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Encounters for foot and ankle pain in UK primary care:

a population-based cohort study of CPRD data

Abstract

Background

Older patients who have foot pain report variation in access to services to manage their foot health. To plan services it is essential to understand the scale and burden of foot pain that exists for GPs.

Aim

To provide UK-wide population-level data of the frequency of foot and/or ankle pain encounters recorded in general practice.

Design and setting

Population-based cohort design study using data drawn from the UK Clinical Practice Research Datalink (CPRD) from January 2010 to December 2013.

Method

All CPRD data were collected prospectively by participating GPs. The primary outcome was prevalence of GP encounters for foot and/or ankle pain, stratified by age, sex, and different subgroups of causes.

Results

A foot and/or ankle pain encounter was recorded for 346 067 patients, and there was a total of 567 095 recorded encounters (mean per person 1.6, standard deviation [SD] 1.3). The prevalence of recorded encounters of foot and/or ankle pain was 2980 per 100 000 (3%). The number of patients with a recorded encounter of foot and/or ankle pain was 1820 per 100 000 (1.8%). Foot and/or ankle pain encounters were reported across all age groups (54.4% females), with those aged 71–80 years placing the greatest burden on GPs. The most common specified referrals were to orthopaedics ($n=36\,881$) and physiotherapy ($n=33\,987$), followed by podiatry ($n=25\,980$).

Conclusion

The burden of foot and/or ankle pain encounters recorded by GPs is not insubstantial, and spans all ages, with a high proportion of referrals to orthopaedics. The authors recommend further exploration of 'first-contact practitioners' for foot and/or ankle pain in general practice to alleviate the burden on GPs.

Keywords

ankle; burden; foot; pain; prevalence.

INTRODUCTION

The UK NHS is increasingly stretched, driving a need for change in its workforce distribution.¹ With limited funding for health care, it is essential that politicians and the commissioners responsible for resource allocation have a clear understanding of the population demands for health care.²

Though policymakers require estimates of future demand for foot care, there are few data available to produce these estimates. Recent investigation of GP encounters for foot and ankle osteoarthritis (OA) in Australia suggests that referrals to allied health professionals were substantially less than those for pharmacological management, and also less than referrals for surgical review.³ Given that pain is often a key driving factor in why patients consult their GP, especially in relation to feet and ankles in the older population,⁴ the lack of reports on referral and access to foot care services in the UK is surprising. Consultation rates for foot and/or ankle musculoskeletal complaints appear to be high in primary care,^{4–8} yet a systematic review by the authors found that the literature on foot care and/or podiatry is concentrated around the assessment and prevention of foot and

ankle problems related to diabetes.⁹

The most recently published systematic review⁵ that synthesised the evidence related to foot pain was limited to those aged ≥ 45 years. Potentially noteworthy data from the rest of the population are omitted, for example, one report identified the foot as the most common region for primary care consultation in children.⁶ Data may also be confusing due to different case definitions used to record foot pain, making comparisons between studies difficult, with a wide range of foot pain being reported in the literature, from 0.8%¹⁰ to 80%.¹¹

The aim of this investigation was to examine the frequency of foot and/or ankle pain encounters recorded in general practice in the UK during a 4-year period. Age, sex, health factors, socioeconomic status, and referral patterns were also examined to better understand foot and/or ankle pain encounters by GPs.

METHOD

Participants

The participant sample population was drawn from the 2010 to 2013 data in the Clinical Practice Research Datalink (CPRD),¹² which was the most recent 4-year

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How this fits in

Prevalence of foot and ankle pain is hard to determine due to inconsistency in case definitions of pain. Most population-level data to date have used questionnaires that focus on patient-reported foot pain. Using a large population-based cohort design, this paper adds novel insights into the burden of foot pain encountered by GPs, alongside examination of consequent referral patterns for foot and/or ankle pain management. The information will be useful to clinicians and those involved in managing foot health services.

period at the time the study concept was formulated. The UK CPRD is a key database for large, longitudinal, anonymised, population-based electronic medical records. It has been used widely in research studies, with many related publications across a broad range of health outcomes.¹³ All data within the CPRD are collected prospectively; since it started, participating GPs have been contributing information on medical diagnoses, lifestyle, and referral and test data covering 11.3 million patients.¹² An 'acceptable patient metric' is followed, with checks that practices are up to standard, to maintain quality and reduce risk of bias.

For the purpose of this study, foot and/or ankle pain codes were defined a priori. A two-round consensus study with GPs in the Portsmouth region¹³ was undertaken to form a comprehensive list of potential search terms for Read codes (the standard clinical terminology system used in general practice in the UK) that may indicate pain in the foot and/or ankle. For patients to be included in

this study there had to be an associated GP encounter, with one of these Read codes recorded on the CPRD system between 2010 and 2013 (further information is available from the author on request).

Statistical analyses

The descriptive statistics and tests of significance used were chosen as appropriate (that is, mean and standard deviation for continuous variables, number and percentage for categorical variables, χ^2 test for categorical comparison, Mann-Whitney or *t*-test for continuous comparisons according to evidence of normality). Analysis was undertaken using SPSS version 24 and Microsoft Excel version 14.6.1.

The prevalence of patients with one or more foot and/or ankle pain encounter was calculated using the denominator of person-time years. Prevalence of recorded foot and/or ankle pain was stratified by age, sex, and the subgroup categories for the different types of foot and/or ankle pain.

The total number of referrals and tests requested were also stratified by the covariates of interest, which included:

- age, years (0–10, 11–17, 18–30, 31–40, 41–50, 51–60, 61–70, 71–80, 81–90, 91–100, >100);
- sex;
- socioeconomic status (Index of Multiple Deprivation deciles);
- body mass index (BMI) (<18.5, 18.5–24.9, 25–29.9, ≥30 kg);
- smoking status (non-smoker, smoker, ex-smoker);
- alcohol consumption (drinks alcohol, does not drink alcohol, ex-drinker);
- musculoskeletal disease state (presence or absence of a systemic musculoskeletal disease);
- diabetes status (presence or absence);
- region (England, Northern Ireland, Scotland, Wales);
- type of foot and/or ankle pain cause (musculoskeletal, vascular, neurological, fracture, amputation, dermatological, tumours, infection, and 'pain' [those not clear from the Read code but often recorded as a symptom code rather than pathology specific]).

RESULTS

A total of 574 083 code events were recorded across the sample relative to foot and/or ankle pain encounters. From

Table 1. Frequency of the 10 most commonly recorded foot and ankle pain codes

Code description	Frequency (%) ^a
Foot pain	112 651 (19.6)
Ankle swelling/ankle swelling symptom/O/E ankle oedema	46 559 (8.1)
Plantar fasciitis	45 301 (7.9)
Ankle pain	42 665 (7.4)
Toe pain	25 526 (4.4)
Ingrowing great toenail	21 842 (3.8)
Ankle sprain	21 211 (3.7)
Achilles tendonitis	17 053 (3.0)
Heel pain	16 779 (2.9)
Other ankle injury	9851 (1.7)

^aPercentage of overall code total, *n* = 574 083. O/E = on examination.

Table 2. Total numbers of patients registered with CPRD, and consultations and number of recorded episodes for foot and ankle pain

	Year				Total
	2010	2011	2012	2013	
Number of patients with a recorded encounter	115 228	93 390	76 884	60 565	346 067
Number of recorded encounters of foot and/or ankle pain	152 951	150 416	139 512	124 216	567 095
CPRD person-time denominator, years	4 991 539	4 852 729	4 743 114	4 461 270	19 048 652

CPRD = Clinical Practice Research Datalink.

those, 781 different Read codes were used to categorise foot and/or ankle pain encounters. The most common of these are shown in Table 1. The average annual sample of patients whose data fed into the CPRD database over the 4-year period 2010 to 2013 was 5 230 037. These patients accounted for 19 048 652 person-years during that time.

Foot and/or ankle pain encounters

The total number of patients identified over the 4-year period with a recording of an encounter for foot and/or ankle pain was 346 067 (54.4% females, mean age 47.4 years, standard deviation [SD] 22.3). The total number of recorded encounters for foot and/or ankle pain was 567 095 (Table 2). The number of encounters per person varied considerably, with a mean of 1.64 (SD 1.3), and recorded encounters

for females were significantly higher than for males ($P<0.001$, $\chi^2 = 262.5$, degrees of freedom [df] 1).

Using the denominator of person time-years, the prevalence of foot and/or ankle pain encounters over the 4-year period was 2980 per 100 000 (3%). The number of patients with a recorded encounter was 1820 per 100 000 (1.8%) (Table 2).

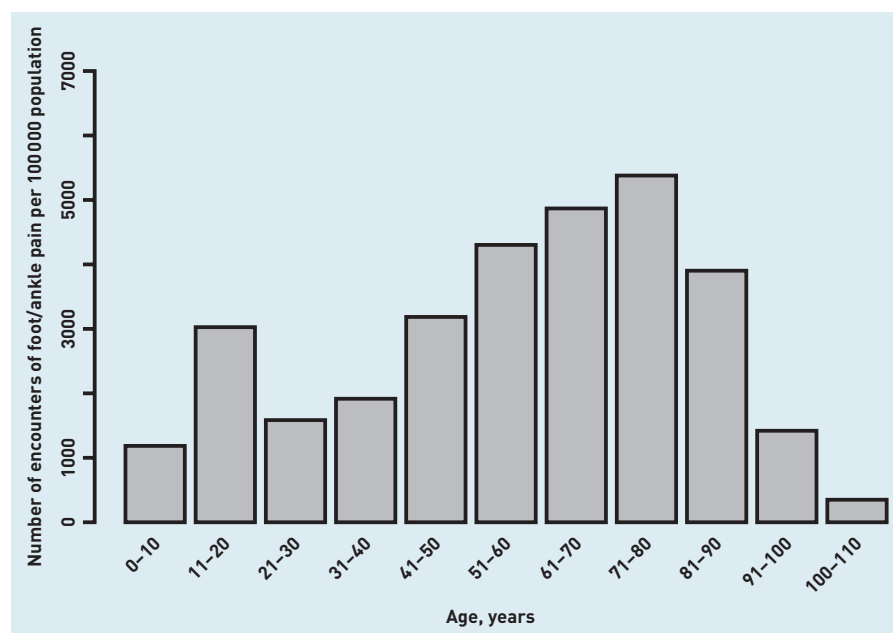
The prevalence of GP-reported foot and/or ankle pain by age is presented in Figure 1. Those aged 61–70 and 71–80 years placed the greatest burden on GPs in terms of encounters for foot and/or ankle pain, with encounters being higher in females aged 71–80 years. The majority of encounters for foot and/or ankle pain were coded as ‘pain’ (51.5%) or ‘musculoskeletal’ events (27.2%).

Socioeconomic status, region, and various known health factors for foot and/or ankle pain

Analysis of foot and/or ankle pain encounters revealed no clear pattern of foot and/or ankle pain prevalence when analysed by socioeconomic group, but regional variation in foot and/or ankle pain recording frequency was noted. The highest recorded encounters were seen in the North West of England, with the lowest recorded in the Yorkshire and Humber regions. At a national level, England recorded the greatest total of foot and ankle pain encounters ($n = 429\,135$) (Figure 2).

There were significantly more encounters for foot and/or ankle pain (71.5%) in those in the overweight or obese categories ($P<0.001$, $\chi^2=582.8$, df 1). Non-smokers had significantly more encounters for foot and/or ankle pain (55.1%) than smokers/ex-smokers ($P<0.001$, $\chi^2 = 89.8$, df 1), and those who drank alcohol had significantly higher encounters recorded for foot and/or ankle pain (76.5%) than those who did not ($P<0.001$, $\chi^2 = 110.6$, df 1) (Table 3).

Figure 1. Frequency of foot and ankle pain encounters, stratified by age.



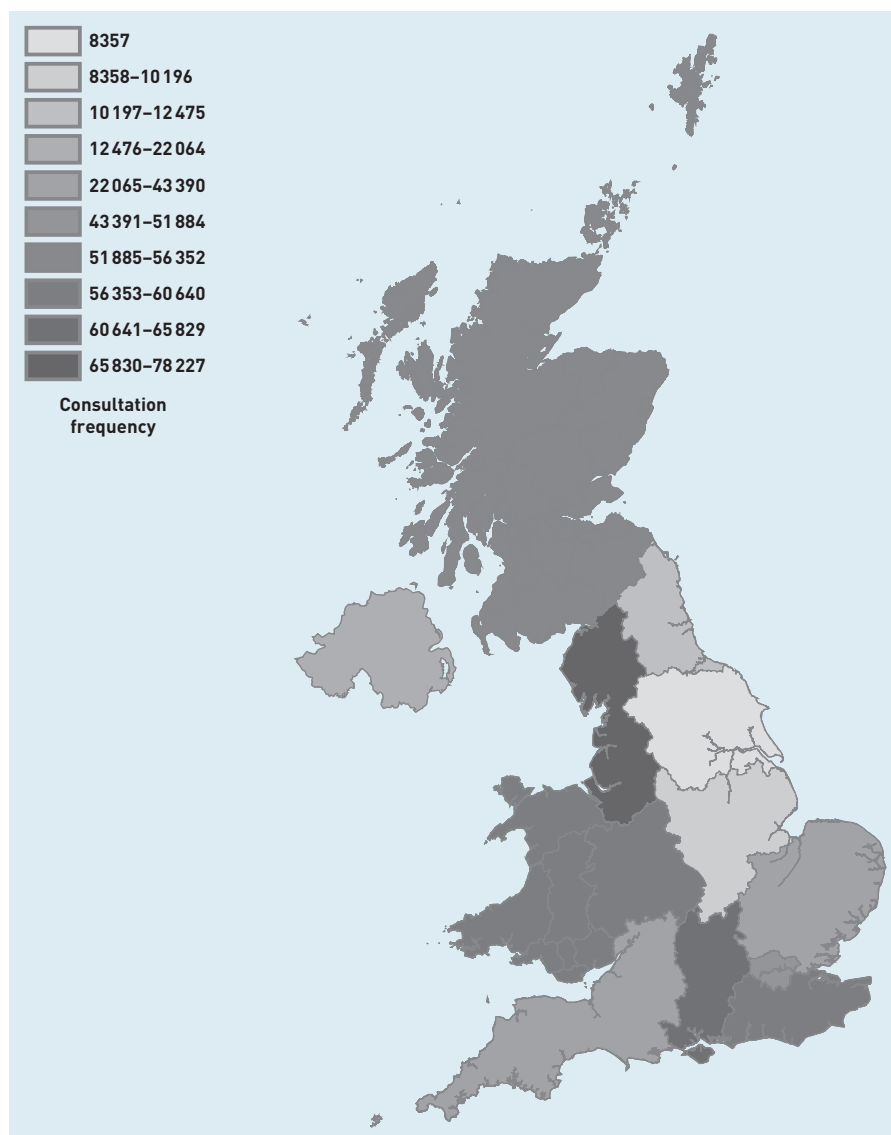


Figure 2. The regional variation in frequency of foot and ankle pain.

Tests requested and referral patterns

Over the 4-year study period, the total number of referrals recorded by GPs linked within CPRD to foot pain encounters was 347 754 (per patient mean 2.4, SD 2.5), and the total number of tests linked to foot pain encounters was 291 968 (per patient mean 3.0, SD 4.1). Figures 3 and 4 show the five most common referrals made and tests requested, and their frequencies. The most common specified referrals for foot pain were to orthopaedics ($n = 36\,881$) and physiotherapy ($n = 33\,987$), then podiatry ($n = 25\,980$). There were 80 005 non-specified referrals. Further analysis (data not shown) showed those aged 71–80 years were more likely to be referred by GPs for tests and to other healthcare professionals.

The most common tests requested by GPs were blood tests ($n = 312\,187$), followed by X-ray ($n = 40\,231$), laboratory

tests ($n = 27\,117$), monofilament tests for sensation ($n = 17\,304$), and ultrasound scans ($n = 7162$).

DISCUSSION

Summary

In this first study using the UK CPRD to report foot and/or ankle pain encounters, the authors' analyses indicated that it is not insubstantial, with 346 067 patients over the 4-year study period identified as reporting foot and/or ankle pain (1.8% of all GP encounters); 567 095 encounters (3%) for foot and/or ankle pain were recorded, with a mean of 1.64 encounters per person (SD 1.3).

Strengths and limitations

The study data were drawn from the CPRD, a large database of anonymised medical records from GPs that is broadly representative of the population in terms of age, sex, and ethnicity.¹² However, the study has some limitations. Primarily, though validation of the CPRD database has been shown to be good,¹³ this is not specifically in the area of foot and/or ankle pain. Although GPs are directed to record a diagnosis, in many cases symptom codes or generalised codes are used. It may be that the authors have underestimated the frequency of foot and/or ankle pain encounters, as only the codes suggested by the initial GP consensus study are included. The authors' findings are, however, similar to those of others. In an Australian-based study,³ the authors demonstrated that 'foot pain' was the most frequently recorded code for musculoskeletal foot and/or ankle problems. Within the authors' data, as well as 'foot pain', the most common codes recorded as 'foot pain' included ankle swelling, pain and injury, Achilles tendonitis, heel pain, plantar fasciitis, toe pain, and ingrowing toenail pain.

A further limitation is that in the CPRD the code only has to be recorded at its initial diagnosis for chronic conditions, unless there is a change in treatment, or a significant event (such as a referral being generated) occurs. Thus, potentially, the authors may have underestimated the prevalence of musculoskeletal conditions.¹⁴

Comparison with existing literature

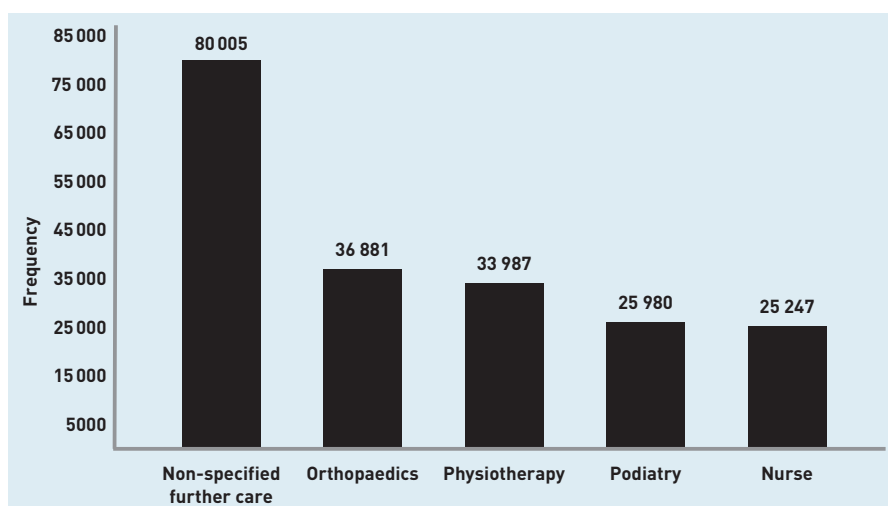
The authors' estimates of the prevalence of foot and/or ankle pain GP encounters (3%) are much lower than those suggested by other authors, who gave a pooled prevalence estimate of 24% (foot pain) and 15% (ankle pain).⁵ A likely explanation is the variety of ways in which foot pain

Table 3. Encounter frequency for foot and/or ankle pain, stratified by lifestyle factors and presence of systemic musculoskeletal disease or diabetes

	Number of patients	Encounters for foot and/or ankle pain, %
Body mass index (kg/m²)^a		
<18.5 (low)	3906	6227 (1.5)
18.5–24.99	70 644	114 798 (27.1)
≥25	87 733	149 754 (35.4)
≥30	85 232	152 984 (36.1)
Smoking status^a		
Ex-smoker	77 861	136 620 (27.5)
Smoker	52 518	86 242 (17.4)
Non-smoker	165 231	273 410 (55.1)
Alcohol consumption^a		
Ex-drinker of alcohol	7394	13 352 (3.5)
Drinks alcohol	171 098	289 411 (76.5)
Does not drink alcohol	42 830	75 637 (20.0)
Diabetes status		
Patient does not have diabetes	313 297	502 407 (88.6)
Patient has diabetes	32770	64 688 (11.4)
Musculoskeletal disease status		
Musculoskeletal disease diagnosis	38 970	81 071 (14.3)
No musculoskeletal disease diagnosis	307 097	486 024 (85.7)

^aNot all participants in the cohort had data on body mass index, smoking, or drinking status. As such, they were excluded from this part of the analyses.

Figure 3. Frequency of the five most common types of referrals made by GPs.



data are collected and/or recorded. Data included within the systematic review of Thomas *et al* were extracted from studies that used self-completed questionnaires, personal interviews, and clinical/physical examination.⁵ Findings from a population-based computer-aided telephone survey of people ($n = 751$) aged 18–65 years indicate that chronic musculoskeletal

ankle disorders affect almost 20% of the Australian community.¹¹ Further investigation of management of foot OA by GPs in Australia reported a rate of 1.1 per 1000 encounters, which is closer to the current study's rate of 1.8 per 1000 patients with a recorded encounter related to foot pain.³ In a Dutch population-based survey ($n = 7200$, ≥ 65 years) 16% (1130) reported suffering non-traumatic foot complaints for >4 weeks. When GP encounters are calculated, 26% consulted a GP — that is, 4% from the source population.¹⁵ In a similar UK study focusing on GP consultation for foot disorders, though confined to a smaller, well-defined population in North Staffordshire, 40.8% had self-reported foot problems ($n = 5706$).⁷ Of 4402 (77.1%) who consented to medical record review, only 544 (12.4%) had a record of a previous consultation for a musculoskeletal foot problem.⁷ Therefore, despite the high prevalence of foot and/or ankle pain reported in the community, people are not consulting their GP for it, and this is consistent with international data.

The authors' finding that slightly more foot and/or ankle pain encounters were

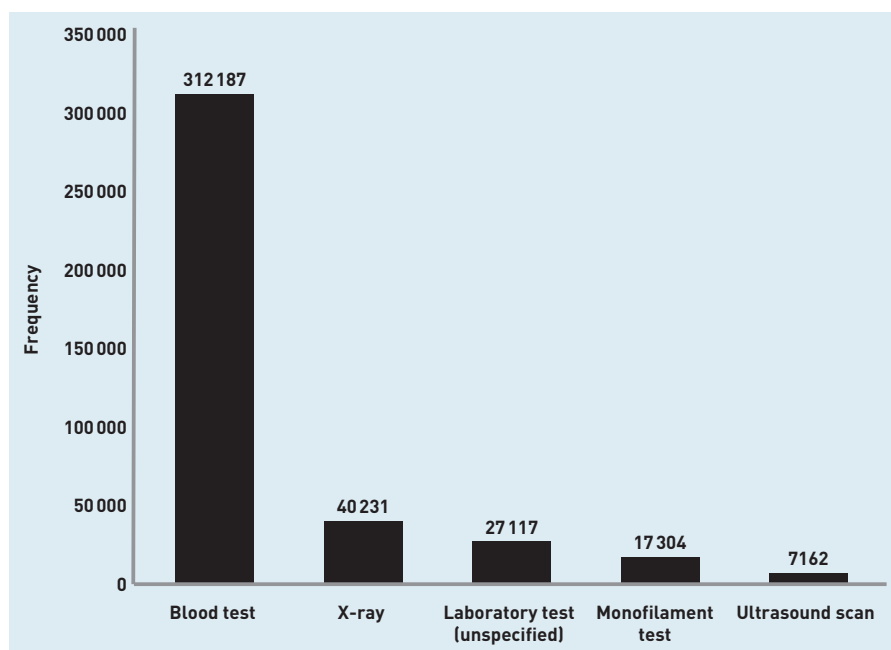


Figure 4. Frequency of the five most common test requests made by GPs.

reported for females (54.4%) is consistent with those of similar studies.^{4,6} Of note is the authors' inclusion of the full spectrum of patients' ages, whereas the majority of other similar investigations have focused on older age groups. When the authors performed additional analyses that excluded younger categories, the prevalence rate (32%) for participants >41 years was more comparable to that reported by others for those aged >50 years.^{7,15} This is consistent with other work that has reported consultation prevalence of musculoskeletal problems for any part of the lower limb increasing with age.^{4,6,15} Though this highlights that foot and/or ankle pain encounters are higher in older populations, the authors found that there are encounters at all ages. Very few studies report consultation rates for foot problems in children. One investigation using the Consultations in Primary Care Archive (CiPCA), North Staffordshire, UK, found that for children aged <15 years the most commonly recorded region for musculoskeletal consultation was the foot.⁶ The authors' work further exposes a demand for children's foot care; though referral to a foot specialist such as a podiatrist is recommended for children's foot problems,¹⁶ such services remain underdeveloped in the UK.^{17,18}

Within the authors' findings, there was no clear pattern of foot and/or ankle pain and socioeconomic group, and no significant difference between the varying socioeconomic groups. However, regional variation in foot and/or ankle pain recording

frequency was noted. Socioeconomic disadvantage has been linked to diabetic foot ulceration¹⁹ yet, to the authors' knowledge, there are no similar large population studies that have reported on socioeconomic status and foot and/or ankle pain. The authors' observed patterns appear to match other studies using the CPRD to describe musculoskeletal phenomena, in which deprivation levels were higher in Northern England, Scotland, and South Wales than in Southern and Eastern England.²⁰

In the current study, those who drank alcohol also had more foot and/or ankle pain encounters than those who did not, and surprisingly, non-smokers had more recorded foot and/or ankle pain encounters than those who smoked, or were ex-smokers. However, as there is no control group for comparison, causality cannot be attributed to alcohol intake or not smoking. It is probable that these findings may be due to the patients included, and reflects the population prevalence of these characteristics — for example, lifestyle factors such as smoking and alcohol intake are well-established associates with lower socioeconomic status.²¹

Fewer people had an underlying diagnosis of diabetes (11.4%) than those who had a diagnosis of a musculoskeletal condition (14.3%), and only 1.2% recorded encounters under the foot and/or ankle pain codes for circulation, both of which are linked to smoking.²² Obesity is also greater among populations of lower socioeconomic status, and is often linked to foot pain.^{5,23,24} The findings in the current study are consistent, in that those with a higher BMI had more recorded GP encounters for foot and/or ankle pain than those with a lower BMI.

From the authors' results, the demand for management of foot and/or ankle pain for older adults is predominant. When stratified by age, those in the 71–80 years age group have the highest recorded rate of foot and/or ankle pain and the highest number of referrals being made or tests instigated by their GP. Surprisingly, the authors identified that the majority of referrals related to foot and/or ankle pain were to orthopaedic services, and the most frequent tests requested were blood tests. This is not dissimilar to the Australian data, in which patients defined as having foot OA were referred to orthopaedic surgeons 8.4 times per 100 foot and/or ankle encounters, and podiatrists 6.3 times per foot and/or ankle encounters.³

Implications for research and practice

The burden of foot and/or ankle pain

encounters recorded by UK GPs is not insubstantial; these data demonstrate that foot and/or ankle pain is reported at all age groups and that a high proportion of referrals are to orthopaedics. It is not known how many of these patients could be more cost- and clinically effectively managed within primary care foot care services and/or podiatry, as the authors did not directly identify patients who may have been better served by referral to a foot care and/or podiatry service. The authors recommend future work should focus on the design and implementation of a standardised referral template related to foot and/or ankle

pain to help GPs to reduce the number of inappropriate referrals to orthopaedics or imaging.²⁵ Further work should also focus on investigation of a 'first-contact practitioner service' for foot and/or ankle pain. Models of care for musculoskeletal conditions in primary care in the UK have recently been transformed by the involvement of 'first-contact' physiotherapists working within GP practices.^{25,26} Enabling people who have foot pain to self-refer to a similar model of care with a first-contact podiatrist and/or foot care service has the potential to significantly reduce the burden of foot and/or ankle pain on GPs.

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Ethical approval

Ethical approval was granted through the University of Southampton for the generation of the foot and ankle pain code list (ethics number 11557). For the overall body of work, the protocols were reviewed and approved by the Independent Scientific Advisory Committee of the CPRD (protocol number 15_182R2Mn).

Provenance

Freely submitted; externally peer reviewed.

Competing interests

The authors have declared no competing interests.

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