

Title: Physiotherapist and Podiatrist Independent Prescribing in the United Kingdom: A quasi experimental study

Short title: Physiotherapist and Podiatrist Independent Prescribing in the United Kingdom

Nicola Carey, PhD, Reader, School of Health Sciences, University of Surrey, UK

Judith Edwards, MSc, Research Fellow, School of Health Sciences, University of Surrey, UK

Simon Otter, PhD, Principal Lecturer, School of Health Science, University of Brighton, UK

Heather Gage, PhD, Professor of Health Economics, University of Surrey, UK

Peter Williams, MSc, Medical Statistician, University of Surrey, UK

Molly Courtenay, PhD, Professor, School of Healthcare Sciences, Cardiff University, UK

Ann Moore PhD, FCSP, FMACP, Cert Ed, Dip.TP, Emeritus Professor, Centre for Health Research, School of Health Sciences, University of Brighton, UK

Karen Stenner, PhD, Lecturer in Health Services Research, School of Health Sciences, University of Surrey, UK

Keywords: physiotherapy, podiatry, independent prescribing, quasi experiment

Short title: Physiotherapist and Podiatrist Independent Prescribing in the UK

Words: 5358

Tables: 8

Corresponding author: Nicola Carey, School of Health Sciences, Kate Granger Building, University of Surrey, Guildford, GU2 7YH, UK

Email: n.carey@surrey.ac.uk

Abstract

Background

Increasing numbers of nurses, pharmacists and allied health professionals across the world have prescribing rights: over 90,000 of the eligible United Kingdom workforce are qualified as non-doctor prescribers. In order to inform future developments, it is important to understand the benefits and impact of prescribing by allied health professionals including physiotherapists and podiatrists.

Aim: to compare outcomes of Physiotherapist and Podiatrist Independent Prescriber (PP- IP) patients with those of Physiotherapist and Podiatrist non-prescribers (PP-NPs). Outcome measures included patient satisfaction, ease of access to services, quality of life and cost implications.

Design: a quasi-experimental, post-test control group design

Methods: Using mixed methods outcomes were compared between 7 sites where care was provided from a PP-IP (3 podiatrist and 4 physiotherapist IPs) and 7 sites from a PP-NP (3 podiatrist and 4 physiotherapist NPs). Patients were followed up for 2 months (2015-2016).

Results: 489 patients were recruited: n=243 IP sites, and n=246 NP sites. Independent prescribing was found to be highly acceptable, and equivalent in terms of quality of life ($p>0.05$) and patient satisfaction ($p\leq0.05$) compared to care provided by NPs. PP-IP care delivery was found to be more resource intensive than NP-PP, with longer consultation duration for IPs (around 6.5 mins), and a higher proportion of physiotherapy patients discussed with medical colleagues (around 9.5 minutes).

Conclusion

This study provides new knowledge that PP-IPs provide high levels of care. PP-IP care delivery was found to be more resource intensive. Further research is required to explore cost effectiveness. A more focussed exploration within each profession using targeted outcome measures would enable a more robust comparison, inform future developments around the world and help ensure non-doctor prescribing is recognised as an effective way to alleviate shortfalls in the global workforce.

Background

As life expectancy increases, and the world's population continues to grow (1-3), many countries are shifting the focus of their health system from acute to chronic diseases, alongside managing increasing service demands (4). Global level predictions indicate >2 billion people will be aged >65 years by 2050, with the number > 80 years expected to double in the next decade, reaching 400 million by 2050 (1, 5). The implications for ensuring access to medicines are profound: 75% of the aging population in developed countries live with one or more chronic conditions (6), with many requiring multiple medications (5, 7). Recent data from the United Kingdom (UK), United States (US) and across Europe confirms 25% of adults take three or more medicines each day (2, 8) and that by 2020 the world's population will receive 4.5 trillion doses of medicine each year (8-10).

There is however, a worldwide deficit of 18 million health workers (11), with a predicted 350,000 shortfall in the UK, and a third of the current workforce due to retire by 2030 (12). With a 16% increase in workload since 2010, UK workforce deficits are magnified in primary care (13), where 90% of all health encounters occur (14), and there is shortage of 2,500 general practitioners. Given the unprecedented level of future demand it is crucial that sustainable solutions that alleviate shortfalls in the global health workforce are identified (11, 12). The nature of primary care has shifted, and an increasing number of appointments in UK general practice are provided by non-medical staff (12, 15). The recent NHS Long Term Plan proposes for example, a further 20,000 non-doctor roles for primary care (16). Inadequacies with traditional doctor-led care systems mean that in order to maintain patient access to prescription medicines, new approaches are urgently required (12, 17). Allied Health Professions i.e. therapeutic radiographers, paramedics, podiatrists and physiotherapists

(AHP) have in particular been identified as having an integral role to the required transformational change (18).

Extending prescribing rights to nurses, pharmacists and allied health professions (19, 20) has been the focus of a UK policy drive to improve services and access to medicines by making better use of existing skills and support service innovation (18, 21-23). Of the 907,000 UK healthcare professionals entitled to undertake prescribing training (24), over 90,000 of the eligible workforce are now qualified as prescribers (24), placing the UK as a pioneer in the development of non-doctor prescribing worldwide.

In the UK Independent Prescribing (IP) and Supplementary Prescribing (SP) are two different forms of non-doctor prescribing. Training typically involves 27 classroom days and 12 days in practice under medical supervision (25, 26), a dual qualification in IP and SP being awarded to nurses, pharmacists, radiographers and paramedics, podiatrists and physiotherapists. Independent prescribers can make prescribing decisions without the need for a doctor, while supplementary prescribing is defined as dependent prescribing, as it is based on an initial diagnosis by a doctor and an agreed clinical management plan (CMP) detailing medicines that can be prescribed by the SP (27). SP prescribing rights were extended to some allied health professions in 2005, with further changes to legislation in 2013 permitting physiotherapists and podiatrists to prescribe medicines independently (28-30).

Although several other countries, including Australia, Ireland, and Netherlands, have seen similar developments in non-medical prescribing, approaches to training, accreditation and models of prescribing practice are varied (31-34). Physiotherapists have for example, authorisation to provide advice about and/or to administer or supply medicines in some

states in Australia, New Zealand and Canada, but only those in the US military can prescribe (35, 36). Podiatrists have similar authority in Australia and some European countries but are only entitled to prescribe in some Canadian states (35, 37).

When used by nurses and pharmacists, SP and IP are reported as acceptable and beneficial to patients, with some evidence of enhanced clinical outcomes compared to those achieved by doctors (32, 38-40). More recently a systematic review of non-doctor prescribing, also known as non-medical prescribing (NMP), reported that NMP has no adverse impact upon patient outcomes, patient satisfaction or resource utilisation (41). Reviews on the impact of extended physiotherapist roles reveal research hampered by small numbers of practitioners, role variation and poor role definition (42, 43), literature dominated by service descriptions and audit with positive reporting bias (35, 42, 43), and a lack of evidence regarding podiatric practice (35). Whilst PP-SP helps streamline service delivery (44, 45), IP is expected to bring additional benefits in line with nurse and pharmacist prescribing (46, 47). Exploration of clinical and cost effectiveness in this area is however limited and has to date lead to inconclusive findings (48-53). As most evidence relates to nurses and pharmacists, it is important to evaluate the impact of prescribing by allied health professionals (AHPs) in order to inform commissioning and implementation of NMP services where they are beneficial.

Six years after the introduction of current legislation enabling physiotherapists and podiatrists to prescribe independently, there has been nearly a fourfold increase in the number of physiotherapists and podiatrists with prescribing rights in England (54, 55). As of November 2019 there were 1,017 physiotherapists and 376 podiatrists with an annotation as independent prescriber, with a further 118 physiotherapists and 71 podiatrists with just

supplementary prescribing (56). There is a lack of evidence of reporting on PP-IP practice, or the medicines they prescribe. Evidence from a national survey collected during preparation for the IP role indicated that PPs planned to prescribe on a regular basis, with an overall volume of prescribing suggestive of 1-2 items per day. Reflecting clinical specialities key areas of intended prescribing for physiotherapists were musculoskeletal (MSK) services, orthopaedics, respiratory and pain management, and for podiatrists' skin, infections and MSK conditions (57).

There are additionally no studies available which quantify the impact of podiatrist and physiotherapist independent prescribing on patient satisfaction, access to services, quality of life or report cost-implications of care delivery. This is important given the increasing emphasis in the UK and around the world on extending prescribing rights to nurses, pharmacists and AHPS as a key strategy in addressing workforce deficits and ensuring patients have ongoing access to medicines (11, 12, 17, 58).

The Study

Aim: was to compare the outcomes of patients managed by Physiotherapist and Podiatrist Independent Prescribers (PP- IP) with those under the care of Physiotherapist and Podiatrist non-prescribers (PP-NPs). Outcome measures included patient satisfaction, ease of access to services and quality of life. In addition, a cost-consequences analysis was undertaken which compared care delivery at the individual patient level from the NHS perspective.

Study Design and Methods

The study adopted a quasi-experimental, post-test control group design (59). This was framed within a case study methodology used in situations when no single outcome measure is available (60, 61). Outcomes were compared between 7 sites where patients received care from a PP-IP (3 podiatrist and 4 physiotherapist IPs) and 7 sites where care was provided by a PP-NP without a prescribing qualification (3 podiatrist and 4 physiotherapist NPs) (62).

Mixed methods (including interviews, structured observation of consultations, patient questionnaires and patient record audit) were used to collect data at each of the 14 sites over 2 months (Table 1). Data collection took place simultaneously January 2015-March 2016.

Table 1 Summary of data collection arrangements and instruments

Category of data	Method of data collection	Timing of collection	Items and instruments	Piloting
1) Characteristics of PPs & sites	i) Structured interview and site visit	Prior to observation period	Setting and geographic location <i>PPs profile:</i> Age, gender, highest educational qualification, salary/band, full/part time status, job title/role; <i>Service Information:</i> service description & patient profile, single or multi-professional team, other NMPs in team	Interview schedules were reviewed by research team and project advisory group. Main interviewer (JE) was buddied by experienced team member (KS) for first two interviews in order to provide guidance and clarify and address any issues with the interview schedule. Following this, minor revisions were made to improve the flow of questions.
2) Patient characteristics	i) Patient questionnaire 1 & 2	Post consultation and 2 months following	<i>Socio-demographics:</i> age, gender, living arrangements; accommodation, employment; education; ethnicity	Q1: Patients (n=5) completed and commented on ease of comprehension, length and time. Based on comments no refinements were made. Q2: piloted concurrently at first site (case-site 3). After first 10 completed, ease of use, consistency and question completion rate were discussed with no amendments or changes required.
3) Patient reported outcomes	i) Patient questionnaire 1	Post consultation	<i>Patient satisfaction:</i> with consultation, advice and medicines information comprised subscales from several validated tools (total 24 items): i) <i>Consultation Satisfaction Questionnaire</i> i.e. 'professional care', 'perceived time' and 'overall satisfaction' and ii) <i>Medical Interview Satisfaction</i>	Formal piloting was undertaken in January 2015 in a secondary care based rheumatology outpatient clinic (not designated as a site). Five completed questionnaires were returned with comments indicating

	ii) Patient questionnaire1 and 2	Post- consultation and 2 months following consultation	<p><i>Survey (MISS) (63, 64)</i> 'compliance intent' (10 items) & for patients who received medicines information or advice questions from PP iii) <i>Satisfaction with Information about Medicines (SIMS) Scale (65)</i> e.g. dose schedule, how medicine works, side-effects, and medicines adherence) (63, 65-67) (14 items).</p> <p><i>Service Satisfaction:</i> Ease of access to service based on outpatients' opinion of quality of hospital departments questionnaire (68)- 7 items.</p> <p><i>Attitudes towards PP-IP (66, 69)</i>- 4 items.</p> <p>6 point Likert scales (strongly disagree to strongly agree) used for all items</p> <p>Quality of life validated EQ-5D-5L (70) comprising 5 dimensions, from independent – dependent, with 5 weighted levels affording a single index value score. (i.e. mobility, self-care, usual activities, pain/discomfort and anxiety/depression)</p>	that content, layout and design was comprehensive and completion time was of acceptable length, ranging from 9-15 minutes.
4) PPs activities	i) Observation diary completed by researcher	Real-time service delivery up to 5 working days (37 hours)	<p>Using a Microsoft Access© custom built electronic diary based on previous validated tools(71-73), a researcher recorded details of the model of service provision and MMA (including outcome and prescribing actions) during each observed consultation.</p> <p><i>Model of service provision:</i> Consultation duration (in minutes); type of consultation (face to face, telephone, email) and appointment (initial, follow-up, emergency), service & referral source (e.g. NHS in/outpatient, community, GP, social enterprise, private). Other work activities in relation to care included referrals made (to whom and how), discussion with colleagues, time spent in discussions with colleagues and review arrangements.</p>	Questionnaire 2 was implemented following data collection completion at the first four sites, and was piloted concurrently at the first site visited (site 3) after its approval. After the first 10 completed questionnaires, ease of use, consistency and question completion rate were discussed at team meetings; no amendments or changes were required.

	ii) Prescriptions	Real-time service delivery up to 5 working days (37 hours)	<p>MMA i) <i>outcome</i>: whether a. new medication was required; decisions to alter, stop, or make no change to existing medications; or decision to repeat prescribe previous item(s);</p> <p>ii) <i>prescribing actions</i>; decision to recommend OTC product; recommend to Dr, other prescriber or via hospital notes prescription is required; adjust dose/drug according to pre-agreed protocols; (i.e. PGD; PSD, exemptions); whether provided advice to patients about medicines (i.e. how it works, when to take and side-effects); medication details (i.e. name, dose, duration, formulation)</p> <p>Questions were fixed option and/or free text.</p> <p>All prescriptions issued by PP-IPs during observed consultations were collected and assessed based on previous work (74-76) and guidelines for prescription writing in the BNF (77) (i.e. accuracy, legibility, correct use of terminology, whether medicines were prescribed generically, preparation details, dose, dose frequency, length of treatment, and instructions regarding frequency, location and application of topical treatments).</p>	There was no piloting of the assessment tool as it had been used in previous studies (47, 78).
5) Resource implications and costs	i) Interviews with PPs	Prior to baseline data collection	Grade/ banding of each of the PPs in the study. Bands ranged from 6-12 with higher bands reflecting greater clinical and managerial responsibility and attracting higher salaries	(as reported above)
	ii) Observation diary completed by researcher	Real-time service delivery up to 5 working days (37 hours)	<p>Six items related to consultations with individual patients were also examined for differences between PP-IPs and NP-PP-NPs</p> <ul style="list-style-type: none"> -number and duration of consultations -frequency & duration of discussions with colleague or other professional regarding patient's medication -frequency of new medications -frequency of referrals and follow-up consultations 	(as reported above)

	iii) Patient questionnaire 2	2 months following consultation	Self-report use of health services for PP related issues in the previous 2 months including: tests received, referrals, follow-up consultations, un-planned consultation; visits or contact with GPs, clinical nurse specialist, pharmacists, social services, other healthcare professionals, hospital outpatient clinics, A&E visits, hospital admissions, and number of inpatient days	
	iv) Patient record audit	Clinical records 2 months following consultation	Requested investigations, tests (e.g. BP, bloods, x-ray, MRI scan, CT, urine, sputum etc.) and referrals and services used relevant to the presenting complaint (i.e. case site PP, consultant specialist, clinical nurse specialist, GP, GP based nurse/ nurse practitioner, community nurse pharmacists, social services, other healthcare professionals) other hospital outpatients, hospital admissions, and number of in-patient days, A&E visits etc.	Audit tool: was piloted on 8 sets of medical records. Concerns were raised about quality of available data and that retrospective data collection could present difficulties with potential incomplete data. An amendment to the study protocol, as previously described, was therefore made.

Abbreviations

A&E: Accident and Emergency; BP: Blood pressure; BNF: British National Formulary; CT: Computerised tomography; EQ5-D: EuroQol 5-D; GP: General Practitioner; MMA: Medicines Management Activities; MRI: Magnetic Resonance Imaging; NMP: non-medical prescriber; OTC: Over the counter; PGD: Patient Group Direction; PP: Physiotherapist & Podiatrist; PP-IP: Physiotherapist & Podiatrist Independent Prescriber PSD: Patient Specific Direction; NP-PP: Non-prescribing Physiotherapist & Podiatrist

Sample size

The key patient outcomes related to satisfaction and ease of access to services. These were measured on a 5-point Likert scale or as Yes/No responses. The Likert scale responses were easily reducible to positive or negative responses. With respect to any dichotomous outcome variable, in order to detect an absolute underlying difference of 40% between PP-IP and NP-PPs, with size = 5% and power = 80%, a minimum of 24 subjects were needed in each PP-IP and NP-PP site. Allowing for a dropout rate of 20%, to enable a statistically sound comparison to be made between any specific pair of PP-IP and NP-PP sites, a target recruitment of 30 patients per site (total n=420), collected over a maximum of 5 working days, was set.

Initial sample estimates, based on information provided by physiotherapists and podiatrists in clinical practice, indicated that full-time PP-IPs/NP-PPs have up to 60 consultations, lasting approximately 20-40 minutes each, per week, generating data on potentially 840 patient care episodes across 14 sites, indicating that, even allowing for repeat patient visits and inclusion criteria failures, such a recruitment was feasible.

Case sites: Sites with PP-IPs were purposively selected from an earlier study phase (62) to include diversity with respect to care setting, geographical location and patient demographics across England.

Recruitment

Podiatrists and Physiotherapists

Initial email/ telephone contact was made with PP-IPs who had completed an earlier survey whilst undertaking IP training (n=70) and indicated willingness to participate in further research (62). Those who expressed an interest were provided with a participant information

sheets and supplementary information on case site involvement and requested to ensure organisational and local Research and Development (R&D) support.

Matched NP-PP sites, based on professional role, care setting, geographical location and NHS Agenda for Change (Afc) banding, were either nominated by PP-IPs, identified through personal contacts of the project advisory group or enquiries from individual Research and Development departments via the National Institute of Health Research (NIHR) portfolio. These matched NP-PPs were, with consent, contacted by a member of the research team and recruited following the same process as for PP-IPs. Written informed consent was taken from PP-IPs and NP-PPs on the first day of each case site visit by JE, who assured on-going consent with each PP-IP or NP- PP at the beginning of each contact day.

Patients

At each case site a consecutive sample of patients who had scheduled appointments with PP-IPs/NP-PPs during a 5-day (up to 37hrs) site visit by the study researcher (JE) were recruited in NHS sites by trained research nurses, and private sites by a second study researcher (EK) between March 2015 and February 2016.

A screening log of all patients approached for participation in the study (n=563) was recorded; both those recruited to the study (n=488, 86.7%) and those declining participation (n=75,13.3%), including hospital/unit medical record numbers, gender and the date of consent, by the local research nurse/ study researcher. Following the observed consultation (see table 1) those who agreed to participate completed and posted questionnaires into a box in the clinic area or returned using pre-paid envelopes.

Ethical considerations

NHS Research Ethics approval from London – Surrey Borders Research Ethics Committee was (REC Ref No 14/LO/1874) and the University was obtained. R&D approval was obtained from each National Health Service (NHS) trust and private healthcare providers.

Data collection

An initial telephone interview, informed by previous work in the area (79) was conducted with the PP from each site using semi-structured questions to gather information on site characteristics, and professional role. Details of the data collection and instruments, informed by the study patient and public involvement (PPI) and advisory groups, are presented in Table 1. All data collection instruments were piloted in a non-study physiotherapist IP NHS outpatient clinic in January 2015, with only minor corrections to wording required (see Table 1).

Outcome measures

The patient questionnaire (Q1), informed by previous work (79) and several validated tools was designed to ensure that it: i) was relevant to patients with a range of acute and long-term conditions, attending an initial, surgical or follow-up appointment with PP: ii) supported collection of data that would allow comparisons of patient satisfaction between prescribing and non-prescribing professionals. A generic questionnaire developed to evaluate prescribing by nurses and midwives in the Republic of Ireland (66) was therefore selected for adaptation.

Two indicators of satisfaction from the post consultation questionnaire were used as outcome measures (satisfaction with the consultation and satisfaction with the advice given by the PP).

The questionnaire comprised the following subscales from validated tools:

- the subscales on ‘professional care’, ‘perceived time’ and ‘overall satisfaction’ from the Consultation Satisfaction Questionnaire (67, 80, 81)
- the ‘compliance intent’ subscale of the Medical Interview Satisfaction Survey (MISS) (63, 64)
- Questions from the Satisfaction with Information about Medicines Scale (65, 66)

Section 1 asked participants to rate 17 statements related to patient satisfaction with services received at the time of consultation (questions 1-17). Ten questions were based on the previously validated tool Medical Interview Satisfaction scale (65, 66), and 7 additional questions designed to capture information on ‘ease of access’ to service based on outpatients’ opinion of quality of hospital departments questionnaire (68).

Section 2a comprised 4 statements measuring patients’ attitudes to PP-IP (66, 69) and a filter question asking whether participants had been given advice/information on medicines during the consultation. Those indicating “no” were re-directed to Section 3. Those confirming “yes” were asked to complete *section 2b*, comprising 14 statements about the advice/information they had received from PP-IPs/NP-PPs during the consultation including side effects, action of use and dose schedule and medicines adherence (63, 65-67).

Section 3 employed the validated EQ-5D-5L quality of life profile measure of five dimensions (mobility, self-care, usual activities, pain, anxiety/ depression) rated on five levels (no problem to severe problem/ unable questionnaire (70). Although the standardized extended EQ-5D

incorporates a vertical 20 cm visual analogue scale (VAS) rating scale, Patient and Public Involvement group members consistently reported difficulty indicating numerical values for how they felt at any one time point. It was therefore decided to exclude this from the questionnaire.

Section 4 comprised 7 items related to general demographics in order to describe respondent characteristics including age, living arrangements, employment, ethnic group and educational attainment.

Data Analysis

Quantitative data were entered in to SPSS© Version 22. Descriptive statistics were used to summarise the data and reported where open text data (specifically in relation to medication details and requested tests from the observation diary) had been converted to numeric data. When assessing change in a continuous outcome from Patient Questionnaire 1 to Questionnaire 2, a paired t-test was used.

When comparing 2 subgroups for normally distributed outcomes (notably change scores from Questionnaire 1 to Questionnaire 2, such as for overall EQ-5D-5L score), an unpaired t-test was utilised.

When comparing 2 subgroups (in particular prescribing and non-prescribing) for an ordinal outcome, a Mann-Whitney U test was utilised. When comparing 2 subgroups (notably Podiatry and Physiotherapy or prescribing and non-prescribing) for a categorical outcome,

the Chi-Squared test was used, reverting to a Fisher's Exact test in 2x2 cross tabulations if 1 or more expected cell count was found to be < 5.

Economic analysis:

Seven resource implications of IP compared to NP were considered: rates of new prescribing; tests ordered; referrals to other health professionals; frequency of follow up; consultation duration; time spent discussing the patient with other colleagues; unplanned consultations for the same condition within two months of the index consultation. Data were gathered through the observation diary, except for tests (from the retrospective audit) and unplanned consultations (from the patient follow up questionnaire).

Group level comparisons of IP vs NP for PT and PO were undertaken separately for each of the seven variables. The cost implications (British pounds 2015) of differences in consultation length and colleague's time spent in discussion were examined by applying nationally valid unit costs (82). A comprehensive micro level costing analysis could not be conducted because data on tests and unplanned consultations were only gathered for a sample of patients and insufficient details were available on medications, referrals and planned follow up to enable costs to be reliably ascribed. Costs that could be estimated were considered in relation to outcomes (satisfaction with consultation, satisfaction with advice, changes in health-related quality of life (EQ-5D-5L) between baseline and follow up) in a simple cost consequences framework.

Results

Characteristics of participants

i) PPs and case sites

Seven matched pairs of sites, (3 podiatry and 4 physiotherapy) were recruited. Sites were based across 8 Academic Health Science Networks in England (<https://www.ahsnnetwork.com/>) , a mixed range of settings, including private practice (n=2), primary care (n=6), secondary care (n=6), social enterprise (n=2) and were well matched by professional role, care setting and agenda for change banding (see Table 2). All PP-IPs had been qualified for at least 12 months prior to data collection. A total of 489 patients were recruited: 243 across the PP-IP sites with 246 across the NP-PP sites.

Nearly all consultations (n=474), both PP-IPs and PP-NPS, were face to face (n=473, 99.8%), duration 2-203 minutes. There was considerable variation in the location of services: 39.2% (n=186) of consultations were provided in NHS hospital outpatients, 25.1% (n=119) NHS community clinics, 20.3% (n=96) private practice, 9.7% (n=46) general practice, 4.4% (n=21) social enterprise and 1.3% (n=6) community service.

Table 2: Characteristics of the sites and Physiotherapists and Podiatrists

Pair	Case study site	No. Patients Recruited	Type of PP	Job Title	Setting	Location in England *	Age	Salary band	Full or part time <30 hrs in practice	Education highest	Single or multi-professional team	Patient questionnaire 1	Follow up-Patient Questionnaire	Prescriptions
1	1	49	PO-IP	General/Private	Private	London	71	8a	Full time	Doctorate	single	40	N/A	0
	2	46	PO-NP	General/Private	Private	London	47	12	Full time	Masters	single	35	N/A	n/a
2	3	33	PO-IP	Specialist	Secondary care, NHS In/out patient	Wessex	41	7	Full time	Masters	multi-professional	22	19	6
	8	37	PO-NP	Specialist	NHS primary & secondary (& private)	Kent, Surrey, Sussex	39	6	Full-time	Degree	single	25	22	n/a
3	10	51	PO-IP	Surgeon/consultant	NHS secondary (& private)	Oxford	59	9	Full time	Masters	multi-professional	32	38	3
	6	42	PO-NP	Surgeon/consultant	NHS secondary	North East & North Cumbria	47	9	Part-time	Masters	multi-professional	26	23	n/a
4	7	6	PT-IP	Specialist	Community	London	31	7	Part-time	Masters	multi-professional	25	N/A	0
	4	11	PT-NP	Specialist	NHS Primary, Community care	Kent, Surrey, Sussex	47	8a	Full time	Masters	multi-professional	25	N/A	n/a
5	9	42	PT-IP	Specialist	Primary, community Social enterprise	Kent, Surrey, Sussex	46	8a	Full time	Diploma	multi-professional	2	2	3
	5	38	PT-NP	Surgeon/consultant	Tier 2 NHS ESP assessment service	Wessex	42	8a	Part-time	Doctorate	multi-professional	6	3	n/a
6	11	41	PT-IP	Specialist	Acute Foundation Trust	Northwest coast	58	8a	Full time	Masters	multi-professional	27	29	0
	12	35	PT-NP	Surgeon/consultant	NHS secondary care	Kent, Surrey, Sussex	48	8c	Full time	Masters	multi-professional	19	23	n/a
7	13	21	PT-IP	Specialist	NHS primary & community Social enterprise	Kent, Surrey, Sussex	52	8a	Full time	Masters	multi-professional	8	16	3
	14	36	PT-NP	Specialist	Primary & community	Kent, Surrey, Sussex	38	8a	Full time	Masters	multi-professional	23	20	n/a

					Social enterprise									
Totals		488										315	195	15

PO-IP: Podiatrist independent prescriber PO-NP: Podiatrist non-prescriber PT-IP: Physiotherapist independent prescriber PT-NP: Physiotherapist non-prescriber

Job title: **Surgeon/Consultant** (consultant physiotherapists, consultant podiatric surgeons) **General/Private** (physiotherapists practitioners, physiotherapists, podiatrists) **Specialist** (e.g. Clinical specialist physiotherapists, extended scope physiotherapist clinical specialist podiatrists, clinical lead or senior podiatrists)

ii) Patients

Demographic data (see table 3) were collected from 315/ 468 (67.3%) patients who consented to and returned the initial questionnaire: 49.5% (n=156) were from prescribing and 50.5% (n=159) from non-prescribing sites. The samples were similar in terms of age, employment status, level of formal education, and ethnic group ($p>0.05$).

Table 3: Patient characteristics

	Physiotherapy n (%)	Podiatry n (%)	Total n=number of responses	% of total sample
Professional group				
Which professional consulted	135 (42.86%)	180 (57.14%)	315	100%
Gender			n=254	
Male	34 (30.4%)	55 (38.7%)	89	35%
Female	78 (69.6%)	87 (61.3%)	165	65%
Age				
Physiotherapy group: n= 111, mean 59.7, SD 16.6, (range 17.6-100.98)				
Podiatry group: n=139, mean 67.1, SD 16.16, (range 3.17-94.32)				
Total: n=250, mean 63.8, SD 16.7				
Living arrangements			n=257	
Live alone	19 (17.4%)	32 (21.6%)	51	19.8%
Live with other adult(s)	90 (82.6%)	94 (63.5)	184	71.6%
Care home resident	0	22 (14.9%)	22	8.6%
Type of accommodation			n=276	
Owner occupied house/flat	97 (82.2%)	104 (65.8%)	201	72.8%
Privately rented house/flat	12 (1.02%)	12 (7.6%)	24	8.7%
Local authority/housing association/cooperative	9 (7.6%)	13 (8.2%)	22	8%
Residential or care home, hospice	0	29 (18.4%)	29	1.05%
Employment group			n=262	
In paid or voluntary employment	46 (41.1%)	40 (26.7%)	86	32.8%
Unemployed/student/at home/sick	15 (13.4%)	12 (8%)	27	10.3%
Retired	51 (45.5%)	98 (65.3%)	149	56.9%
Educated beyond 18 years			n=274	
Yes	32 (27.4%)	51 (32.5%)	83	30.3%
No	85 (72.6%)	106 (67.5%)	191	69.7%
Ethnic group			n=283	
White	117 (96.7%)	160 (98.8%)	277	97.9%
Other	4 (3.3%)	2 (1.2%)	6	2.1%

iii) Patient outcomes

a) Satisfaction and access to services

The majority of patients (75.9%, n=239) agreed that PP's should be able to prescribe medicines for patients, however 23.2% (n=73) would prefer a doctor to prescribe. Levels of satisfaction for the sample as a total were high, with over 60% positive agreement on all items other than ability to contact the service in an emergency (n=144, 44.4%). Satisfaction with 17 specified aspects of the consultation and services provided by PPs indicated a significantly higher level of satisfaction among the patients of PP-IPs than those of NP-PPs in 8 instances (table 4).

With respect to service access, patients of PO-IPs were more satisfied with 'the ease of making an appointment' and 'the ability to contact the service by phone or in times of emergency' (see table 4) than NP-PO patients, with no notable difference evident in patients attending PT-IPs compared to NP-PTs.

There was no effect on the remaining four items reporting on ease of access on the acceptability of: i) waiting time to obtain an appointment; ii) obtaining an appointment on a convenient day or hour; iii) waiting time or iv) seeing the PT or PO at the appointed time between patients attending a PP-IPs when compared to those attending a NP-PP.

Table 4 Patient views and experience of satisfaction with care received from physiotherapist or podiatrist

Patient views and experience of consultation with physiotherapist or podiatrist (R) indicates reverse score item	Physiotherapist Independent Prescriber (n=62)		Physiotherapist Non-prescriber (n=73)		Mann-Whitney U-test	Podiatrist Independent Prescriber (n=94)		Podiatrist Non-prescriber (n=86)		P *	Total n=315	
	Strongly Agree/Agree (compared with strongly disagree/disagree/no opinion)					Strongly Agree/Agree (compared with strongly disagree/disagree/no opinion)					Strongly Agree/Agree	
	n	% sample	n	% sample	p*	n	% response	n	% response	n	%	
1. Overall I was satisfied with the consultation from this physiotherapist or podiatrist	59	95.1%	67	91.2%	0.280	85	90.4%	80	93.0%	0.281	291	92.4%
2. The physiotherapist or podiatrist was very careful to check everything when carrying out my care	60	96.8%	69	94.5%	0.092	82	87.2%	77	89.5%	0.367	288	91.4%
3. I will follow the advice of this physiotherapist or podiatrist because I think she/he is right	59	95.1%	64	87.7%	0.021	81	86.2%	75	87.2%	0.020	279	88.6%
4. The time I was able to spend with the physiotherapist or podiatrist was a bit too short (R)	46	74.2 %	61	83.6%	0.807	68	81.0%	59	68.6 %	0.333	234	74.3%
5. The physiotherapist or podiatrist explained the reasons for the advice given	56	90.3%	67	91.2%	0.150	79	94.0%	72	83.7%	0.711	274	87.0%
6. Some things about the consultation with the physiotherapist or podiatrist could have been better (R)	46	74.2 %	53	63.0 %	0.166	68	72.3%	60	69.8%	0.120	227	72.1%
7. The physiotherapist or podiatrist listened very carefully to what I had to say	57	91.2%	68	93.2%	0.344	79	94.0%	74	86.0%	0.330	278	88.3%
8. I understand my treatment much better after seeing this The physiotherapist or podiatrist	54	87.1%	54	74.0%	0.025	68	72.3%	61	70.9%	0.164	237	75.2%
9. The physiotherapist or podiatrist was interested in me as a person not just my illness	50	80.1%	56	76.7%	0.033	77	81.9%	65	75.6%	0.152	248	78.7%

Patient views and experience of consultation with physiotherapist or podiatrist (R) indicates reverse score item	Physiotherapist Independent Prescriber (n=62)		Physiotherapist Non-prescriber (n=73)		Mann- Whitney U-test	Podiatrist Independent Prescriber (n=94)		Podiatrist Non-prescriber (n=86)		P *	Total n=315	
	Strongly Agree/Agree (compared with strongly disagree/disagree/no opinion)					Strongly Agree/Agree (compared with strongly disagree/disagree/no opinion)					Strongly Agree/Agree	
	n	% sample	n	% sample	n	% sample	n	% sample	n	P *	n	% sample
10.I am NOT completely satisfied with the advice received from this physiotherapist or podiatrist (R)	46	74.1 %	61	83.6%	0.019	75	79.8%	67	78.0 %	0.455	249	79.0%
11.It was easy to make an appointment with the physiotherapist or podiatrist	35	56.5%	49	67.1%	0.900	74	78.7%	60	69.8%	0.028	218	69.2%
12.There was an acceptable time lapse to obtain an appointment	30	48.4%	43	58.9%	0.759	67	71.3%	57	66.3%	0.378	197	62.5%
13.It was possible to obtain an appointment on a convenient day or hour	40	64.5%	49	67.1%	0.695	70	74.5%	62	72.1%	0.067	221	70.2%
14.I can contact someone in the service by phone for help or advice in case of problem	38	61.2%	47	64.4%	0.881	70	74.5%	56	65.1%	0.020	211	67.0%
15.In an emergency I can get a quick appointment/consultation at this service	19	30.6%	25	34.2%	0.177	60	63.8%	36	41.9%	0.001	140	44.4%
16.I saw the physiotherapist or podiatrist at the appointed time	42	67.7%	62	84.9%	0.111	74	78.7%	73	84.9%	0.952	251	79.7%
17.The waiting time was acceptable	45	72.5%	64	87.7%	0.088	80	85.1%	71	82.6%	0.494	260	82.5%

* p based on Mann Whitney U test using 5-point Likert Scale; for ease of interpretation, the table only displays for each item the number of patients who indicated a positive response (i.e. Strongly Agree/Agree or Strongly Disagree/Disagree for negatively paraphrased items (R)) – all corresponding percentages relate to the entire subgroup at the top of the column i.e. interpreting no response to the specific item as a lack of a positive response.

Patients of PP-IPs were more likely to receive medicines information or advice during the consultation (58 out of 146 (39.7%) vs 37 out of 151 PP-NP patients (24.5%); $p=0.005$), with varying levels of satisfaction reported (see table 5). Compared to PT-NPs patients, PT-IP patients were significantly more likely to: 'be told when' and 'how often' to take their medicine, 'intend to take their medicines' and 'find it easier to follow the PT advice' ($p \leq 0.05$).

Table 5 Patient views and experience of medicines management advice and information provided by physiotherapist or podiatrist

Patient views and experience of medicines management advice and information provided by physiotherapist or podiatrist		Physiotherapist Independent Prescriber (n=27)	Physiotherapist Non-prescriber (n=24)	Mann- Whitney U-test	Podiatrist Independent Prescriber (n=31)		Podiatrist Non-prescriber (n=13)		Mann- Whitney U-test	Total			
					Strongly Agree/Agree					Strongly Agree/Agree			
		N (excluding not applicable ^a)	n	%	n	%	p*	n	%	n	%	p*	n
1. The physiotherapist or podiatrist gave me time to clarify questions I may have had about my medicine	84	24	96.0%	19	86.4%	0.627	21	84.0%	11	91.7%	0.901	75	89.3%
2. The physiotherapist or podiatrist told me when to take my medicine	64	11	73.3%	6	40.0%	0.030	19	82.6%	9	81.8%	0.719	45	70.3%
3. The physiotherapist or podiatrist told me how often I should take my medicine	61	12	85.7%	5	35.6%	0.002	19	86.4%	9	81.8%	0.835	43	70.5%
4. The physiotherapist or podiatrist provided me with information on the purpose of my medicine	75	16	73.7%	14	70.0%	0.547	19	82.6%	11	84.6%	0.549	60	80.0%
5. The physiotherapist or podiatrist provided me with information on how to use my medicine	59	11	73.3%	5	45.5%	0.062	16	80.0%	10	91.0%	0.608	42	71.2%
6. I expect that it will be easy to follow the physiotherapist's or podiatrist's advice about my medicine	68	12	75.0%	10	66.7%	0.181	22	91.7%	11	84.6%	0.346	57	83.8%
7. The physiotherapist or podiatrist told me the name of my medicine	71	17	85.0%	9	60.0%	0.178	18	75.0%	9	75.0%	0.354	53	74.6%

Patient views and experience of medicines management advice and information provided by physiotherapist or podiatrist		Physiotherapist Independent Prescriber		Physiotherapist Non-prescriber			Podiatrist Independent Prescriber		Podiatrist Non-prescriber			Total	
		Strongly Agree/Agree					Strongly Agree/Agree					Strongly Agree/Agree	
		N (excluding not applicable [^])	n	%	n	%	p*	n	%	n	%	p*	n
8. The physiotherapist or podiatrist explained the side effects of my medicine	63	11	68.8%	12	70.6%	0.578	13	59.1%	5	50.0%	0.443	41	65.0%
9. I would have liked to have received more information about my medicine from the physiotherapist or podiatrist #	73	3	13.6%	3	17.6%	0.438	0	0.0%	3	25.0%	0.288	9	12.3%
10. The physiotherapist or podiatrist provided me with information on what to do if I missed a dose of my medicine	48	3	25.0%	3	27.3%	0.795	3	21.4%	1	9.1%	0.274	10	20.8%
11. It may be difficult for me to do exactly what the physiotherapist or podiatrist told me to do in relation to my medicine #	56	0	0.0%	1	9.1%	0.038	5	23.8%	1	9.1%	0.832	7	12.5%
12. I'm not sure it will be worth the trouble to take the medicine advised by the physiotherapist or podiatrist #	62	2	13.3%	1	8.3%	0.298	1	6.7%	1	8.3%	0.570	5	8.1%
13. Receiving a prescription for medicine from my physiotherapist or podiatrist reduced my waiting time today	40	4	30.8%	1	16.6%	0.919	6	46.1%	6	75.0%	0.446	17	42.5%
14. I am likely to take the medicine prescribed for me today	47	7	36.8%	2	28.5%	0.022	13	72.2%	11	100.0%	0.204	33	70.2%

[^] those patients who did not respond “Yes” to the preceding question “During the consultation today, did the physiotherapist or podiatrist prescribe and/or give you advice and information about medicines(s) ?”.

*p-value based on Mann Whitney U test utilising the original 5 point Likert scale; for ease of interpretation, the table only displays for each item the number of patients who responded Strongly Agree/Agree.

Note that for items labelled # this may not be regarded as a positive response.

b) Quality of life- EQ-5D-L

Indications at baseline were that patients who saw PP-IPs scored less for mobility, however there was no statistically significant difference between PP-IP and PP-NP groups on either individual items or overall score ($p \geq 0.05$).

Indications at baseline were that patients who saw PT-IP had lower generic quality of life than those seeing the PT-NP, due to lower scores on the mobility dimension. However, there was no statistically significant difference between PP-IP and PP-NP groups on either individual items or overall EQ-5D-5Lscore ($p \geq 0.05$) (Table 6, individual dimension scores not shown).

Quality of life overall scores in both PP-IP and PP-NP groups improved significantly between baseline and follow-up. Differences in change scores between the PP-IP and PP-NP group, however, were not statistically significant (Table 6). The sample for which data at both time points were available was limited ($n=116$).

Table 6: Overall EQ5D index score: baseline and follow-up

	From the 129 completers	Baseline for 116 with EQ5D in BOTH data sets only	Follow-Up for 116 with EQ5D in BOTH data sets only		
	Number of patients completing BOTH sets of EQ5D questions	EQ5D-5L Mean (SD)	EQ5D-5L Mean (SD)	Change from Baseline (95% CI)*	Paired t-test p-value
PT IP	25	0.56 (0.31)	0.64 (0.27)	0.08 (-0.04 to 0.19)	0.194
PT NP	28	0.73 (0.19)	0.73 (0.22)	0.001 (-0.07 to 0.07)	0.973
PO IP	33	0.70 (0.26)	0.78 (0.20)	0.08 (0.003 to 0.16)	0.042
PO NP	30	0.66 (0.26)	0.76 (0.28)	0.10 (0.03 to 0.16)	0.004
All IP	58	0.64 (0.29)	0.72 (0.24)	0.08 (0.01 to 0.14)	0.019
All NP	58	0.69 (0.23)	0.75 (0.25)	0.05 (0.003 to 0.10)	0.036
All PT	53	0.65 (0.26)	0.69 (0.25)	0.04 (-0.03 to 0.10)	0.266
All PO	63	0.68 (0.26)	0.77 (0.24)	0.09 (0.04 to 0.14)	0.001

*[Positive change indicates mean improvement in health at Follow-Up]

Economic analysis-patient level care delivery

Physiotherapists: Compared to NPs, the physiotherapist IPs had significantly longer consultation duration (20.8 vs 27.6 minutes) (Table 7).

Podiatrists: The frequency with which new medications and tests were ordered were significantly higher in IP than NP (Table 7). There was a trend for consultation duration to be longer for IP (23.4 vs 19.9 minutes) (Table 7).

Planning of follow up consultations was higher by podiatrist IPs than physiotherapist IPs, but no significant differences were found between IP and NP within the professions. After removing unplanned consultations in the two months after the original consultation that were considered (by two independent reviewers) to be unamenable to treatment delivered in the index consultation, only four items of unplanned service utilisation remained across the whole sample of patients of PT and PO, all of which were related to pain relief (Table 7).

Costs

Difference in costs of consultation duration of IP v NP for physiotherapist and podiatrist groups were based on Agenda for Change (AfC) band 8a, which was the most frequent grade of PP-IPs in the study, i.e. £70 per hour (82). Compared to the cost of a NP consultation, the IP consultation was, on average, more costly by £7.95 for PT (£24.30 vs £32.25) and £8.62 (£19.69 vs £28.31) for PO. The salary of a grade 9 professional is twice that of grade 8a, so at that higher level, the differences in the cost of consultations between IP and NP would be doubled. Use of grade 7 instead of grade 8a would reduce the differences between IP and NP by about £1.20 per consultation. Amongst the POs, the IPs were at band 7 (advanced / team leader), 8a (principal) and 9 (consultant); two of the NPs were band 9 and the third was band

6 (specialist). Participating physiotherapists were all band 8a, except one NP (grade 8c), and one IP (grade 7)

Costs could not be estimated for the other elements of activity that might differ between IP and NP due to data problems. Information on tests ordered were drawn from a small sample of records in each site (the audit); reporting of the type and dose of new medications, referrals and frequency of planned follow up was incomplete.

.

Table 7 Comparison of independent prescribers and non-prescribers, by profession, on variables used in the cost analysis

Professional group	Prescribing status		Number of new medications required (Observation Q6)	Number of tests requested / patient (Sample audit)	Consultation time in minutes / patient (Observation Q1)	Discussions with colleagues in minutes/ per patient (Observation Q9,10)	x	Patients receiving referral (not for tests) (Observation Q11)	Patients with planned follow up (Observation Q15)	Patients reporting verified unplanned consultations within 2 months (Patient questionnaire)
PHYSIO-THERAPY	Independent prescriber (IP)	N	107	42	107	107	N	107	107	47
		Missing	9	74	9	9	Yes N	32	54 (8 by phone)	1
		N, % of zeros	75, 70.1%	32, 76.2%	0	88, 82.2%	Yes %	29.9%	50.5%	2.1%
		Mean	0.327	0.262	27.64	1.802				
		SD	0.546	0.497	14.10	5.585				
		Median	0	0	24	0				
	Non prescriber (NP)	IQR	0 to 1	0 to 0.25	18 to 34	0 to 0				
		N	115	44	115	115	N	115	115	46
		Missing	7	78	7	7	Yes N	34	51 (1 by phone)	2
		N, % of zeros	87, 75.7%	33, 75.0%	0	114, 99.1%	Yes %	29.6%	44.3%	4.3%
		Mean	0.252	0.250	20.83	0~				
		SD	0.456	0.438	10.46	0~				
	PODIATRY	Median	0	0	19	0				
		IQR	0 to 0	0 to 0.75	14 to 28	0 to 0				
		Significant difference (p)	MWU 0.336	MWU 0.949	MWU <0.0005		Chi Sq 0.956	Chi Sq 0.361	FE 0.617	
		Independent prescriber (IP)	N	128	24	128	N	128	128	57
			Missing	5	109	5	Yes N	17	110 (0 by phone)	0
			N, % of zeros	93, 72.7%	17, 70.8%	0	Yes %	13.3%	85.9%	0%
			Mean	0.328	0.375	24.27	0.976			
			SD	0.616	0.647	24.32	2.682			
			Median	0	0	16	0			
		Non prescriber (NP)	IQR	0 to 1	0 to 1	11 to 27.75	0 to 0			
			N	124	32	123	N	124	124	47
			Missing	3	95	4	Yes N	6	111 (7 by phone)	1
			N, % of zeros	114, 91.9%	32, 100%	0	Yes %	4.8%	89.5%	2.1%
			Mean	0.105	0	16.88	0.726			
			SD	0.379	0	9.86	2.867			
		Significant difference (p)	Median	0	0	16	0			
			IQR	0 to 0	0 to 0	10 to 23	0 to 0			
			MWU 0.001	MWU <0.0005	MWU 0.073	MWU 0.349	Chi Sq 0.20	Chi Sq 0.387	FE 0.452	

Discussions with colleagues

The IPs in the PT group consulted colleagues about patients significantly more often than the NPs (17.8% vs 0.9% of consultations), and most discussions were with medical colleagues, averaging 9.5 minutes per discussion (Table 8).

POs held discussions with colleagues for >10% of consultations (14.8% IPs, 10.5% NPs, (Table 8)), for around 7 minutes. IPs discussed a higher proportion of patients with medical colleagues, than a colleague from the same profession, thereby likely to be incurring higher costs. However, information on colleagues consulted was not precise, so calculations were indicative only. Some POs were band 9 (consultant), so reporting discussions with 'same' professional would imply higher costs than are indicated in the table, which are based on AfC band 8a .

Table 8 Discussion with colleagues about patient

Professional group	Prescribing status	Number and % of all patients seen for whom discussion occurred with colleague	Mean (SD) minutes in discussions with colleague per patient	Discussion with same professional n, mean (SD) minutes	Same colleague cost / discussion* (£, 2015)	Discussion with medical professional n, mean(SD) minutes	Medical colleague cost / discussion* (£, 2015)
PHYSIOTHERAPY	Independent prescriber	19 (17.8%)	10.61 (9.68)	3, 19.5 (14.8)	£22.75	16, 9.5 (8.9)	£21.69
	Non prescriber	1 (0.9%)	0 (n/a)	1, time missing	Not known	0, n/a	0
	Significant difference	p<0.0005#	n/a				
PODIATRY	Independent prescriber	19 (14.8%)	6.89 (3.20)	11, 6.8 (3.6)	£7.93	8, 7.0 (2.8)	£15.98
	Non prescriber	13 (10.5%)	6.92 (6.14)	12, 7.3 (6.3)	£8.52	1, 3.0 (0.0)	£6.85
	Significant difference	p=0.299~	p=0.493^				

Fishers Exact test; ~ Chi squared test; ^ Mann Whitney U test

* Unit costs of health and social care 2015 (Curtis and Burns 2015), pro rata based on £70/ hour for same professional i.e. AfC band 8a, as in Ec2 above, and £137/ hour for medical consultant

Cost consequences analysis

The available data suggest that for both PT and PO in this study, care delivery by IP is more resource intensive and costly than NP due to longer consultations for PTs, and taking more time of colleagues to discuss patients. Whilst not costed, PO-IPs had higher frequency of ordering medications and tests than PO-NPs. Analysis of the changes in self-reported health status between baseline and 2 month follow up using EQ-5D-5L found no difference in change scores of IP and NP for either PT or PO, but these data were only available for a small sample of participants.

Discussion

This is the only known national evaluation of PP-IP in the UK or the world, and the first to adopt a quasi-experimental research design to compare outcomes and costs for patients managed by PP-IPs and NP-PPs. Unlike nurses and pharmacists, where prescribing has been explored in some detail using self-reported outcomes (32, 53, 79), there is a dearth of equivalent information in the allied health professions, including either physiotherapy and/or podiatry (35, 41) and/or studies adopting direct observation of outcomes (32). Our study demonstrates that care provided by PP-IPs is equivalent, in terms of quality of life and patient satisfaction, to care provided by NP-PPs with prescribing undertaken by doctors. IP by PPs was found to be highly acceptable, with higher levels of patient satisfaction in some aspects of medicines information also reported than for NPs.

Importantly, it appears that PP-IP is developing in line with original policy intention to improve access and quality of care in across a range of settings (83-85). The evidence generated in this study demonstrates that PP-IPs can provide a high standard of care. Extending non-

medical staff, such as physiotherapists' and podiatrists', scope of practice to include independent prescribing is key to supporting effective delivering of the NHS Long Term Plan (12, 58, 86), and in creating a step change in developing the capacity and capability of the workforce to deliver innovative models of service delivery (4, 12). The severity of the workforce deficit makes changes, such as the increased level of clinical autonomy, associated with independent prescribing an attractive option to commissioners who seek to address gaps in service delivery. As the world leader in extending prescribing rights to nurses, pharmacists and allied health professions the findings are of significant importance to international policy makers who seek to learn from the pioneering advancement of prescribing rights in UK (31, 34) to inform their own approach to addressing the workforce deficit.

Internationally it is now common for physiotherapists, nurse practitioners, pharmacists, social workers, and psychiatric nurses to be located within extended primary care teams (87) with plans to extend this further recently announced (12, 18). Nearly 50% of appointments in UK general practice are for example, already provided by non-medical staff, i.e. nurses, pharmacists and allied health professionals (12, 15). Although in the current study, there were only four unplanned re-consultations for the same problem across the whole sample, these all related to patients (3 from NPs, 1 from IP) seeking further pain relief. While it is important to recognise that such small numbers do not provide an accurate basis for drawing conclusions about differences between IP and NP, it could be argued that the number of NP patients having to go back for pain medication was more than that for IPs and if this figure was multiplied across the total number of NP consultations per year it would actually be very costly in terms of additional GP appointments. This is important as the current deficit in primary care looks set to continue (88), with a recent proposal for home visits to be removed

from the GP contract, and a government pledge to create 50 million more GP appointments year by 2024/25 (88, 89). As the third largest workforce in health and care in England, AHPs have great potential to contribute to transforming care, and ensuring ongoing access to medicines in these challenging times (18).

Non-medical prescribers see on average 5-30 patients per day (62, 90); based on a median of 17.5 consultations per day recent estimates indicate therefore that the current population of 90,000 qualified NMPs could potentially provide patients access to medicines in 1.56 million consultations per day, 580.35 million per year (90). Economic evaluation undertaken elsewhere in the UK indicates NMPs issue on average 2 medicines per day, thus facilitating the availability of 180,000 medicines via NMP per day, 65.7 million per year (90). However, it is important to note for the benefits of initiatives, such as prescribing, to be fully realised it is crucial that that they are supported by skilful implementation (12, 91, 92).

The economic evaluation of PP-IP is particularly important, given that identifying a sustainable solution that improves the worldwide deficit of health workers and makes best use of limited resources is imperative in ensuring ongoing access to medicines (12, 18). Our cost appraisal from the case sites suggest that PP-IP care delivery is more resource intensive than NP-PP. This arises through longer consultation duration, more ordering of medicines and tests (PO) and more discussions with colleagues (PTs). These costs, however, need to be considered in relation to benefits, many of which could not be measured in this study. Only a limited economic analysis was possible meaning that the findings should be treated with caution. Whilst the original intention had been to undertake a patient level micro costing analysis, data

deficiencies limited what could be included. Further research is required to understand how team configurations affect care delivery, patient outcomes and costs.

The most complete data were available for consultation duration, and the calculation of associated costs showed IPs to incur slightly higher consultation costs than NP in both the PO and PT groups (£8.62 and £7.95 respectively). It is important to note however that consultation duration and associated costs may simply be driven by professional differences and clinic practices. The complexity of these arrangements means that the differences in cost could equally reflect service differences which would exist regardless of IP status. For example, the time spent in discussion with colleagues may reflect the multi-professional service that many case sites provided. Multi-professional, or team-working is a fundamental component of health care delivery in the UK and central to current government policy (93-95). There is increasing emphasis on establishing systems, rather than single episodes of care, that dissolve traditional boundaries (96, 97) to support the increasing number of people with long-term conditions.

There is limited evidence available with which to compare our study findings (32, 41, 51, 52, 91). Despite positive findings that NMP is safe, and provides beneficial clinical outcomes (32, 34, 79), the impact on the health economy, as reported in two recent systematic reviews examining clinical and cost effectiveness, remains unclear (51, 52, 91). The authors, as in this study, highlight the difficulty in separating NMP effects from the contributions of healthcare team members, and a lack of adequately powered randomised controlled trials examining NMP across clinical specialities, professions and settings (31, 51). Given that extended prescribing rights to nurses, pharmacists and AHPs offers a sustainable approach to improving

the global workforce deficit, there is an urgent need to establish economic benefits, or otherwise of non-medical prescribing to inform future international policy developments. A different approach, involving highly targeted specific outcomes, and or longitudinal studies is therefore required. The development of a minimum data set of important outcome measures for NMP assessment would as Noblet et al. suggests (51), be highly beneficial, and generate the required evidence to evaluate the overall benefit of NMP and inform future developments in the UK and around the world.

Strengths and limitations

In the first study to explore AHP prescribing, the 14 case sites supported an in-depth evaluation and comparison of PP-IP to PP-NPs in a range of care settings. Use of multiple methods of data collection, including an observational component, strengthens the trustworthiness of the findings. PP-IP participants were selected from a larger sample (n=35) who completed a trainee PP-IP survey and indicated that they would be willing to be involved in further research (62).

Despite challenges in matching sites, given the diversity of service settings, roles, and patient needs, between and within the two professions, patient characteristics indicated good matching on most factors. However, there are limitations and methodological challenges associated with using the same evaluation measures on two different professional groups for whom separate measures might have been more appropriate. The economic analysis was constrained as described above. An analysis of effectiveness was not possible because it was not feasible to collect data on specific indicators for change across the wide variety of conditions treated within PP consultations. Our ability to link each of the various aspect of patient data (i.e. observation, questionnaires, record audit) was also very limited as patients

had the option to select which aspects of data collection they agreed to. As a result, it was not possible to match patients across the different data sets, or to complete some of the intended analysis.

Conclusions

This study provides new knowledge about physiotherapist and podiatrist independent prescribing, the high level of care and patient satisfaction they provide. Given that extending prescribing responsibilities to nurses, pharmacists, and allied health professionals is increasingly being recognised as effective way to alleviate shortfalls in the global health workforce and ensure ongoing access to prescription medicines around the world this is important. PP-IP care delivery was found to be more resource intensive than NP-PP. However, this study is limited, and findings needs to be verified through further research, including a full economic analysis. A more focussed longitudinal exploration within each profession with targeted outcome measures would enable a more robust comparison of the impact of PP-IP across the United Kingdom, and inform further developments around the world.

Acknowledgements

We would like to thank the physiotherapists and podiatrists, team members, patients and stakeholder participants who took part in our study, and our project advisory group and patient public involvement group for their advice and contributions throughout. Special thanks to assistance from Clareece Kerby, with data preparation and analysis, and Emma Konstantara with recruitment in private healthcare settings.

References

1. GBD 2016 Diseases and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. *Lancet*. 2017;390:1211-59.
2. Marengoni A., Angleman S., R M. Aging with multimorbidity: a systematic review of the literature. *Ageing Research Reviews*. 2011;10:430-9.
3. OECD. *Health at a Glance 2017 OECD Indicators*. OECD Publishing, Paris 2017(http://dx.doi.org/10.1787/health_glance-2017-en accessed 15th August 2019).
4. World Health Organisation. The World Medicines Situation Report. https://wwwwho.int/medicines/areas/policy/world_medicines_situation/en/ accessed 15th August 2019. 2011.
5. Holloway KA, Henry D. WHO Essential Medicines Policies and Use in Developing and Transitional Countries: An Analysis of Reported Policy Implementation and Medicines Use Surveys. *PLOS Medicine* 2014;11(9)(e1001724. doi:10.1371/journal.pmed.1001724).
6. Hajat C, Stein E. The global burden of multiple chronic conditions: A narrative review. *Preventive Medicine Reports*. 2018;12:284-91: doi: 10.1016/j.pmedr.2018.10.008.
7. Eurostat. Medicine use statistics. https://ec.europa.eu/eurostat/statistics-explained/index.php/Medicine_use_statistics#Prescribed_medicines accessed 15th August 2019. 2014.
8. Centers for Disease Control and Prevention. Therapeutic Drug Use. <https://wwwcdc.gov/nchs/fastats/drug-use-therapeutictm> accessed 15th August 2019. 2017.
9. NHS Digital. Health Survey for England 2016. <http://healthsurveyhscicgovuk/media/63790/HSE2016-pres-medpdf> accessed 15th August 2019. 2017.
10. IMS Institute for Healthcare Informatics. Global Medicines Use in 2020: Outlook and Implications. <https://wwwiqviacom/-/media/iqvia/pdfs/institute-reports/global-medicines-use-in-2020pdf?la=uk-ua&hash=968B71C0B0769A179F3A56E331C62754EEF74752> accessed 15th August 2019. 2015.
11. WHO. Working for health and growth: investing in the health workforce. Report of the High-Level Commission on Health Employment and Economic Growth. World Health Organization; 2016.
12. Beech J, Bottery S, Charlesworth A, Evans H, Gershlick B, Hemmings N, et al. Closing the gap: Key areas for action on the health and care workforce. The Health Foundation; The Kings Fund & Nuffield Trust; 2019.
13. Stokes-Lampard H. Primary care: workforce pressures. London: The Nuffield Trust; 2017.
14. Hutt P, Gilmore S. Tackling inequalities in general practice. London: Kings Fund; 2010.
15. NHS Digital. Practice Level Prescribing June 2019. <https://digital.nhs.uk/data-and-information/publications/statistical/practice-level-prescribing-data/june-2019> accessed August 15th 2019; 2019.
16. DH. The NHS Long Term Plan. London: Department of Health; 2019.
17. World Health Organisation. Global strategy on human resources for health: workforce 2030. World Health Organisation; 2016.

18. Chief Allied Health Professions Officers's Team. AHPs into Action. Using Allied Health Professions to transform health, care and wellbeing. London: Chief Allied Heath Professions Officer's Team, NHS England,; 2017.
19. DH. Allied Health Professions Prescribing and medicines supply mechanisms scoping project report. London; 2009.
20. DH. A High Quality Workforce: NHS Next Stage Review: Our vision for primary and community health care. London: DH; 2008.
21. DH. Equity and excellence: liberating the NHS. London: DH; 2010.
22. DH. Meeting the challenge: a strategy for the allied health professions. London: DH; 2000.
23. DH. Framing the contribution of allied health professions: delivering high quality healthcare. London: DH; 2008.
24. Hogg D. Prescription, supply and administration of medicines by allied health professionals- where are we now and where are we going? . South West House Taunton TA1 2PX: Regional AHP Non-Medical Prescriber Forum: April 11th; 2019.
25. DH. Improving Patients' Access to Medicines: A Guide to Implementing Nurse and Pharmacist Independent Prescribing within the NHS in England. London: DH; 2006.
26. NMC. Standards of Proficiency for nurse and midwife prescribers. London: NMC; 2006.
27. DH. Supplementary Prescribing by Nurses, Pharmacists, Chiropodists, Podiatrists, Physiotherapists and Radiographers within NHS in England. A Guide for Implementation. In: DH, editor. London2005.
28. DH. Proposals to introduce independent prescribing by physiotherapists: Impact Assessment. London: DH; 2012.
29. DH. Summary of Public Consultation on proposals to introduce independent prescribing by Physiotherapists. London: Allied Health Professions Team, DH; 2012.
30. DH. Consultation on proposals to introduce independent prescribing by physiotherapists and podiatrists. London:
<https://www.gov.uk/government/news/proposals-to-introduce-independent-prescribing-for-physiotherapists-and-podiatrists>; 2011.
31. Stewart D, Jebara T, Cunningham S, Awaisu A, Pallivalapila A, MacLure K. Future perspectives on nonmedical prescribing. *Ther Adv Drug Saf*. 2017;8(6):186-97.
32. Weeks G, George J, MacLure K, Stewart D. Non-medical prescribing versus medical prescribing for acute and chronic disease management in primary and secondary care. The Cochrane database of systematic reviews. 2016;11: Cd011227.
33. Wilson DM, Murphy J, Nam MA, Fahy A, S T. Nurse and midwifery prescribing in Ireland: A scope-of-practice development for worldwide consideration. *Nursing and Health Sciences*. 2018;20(264-270):<https://doi.org/10.1111/nhs.12408>.
34. Kroezen M, Van Dijk L, Groenewegen PP, Francke AL. Nurse prescribing of medicines in Western European and Anglo-Saxon countries: a systematic review of the literature. *BMC Health Services Research*. 2011;11(127):doi:10.1186/472-6963-11-27.
35. Stenner K, Edwards J, Mold F, Otter S, Courtenay M, Moore A, et al. Medicines management activity with physiotherapy and podiatry: A systematic mixed studies review. *Health Policy*. 2018;122(12):1333-9: <https://doi.org/10.016/j.healthpol.2018.10.004>.
36. Noblet T, Marriot J, Jones T, Dean C, Rushton A. Views and perceptions of Australian physiotherapists and physiotherapy students about the potential implementation of

physiotherapist prescribing in Australia: a survey protocol. *BMC Health Services Research.* 2018;14(472):<https://doi.org/10.1186/s12913-018-3300-x>.

37. Stanhope J, Grimmer-Somers K, Milanese S, Kumar S, Morris J. Extended scope physiotherapy roles for orthopedic outpatients: an update systematic review of the literature. *Journal of Multidisciplinary Healthcare* 2012;5:37-45.

38. Bissell P, Cooper R, Guillaume L, Anderson C, Avery A, Hutchinson A, et al. An Evaluation of Supplementary Prescribing in Nursing and Pharmacy. University of Sheffield & University of Nottingham & Flinders University & University of South Australia; 2008.

39. Norman I, While A, Whittlesea C, Coster S, Sibley A, Rosenbloom K, et al. Evaluation of mental health nurse supplementary prescribing. London: Florence Nightingale School of Nursing and Midwifery at King's College London; 2017.

40. Latter S, Blenkinsopp A, Smith A, Chapman S, Tinelli M, Gerard K, et al. Evaluation of nurse and pharmacist independent prescribing. Department of Health Policy Research Programme : University of Southampton & Keele University; 2010.

41. Graham-Clarke E, Rushton A, Noblet T, J M. Facilitators and barriers to non-medical prescribing - A systematic review and thematic synthesis. *PloS one.* 2017;13(4):e0196471:<https://doi.org/10.1371/journal.pone.0196471>.

42. Kersten P, McPherson K, Lattimer V, George S, Breton A, Ellis B. Physiotherapy extended scope of practice-who is doing what and why? *Physiotherapy.* 2007;93:235-42.

43. McPherson K, Kersten P, George S, Lattimer V, Breton A, Ellis A, et al. A systematic review of evidence about extended roles for allied health professions. *Journal of Health Services Research and Policy.* 2006;11(240).

44. Ramaswamy B. Physiotherapist supplementary prescriber reducing hospital stays duration in an intermediate care, therapy-led bed service: Example of implementation of NMP. Derby: Derbyshire Community Health Services; 2009.

45. Popadiuk S, Rhajbhandari S. Benefits of non-medical prescribing within an NHS podiatry service. *Journal of Foot and Ankle Research.* 2010;3(1):20.

46. Carey N, Stenner K, Courtenay M. Stakeholder views on the Impact of Nurse Prescribing on Dermatology Services. *Journal of Clinical Nursing.* 2010;19:498-506.

47. Courtenay M, Stenner K, Carey N. An exploration of the practice of nurse prescribers who care for people with diabetes: A case study. *Journal of Nursing and Healthcare of Chronic Illness.* 2009;1:311-20

48. Stewart D, Jebara T, Cunningham S, Awaisu A, Pallivalapila A, MacLure K. Future perspectives on nonmedical prescribing. *Ther Adv Drug Saf.* 2017;8(6):183-97.

49. Courtenay M, Carey N, Gage H, Stenner K, Williams P. A comparison of prescribing and non-prescribing nurses in the management of people with diabetes. *Journal of Advanced Nursing.* 2015;71(12):2950-64.

50. Carey N, Stenner K, Edwards J, Gage H, Williams P, Otter S, et al. Evaluation of physiotherapist and podiatrist independent prescribing, mixing of medicines and prescribing of controlled drugs. Guildford: University of Surrey; 2017. Contract No.: PR-R7-0513-11002.

51. Noblet T, Marriott J, Graham-Clarke E, Shirley D, Alison Rushton A. Clinical and cost-effectiveness of non-medical prescribing: A systematic review of randomised controlled trials. *PloS one.* 2018;13(3):e0193286. <https://doi.org/10.1371/journal.pone.0193286>.

52. Anthony BF, Surgey A, Hiscock J, Nefyn H, Williams NH, Charles JM. General medical services by non-medical health professionals: a systematic quantitative review of economic

evaluations in primary care. *British Journal of General Practice* 2019;69(682): e304-e13. DOI: <https://doi.org/10.3399/bjgp19X702425>.

53. Hogg D. An Economic Evaluation of Non-Medical Prescribing. Association of Prescribers Annual Conference, Holiday Inn Regents Park, London, 23rd November 2016.
54. HCPC. Information request: Number of Physiotherapist and Podiatrist Independent Prescribers: Personal Communication. HCPC. 2016.
55. HCPC. Operations Directorate Management Information Pack. HCPC. 2016.
56. Kearney T, editor 'Prescribing for the Future%Supporting Shared Decision Making' Association for Prescribers; 2019; London.
57. Carey N, Stenner K, Edwards J, Gage H, Williams P, Otter S, et al. Evaluation of physiotherapist and podiatrist independent prescribing, mixing of medicines and prescribing of controlled drugs. Guildford: University of Surrey; 2017.
58. Imison C, Castle-Clarke S, Watson R. Reshaping the workforce to deliver the care patients need. <https://www.nuffieldtrust.org.uk/research/reshaping-the-workforce-to-deliver-the-care-patients-need> accessed 27th August 2019: Nuffield Trust; 2016.
59. Shadish WR, Cook TD, Campbell DT. Experimental and quasi-experimental designs for generalized causal inference. . Houghton, Mifflin and Company; 2002.
60. Weiss C. Program Theory in Evaluation: Challenges and Opportunities, New Directions for Evaluation. San Fransisco: Jossey Bass; 2000.
61. Stern E, Stame N, Mayne J, Forss K, Davies R, Befani B. Broadening The Range Of designs and Methods for Impact Evaluations: . London: Report of a Study Commissioned by the Department For International Development; 2012.
62. Carey N, Stenner K, J E, Gage H, Williams P, Otter S, et al. Evaluation of Phsyiotherapist and Podiatrist Independent Prescribing, Mixing of Medicines, and Prescribing of Controlled Drugs: Final Report. <https://www.surrey.ac.uk/evaluation-physiotherapy-podiatrist-independent-prescribing-mixing-medicine-and-prescribing> accessed 27th August 2019: University of Surrey, University of Brighton and University of Cardiff; 2017.
63. Meakin R, Weinman J. The Medical Interview Satisfaction Scale (MISS-21) adapted for British General Practice. *Family Practice*. 2002;19 (3):257-63.
64. Wolf M, Putnam S, James A, Stiles W. The Medical Interview Satisfaction Scale: development of a scale to measure patient perceptions of physician behavior. *Journal of Behavioural Medicine*. 1978;1 301-401.
65. Horne R, Hankins M, Jenkins R. The Satisfaction with Information about Medicines Scale (SIMS): a new measurement tool for audit and research. *Quality in Health Care*. 2001;10:135-40.
66. Drennan J, Naughton C, Allen D, Hyde A, Felle P, O'Boyle K, et al. Independent Evaluation of the Nurse and Midwife Prescribing Initiative. Dublin: University College Dublin; 2009.
67. Poulton B. Use of the consultation satisfaction questionnaire to examine patients' satisfaction with general practitioners and community nurses: reliability, replicability, and discriminant validity. *British Journal of General Practice*. 1996;46 26 - 31.
68. Gasquet I, Villeminot S, Estaquio C, Durieux P, Ravaud P, Falissard B. Construction of a questionnaire measuring outpatients' opinion of quality of hospital consultation departments. *Health Qual Life Outcomes*. 2004;4(2):43.

69. Latter S, Maben J, Myall M, Courtenay M, Young A, Dunn N. An evaluation of extended formulary independent nurse prescribing. Final Report. Policy Research Programme Department of Health & University of Southampton; 2005.

70. Herdman M, Gudex C, Lloyd A, Janssen MF, Parkin D, Bonsel G, et al. Development and preliminary testing of the new five-level version of EQ-5D (EQ-5D-5L). Quality of Life Research. 2011;20(10):1727-36.

71. Courtenay M, Carey N, Stenner K. Evaluation of Nurse Independent Supplementary Prescribing in the UK: Interim Report. University of Surrey; 2010.

72. Latter S, Sibley A, Skinner TC, Craddock S, Zinken KM, Lussier MT, et al. The impact of an intervention for nurse prescribers on consultations to promote patient medicine-taking in diabetes: A mixed methods study. International Journal of Nursing Studies. 2010;doi: 10.1016/ijnurstu.2010.02.004.

73. Sherrington S, Bell D. Quality, innovation, productivity and prevention through non-medical prescribing. Pharmacoepidemiology and Drug Safety. 2011;20(660-667):doi:10.1002/pds.

74. Britten N, Jenkins L, Barber N, Bradley C, Stevenson F. Developing a measure for the appropriateness of prescribing in general practice. Quality and Safety in Health Care. 2003;12:246-50.

75. Courtenay M, Carey N. The Completeness of Prescriptions issued to Dermatology Patients by Nurse Prescribers. Nurse Prescribing. 2008;6(9):391-6.

76. Carey N, Stenner K, Courtenay M. Prescription writing for patients with diabetes: compliance with good practice Nurse Prescribing. 2009;7(10):464-8.

77. BMA. British National Formulary, . BMA, & Royal Pharmaceutical Society: London. 2015.

78. Courtenay M, Carey N, Stenner K. Nurse Prescriber-Patient Consultations: A Case Study in Dermatology. Journal of Advanced Nursing. 2009;65(6):1207-17

79. Courtenay M, Carey N, Stenner K, Gage H, Williams P. A comparison of prescribing and non-prescribing nurses in the management of people with diabetes. Journal of Advanced Nursing. 2015;71(12):2950-64

80. Baker R. Development of a questionnaire to assess patients' satisfaction with consultations in general practice. British Journal of General Practice. 1990;40:487-90.

81. Baker R, Whitfield M. Measuring patient satisfaction: a test of construct validity. Quality in Healthcare. 1992; 1:104-9.

82. Curtis L, Burns A. Unit costs of health and social care. Personal and Social Services Research Unit: <http://www.pssru.ac.uk/index-kent-lse.php>; 2016.

83. Devlin N, Shah K, Feng Y, Mulhern B, van Hout B. Valuing Health-Related Quality of Life: An EQ-5D-5L Value Set for England: Research Paper 16/01. Office of Health Economics Research, London ;; 2016.

84. DH. Extending the practice of allied health professionals in the NHS. Briefing paper. London: NHS Service Delivery and Organisation: Research and Development; 2006.

85. DH. Equity and excellence: liberating the NHS. London: DH; 2010.

86. NHS. The NHS Long Term Plan. <https://www.longtermplan.nhs.uk/wp-content/uploads/2019/08/nhs-long-term-plan-version-1.2.pdf> accessed 27th August 2019; 2019.

87. Schäfer W, L. A, Boerma WGW, Murante AM, Sixma HJM, Schellevisa FG, Groenewegen PP. Assessing the potential for improvement of primary care in 34 countries: a

cross-sectional survey. *Bulletin World Health Organisation*. 2015;15(93):161–8 | doi: <http://dx.doi.org/10.2471/BLT.14.140368>.

88. Kaffash J. GPs vote for home visits to be removed from contract. Pulse. 2019; <http://www.pulsetoday.co.uk/news/gps-vote-for-home-visits-to-be-removed-from-contract/20039743.article:accessed> Nov 26th 2019.

89. Kaffash J. Conservatives pledge 6,000 new doctors in general practice by 2024/25. Pulse. 2019; <http://www.pulsetoday.co.uk/news/conservatives-pledge-6000-new-doctors-in-general-practice-by-2024/25/20039665.article:accessed> 19th November 2019.

90. Health Education North West. Non-Medical Prescribing (NMP); An Economic Evaluation i5 Report. <http://www.i5health.com/NMP/NMPEconomicEvaluation.pdf> accessed 27th August 2019; 2015.

91. Nelson P MA-M, McBride A, Checkland K, Hodgson D Skill-mix change and the general practice workforce challenge. *British Journal of General Practice*. 2018;68(667):66-7; <https://doi.org/10.3399/bjgp18X694469> accessed 27th August 2019.

92. Khadjesari Z, Vitoratou S, Sevdalis N, Hull L. Implementation outcome assessment instruments used in physical healthcare settings and their measurement properties: a systematic review protocol. *BMJ Open*. 2017;7:e017972(doi:10.1136/bmjopen-2017-017972).

93. NHS England, Care Quality Commission, Health Education England M, NHS Trust Development Authority, England PH. Five year forward view. (accessed 24th November 2016) available from www.england.nhs.uk/ourwork/futurenhs/nhs-five-year-forwardview/ ; 2014.

94. DH and Department for Communities and Local Government. Better Care Fund: Policy Framework. DH, ; 2014.

95. DH. The Musculoskeletal framework: Report: 270211. London; 2006.

96. Gilbert H. Supporting integration through new roles and working across boundaries. The Kings Fund. 2016.

97. Chartered Society of Physiotherapy. Physios key in MD teams developing new ways of working. (accessed November 24th 2016) available from <http://www.csp.org.uk/frontline/article/physios-key-md-teams-developing-new-ways-working-> ; 2009.