

## Original article

# Inequalities in primary care management of knee pain and disability in older adults: an observational cohort study

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## Abstract

**Objectives.** To describe primary care management of knee pain, in relation to National Institute for Health and Clinical Excellence (NICE) OA guidelines, and examine variation in management by patient characteristics.

**Methods.** Subjects were 755 adults aged  $\geq 50$  years who responded to baseline and 3-year surveys and had consulted primary care for knee pain. Medical records (1997–2006) were searched. Associations of having interventions from the outer circle (adjunctive treatments or Step 3) of the NICE guidelines with self-reported socio-demographic and knee-specific factors were determined.

**Results.** Eighty per cent had received a Step 3 intervention. Thirty-eight per cent had been referred to secondary care, and 10% had received a knee replacement. Forty-three per cent had been prescribed an opioid and 41% an NSAID. Severe knee pain or disability at baseline and follow-up was the main association with receiving a Step 3 intervention [adjusted odds ratio (OR) 2.26; 95% CI 1.38, 3.70] and with referral (OR 2.57; 95% CI 1.72, 3.83). Older patients were less likely to be referred. Although non-significant, those of higher social class, in more affluent areas, older age or overweight or obese, appeared more likely to receive a knee replacement. Fifty per cent of those reporting severe knee pain or disability in both surveys had not been referred to secondary care.

**Conclusion.** Most of the older adults who consult primary care with knee pain receive at least one Step 3 intervention from the OA guidelines. Inequalities in the management and referral of knee problems in primary care were generally not observed, although there were some trends towards differences in likelihood of total knee replacement.

**Key words:** Inequalities, Knee osteoarthritis, Knee pain, Referral, Primary care, Socio-economic factors, Medical records, Access to care.

## Introduction

People from lower socio-economic backgrounds have a higher prevalence of morbidity including arthritis [1], and may have more need for care. Inequality in access occurs when non-need variables (e.g. social class) affect the use

of health care, and when individuals with the same needs (e.g. pain levels) consume different amounts of care [2]. Equity in access to services for musculoskeletal pain is highlighted in US, European and UK publications. These recommend that evidence-based interventions should be available to all who need them [3], health disparities in OA treatment should be identified and that current practice is reviewed in light of treatment guidelines [4]. Specifically, primary care should review referral procedures for ease of access to secondary care and rehabilitation services and referral to specialist services should be timely and appropriate [5].

OA is the most common form of arthritis. By 2020, OA is predicted to be the fourth largest cause of disability [6].

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The knee is the most commonly affected joint, and is particularly important because of its contribution to disability. People with OA require a continuum of health services and access to high-quality, effective and timely advice [5, 7] and a model for assessment and management of OA in primary care exists [8]. This model outlines treatments in the order in which they should be considered. It has an inner circle (or Step 1) of core treatments to be considered for everyone (including exercise, advice and weight loss), paracetamol and topical NSAIDs are outlined in the second circle (or Step 2) for consideration alongside the core treatments. The outer circle of adjunctive treatments (or Step 3) is to be considered when further treatment is needed (e.g. prescriptions for Cox-2 inhibitors and opioids, and referral for surgery).

Few studies have investigated whether socio-economic factors influence initial General Practitioner (GP) consultation for knee pain. Findings overall suggest little effect [9–13]. In contrast, studies have reported disparities in the provision of joint replacement surgery [14–18]. This pattern, where people with lower socio-economic status report equal or increased access to primary care services but encounter barriers at later treatment stages is reported for access to care for cardiovascular problems and cancer [19]. Studying primary care management may help to understand this conundrum. We have studied management and referral for knee pain to explore if and where unequal opportunities for care develop in the pathway before knee replacement surgery.

Primary care management for OA has been studied to a limited extent using self-reported data [20–22]. These suggest an under utilization of core treatments for OA. The few studies investigating relationships with referral to secondary care for joint pain have tended to be small in size, have relied on self-reported data (which may be subject to recall bias), had low response rates or have not assessed the role of socio-economic factors [9, 21, 23–25]. There were two aims to our study (i) To describe management of knee pain in primary care alongside Step 3 of National Institute for Health and Clinical Excellence (NICE) guidelines for the management of OA in primary care [8]. We have focussed on Step 3 as these should be comprehensibly recorded in medical records. (ii) To examine variation in management by socio-economic and deprivation characteristics, and by self-reported severity of knee pain. We wanted to explore if inequalities observed previously for total joint replacement also existed in more conservative management options or whether management appears more driven by severity of pain.

## Patients and methods

We linked self-reported survey data with 10-year primary and secondary care NHS medical records. The study was set within a larger study of knee pain [11, 26, 27]. Everyone aged  $\geq 50$  years registered at three general practices in North Staffordshire, UK, were sent a questionnaire in 2000. Those who responded and still registered with the practices were sent a follow-up questionnaire 3 years later. Both questionnaires included

the knee pain screening tool (KNEST) [28] to identify knee pain and related health-care use in the past 12 months. Subjects were also asked whether they consented to viewing of their medical records. North Staffordshire Local Research Ethics Committee approved the study.

### Identification of participants

Subjects were selected who: (i) responded to both baseline and follow-up surveys; (ii) consented to medical record review; (iii) reported knee pain on the follow-up survey; (iv) either self-reported a GP consultation for knee pain at baseline or follow-up, or had a recorded GP consultation for knee pain between 1997 and 2004; and (v) were still alive and registered at the practice at the end of 2006.

We defined a recorded GP consultation as an entry in the general practice computerized database in the study period. The practices undergo a cycle of assessment, feedback and training in the use of computerized morbidity Read coding [29]. Read codes are a commonly used morbidity coding system in the UK [30]. GPs can add information about a consultation (free text) alongside the code. Read-coded information and consultation text for consultations were searched to identify all consultations which had an allocated knee-related Read code or a musculoskeletal-related knee disorder mentioned in the text of the consultation.

### Medical record review

While evidence of GP consultation was assessed for the period 1997–2004, the review of medical records for management were for the period 1997–2006. This period enabled a reasonable length of time for a course of management in primary care to be undertaken for all primary care consulters including those who had first consulted recently. Two searches of medical records for that period were made:

- (i) all selected participants had their complete GP records manually searched at their practice for information relating to all management of their knee pain including prescribed medication at the time of a consultation for knee pain, referral to secondary care or physiotherapy, surgery, injections, X-rays and OA or RA diagnoses; and
- (ii) following the search of the primary care records, all those who had evidence of referral to secondary care for knee pain had their notes at the local hospital, including the local orthopaedic service, and the letters database at the local rheumatology service searched for contacts relating to the knee.

The manual searches were conducted by three research nurses and a health services researcher using a standardized protocol and an electronic data collection sheet. Reliability of data extraction was tested initially on 31 sets of GP records. Once all data had been extracted, the reason for medication and other management was linked to the NICE OA guidelines algorithm by an experienced GP (M.P.).

### Survey self-report measures

Respondents who reported knee pain on the surveys completed the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) [31]. Severe knee pain or disability was defined as reporting severe or extreme on at least one item on the pain scale or severe or extreme difficulty on at least one item on the physical function scale. Subjects who did not report any severe or extreme problem and answered at least 4 of the 5 pain items and 14 of the 17 physical function items were rated non-severe. Persistent knee pain was defined as reporting knee pain in both the baseline and 3-year surveys. Persistent severe knee pain or disability was defined as reporting severe knee pain or disability in both surveys. We did not use the WOMAC stiffness scale. Also included was the Hospital Anxiety and Depression scale (HADS) [32]. Subjects scoring above the upper tertile of scores on the anxiety scale or depression scale were rated as being most anxious or depressed.

A body manikin for shading pain that has occurred in the past 4 weeks was used to determine pain elsewhere (hip, lower back, foot/ankle, hand or neck). Self-reported height and weight at baseline were used to determine BMI. A BMI of  $>25$  was defined as overweight and  $\geq 30$  as obese. Demographic variables included co-habiting status, further education after leaving school, and household social-economic class based on current or last job [33].

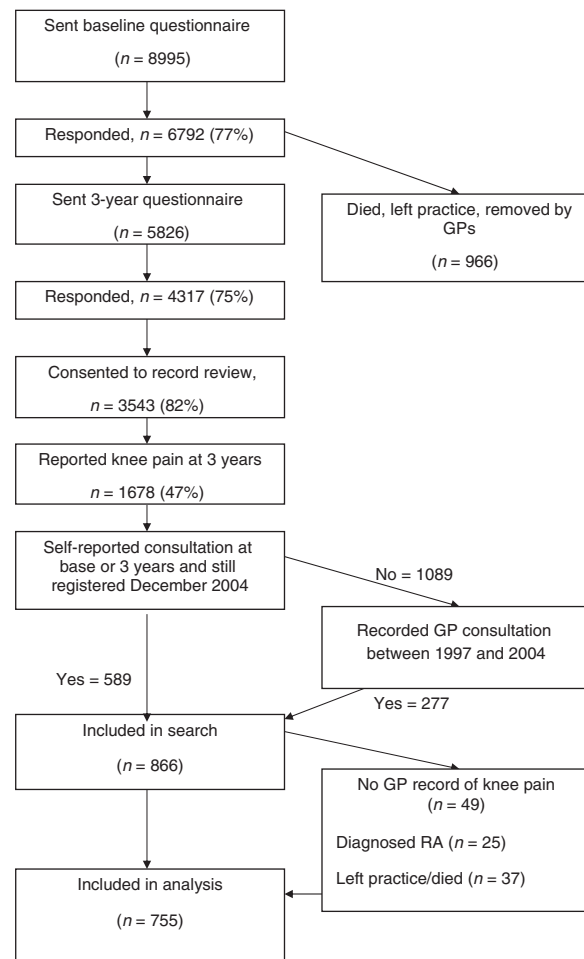
Area deprivation was determined using the index of multiple deprivation (IMD) 2004 for England [34]. The index is based geographically at the lower level super output area (SOA) of which there are 32 482 in England with a mean population of 1500. The IMD has an overall score, based on a weighted combination of seven domains: income; employment; health; education, skills and training; barriers to housing and services; crime; and living environment. The SOAs from which the people in this study were drawn were categorized into three groups: the least deprived 20%, the most deprived 20% and the mid 60% [34, 35].

### Statistical analysis

The proportion of primary care consultants having each management option within Step 3 of the guidelines were determined first with 95% CIs. Rates were adjusted using direct age and gender standardization to the England and Wales population.

The outcome measures for assessment of social inequalities were: (i) any intervention from Step 3 during the 10-year period; (ii) referral to rheumatology or orthopaedics; and (iii) evidence of a total knee replacement (TKR). Unadjusted associations between independent variables and each outcome were assessed and factors with a  $P < 0.05$ , or an odds ratio (OR)  $> 1.30$  or  $< 0.77$  [11, 36] were taken forward alongside age and gender into the multivariable analysis using logistic regression.

**Fig. 1** Flowchart detailing course of participants in the study.



## Results

### Participants

The flowchart of participants through the study is shown in Fig. 1. Response at baseline was slightly higher in females (79%) than males (75%,  $P < 0.001$ ) and responders were slightly older than non-responders (mean difference 1.5 years, 95% CI 1.0, 2.0). At follow-up survey, those who responded and consented to medical record review were no different to non-responders and non-consenters by gender or age, but were slightly more likely to report knee pain at baseline (48 vs 45%,  $P = 0.03$ ).

A total 1678 people self-reported knee pain in the follow-up survey and consented to record review. Of those, 755 (45%) had an identified primary care consultation for knee pain and were included in the analysis (Fig. 1). Four hundred and fifty-one (60%) were females and the mean (s.d.) age was 67.5 (9.06) years. Six hundred and eleven (83%) also reported knee pain at baseline (persistent knee pain). Two hundred and sixty-eight (35%) reported severe pain at both time points (persistent severe knee pain). An OA diagnosis was recorded for 375

**TABLE 1** Recorded management

Recorded management	<i>n</i>	% (95% CI)
Patients reviewed	755	
Management from Step 3 of NICE guidelines	607	80 (77, 83)
Referral (orthopaedic or rheumatology)	290	38 (35, 42)
Injection	105	14 (12, 17)
Opioid prescribed <sup>a</sup>	328	43 (40, 47)
NSAID prescribed <sup>a</sup>	309	41 (37, 44)
Cox-2 inhibitor prescribed <sup>a</sup>	71	9 (8, 12)
Capsaicin prescribed <sup>a</sup>	23	3 (2, 5)
TKR <sup>b</sup>	76	10 (8, 12)
In those without TKR ( <i>n</i> =679)		
Referral (orthopaedic or rheumatology)	214	31 (28, 35)
Referral (physiotherapy)	247	36 (33, 40)
X-ray performed	320	47 (43, 51)

<sup>a</sup>At time of a consultation for knee problem. <sup>b</sup>On waiting list or performed.

(50%) patients. Standardized rates of primary care consultation between 1997 and 2004 were 59% in those with knee pain, 66% in those reporting with persistent knee pain and 79% in those reporting persistent severe knee pain or disability.

#### Ten-year management of knee pain

The use of interventions for those consulting primary care is shown in Table 1 with standardized rates in Fig. 2. The standardized rates are essentially unchanged from the unstandardized rates. For every 100 people consulting for knee pain, 80 had at least one intervention from Step 3 of the NICE guidelines. Of these, 43 had an opioid prescription, 41 an NSAID, 9 received a Cox-2 inhibitor, 38 were referred to secondary care and 10 received a TKR during the 10-year period (26% of those who had a referral record). Of those with a TKR, 29 (38%) had the replacement before the follow-up survey.

The figures are similar but slightly higher when restricting the analysis to just those with persistent knee pain (whether severe or not). In those with persistent severe knee pain or disability, 87 out of every 100 consulters received a Step 3 intervention, 62 were prescribed opioids, 50 were referred and 17 had a TKR. However, rates of NSAID use did not differ between those with persistent severe knee pain or disability and those with non-severe pain or disability (*P*=0.34).

#### Associations with receiving a Step 3 intervention

Due to the similarity in the use of interventions of those with persistent knee pain to the entire group, we concentrated on severity as our measure of knee pain. There were elevated, although non-significant, relationships with two socio-economic factors: not going on to further education (adjusted OR 1.55; 95% CI 0.90, 2.69), and living in the most deprived areas (adjusted OR 1.46;

95% CI 0.64, 3.37) (Table 2). However, the only significant association with management at the highest level of the NICE guidelines was reporting severe knee pain or disability at baseline and follow-up (adjusted OR 2.26; 95% CI 1.38, 3.70 compared with not reporting severe pain or disability in either survey).

#### Associations with referral to orthopaedics or rheumatology

Those aged  $\geq 75$  years were less likely to be referred to secondary care (adjusted OR 0.63; 95% CI 0.41, 0.95) (Table 3). However, there appeared little influence of other socio-economic variables in the decision to refer. The strongest associations with referral were reporting severe knee pain or disability at both baseline and follow-up (adjusted OR 2.57; 95% CI 1.72, 3.83 compared with not reporting severe pain or disability at either time point) and reporting severe knee pain or disability in one but not both surveys (adjusted OR 1.68; 95% CI 1.12, 2.52).

#### Association with TKR

Reporting severe knee pain or disability at both time points (adjusted OR 7.08; 95% CI 3.22, 15.58) was strongly related to a record of TKR, as was reporting severe knee pain or disability at one time point (adjusted OR 3.99; 95% CI 1.76, 9.04) (Table 4). Although non-significant, there was suggestion with elevated ORs that those of higher social class, living in more affluent areas, of older age or overweight or obese, were more likely to receive a replacement.

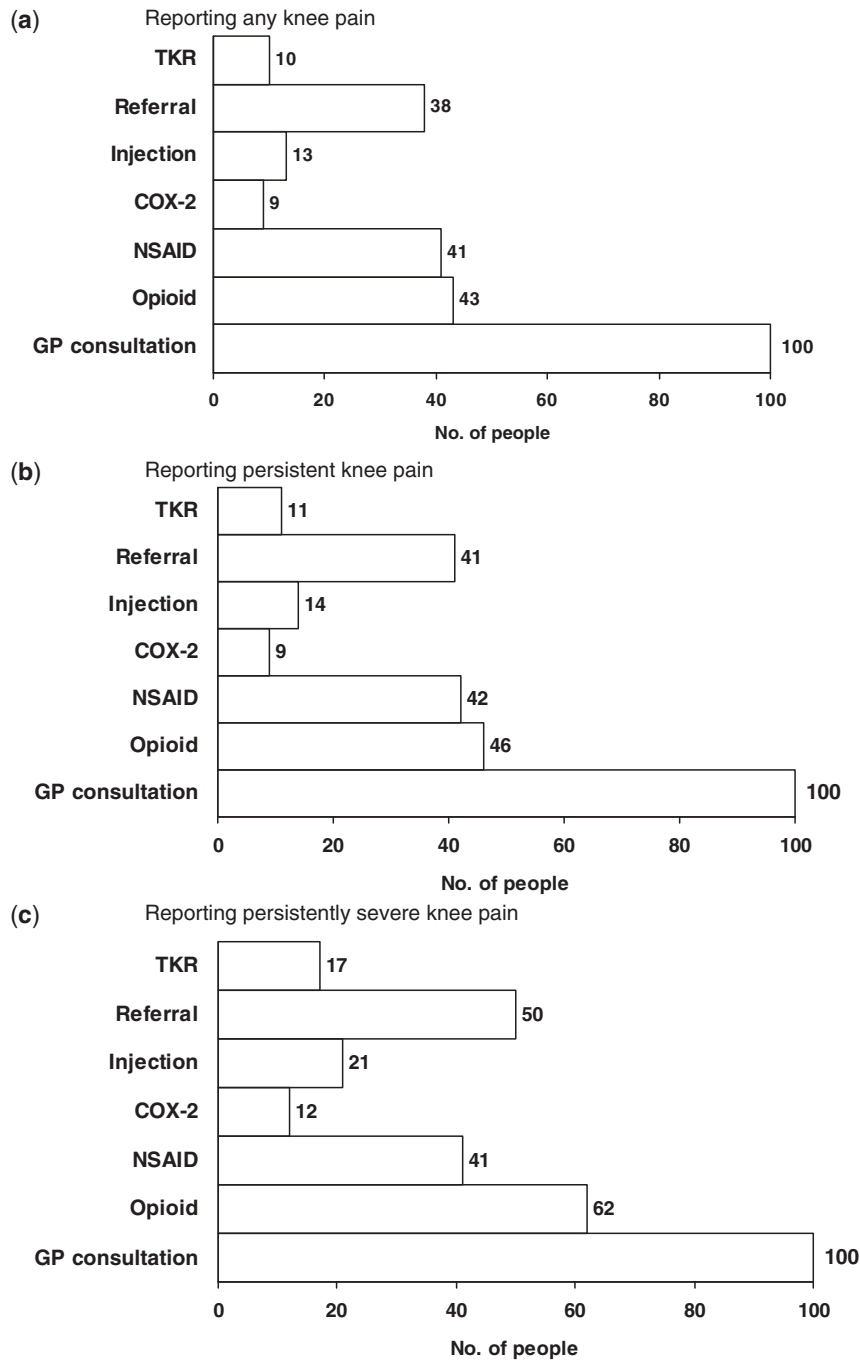
## Discussion

### Summary of main findings

Overall, we found that NICE Step 3 management of knee pain or disability is mainly related to clinical need and influences other than socio-economic factors seem to drive referral and management for people who consult primary care. A substantial group of patients with persistent and severe knee pain or disability appear to be managed within primary care and do not get referred on. This finding may be due to reluctance to refer by the GP, or to be referred by the patient. As conservative treatments aim to manage (not cure) pain, it may be expected that people continue to report persistent and severe pain.

Our study showed that most of the older adults who consult primary care with knee pain receive a Step 3 intervention. Guidelines suggest these should only be considered when further treatment is needed. This group may have needed further treatment, although we do not have reliable data on their use of Step 1 or 2 treatment as these are not routinely coded in GP records. It is previously recognized that clinical practice for OA does not reflect guideline recommendations [22, 37].

Older people were less likely to be referred to secondary care, and a possible reason may be comorbidity. However, 44% of those aged  $\geq 75$  years who had been referred had a record of TKR compared with 21% of those

**Fig. 2** Health-care management in 100 older adults consulting primary care with knee pain.

aged <75 years, which suggests that once referred, those of older age are more readily accepted for TKR.

#### Comparison with other studies

Reporting severe knee pain or disability in both surveys had the strongest relationship with NICE Step 3 interventions including referral and surgery. Prescription of NSAIDs was not seemingly related to severity of pain or disability. Blamey *et al.* [38] highlighted irregular use of

analgesics among hospital attenders, including some reporting severe pain. McHugh *et al.* [20] also observed little change in medication use despite increased pain levels in adults with end-stage lower limb OA. Other studies highlight complex decision making for medications use and our findings may be a reflection of this (e.g. perceptions of risk of adverse events, presence of other illness, reluctance) [39–41]. Rates of injection and X-ray in our study, and rates of NSAID use, were similar to previous studies



**TABLE 2** Associations with an intervention from NICE guidelines for OA Step 3

Patient characteristics	Total	Step 3 management, n (%)	OR (95% CI)	OR <sup>a</sup> (95% CI)
Gender				
Male	304	236 (78)	1.00	1.00
Female	451	371 (82)	1.34 (0.93, 1.92)	1.21 (0.83, 1.78)
Age <sup>b</sup> , years				
53–64	310	242 (71)	1.00	1.00
65–74	265	217 (82)	1.27 (0.84, 1.92)	1.24 (0.81, 1.92)
≥75	180	148 (82)	1.30 (0.81, 2.07)	1.18 (0.70, 1.97)
Practice				
A	281	224 (80)	1.00	–
B	240	191 (80)	0.99 (0.65, 1.52)	
C	234	192 (82)	1.16 (0.75, 1.81)	
Further education				
Yes	86	61 (71)	1.00	1.00
No	644	527 (82)	1.85 (1.11, 3.06)	1.55 (0.90, 2.69)
Unknown	25	19 (76)	1.30 (0.46, 3.63)	1.06 (0.34, 3.32)
Cohabiting				
Yes	555	441 (79)	1.00	–
No	192	159 (83)	1.25 (0.81, 1.91)	
Socio-economic class				
Managerial/professional	225	178 (79)	1.00	–
Intermediate	166	133 (80)	1.11 (0.65, 1.75)	
Routine/manual	321	261 (81)	1.15 (0.75, 1.76)	
Unknown	43	35 (81)	1.16 (0.50, 2.66)	
Area deprivation <sup>c</sup>				
Least	219	174 (79)	1.00	1.00
Mid	468	373 (80)	1.02 (0.68, 1.51)	0.90 (0.59, 1.38)
Most	68	60 (88)	1.94 (0.87, 4.35)	1.46 (0.64, 3.37)
BMI <sup>d</sup>				
Normal/underweight	161	122 (76)	1.00	1.00
Overweight	345	275 (80)	1.26 (0.80, 1.96)	1.10 (0.69, 1.76)
Obese	244	206 (84)	1.73 (1.05, 2.86)	1.38 (0.81, 2.33)
Anxious or depressed <sup>e</sup>				
No	338	265 (78)	1.00	–
Yes	416	341 (82)	1.25 (0.87, 1.80)	
Pain elsewhere <sup>f,g</sup>				
No	114	86 (75)	1.00	1.00
Baseline or follow-up	219	177 (81)	1.37 (0.80, 2.36)	1.21 (0.68, 2.14)
Both baseline and follow-up	422	344 (82)	1.44 (0.88, 2.35)	1.07 (0.63, 1.82)
Unilateral knee pain <sup>e,g</sup>	271	205 (76)	1.00	1.00
Bilateral knee pain	474	395 (83)	1.61 (1.11, 2.33)	1.35 (0.91, 2.00)
Non-severe knee pain	281	202 (72)	1.00	1.00
Severe baseline or follow-up	206	169 (82)	1.79 (1.15, 2.78)	1.57 (0.98, 2.49)
Severe baseline and follow-up	268	236 (88)	2.88 (1.84, 4.53)	2.26 (1.38, 3.70)

Numbers may not add to 755 due to missing data. <sup>a</sup>Adjusted for other presented variables; <sup>b</sup>at follow-up survey; <sup>c</sup>based on SOA, divided into 20% of SOAs least deprived and 20% of SOAs most deprived; <sup>d</sup>based on the largest BMI recorded at baseline and follow-up survey; <sup>e</sup>at baseline or follow-up survey; <sup>f</sup>hip, low back, foot/ankle, hand, neck; <sup>g</sup>self-report.

[21, 23, 25]. However, rates of referral to physiotherapy or other specialists were lower in these self-report studies. Previous estimates of health care for knee pain may, therefore, be underestimated.

We found no relationship between referral and either individual socio-economic status or local area deprivation. These findings are in agreement with Thorstensson *et al.* [9] who found deprivation was not associated with help seeking behaviour although urban living was. Mitchell *et al.* [23] found that those referred on by the GP did not have more self-reported severity and there were

differences in patients' beliefs about their illness, income and economic circumstances. That survey had a 34% response rate so the results may be affected by selection bias. Jordan *et al.* [21] found no difference in the use of paracetamol or NSAIDs according to socio-economic groups, although those in higher social class groups had a higher use of physiotherapy services. In Solomon's study of 160 people with knee or shoulder problems, education levels or medical insurance type were not related to referral to a rheumatologist or orthopaedic surgeon [24].

TABLE 3 Associations with referral to rheumatology or orthopaedics

Patient characteristics	Total	Referral, n (%)	OR (95% CI)	OR <sup>a</sup> (95% CI)
Gender				
Male	304	106 (35)	1.00	1.00
Female	451	184 (41)	1.29 (0.95, 1.74)	1.21 (0.88, 1.66)
Age <sup>b</sup> , years				
53–64	310	122 (39)	1.00	1.00
65–74	265	105 (40)	1.01 (0.72, 1.41)	0.96 (0.67, 1.36)
≥75	180	63 (35)	0.83 (0.57, 1.22)	0.63 (0.41, 0.95)
Practice				
A	281	99 (35)	1.00	–
B	240	97 (40)	1.25 (0.87, 1.78)	
C	234	94 (40)	1.23 (0.86, 1.77)	
Further education				
Yes	86	34 (40)	1.00	–
No	644	249 (39)	0.96 (0.61, 1.53)	
Unknown	25	7 (28)	0.60 (0.23, 1.58)	
Cohabiting				
Yes	555	214 (39)	1.00	–
No	192	73 (38)	0.98 (0.70, 1.37)	
Socio-economic class				
Managerial/professional	225	93 (41)	1.00	–
Intermediate	166	60 (36)	0.80 (0.53, 1.21)	
Routine/manual	321	121 (38)	0.86 (0.61, 1.22)	
Unknown	43	16 (37)	0.84 (0.43, 1.65)	
Area deprivation <sup>c</sup>				
Least	219	76 (35)	1.00	–
Mid	468	190 (41)	1.29 (0.92, 1.80)	
Most	68	24 (35)	1.03 (0.58, 1.82)	
BMI <sup>d</sup>				
Normal/underweight	161	56 (35)	1.00	1.00
Overweight	345	132 (38)	1.16 (0.79, 1.72)	1.01 (0.67, 1.52)
Obese	244	100 (41)	1.30 (0.86, 1.97)	0.91 (0.59, 1.41)
Anxious or depressed <sup>e</sup>				
No	338	107 (32)	1.00	1.00
Yes	416	183 (44)	1.70 (1.26, 2.29)	1.38 (1.00, 1.91)
Pain elsewhere <sup>f,g</sup>				
No	114	40 (35)	1.00	–
Baseline or follow-up	219	81 (37)	1.09 (0.68, 1.74)	
Both baseline and follow-up	422	169 (40)	1.24 (0.80, 1.90)	
Unilateral knee pain <sup>e,g</sup>	271	89 (33)	1.00	1.00
Bilateral knee pain	474	197 (42)	1.45 (1.06, 1.99)	1.16 (0.83, 1.62)
Non-severe knee pain	281	75 (27)	1.00	1.00
Severe baseline or follow-up	206	79 (38)	1.71 (1.16, 2.51)	1.68 (1.12, 2.52)
Severe baseline and follow-up	268	136 (51)	2.83 (1.98, 4.04)	2.57 (1.72, 3.83)

Numbers may not add to 755 due to missing data. <sup>a</sup>Adjusted for other presented variables; <sup>b</sup>at follow-up survey; <sup>c</sup>based on SOA, divided into 20% of SOAs least deprived and 20% of SOAs most deprived; <sup>d</sup>based on largest BMI recorded at baseline and follow-up survey; <sup>e</sup>at baseline or follow-up survey; <sup>f</sup>hip, low back, foot/ankle, hand, neck; <sup>g</sup>self-report.

### Strengths and limitations

We have undertaken an extensive manual search of general practice records including free text that GPs can enter. We also used multiple data sources and searched over a 10-year period. This time frame enabled a comprehensive and long-term assessment of management in primary care. We have not, however, been able to study patient factors such as illness perceptions, and these alongside beliefs about effectiveness of treatment have influenced uptake of care in previous studies [23, 42].

Our analyses only covered Step 3 (outer circle) of the NICE guidelines as data on Steps 1 and 2 are variable within medical records. Broadbent *et al.* [43] highlight this problem. They used nine quality indicators to measure the quality of recorded primary care treatment. There was variation from 17 to 30% in recording related to provision of information for OA and ‘considerable scope for improvement in the recording of high-quality care’ (p. 839).

There was some evidence of social inequity in receiving a TKR with those of higher social class or living in areas

TABLE 4 Associations with knee replacement

Patient characteristics	Total	TKR, n (%)	OR (95% CI)	OR <sup>a</sup> (95% CI)
Gender				
Male	304	26 (9)	1.00	1.00
Female	451	50 (11)	1.33 (0.81, 2.19)	1.21 (0.71, 2.07)
Age <sup>b</sup> , years				
53–64	310	21 (7)	1.00	1.00
65–74	265	27 (10)	1.56 (0.86, 2.83)	1.43 (0.76, 2.68)
≥75	180	28 (16)	2.54 (1.39, 4.61)	1.84 (0.95, 3.56)
Practice				
A	281	34 (12)	1.00	1.00
B	240	22 (9)	0.73 (0.42, 1.29)	0.70 (0.38, 1.27)
C	234	20 (9)	0.68 (0.38, 1.21)	0.65 (0.33, 1.27)
Further education				
Yes	86	8 (9)	1.00	–
No	644	66 (10)	1.11 (0.52, 2.41)	
Unknown	25	2 (8)	0.85 (0.17, 4.27)	
Cohabiting				
Yes	555	58 (10)	1.00	–
No	192	18 (9)	0.89 (0.51, 1.55)	
Socio-economic class				
Managerial/professional	225	24 (11)	1.00	1.00
Intermediate	166	11 (7)	0.59 (0.28, 1.25)	0.48 (0.22, 1.07)
Routine/manual	321	35 (11)	1.02 (0.59, 1.78)	0.84 (0.46, 1.55)
Unknown	43	6 (14)	1.36 (0.52, 3.55)	0.80 (0.28, 2.27)
Area deprivation <sup>c</sup>				
Least	219	25 (11)	1.00	1.00
Mid	468	48 (10)	0.89 (0.53, 1.48)	0.96 (0.54, 1.71)
Most	68	3 (4)	0.36 (0.10, 1.23)	0.36 (0.09, 1.38)
BMI <sup>d</sup>				
Normal/underweight	161	9 (6)	1.00	1.00
Overweight	345	40 (12)	2.21 (1.05, 4.68)	2.15 (0.98, 4.69)
Obese	244	27 (11)	2.10 (0.96, 4.59)	1.82 (0.79, 4.15)
Anxious or depressed <sup>e</sup>				
No	338	31 (9)	1.00	–
Yes	416	45 (11)	1.20 (0.74, 1.95)	
Pain elsewhere <sup>f,g</sup>				
No	114	13 (11)	1.00	1.00
Baseline or follow-up	219	27 (12)	1.09 (0.54, 2.21)	0.83 (0.39, 1.75)
Both baseline and follow-up	422	36 (9)	0.72 (0.37, 1.42)	0.49 (0.24, 1.01)
Unilateral knee pain <sup>e,g</sup>	271	21 (8)	1.00	–
Bilateral knee pain	474	52 (11)	1.47 (0.86, 2.49)	
Non-severe knee pain	281	9 (3)	1.00	1.00
Severe baseline or follow-up	206	23 (11)	3.80 (1.72, 8.40)	3.99 (1.76, 9.04)
Severe baseline and follow-up	268	44 (16)	5.94 (2.84, 12.42)	7.08 (3.22, 15.58)

Numbers may not add to 755 due to missing data. <sup>a</sup>Adjusted for other presented variables; <sup>b</sup>at follow-up survey; <sup>c</sup>based on SOA, divided into 20% of SOAs least deprived and 20% of SOAs most deprived; <sup>d</sup>based on largest BMI recorded at baseline and follow-up survey; <sup>e</sup>at baseline or follow-up survey; <sup>f</sup>hip, low back, foot/ankle, hand, neck; <sup>g</sup>self-report.

of lower deprivation more likely to receive a TKR. The number of TKRs, however, were small, hence the results were not statistically significant and so caution is needed. Also some people may have had a TKR before the start of the study. The majority of people, however, receiving a TKR in our study received it after the follow-up survey.

Another potential limitation of our study is the study setting, which was three general practices in North Staffordshire. While the general practices cover a range of socio-economic areas (a rural affluent town, a

semi-rural mixed deprived area, a urban deprived area), the scope for assessing area deprivation differences may be limited. There was some survey non-response at 3 years. However, the data in Fig. 2 are standardized to the England and Wales population and the non-response is unlikely to affect the associations reported here.

#### Implications for research and clinical practice

Overall, we found that the inequalities that exist for joint replacement surgery do not seem to exist in earlier



management of this condition. Our findings are both encouraging and worrying. On the one hand, people seem to be getting primary care treatment according to clinical need. On the other hand, non-significant differences exist at the later stages of treatment, for those arguably in most need. This disparity has also been shown elsewhere [14, 44]. The development of local appropriateness criteria for patients thought to be in need of joint replacement (that is owned by both GPs and surgeons), has been suggested as one potential way to reduce these inequalities, together with a focus on capacity to benefit [17]. The reasons for continuing disparities in the provision of TKRs require further research.

Many patients with severe knee pain or disability do not get referred on. One study highlighted referral status had no association with improvement of pain and function at 12 months [24]. Whether or not there are unmet needs for care in the group who remain managed in primary care requires further study.

Further research is also needed into the provision of management options covered in Steps 1 and 2 of the NICE guidelines, but this relies on more detailed recording of care in primary care settings. Quality indicators may help with this, but as Hunter *et al.* [37] note those developed hitherto have not been widely adopted. We agree with the suggestion that system-level initiatives may be needed to improve recording and care for OA in primary care [43].

## Conclusion

In conclusion, social inequalities in the management and referral of knee problems in primary care were generally not observed, although there were some trends towards differences in likelihood of TKR. Most of the older adults who consult primary care with knee pain receive at least one Step 3 intervention from the NICE OA guidelines. A large group of people with continuing severe problems are managed solely in primary care. Inequalities in care for knee pain in older adults seem to be related to the provision of surgery only, at the point of uptake, and not within preceding management and referral in primary care.

### Rheumatology key messages

- Half of the people with severe knee pain or disability do not get referred to secondary care.
- Primary care management and referral are based more on clinical need than patient characteristics.

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