An Observational Study of Gout Prevalence and Quality of Care in a National Australian General Practice Population

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ABSTRACT. ***Objective.*** The central strategy for effective gout management is longterm urate-lowering therapy to maintain the serum urate at a level below 0.36 mmol/l. We sought to determine the prevalence of gout and the quality of care in a national Australian general practice population.

Methods. Data were from general practice point-of-care electronic records over a 5-year period (n = 1,479,449). Information was collected on patients with gout according to a validated definition. All patients who visited the same general practices over the study period formed the denominator group. We determined the estimated prevalence of gout, the frequency of allopurinol prescription, and serum urate testing, and the percentage of patients achieving a target serum urate level.

Results. The crude prevalence of gout in this general practice population was 1.54% (95% CI 1.52–1.56). Prevalence in men was 2.67% and in women 0.53%. Prevalence increased with age in both men and women (4.90%, 95% CI 4.82–4.99, in men > 65 yrs). Allopurinol was prescribed to 57% of patients with gout during the 5 years of the study. Only 55% of patients with gout had their serum urate tested at any time during the 5-year study period. A target serum urate concentration of < 0.36 mmol/l at any time during the 5-year study period was documented in 22.4% of all people with gout.

Conclusion. Gout is managed poorly in Australian primary care, with low levels of allopurinol prescribing and serum urate testing. Collectively, these factors probably contribute to low achievement of serum urate targets. (J Rheumatol First Release August 1 2015; doi:10.3899/jrheum.150310)

Key Indexing Terms:
GOUT SERUM URATE PREVALENCE QUALITY OF CARE

Gout is the most common inflammatory arthritis in men and is associated with functional impairment and significant comorbidity[1,2,3]. The prevalence of gout is increasing in developed countries[4,5].

Gout is a chronic disease of monosodium urate (MSU) crystal deposition that can be effectively treated with longterm urate-lowering therapy (ULT). This requires treating to a serum urate target, which for the majority of people with gout is likely to be below 0.36 mmol/l[6,7]. Reducing the serum urate below this level leads to dissolution of MSU crystals, reduction and eventual disappearance of acute flares, and the reduction of tophi[8]. Effective longterm management requires continuing ULT and intermittent monitoring of serum urate to ensure that the treatment target is achieved and maintained[6].

There is international evidence that gout is inadequately treated and that adherence to urate-lowering therapies is low[9,10]. For example, in a recent quality-of-care assessment in the United Kingdom, there were low levels of allopurinol prescription, infrequent serum urate and renal function testing, and very low rates of achievement of target serum urate levels documented[11]. Similar findings have been observed in North America and Europe[12,13].

Australia is a large country of 26 million people in the Pacific with 6 states (Queensland, New South Wales, Victoria, Western Australia, South Australia, and Tasmania) and 2 territories (Australian Capital Territory and the Northern Territory). It is a developed nation with a national health system similar to that of the United Kingdom and

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Canada. It has a gross domestic product of US$1.6 billion, which is around 10% of the United States. In Australia, little research has focused on the prevalence of gout, although a review suggested that the prevalence is increasing[14]. The aim of our present study was to estimate the contemporary prevalence of gout in Australia and assess the quality of gout care in a large general practice population. We used a national general practice dataset to assess gout prevalence, the proportion of allopurinol use, the frequency of serum urate testing, and achievement of the recommended serum urate target.

MATERIALS AND METHODS

The Australian healthcare environment. The Australian primary healthcare environment is made up of general practices with medically trained general practitioners (GP). These GP provide the primary medical care for patients, including pediatrics, psychiatry, surgery, and most travel medicine. When patients have medical problems they attend their GP, with the visit being largely subsidized by the federal government through taxation. GP are private small businesses or corporate organizations and are free to set fees above the government rebate, a policy that requires the patient to pay additional out-of-pocket expenses. If a prescription is issued, the patient pays a small partial charge and the remainder is covered by the federal government. If a GP recommends additional specialist care, then he or she will refer the patient either to a private specialist provider (which is also partly subsidized by the federal government) or to a specialist at a public hospital, where the treatment is free of charge. Emergency department attendance at a public hospital is also free of charge. Most patients will see their GP on a regular basis even if they also attend a specialist doctor, for general healthcare needs (such as screening, contraception, and vaccination) unrelated to their specialist health problem, and also to obtain repeat prescriptions of medication that may have been initiated by a specialist doctor.

Data collection. We used general practice data collected in point-of-care GP electronic medical records (Medical Director 3, http://medicaldirector.com; BestPractice, bpsoftware.net; and ZedMed, zedmed.com.au) supplied by Practice Profiles Pty Limited (PPPL). The data were collected across Australia for 5 years from December 1, 2008, to November 30, 2013, for those aged 20 years or older. These computer-based point-of-care systems are used by GP in their daily work to record notes, order laboratory tests and imaging investigations, and issue prescriptions. Data were available from all states except Tasmania and the Northern Territory because at the time of provision of data, no practices were providing data to PPPL from those states. There was no information about the size of the population that each GP practice drew its patients from.

Patient inclusion and disease definition. We defined gout using a validated method for population-wide epidemiological studies of gout[4,15,16,17]. A patient was defined as having gout if they had (1) been prescribed allopurinol, (2) been prescribed colchicine, or (3) been coded as having gout in their computerized GP record, including tophi, tophus, or podagra. Patients with leukemia and lymphoma were excluded. This definition has been used previously in population prevalence studies and validated using capture-recapture methodology[4,17].

Quality measures. Our study used as measures of gout care quality the proportion of patients prescribed urate-lowering medication, the number who had their serum urate checked, and the number who had a serum urate level below the target 0.36 mmol/l, a target widely recommended by the American College of Rheumatology, primary care guidelines, the European League Against Rheumatism, and other consensus guidelines[6,7,18,19]. The British Society for Rheumatology recommends a lower target of 0.30 mmol/l[20]. Similar quality measures have been used in other quality-of-care studies[11].

Statistical analyses. Prevalence was calculated by dividing the number of patients with gout (numerator) by the total number in the population (denominator). To define the denominator for prevalence estimation, we collected data on all visits to participating GP during the study time period. Patients within each practice have a unique identifier and consecutive visits to the same GP are therefore identifiable. We then calculated crude and World Health Organization (WHO) age-standardized prevalence of gout[21]. We determined prevalence by sex, age, smoking status, and socioeconomic status. We also ascertained allopurinol use, serum urate testing, and renal function in the participants. Socioeconomic status (SES) was defined using the Australian Bureau of Statistics Socio-Economic Indexes for Areas 2011: The Index of Relative Socio-Economic Disadvantage and applied by postcode[22]. The index allocates a score, with a low index score indicating the most disadvantage and a high index score indicating the least. There are 16 variables that make up this score including various percentages, such as of people who do not speak English well, of dwellings with no car, of people employed as low-skill community or personal service workers, of machinery operators, of drivers, of laborers, of unemployed people, of people with household income < A$20,799, and of children under 15 years old who live with jobless parents. Estimated glomerular filtration rate in those who had a serum creatinine measure was determined using the Modified Diet in Renal Disease formula[23].

To quantify how similar the study cohort was to the Australian general population, we used Australian Bureau of Statistics (ABS) population demographic statistics for the quarter ending December 2013. We then used the prop.test() function in R to determine whether the demographic proportions (sex, socioeconomic status, age, and state distribution) in the study cohort were significantly different from the Australian general population.

All analyses were completed in R. We fitted a modified Poisson regression model with main effects to estimate relative risks. The R function generalized linear models and the R packages sandwich and lmtest were used for estimation. These estimates were adjusted for first-order effects but not interactions. Prevalence estimates were calculated and age standardized to the WHO reference population to facilitate international comparisons. Linear trends were assessed with linear regression and r^2 and degrees of freedom reported with the p value.

To ascertain the most contemporary estimate of the proportion of those who had serum urate testing, we determined the frequency of serum urate testing in those with gout in the final year of the study. In addition, to estimate the rate of serum urate testing in those taking allopurinol in the final year, we assessed all patients with gout who received an allopurinol prescription in the final 15 months of the study. We used the time period of 15 months because those who received a prescription in the final 15 months of the study and were compliant would have been taking allopurinol in the final 12 months of the study, and would therefore enable estimation of the rate of serum urate testing in those taking allopurinol in the final 12 months of the study.

The study received approval from the University of Queensland Human Ethics Committee (#2014000393).

RESULTS

Participants. There were 1,479,449 unique patients seen in the general practices over the study time period who formed the population for denominator purposes. All comparisons of the denominator population with the ABS-reported Australian population were numerically similar; however, given the large population, the proportions were statistically significantly different (shown in Supplementary Table 1, available online at jrheum.org).

In total, there were 22,776 patients meeting the definition of gout. There were 12,208 patients coded as having gout,

Table 1. Prevalence of gout and relative risks by stratifying variables.

Factor	Gout	Population	Crude Prevalence, %	Relative Risk (95% CI)	p
Sex*					
Female	4185	783,049	0.53	1.00	
Male	18,583	696,400	2.67	4.78 (4.53–5.05)	< 0.0001
Smoking status					
Nonsmoker	3734	164,032	2.28	1.00	
Ex-smoker	3066	58,618	5.23	1.18 (1.13–1.24)	< 0.0001
Smoker	1605	99,628	1.61	0.76 (0.72–0.81)	< 0.0001
Age group, years					
20–24	66	131,606	0.05	1.00	
25–29	191	181,792	0.11	2.25 (1.38–3.65)	0.001
30–34	435	179,524	0.24	5.32 (3.38–8.37)	< 0.0001
35–39	646	149,358	0.43	9.2 (5.9–14.35)	< 0.0001
40–44	1109	142,190	0.78	16.32 (10.54–25.27)	< 0.0001
45–49	1383	121,326	1.14	23.34 (15.1–36.06)	< 0.0001
50–54	1701	116,694	1.46	29.57 (19.16–45.64)	< 0.0001
55–59	2034	105,049	1.94	39.92 (25.89–61.55)	< 0.0001
60–64	2637	95,807	2.75	55.66 (36.13–85.74)	< 0.0001
65–69	2849	85,236	3.34	64.27 (41.72–99.01)	< 0.0001
70–74	2625	60,150	4.36	80.43 (52.2–123.95)	< 0.0001
75–79	2452	44,142	5.55	97.3 (63.12–150)	< 0.0001
80–84	2121	31,559	6.72	113.06 (73.31–174.37)	< 0.0001
85+	2519	35,016	7.19	121.73 (78.96–187.68)	< 0.0001
Socioeconomic status					
1	4339	286,008	1.52	1.00	
2	4759	306,460	1.55	1.15 (1.06–1.24)	0.001
3	4224	281,400	1.5	1.24 (1.15–1.34)	< 0.0001
4	5240	284,295	1.84	1.71 (1.59–1.84)	< 0.0001
5	4119	305,623	1.35	1.04 (0.97–1.12)	0.306

* Data not available for all patients.

12,975 patients prescribed allopurinol, and 7688 patients prescribed colchicine. The overlapping ascertainment of the gout study groups is shown in Figure 1.

Prevalence and demographic trends. The crude prevalence of gout was 1.54% (95% CI 1.52–1.56). Age standardization resulted in a slightly lower estimate at 1.27% (95% CI 1.00–1.54).

The prevalence was about 5 times higher in men compared to women (Table 1). The prevalence of gout was lowest in current smokers, followed by nonsmokers and then ex-smokers. There was no clear trend in an association of gout prevalence by SES, with quintile 4 being elevated compared to the other quintiles but then quintile 5 being reduced. The estimated prevalence by age increased with very low numbers having gout in their 20s and increasing substantially in the elderly (Figure 2, and Supplementary Table 2, available online at jrheum.org). The prevalence rate increased steadily from 0.20% (95% CI 0.17–0.24%) in men aged 25–29 years to over 11.05% (95% CI 10.53–11.57%) in men older than 85 years. Women also showed a rising prevalence with age but the rates in premenopausal women were

Figure 1. Overlapping ascertainment of the groups used in the study. 1. Labeled as gout. 2. Allopurinol prescription. 3. Colchicine prescription.

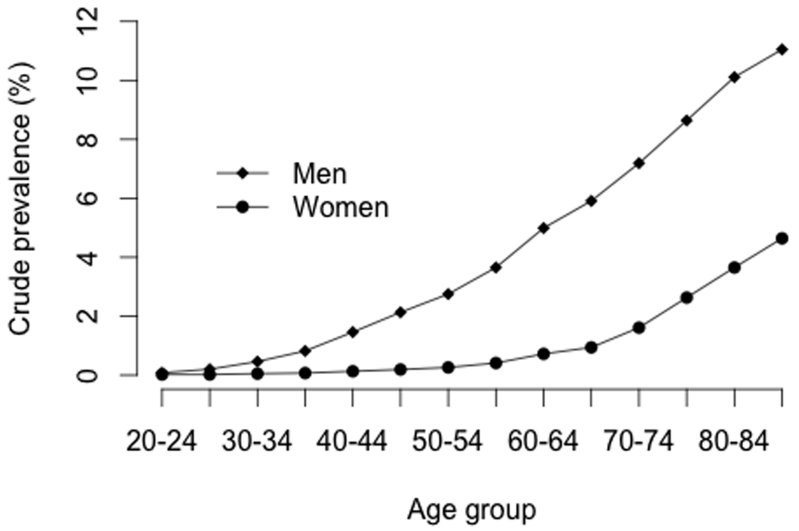

Figure 2. The crude prevalence of gout by age and sex.

Table 2. Serum urate (SU) testing by allopurinol prescription status.

	No. SU tested	Reference Population	Proportion
All gout	12,446	22,776	54.6%
Gout, taking allopurinol	7979	12,975	61.5%
Gout, not taking allopurinol	4467	9801	45.6%

low compared to men. The prevalence in women over 85 years of age was 4.64% (95% CI 4.35–4.92%).

Allopurinol use. In those patients defined as having gout (by coding, allopurinol prescription, or colchicine prescription), 12,975/22,776 (57.0%) had an allopurinol prescription at any time over the 5-year study period. Allopurinol use was higher in males (10,858/18,583, 58.4%) compared to females (2,122/4,185, 50.7%, $p < 0.0001$). Allopurinol use also increased with age: prescribed in 565/1338 (42.2%) of those 20 to 39 years, 4689/8868 (52.9%) of those 40 to 64 years, and 7726/12,570 (61.5%) of those aged 65 years and over ($p < 0.0001$ for all comparisons). In patients who were coded with a diagnosis of gout, 5200/12,208 (42.6%) had a prescription for allopurinol at any time over the 5-year study period.

Frequency of serum urate testing and serum urate target achievement. Serum urate was tested at any time over the 5-year study period in 12,446/22,776 (54.6%) of patients with gout. The frequency of serum urate testing was significantly greater in those who were taking allopurinol (61.5% vs 45.6%, $p < 0.001$; Table 2). The estimated frequency of serum urate testing in those with gout in the final year of the study was 5656/22,776 (24.4%). The estimated rate of serum urate testing in those taking allopurinol in the final year of the study was 3717/8633 (43.1%).

In the patients with a serum urate test during the 5-year study period, 5093/12,446 (40.9%) had a target serum urate level (< 0.36 mmol/) recorded on at least 1 occasion. In those with serum creatinine and urate tests available (n = 2244), there was a progressive decrease in proportion of patients achieving the serum urate target with worsening stage of chronic kidney disease ($p = 0.005$, degrees of freedom = 3, $r^2 = 0.93$). In total, 5093/22,776 (22.4%) of all patients with gout had a serum urate level below target (0.36 mmol/l) documented at any time during the 5-year period.

DISCUSSION

In our study, the contemporary crude national prevalence of gout in an Australian population of GP attendees was 1.54%. The absolute prevalence of gout in this population is consistent with GP data from Germany. In 2000 to 2005, the prevalence of gout in GP populations in Germany was 1.4%[13]. In 2012 the prevalence of gout in the United Kingdom was 2.5%[24]. Prevalence data from a US National Health and Nutrition Examination Survey (NHANES) in 2007 to 2008 reported a rate of 3.9%[5]. However, the NHANES study was a general population study, not a GP attendee population study. The reasons for such diverse estimates of gout prevalence from countries with similar levels of development may relate to individual study design (particularly case ascertainment), health-seeking behavior, or the contribution of environmental factors specific to each country such as diet.

A recent metaanalysis examining gout prevalence found high heterogeneity in studies (I^2 = 99.9%), with an unweighted mean prevalence of 1.6% and a pooled estimated prevalence of 0.6% (95% CI 0.4–0.7)[25]. Our study found demographic patterns of gout similar to those seen in other studies, with more men than women and prevalence increasing substantially with age.

Our study found that only 55% of patients with gout had their serum urate tested in the 5 years of the study. In GP cohorts in Germany and the United Kingdom over a period of 3.5 to 5 years, 9% and 14% had a serum urate test, respectively[13]. This suggests that testing in Australia is higher than in these comparable countries. This may be because urate is often assayed as part of routine biochemistry analyses in Australia, and that may not be the case in the United Kingdom and Germany.

We observed very low levels of achievement of target serum urate concentrations over the 5-year period. These results were similar to a large US claims study that found that 21% of treated patients with gout had serum urate levels below target[26]. In our study, allopurinol was prescribed to only 43% of patients labeled as having gout in GP records and 57% of patients defined as having gout by the validated combined drug-labeling definition in the 5 years of the study. The rate of allopurinol prescription in GP cohorts from 2000 to 2005 in the United Kingdom and Germany was 56% and 79%, respectively[13]. In a large US managed-care population in 1999 to 2004, 40% had a prescription of allopurinol. In New Zealand it was estimated that 57% of patients with gout in 2010/2011 were taking allopurinol[15]. The proportion of patients who had a serum urate level below target decreased as renal function declined. This might represent underdosing in those with chronic kidney disease (CKD) because of a fear of increased adverse events in CKD, and has been noted previously[27]. Collectively, the results of the current study support previous international research findings that primary care patients with gout are often not treated with urate-lowering therapy and they do not have their serum urate tested as often as recommended by the American College of Rheumatology and primary care gout guidelines[6,19,28].

Our study found no association between area level SES and gout. Previous studies from New Zealand have found this association; however, research from England found only an association at an individual level between income and gout but not using an area level measure of deprivation[4,29].

There are a number of limitations that should be considered when interpreting the results of our study. The definition of gout we used for the study is not 100% sensitive or specific. The validity of a GP label of gout is moderate based on urate crystal identification as a gold standard[30,31]. A small number of medical conditions such as asymptomatic hyperuricemia, uric acid kidney stones, and familial Mediterranean fever are treated with agents such as allopurinol and colchicine. However, the number of patients in these groups is very small. We specifically excluded patients with leukemia and lymphoma, because these conditions can be treated with allopurinol.

Owing to the data source and the absence of Tasmania and the Northern Territory (which together have 3% of the Australian population), the sample is not completely representative of the Australian population. It is known that there are more Australian Aborigines in the Northern Territory. Numerically, the proportions of sex, age, and SES were similar to the general population; however, the large size of the comparator population means small differences generate statistically significant results. Although we could detect patients who visited the same practice repeatedly as the same patient, we were unable to identify return visits as the same patient if they visited a different participating practice. There would also have been patients who visited a practice from which we collected data and then left for a non-data practice for subsequent care during the study period, and vice versa. Because we only recorded people with gout who visited a GP, there is also the potential to underestimate gout prevalence. Using allopurinol as an inclusion criterion and also as an outcome introduces a degree of circularity, but the use of allopurinol as an inclusion criterion clearly identifies a large proportion of patients with gout who would otherwise be missed because they are not labeled as gout by their GP or prescribed colchicine.

It is likely that almost all patients seen in secondary care justify pharmacological treatment, but the same is not true for primary care patients with gout. Information on the proportions justifying treatment is dependent on the guideline used to treat and the population. The authors are not aware of any information that is published on the likely size of each of these 2 groups, and they would also vary in size depending on the above factors. This therefore is a limitation for all research in this area, and limits the conclusions that can be drawn on the size of the undertreatment evidence in research such as this in primary care. The reasons for the widespread undertreatment of gout may relate to the perceived unavailability of adequate therapy, fear of medication side effects, or poor knowledge of treatments or consequences of undertreatment[10]. Another reason may also be the lack of evidence from randomized controlled trials that reduction of urate reduces gout flares; however, other evidence supports this premise[32,33]. Allopurinol is effective when used appropriately, but appropriate use requires slow up-titration, appropriate flare prophylaxis, and awareness of the potentially serious side effects[34].

A further barrier to effective gout management may be the perception of healthcare professionals that gout is a trivial, self-inflicted condition that does not require regular therapy beyond treatment of acute attacks[10]. Contrary to these beliefs, gout is associated with substantial pain, functional disability, significant comorbidity, and reduced quality of life, as well as social stigma[1,35,36]. Recognition that gout is common and poorly managed is the first step toward improving the quality of care for people with gout.

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ONLINE SUPPLEMENT

Supplementary data for this article are available online at jrheum.org.

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