within 2 years. This will enable timely capture of how skill mix is being implemented and experienced in a changing work environment in order to inform forward planning of training, and effective embedding of non-GP practitioners.

Leadership or involvement in several projects strengthens the value gained from this team;

- Sutton, Checkland, Gibson, Spooner and Hann's roles in the National GP Worklife Survey (WLS) series allows us full access to and knowledge of a rich source of current and historical data. We therefore benefit from previously funded work as initial intelligence in this study.
- Checkland's research of Clinical Commissioning Groups and New Models of Care strengthen our knowledge of how they are involved with implementing changes in skill mix (www.prucomm.ac.uk)
- Checkland, Hodgson and Spooner are involved with an NIHR HS&DR study (14/197) exploring the development of GP Federations
- McBride, Gibson and Sutton's involvement with a European study (MUNROS <http://www.abdn.ac.uk/munros/>) of tasks undertaken by different practitioners adds greater insight about the context of skill mix in primary care, and links with their wider work on workforce planning.
- Early data from projects investigating skill mix in Salford and Greater Manchester (<http://clahrc-gm.nihr.ac.uk/>) led by Hodgson will also be available to guide this project. Hodgson will also draw on emerging findings of the National GP Access Fund evaluation, where he is academic advisor.
- Sutton has been involved in an SPCR-funded project linking primary datasets which will save time and resources needed to assemble data (<http://tinyurl.com/spcr-data-proj>)
- Spooner and Checkland draw on academic and clinical experience of how practitioners negotiate changes in the workplace
- Expert statistical support is supplied by Hann.
- As a named RA, Gibson's brings useful experience from WLS, MUNROS and linked datasets

Spooner will benefit from support from Hodgson who has broad experience of project management in CLAHRC projects and continue her existing mentoring relationship with Checkland. Spooner brings existing, complementary NIHR funding until 31st August 2018, which reduces the requested allocation.

We will seek to minimise costs, for example by: co-ordinating activities at research sites to reduce travel/subsistence costs;; and using online practice manager survey.

Calculation and allocation of costs

Research staff

A full-time Research Fellow (RF) will lead on the qualitative work of WP3 and maintain close contact with work being done by a quantitative RA. Their duties will include, for example, preparation of documents for ethical review, development of topic guides and leading participant recruitment at GP practices.

A full-time qualitative RA is required to support the RF during a 12- month period when qualitative fieldwork and analysis are most active.

Extensive work on data access, analysis and reporting (WP1 & 2) requires a full-time quantitative RA (Gibson) for the duration.

Project Manager

An experienced project manager (40% fte) will support the PI and research team and be involved in regular review meetings. Their duties will include; monitoring progress, identifying risks, arranging research team meetings, coordinating participant recruitment and site visits, and communicating with EAG.

Costs have been included for PI Spooner [40%], CIs Hodgson, McBride and Sutton [each 10%], Hann [5%] and Checkland [2% in addition to her no-cost NIHR mentor role]. Spooner will contribute to all WPs and oversee staff, supported by Hodgson and Checkland. Other CIs will contribute expertise in relation to WP1 (Sutton, Hann), WP2 (Sutton, Hann, McBride), WP3 (Hodgson, McBride, Checkland) and WP4 (all).

Study Steering Committee (SSC)

Costs have been added for travel and refreshments for members of the SSC. An additional cost is shown to support the work of the member whose role is as a public/PPI representative.

Expert Advisory Group (EAG)

Four meetings of the EAG are costed (refreshments and travel). A small additional allocation has been included for travel to breakout meetings to work with individual EAG members.

PPI engagement

PPI advisers were involved in developing the project and links will be maintained via the Manchester-based PRIMER group. Two PRIMER members will join the EAG and share in reporting findings relating to patient experiences of changes in skill mix back to PRIMER. Costs reflect INVOLVE recommendations on reimbursing PPI collaborators.

Additional non-staff costs:

Laptop computer to allow the RF to work effectively from multiple sites.

Software licenses required to support (quantitative) data extraction and analysis (Sawtooth and Stata 15)

Encrypted interview recording equipment for RF/RA.

Travel to 6 practice sites to conduct interviews, for observational work and to liaise with PPGs. Activities will be coordinated to keep visits to a minimum (estimated 8-10 per site).

Professional transcription for 60 x 70-minute interviews

Travel to 6 sites for PPG group interviews and patient interviews, and interview transcription

Attendance at two practitioner conferences: RCGP (PI/RF) and Management in Practice (PI/RF – free event) to facilitate dissemination and input into analysis.

Attendance at academic conferences: HESG (RA), NAPCRG (PI) and EURAM (PI) to elicit feedback and maximise the impact of the research across multiple subfields.

Open access publishing for 5 papers in Health Economics, Health Policy and Organisational Studies journals.

No costs have been included to reimburse practices for interview participation and administration related to the patient survey as this can be organised through the Greater Manchester CRN (letter submitted as additional documentation).

