

Ambulatory Resource Utilization and Cost for Gout in United States

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ABSTRACT

Objectives: To estimate the ambulatory care utilization and cost associated with gout in the United States.

Methods: Data were from the 2002 to 2008 National Ambulatory Medical Care Survey and National Hospital Ambulatory Medical Care Survey. Visits associated with gout were identified based on physician diagnosis codes, reason for visit codes, and medications mentioned during the visits. Rates of visits per 1000 persons per year in the US population were estimated using census data. Average costs for visits and prescriptions obtained from a commercial administrative claims database were applied to the estimated utilization counts to estimate US costs as 2009 dollars. Logistic regression was used to examine patient characteristics associated with ambulatory visits for gout. Data were analyzed using Stata 9.2, accounting for complex survey design, and weights were applied to generate national estimates.

Results: Between 2002 and 2008, an estimated 7 million ambulatory visits annually were associated with gout, with 2 million (28%) of them attributable to gouty arthritis attacks. The rate was 24.18 gout-related visits per 1000 persons per year, which more than doubled from 2002 to 2008. Total ambulatory care costs associated with gout were estimated at \$933 million annually, 32% for gouty arthritis attacks and 61% for prescription drugs.

Conclusions: The annual ambulatory care costs associated with gout may be as high as \$1 billion annually with 32% of the costs attributed to gouty arthritis attacks. Annual rates of gout-related ambulatory visits more than doubled from 2002 to 2008 and increased profoundly with age.

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Gouty arthritis, or gout, is an inflammatory condition associated with the crystallization of monosodium urate within synovial joints. It is the most common inflammatory joint disease for men over 40 years of age.¹⁻³ Women are less likely to experience gout,^{1,3,4} and primarily develop it after menopause.^{1,2} Acute gouty arthritis attacks are the most common clinical findings in patients with gout and present as acutely inflamed and painful joints.^{5,6} Following diagnosis, gouty arthritis attacks may continue due to persistently elevated uric acid levels and inflammation.⁵⁻⁷ Most untreated patients will experience a second attack within 2 years of the initial attack,² and 6.5% of patients with gout may experience 3 or more gouty arthritis attacks per year.⁸

Gout is increasingly prevalent in the United States and creates a heavy economic burden. Approximately 8.3 million US adults were affected in 2007 and 2008, representing a 35% increase in age-adjusted prevalence from 2 decades ago.⁹ Annual direct costs for new cases of acute gout in US men are estimated to be \$27.4 million (in 2003 dollars).¹ Employed gout patients incur significantly higher costs for medical and prescription claims, sick leave, short-term disability, and workers' compensation benefits; the incremental annual healthcare cost (compared with employees without gout) was estimated to be \$987 million in the United States.¹⁰

Although gout-related healthcare utilization and costs have been estimated for men,¹ employed individuals,¹⁰ elderly patients,¹¹ and managed care population,⁸ nationally representative estimates are lacking. The objectives of this study were to (1) describe ambulatory medical care resource utilization and prescribing patterns for patients with gout as well as the associated costs and (2) examine patient characteristics associated with visits for gout.

METHODS

Data Source

Data were from the 2002 to 2008 National Ambulatory Medical Care Survey (NAMCS) and National Hospital Ambulatory Medical Care Survey (NHAMCS), annual surveys

conducted by the National Center for Health Statistics (NCHS) at the Centers for Disease Control and Prevention. The National Ambulatory Medical Care Survey is designed to generate nationally representative estimates of visits to nonfederal, office-based physicians providing direct patient care in the 50 states or District of Columbia, excluding radiologists, anesthesiologists, and pathologists. The National Hospital Ambulatory Medical Care Survey produces nationally representative estimates of visits to emergency departments (EDs) and outpatient department (OPD) clinics of short-stay or general hospitals, excluding federal, military, and Veterans Administration hospitals. Details on the sampling and estimation process are available at the NCHS website (www.cdc.gov/nchs/). We also used population estimates from the US Census Bureau in the rate calculations. Average costs for visits and medications obtained from a large commercial administrative claims database were used to estimate US costs expressed in 2009 dollars.

Case Definitions

Gout-related office-based physician visits (NAMCS) and OPD and ED visits (NHAMCS) were identified based on physicians' diagnosis codes, reason for visit (RFV) codes, and use of anti-gout/anti-hyperuricemia agents. For each visit, the surveys record up to 3 diagnoses (the first is the primary diagnosis) coded using the *International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM)* codes, and up to 3 RFV codes (the first is the major reason). The RFV codes are based on patients' complaints, symptoms, or other reasons for visit and are coded centrally by trained NCHS personnel using a standard RFV classification.¹² Additionally, up to 8 medications (up to 6 in 2002) ordered, provided, or continued during a visit are recorded. Drugs are classified using Multum Lexicon therapeutic categories, a proprietary database of all prescriptions and some nonprescription drug products available in the United States.¹³ Multum classification was adopted by NAMCS/NHAMCS in 2006. For years 2002 to 2005, a mapping file provided by NCHS was used to match drug codes with the corresponding 2006 Multum codes for generic composition of the drugs and their corresponding therapeutic categories.¹³

Gout-Related Visits. Gout-related visits were operationally defined as those with either a diagnosis of gout (*ICD-9-CM* code 274.XX), an RFV code of 2210.0 (gout, hyperuricemia), or a drug mention of any anti-gout/anti-hyperuricemia agents (allopurinol, colchicine, probenecid, probenecid-colchicine combination). Febuxostat

PRACTICAL IMPLICATIONS

Annual rates of gout-related ambulatory visits more than doubled from 2002 to 2008 and increased profoundly with age, suggesting that as the population ages, gout will represent an increasing burden on the healthcare system.

- Annual ambulatory care costs associated with gout may reach \$1 billion annually with 32% of the costs attributed to gouty arthritis attacks.
- Drug expenditures accounted for about \$6 of every \$10 spent for ambulatory care of gout.

(approved in 2009 in the United States) was not available for the years examined. Sulfinpyrazone was not detected in the database. Because allopurinol is also approved for treatment of hyperuricemia in cancer patients undergoing chemotherapy,^{14,15} we excluded visits with a drug mention of allopurinol (without gout-related diagnosis, RFV code, or mentions of other anti-gout/anti-hyperuricemia agents) and evidence of cancer (*ICD-9-CM* diagnosis codes 140–239.9, V10.xx, V58.0, V58.1, V66.1, V66.2, V67.1, V67.2; RFV codes for neoplasm [2100-2199]; or medication mentions of anti-neoplastic medications).^{14,15}

Visits Related to Gouty Arthritis Attacks. Among gout-related visits, we identified visits for gouty arthritis attacks. The definition of ED visits for gouty arthritis attacks differed slightly from those for office or OPD visits due to the acute nature of ED visits in general.

Office and Outpatient Department Visits. An office or OPD visit was considered to be related to a gouty arthritis attack if (1) gout was the primary diagnosis or RFV and the visit was marked on the patient record form by the responding provider either as a “new problem (onset within last 3 months)” or a “chronic problem flare”; (2) the visit had a joint- or joint pain–related diagnosis code (**Appendix A**), or a joint pain or pain symptoms RFV code (**Appendix B**) with a drug mention of colchicine; or (3) gout was a diagnosis or RFV with a drug mention of colchicine, nonspecific analgesics (nonsteroidal anti-inflammatory drugs [NSAIDs], cyclooxygenase 2 inhibitors, narcotics/combination, acetaminophen, or other analgesic combination drugs), adrenocorticotrophic hormone (ACTH)/corticotrophin, corticosteroids, or a gout-related procedure. The following procedures coded using Volume 3 *ICD-9-CM* procedure codes were considered gout related if they were present in conjunction with the 3 criteria described above: microscopic examination of specimen from musculoskeletal system/joint fluid (91.5X),

joint aspiration (81.91), injection of therapeutic substance into joint or ligament (81.92), injection of steroid (99.23), and aspiration biopsy of joint structure (80.3x). In addition, we used the variable provided in the public-use files indicating any orthopedic care, including “reduction, casting, wrapping, splinting, and aspiration of fluid from joints,” conducted during a visit.¹³

ED Visits. An ED visit was considered to be related to a gouty arthritis attack if (1) gout was the primary diagnosis or major RFV; (2) there was a drug mention of colchicine regardless of the diagnoses or reasons for visit; or (3) gout was the secondary diagnosis or RFV with 1 of the following conditions satisfied: a primary diagnosis of joint- or joint pain–related conditions (Appendix A), a major RFV code for joint pain or pain symptoms (Appendix B), or drug mentions of nonspecific analgesics as listed above, ACTH/corticotrophin, or corticosteroids. Gout-related procedures could not be identified in the ED files because the procedure codes were not recorded and the question regarding orthopedic care was not asked in the ED portion of NHAMCS.

Data Analysis

Rate Calculation. The rate of gout visits was calculated as the number of visits per 1000 persons per year. The base population estimates used to compute the annual rates and the rates stratified by age, sex, race, ethnicity, and geographic regions were the mid-year resident population estimates from the US Census Bureau and were considered free of sampling errors. Differences in the rates of visits across groups and over time were compared using design-adjusted F tests.

Multivariate Analysis of Factors Associated With Gout-Related Visits. Multivariate logistic regressions were estimated to determine patient characteristics associated with gout-related ambulatory care visits among those who had any ambulatory visits. The regression models were adjusted for patient age, sex, geographic location, payment type (defined hierarchically as Medicaid, Medicare, private insurance, self-pay/no pay/charity care, or other), indicator for a metropolitan statistical area as a proxy for urban versus rural location, and comorbidities (hypertension, diabetes, metabolic syndrome, renal diseases, nongouty arthritis, heart failure, ischemic heart disease, or cerebrovascular disease) identified based on the treating physician’s diagnoses (see [Appendix C](#) for a list of *ICD-9-CM* codes used). Yearly dummies were also included for checking temporal changes. Adjusted odds ratios (AORs) and 95% confidence intervals (CIs) are reported.

Cost Analysis. Information on costs or charges is not reported by NAMCS and NHAMCS. Average costs for visits and medications obtained from a large commercial claims database for 2009 were applied to the estimated visit counts from NAMCS and NHAMCS. Costs were expressed in 2009 dollars. Because a portion of gout-related visits had primary diagnoses or RFVs other than gout, gout may represent only a small component of the care delivered during these visits. A more conservative “gout-specific” cost estimate was also provided, which included only the costs associated with visits where gout was the primary diagnosis or RFV and drug costs of anti-gout/anti-hyperuricemia agents, so that the ambulatory care costs could be more clearly attributed to gout.

For all analyses, sampling weights were applied to generate nationally representative estimates. Analyses were conducted using Stata statistical software, release 9.2 (StataCorp LP, College Station, Texas). We used SVY commands to account for the complex survey designs of the NAMCS and NHAMCS. As advised by NCHS, estimates based on fewer than 30 unweighted cases or with standard errors greater than 30% of the estimated values were considered statistically unreliable,¹³ and are denoted in the tables and figures.

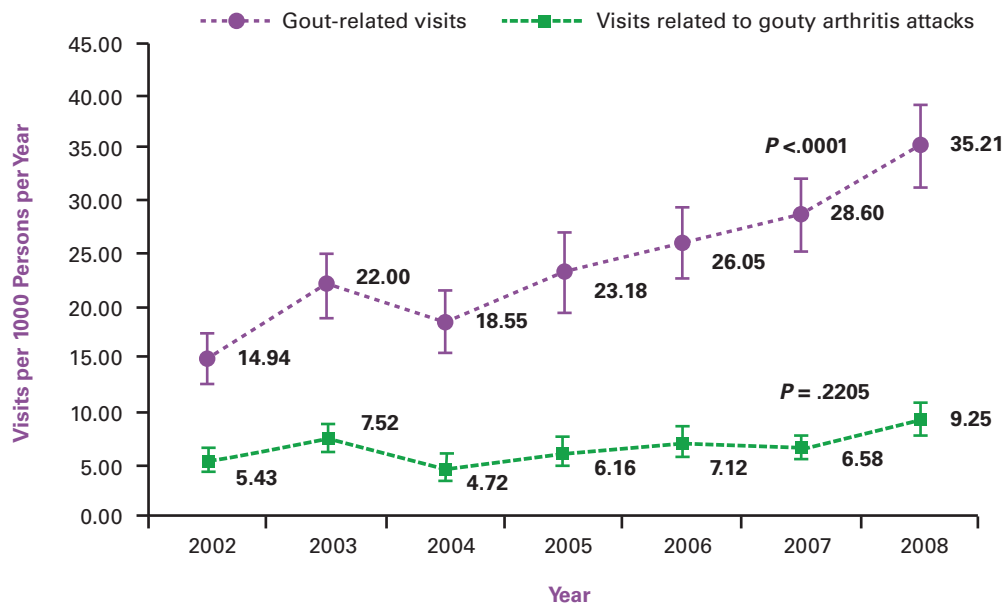
Human Subject Research

This study used only de-identified public-use databases and was determined to be exempt from review by the University of Arkansas for Medical Sciences Internal Review Board.

RESULTS

From 2002 to 2008, 50.1 million ambulatory visits (or 7.2 million annually) were related to gout, with 13.9 million (28%) of them attributable to gouty arthritis attacks. Although the total number of ambulatory visits for all causes remained unchanged during these years, gout-related visits more than doubled from 14.9 (95% CI, 10.4–19.5) visits per 1000 persons per year in 2002 to 35.2 (95% CI, 27.4–43.0) visits in 2008 ($P < .001$) ([Figure 1](#)). Most gout-related visits (89%) and visits for gouty arthritis attacks (80%) occurred in physician offices; and 4% and 13% of gout-related visits and visits for gouty arthritis attacks, respectively, occurred in EDs, with the remainder in OPD clinics.

Rates for gout-related visits increased substantially with age and were more than twice as high in males. Although the overall rates for gout-related visits were similar between whites and blacks, gout-related visits occurring in EDs were more than 2 times more frequent in

Figure 1. Annual Rate of Ambulatory Visits Related to Gout and Gouty Arthritis Attacks: 2002 to 2008 NAMCS and NHAMCS^a

NAMCS indicates National Ambulatory Medical Care Survey; NHAMCS, National Hospital Ambulatory Medical Care Survey.
^aError bars are the estimated standard errors, adjusting for the complex survey designs of NAMCS and NHAMCS.

blacks than in whites. The rate of gout-related visits for Hispanics was 60% lower than that for non-Hispanics, but these visits were more likely to occur in EDs ($P = .037$). There were no regional differences in the overall visit rates for gout, but the Midwestern region had the lowest ED rates ($P = .010$) (Table 1).

Among patients with an ambulatory visit, the likelihood of a gout-related visit increased with age and was lower among females, Hispanics, and those residing in the Northeast, South, or metropolitan statistical areas. After controlling for demographic characteristics and geographic regions, diagnoses of renal diseases (AOR = 5.26; 95% CI, 3.72-7.44), hypertension (AOR = 2.23; 95% CI, 1.79-2.78), diabetes (AOR = 1.45; 95% CI, 1.14-1.83), heart failure (AOR = 2.02; 95% CI, 1.36-2.99), and nongouty arthritis (AOR = 1.51; 95% CI, 1.00-2.29) increased the likelihood of a gout-related ambulatory visit. Gout-related visits were less likely to occur in EDs than in physician offices (AOR = 0.60; 95% CI, 0.51-0.71). However, visits for gouty arthritis attacks were more likely to occur in EDs than in physician offices (AOR = 1.58; 95% CI, 1.24-1.99) (Table 2).

Table 3 shows medications reported during gout-related visits and visits for gouty arthritis attacks by therapeutic classes. Allopurinol (64%), NSAIDs (20%), and colchicine (17%) were the most frequently recorded medications during gout-related visits. For visits associated with gouty

arthritis attacks, NSAIDs (44%), colchicine (28%), and allopurinol (25%) were most frequently recorded.

The total annual direct ambulatory care costs associated with gout were estimated at \$933 million (Figure 2), with 32% (\$297 million) attributed to gouty arthritis attacks (Appendix D). Drug costs accounted for 61% of the total costs. Gout-specific costs were estimated at \$286 million annually (or 31% of the total estimated gout-related ambulatory care costs) (Figure 2). The ambulatory visits with gout as the primary diagnosis or major RFV were estimated to be 1.4 million per year, accounting for 19% of the total estimated gout-related visits.

DISCUSSION

In this study, gout was associated with substantial health resource utilization and costs. Annually, 7.2 million ambulatory visits were related to gout between 2002 and 2008. Annual ambulatory care costs in which gout is at least a component of the care may be near \$1 billion, which is similar to the previously reported \$987 million incremental costs of gout.¹⁰ When only care provided primarily for the management of gout is considered, the costs approach \$300 million annually. Drug expenditures accounted for about \$6 of every \$10 spent for ambulatory care of gout, reflecting the recommended pharmacotherapy-intensive approach for managing gout and gouty arthritis attacks.¹⁶

Table 1. Rate of Gout-Related Ambulatory Visits by Selected Patient Characteristics: 2002 to 2008 NAMCS and NHAMCS

Characteristics	Estimated Number of Visits (Annualized)	Percentage	Visits per 1000 Persons per Year							Gouty Arthritis-Related Visits	
			Combined Setting		OB	OPD	ED	P ^a	Rate	95% CI	
			Rate	95% CI	Rate	Rate	Rate				
Total	7,156,698	100.00	24.18	20.79-27.58	21.61	1.49	1.08		6.70	5.59-7.81	
Age, y											
<45	602,828	8.42	3.23	2.40-4.06	2.40	0.39	0.44	<.001	1.48	1.04-1.93	
45-54	1,059,427	14.80	25.09	19.38-30.80	21.60	1.83	1.66		10.19	6.91-13.47	
55-64	1,464,020	20.46	48.45	39.19-57.72	43.00	3.38	2.08		14.55	10.36-18.73	
65-74	1,861,019	26.00	98.45	78.13-118.77	90.47	5.52	2.45		25.34	18.51-32.18	
≥75	2,169,405	30.31	120.51	100.92-140.11	112.49	4.75	3.27		19.83	13.66-26.00	
Sex											
Male	5,176,242	72.33	34.44	29.22-39.67	30.83	2.05	1.57	.460	10.00	8.12-11.88	
Female	1,980,456	27.67	13.60	11.20-16.00	12.10	0.93	0.57		3.30	2.44-4.16	
Race											
White	5,749,162	80.33	23.98	20.24-27.72	21.90	1.23	0.85	<.001	5.90	4.75-7.05	
Black	904,259	12.64	23.18	18.02-28.34	17.34	3.20	2.64		10.61	7.50-13.71	
Other	503,277	7.03	29.28	18.91-39.64	27.24	1.33	0.71		8.99	4.12-13.86	
Ethnicity											
Hispanic	421,434	5.89	9.89	6.49-13.28	8.40	0.64	0.84	.037	3.20	1.60-4.80	
Non-Hispanic	6,735,264	94.11	26.59	22.81-30.37	23.83	1.64	1.12		7.29	6.02-8.56	
Region											
Northeast	1,299,918	18.16	23.80	15.75-31.86	20.75	2.04	1.01	.010	6.94	3.89-10.00	
Midwest	1,676,650	23.43	25.47	17.68-33.26	22.91	1.92	0.64		5.54	3.73-7.35	
South	2,576,728	36.00	23.97	18.33-29.61	21.18	1.46	1.33		8.17	6.11-10.23	
West	1,603,401	22.40	23.58	17.24-29.92	21.73	0.70	1.15		5.30	3.41-7.20	

CI indicates confidence interval; ED, emergency department; NAMCS, National Ambulatory Medical Care Survey; NHAMCS, National Hospital Ambulatory Medical Care Survey; OB, office-based; OPD, outpatient department.

^aP values are for χ^2 tests comparing patient demographic and clinic characteristics across settings.

Trend

During the years 2002 to 2008, gout-related ambulatory visits increased significantly, with the number of visits in 2008 more than double that in 2002. This trend likely reflects the increasing prevalence of gout and/or more intensive ambulatory management as patients age and the disease progresses over time. According to the most recent estimates, the age-adjusted prevalence in US adults increased by 34% from 1988 to 1994 (2.9%) to 2007 to 2008 (3.9%).⁹ The increasing prevalence of gout has been attributed to an aging population, an increasing prevalence of comorbidities, drug use that elevates the risk of gout, and changing diets and lifestyles.³

Management of Gout

Controlling uric acid levels is key to the management of gout. The incidence of gouty arthritis attacks most closely correlates with elevated uric acid levels.¹⁷⁻¹⁹ In

this study, allopurinol was the most frequently used anti-hyperuricemia agent, which was recorded during 64% of gout-related visits and 25% of visits for gouty arthritis attacks. Preference for allopurinol was also observed in other studies.^{11,19} Although allopurinol has been the mainstay of chronic management of hyperuricemia for decades, clinical results with allopurinol were often sub-optimal¹⁹ due to low adherence and subtherapeutic dosing.^{3,14,18,20} Probenecid use was rare and reported in only 3.3% of gout-related visits.

Management of Gouty Arthritis Attacks

The standard pharmacotherapies for acute gouty arthritis attacks are NSAIDs, colchicine, or corticosteroids, which “nonselectively inhibit pathways of the neutrophil-driven inflammation that is characteristic of acute gout.”²¹ Consistent with those recommendations, we found NSAIDs (44%) and colchicine (28%) were the most

Table 2. Adjusted Odds Ratios for Ambulatory Visits Related to Gout and Gouty Arthritis Attacks: 2002 to 2008 NAMCS and NHAMCS

Characteristics	Gout-Related Visits			Visits for Gouty Arthritis Attacks		
	AOR	95% CI	P	AOR	95% CI	P
Age, y (reference, <45 y)						
45-54	4.86	3.64-6.49	<.001	4.95	3.24-7.58	<.001
55-64	6.50	4.84-8.73	<.001	5.31	3.47-8.14	<.001
65-74	8.50	6.03-11.98	<.001	5.37	3.14-9.16	<.001
≥75	9.68	6.94-13.51	<.001	3.89	2.33-6.51	<.001
Female (reference, male)						
	0.27	0.23-0.32	<.001	0.22	0.16-0.29	<.001
Race (reference, white)						
Black	1.26	1.06-1.49	.009	2.16	1.59-2.93	<.001
Other	1.56	1.17-2.07	.003	2.44	1.47-4.06	.001
Hispanic (reference, non-Hispanic)						
	0.61	0.47-0.80	<.001	0.79	0.48-1.32	.370
Payment type defined hierarchically (reference, private)						
Medicaid	1.07	0.80-1.43	.663	0.86	0.57-1.28	.456
Medicare	1.11	0.91-1.37	.311	1.34	0.92-1.96	.125
Self-pay/no pay/charity	1.09	0.79-1.52	.591	1.54	0.96-2.47	.072
Other	0.79	0.56-1.12	.189	0.41	0.22-0.76	.005
Region (reference, West)						
Northeast	0.75	0.59-0.94	.015	0.97	0.63-1.49	.891
Midwest	0.89	0.71-1.12	.338	0.83	0.55-1.24	.352
South	0.78	0.64-0.95	.014	1.09	0.77-1.56	.626
Non-MSA (reference, MSA)						
	1.44	1.14-1.83	.002	1.90	1.38-2.61	<.001
Comorbidities						
Hypertension	2.23	1.79-2.78	<.001	1.94	1.38-2.73	<.001
Diabetes	1.45	1.14-1.83	.002	0.73	0.43-1.23	.241
Metabolic syndrome	0.98	0.74-1.31	.916	0.78	0.45-1.36	.376
Ischemic heart disease	1.20	0.93-1.54	.168	–	–	–
Renal diseases	5.26	3.72-7.44	<.001	–	–	–
Nongouty arthritis	1.51	1.00-2.29	.049	2.60	1.56-4.33	<.001
Heart failure	2.02	1.36-2.99	<.001	–	–	–
Cerebrovascular disease	1.38	0.83-2.29	.217	–	–	–
Setting (reference, OB visits)						
ED	0.60	0.51-0.71	<.001	1.58	1.24-1.99	<.001
OPD	0.86	0.73-1.02	.079	1.01	0.78-1.30	.965
Year (reference, 2002)						
2003	1.46	1.04-2.07	.031	1.36	0.82-2.25	.236
2004	1.21	0.85-1.73	.295	0.83	0.44-1.56	.563
2005	1.45	1.02-2.04	.036	1.07	0.62-1.84	.821
2006	1.73	1.27-2.38	.001	1.30	0.77-2.19	.322
2007	1.74	1.27-2.37	.001	1.07	0.69-1.69	.754
2008	2.11	1.57-2.83	<.001	1.60	1.01-2.54	.046

AOR indicates adjusted odds ratio; CI, confidence interval; ED, emergency department; MSA, metropolitan statistical area; NAMCS, National Ambulatory Medical Care Survey; NHAMCS, National Hospital Ambulatory Medical Care Survey; OB, office-based; OPD, outpatient department.

Table 3. Medications Reported During Ambulatory Visits Related to Gout and Gouty Arthritis Attacks: 2002 to 2008 NAMCS and NHAMCS^a

Medications	Gout-Related Visits						Visits for Gouty Arthritis Attacks					
	All			By Setting			All			By Setting		
	Un-weighted Number of Visits	Esti-mated Number of Visits	Total Gout-Related Visits, %	OB %	OPD %	ED %	Un-weighted Number of Visits	Esti-mated Number of Visits	Total Visits for Gouty Arthritis Attacks, %	OB %	OPD %	ED %
Anti-gout/anti-hyperuricemia agents												
Allopurinol	1463	4,547,192	63.54	66.20	57.52	18.59	175	493,313	24.88	27.09	31.85	6.96
Colchicine	556	1,205,179	16.84	16.02	26.73	19.58	307	545,317	27.50	27.45	32.83	24.76
Probenecid	92	233,786	3.27	3.36	1.36 ^b	4.09	10 ^b	38,250 ^b	1.93 ^b	2.28 ^b	1.33 ^b	0.05 ^b
Other	21 ^b	58,414 ^b	0.82 ^b	0.76 ^b	1.60 ^b	0.87 ^b	3 ^b	1885 ^b	0.10 ^b	0.08 ^b	0.00 ^b	0.25 ^b
Analgesics												
NSAIDs	704	1,417,399	19.81	18.04	22.62	51.29	527	875,239	44.14	40.91	51.85	59.99
Narcotics/narcotic combinations	522	767,857	10.73	8.83	14.08	44.22	350	383,810	19.36	14.22	22.81	49.60
Salicylates	434	1,134,710	15.86	16.04	20.08	6.22	90	224,416	11.32	12.41	13.74	3.09 ^b
COX-2 inhibitors	89	311,826	4.36	4.63	2.75 ^b	1.13 ^b	33	89,611	4.52	5.46 ^b	1.06 ^b	0.60 ^b
Other analgesics	140	285,157	3.98	3.69	6.22	6.87	70	117,536	5.93	5.37 ^b	11.2 ^b	6.36
Adrenal cortical steroids												
Glucocorticosteroids/mineralocorticosteroids	234	606,600	8.48	8.24	8.55	13.14	154	334,457	16.87	17.32	14.49	15.39
ACTH/corticotrophin	1	—	—	—	—	—	1	—	—	—	—	—

ACTH indicates adrenocorticotropic hormone; COX-2, cyclooxygenase 2; ED, emergency department; NAMCS, National Ambulatory Medical Care Survey; NHAMCS, National Hospital Ambulatory Medical Care Survey; NSAID, nonsteroidal anti-inflammatory drug; OB, office-based; OPD, outpatient department.

^aEstimates were weighted estimates and adjusted for survey designs of NAMCS and NHAMCS unless otherwise noted.

^bEstimates were based on fewer than 30 unweighted cases.

frequently recorded medications during visits for gouty arthritis attacks. Corticosteroids were recorded in 17% of visits. Use of ACTH was rare (only 1 case), which likely reflects the high costs and limited availability of this therapy.²¹ A significant proportion of visits for gouty arthritis attacks recorded use of narcotics or narcotic combination products (19%). The proportion was even higher during ED visits (50%), which is consistent with other studies that showed greater use of narcotics for noncancer pain in EDs.²² Although opioid analgesics can be used as adjunct therapy,¹⁶ they do not address the inflammation that is intrinsic to the pathophysiology of a gouty arthritis attack.^{5,6}

Factors Associated With Gout-Related Visits

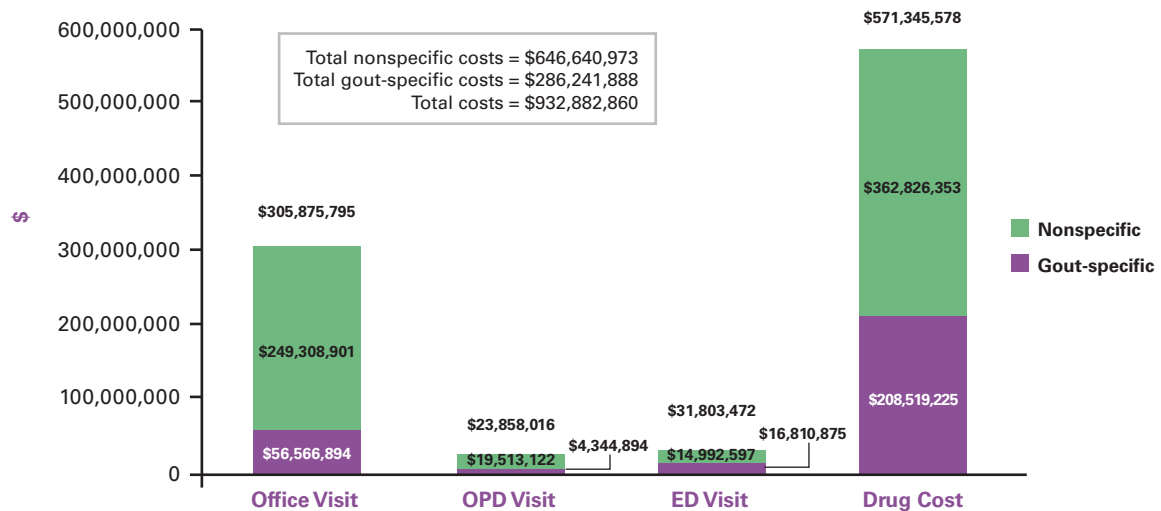
The rate of visits for gout and gouty arthritis attacks increased substantially with age and was higher in males than females, which is consistent with the increasing prevalence of gout with age and among males.^{9,23,24} Management of gout in older patients is complicated by comorbidities, decreased renal function, and increased risk of drug interactions, leading to increased healthcare utilization and costs.^{11,25}

Although the overall rates of ambulatory visits were comparable between whites and blacks, the gout-related ED visit rate was more than 2 times higher in blacks than whites. This racial difference remained significant even after adjustments for comorbidities and insurance coverage, suggesting worse control of gout among blacks and/or more potential barriers to non-ED ambulatory gout treatment. It has long been known that blacks more frequently use EDs for care, but it is less clear if these racial differences remain after adjusting for insurance and other access factors.²⁶ Our data suggest that racial disparities in managing gout may persist, and further research to address these racial gaps should be considered.

Limitations

Gout cases were identified by physicians' diagnoses, patient-reported RFVs, and reported use of anti-gout/anti-hyperuricemia agents, which are subject to recording errors. The definition for gouty arthritis attacks was not validated using similar databases or clinical measures.

Cost information is not available in NAMCS/NHAMCS, and average costs from a commercially insured population

Figure 2. Annual Ambulatory Care Costs Related to Gout: 2002 to 2008 NAMCS and NHAMCS^a

ED indicates emergency department; NAMCS, National Ambulatory Medical Care Survey; NHAMCS, National Hospital Ambulatory Medical Care Survey; OPD, outpatient department.
^aGout-specific costs include only costs for visits with gout as the primary diagnosis or reason for visit, and drug costs for anti-gout and anti-hyperuricemia agent use.

were applied to the estimated utilization counts. Because NAMCS/NHAMCS lack information on medication days of supply, the estimated drug costs assumed the average annual days of supply among the commercially insured individuals, which may not precisely estimate the costs of treating gout with agents not designated for that purpose. Also, only medications recorded during medical encounters were counted in our estimates; given that many gout patients self-medicate to manage acute flares, we might have underestimated the total drug use and costs, particularly for over-the-counter pain medications. Moreover, we could not ascertain that pain medications recorded during gout-related visits were used for gout, which could have resulted in overestimation of their use and expenses for gout. To reduce these biases, gout-specific drug costs were provided, which included only costs of anti-gout/anti-hyperuricemia agents. Last, no clear methods exist for allocating costs to a particular condition when comorbid conditions coexist. To address this problem, we provided a range of cost estimates based on the presence or absence of gout as the primary diagnosis or RFV.

CONCLUSIONS

Annual ambulatory care costs associated with gout may reach \$1 billion annually, with 32% of the costs attributed to gouty arthritis attacks. Drug expenditures accounted for 61% of the total costs. Annual rates of gout-related ambulatory visits more than doubled from 2002 to 2008 and increased profoundly with age,

suggesting that as the population ages, gout will represent an increasing burden on the healthcare system.

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Appendix A. Diagnosis Codes for Joint and Joint Pain

ICD-9-CM

Codes	Description
713.8X	Arthropathy associated with other conditions classifiable elsewhere
714.9X	Unspecified inflammatory polyarthropathy
715.XX	Osteoarthritis and allied disorders
716.8X	Other specified arthropathy
716.9X	Unspecified arthropathy
719.0X	Joint effusion
719.4X	Joint pain
719.9X	Unspecified disorder of joint
780.96	General pain NOS

ICD-9-CM indicates *International Classification of Diseases, Ninth Revision, Clinical Modification*; NOS, not otherwise specified.

Appendix B. Reason for Visit Codes for Joint Pain and Pain Symptoms

Reason for Visit	
Code	Description
1060.0	Pain and related symptom
1060.1	Pain, unspecified including pain all over and incisions
1900.1	Neck pain, ache, soreness, discomfort
1905.1	Back pain, ache, soreness, discomfort
1910.1	Low back pain, ache, soreness, discomfort
1915.1	Hip pain, ache, soreness, discomfort
1920.1	Leg pain, ache, soreness, discomfort
1925.1	Knee pain, ache, soreness, discomfort
1930.1	Ankle pain, ache, soreness, discomforts
1935.1	Foot and toe pain, ache, soreness, discomfort
1940.1	Shoulder pain, ache, soreness, discomfort
1945.1	Arm pain, ache, soreness, discomfort
1950.1	Elbow pain, ache, soreness, discomfort
1955.1	Wrist pain, ache, soreness, discomfort
1960.1	Hand and finger pain, ache, soreness, discomfort
1970.1	Pain, ache, soreness, discomfort of unspecified joints
1980.0	Other musculoskeletal symptoms include bone pain and stump pain
2900.0	Arthritis including osteoarthritis, rheumatism NOS, rheumatoid arthritis, septic

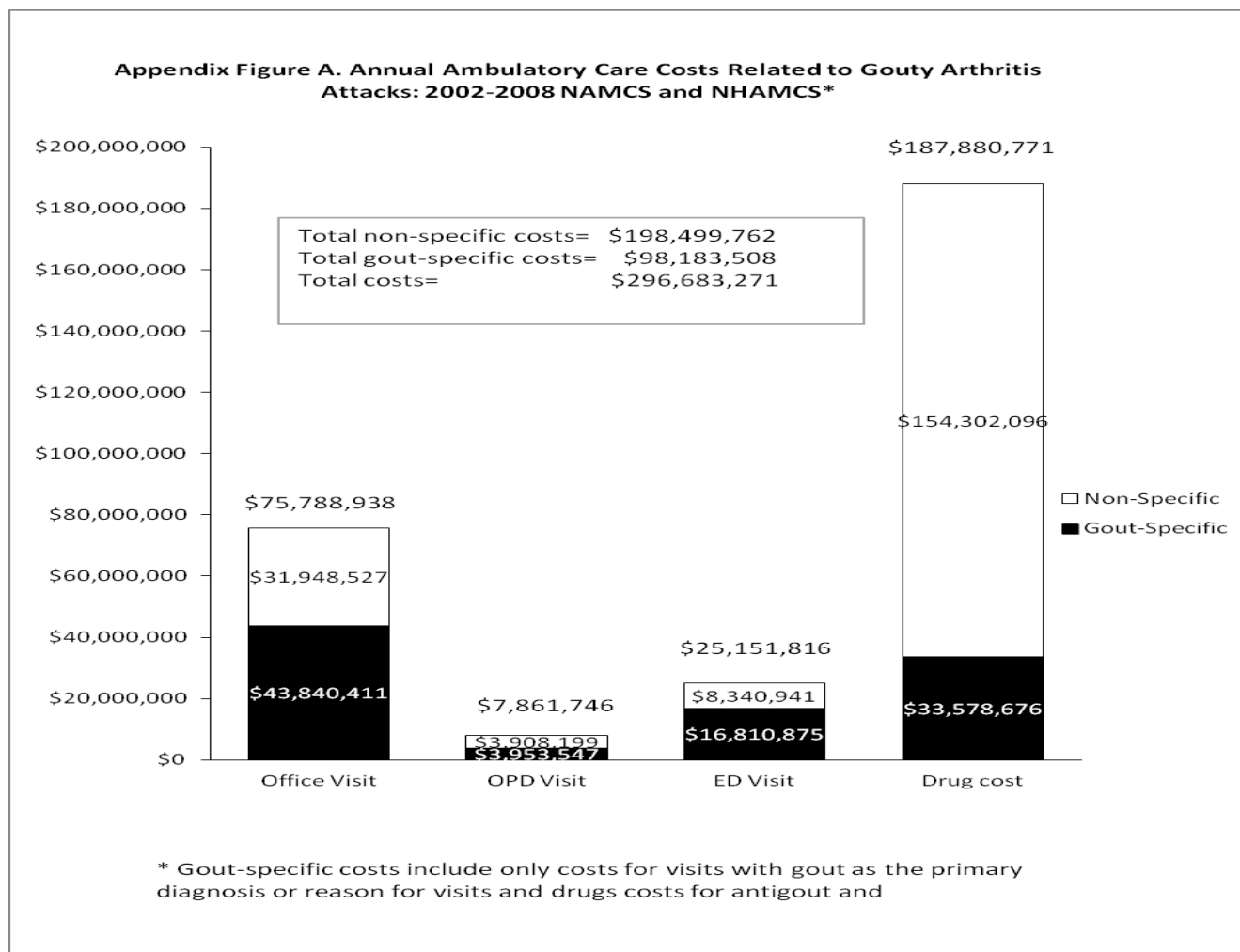
NOS indicates not otherwise specified.

Appendix C. Diagnosis Codes for Comorbidities

Comorbidity	ICD-9-CM Codes	Description
Renal diseases	585.1X-585.6X, 585.9X	Chronic kidney disease
	403.XX	Hypertensive chronic kidney disease
	250.4X	Diabetes with renal manifestation
	592.XX	Kidney stone
Diabetes	250.X	Diabetes
Metabolic syndrome	272.XX	Dyslipidemia
	277.7X	Dysmetabolic syndrome X
	278.00, 278.01	Obesity
Hypertension	401.XX	Essential hypertension
Ischemic heart disease	410.XX-414.X	Ischemic heart disease
Cerebrovascular disease	430.XX-438.XX	Cerebrovascular disease
Heart failure	428.XX	Heart failure
Nongouty arthritis	714.XX	Rheumatoid arthritis
	715.XX	Osteoarthritis

ICD-9-CM indicates International Classification of Diseases, Ninth Revision, Clinical Modification.

Appendix D. Annual Ambulatory Care Costs Related to Gouty Arthritis Attacks: 2002 to 2008 NAMCS and NHAMCS^a



ED indicates emergency department; NAMCS, National Ambulatory Medical Care Survey; NHAMCS, National Hospital Ambulatory Medical Care Survey; OPD, outpatient department.

^aGout-specific costs include only costs for visits with gout as the primary diagnosis or reason for visit, and drug costs for anti-gout and anti-hyperuricemia agent use.