Trends in Emergency Department Visits and Charges for Gout in the United States between 2006 and 2012

Sadao Jinno, Kohei Hasegawa, Tuhina Neogi, Tadahiro Goto, and Maureen Dubreuil

ABSTRACT. Objective. To examine temporal trends in the rate of gout emergency department (ED) visits and charges in the United States between 2006 and 2012.

Methods. A serial cross-sectional analysis of the Nationwide Emergency Department Sample.

Results. The rate of ED visits for gout in adults overall increased from 75.0 to 85.4 per 100,000 persons over the study period (14% increase, p < 0.001), and increased 29% for those aged 45–54 years. Nationwide ED charges increased from $156 million to $281 million (80% increase, p < 0.001).

Conclusion. Between 2006 and 2012, the rate of gout ED visits increased among US adults, most notably in those aged 45–54 years. (First Release June 1 2016; J Rheumatol 2016;43:1589–92; doi:10.3899/jrheum.151432)

Key Indexing Terms:
GOUT EPIDEMIOLOGY OUTCOME ASSESSMENT

Gout is a major public health concern in the United States, with a prevalence of 3.9%, or 8.3 million individuals. Acute gout is an excruciatingly painful and disabling inflammatory arthritis that causes some patients to present to the emergency department (ED), incurring significant healthcare costs. Despite its public health importance, to our knowledge, only 1 study examined the trends in ED visits for gout in the United States, reporting that gout accounted for 0.2% of all ED visits and $166 million in ED charges in 2008. It is speculated that gout ED visits will continue to rise as a result of an increasing elderly population, which is at higher risk of acute gout attack. Additionally, trends in healthcare use may have been affected by recent changes in gout medication availability. Most importantly, colchicine was patented in 2009; however, febuxostat was approved in 2009 and pegloticase in 2010. These changes could contribute to an increase in ED visits for gout because significant costs may make patients unable to access the medication. Despite these changes, contemporary data on trends in healthcare use for gout are lacking. Here, we examined temporal trends in the rate of acute gout ED visits and charges in adults between 2006 and 2012 using a nationally representative sample according to age and sex.

MATERIALS AND METHODS

We conducted a cross-sectional analysis of data from the 2006 to 2012 Nationwide Emergency Department Sample (NEDS), a component of the Healthcare Cost and Utilization Project, sponsored by the US Agency for Healthcare Research and Quality. NEDS is nationally representative of all community hospital–based ED in the United States (excluding VA hospitals).

For our current analysis, we identified all ED visits for patients aged ≥ 18 years who had an International Classification of Diseases, 9th ed, Clinical Modification (ICD-9-CM) code for gout (274.xx) in the primary diagnosis fields. The institutional review board of the Massachusetts General Hospital approved this analysis (2013P002545).

NEDS contains patient demographics, ED visit date(s), diagnoses, procedures, total ED charges, and ED disposition. Primary insurance types were categorized into Medicare, Medicaid, private, and others (including uninsured). Socioeconomic status was estimated using national quartiles for median household income based on the patient’s postal code and primary health insurance. Elixhauser comorbidity was calculated using ICD-9-CM codes. Urban-rural status for each patient residence was defined based on the National Center for Health Statistics. Hospital characteristics included US region, urban–rural status, and teaching status. Geographic regions were defined according to the Census Bureau boundaries.

The primary outcome was the rates of gout ED visits calculated using population estimates obtained from the US Census Bureau. ED visit rates were expressed as the number of estimated ED visits per 100,000 US adults of the corresponding age group per year. The secondary outcome was charges for ED services, which reflected the total facility fees reported for each ED discharge.

Statistical analysis. We examined the trends in the outcomes from 2006 through 2012 by constructing negative binomial regression models. In the sensitivity analysis, we also fitted ordinary least squares models with heteroscedasticity-robust standard errors. Analyses were performed with Stata software version 13.1 (StataCorp).

To test for trends in ED charges, we fitted unadjusted linear regression models for log-transformed charge because ED charges were not normally distributed. To facilitate direct comparisons for ED charges over time, we...
converted charges to 2012 US dollars using the medical care component of the Consumer Price Index. We estimated total charges as a weighted sum of case-level charges based on the hospital sampling ratios.

RESULTS

Patient and ED characteristics. We identified a total of 293,913 ED visits with a primary diagnosis of gout in NEDS between 2006 and 2012 corresponding to a US national estimate of 1,309,448 ED visits. A primary diagnosis of gout accounted for 0.19% (95% CI 0.18–0.19) of all ED visits for adults aged ≥ 18 years. The patient and ED characteristics are shown in Table 1. Adults aged 18–64 years accounted for about 70% of overall gout ED visits; 77% were men. Patients with the lowest quartile for median household income contributed about 40% of ED visits. Although Medicare health insurance coverage was stable during the study period (about 35% of total subjects), the proportion of subjects of other insurance varied. Additionally, patients were more likely to have comorbidities including hypertension, diabetes, renal failure, and obesity (all p for trend < 0.01) in recent years. Patients who had at least 1 comorbidity contributed half of the gout ED visits in 2012.

The overall number of ED visits for gout increased from 75.0 to 85.4 per 100,000 US adults during the study period (14% increase, p for trend < 0.001; Table 2). There was no significant difference in the rate of ED visits between the

Table 1. Patient and hospital characteristics in adults presenting to the emergency department with gout. Data are % (95% CI) unless otherwise specified.

<table>
<thead>
<tr>
<th>Variables</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unweighted sample, n</td>
<td>36,117</td>
<td>37,825</td>
<td>40,131</td>
<td>40,012</td>
<td>44,379</td>
<td>47,599</td>
<td>47,850</td>
<td></td>
</tr>
<tr>
<td>Weighted sample, n</td>
<td>168,410</td>
<td>171,743</td>
<td>174,823</td>
<td>180,789</td>
<td>201,044</td>
<td>207,847</td>
<td>205,152</td>
<td></td>
</tr>
</tbody>
</table>

Patient characteristics

<table>
<thead>
<tr>
<th>Variables</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>24.2</td>
<td>21.5-27.1</td>
<td>25.3</td>
<td>22.9-27.9</td>
<td>25.3</td>
<td>22.1-29.3</td>
<td>25.3</td>
<td>21.6-29.4</td>
</tr>
<tr>
<td>Urban</td>
<td>75.8</td>
<td>72.9-78.5</td>
<td>74.7</td>
<td>72.1-77.2</td>
<td>74.7</td>
<td>71.9-77.2</td>
<td>74.7</td>
<td>70.6-78.4</td>
</tr>
<tr>
<td>Hospital characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>20.6</td>
<td>17.3-24.2</td>
<td>18.7</td>
<td>15.9-21.9</td>
<td>17.7</td>
<td>15.0-20.9</td>
<td>17.3</td>
<td>14.6-20.3</td>
</tr>
<tr>
<td>Midwest</td>
<td>17.5</td>
<td>14.9-20.6</td>
<td>18.3</td>
<td>15.7-21.2</td>
<td>18.8</td>
<td>16.1-21.7</td>
<td>19.4</td>
<td>16.4-22.8</td>
</tr>
<tr>
<td>South</td>
<td>47.4</td>
<td>43.6-51.3</td>
<td>49.1</td>
<td>45.3-52.8</td>
<td>48.5</td>
<td>44.7-52.3</td>
<td>48.4</td>
<td>44.1-52.7</td>
</tr>
<tr>
<td>West</td>
<td>14.5</td>
<td>12.2-17.2</td>
<td>13.9</td>
<td>11.7-16.5</td>
<td>15.0</td>
<td>12.8-17.6</td>
<td>14.9</td>
<td>12.6-17.6</td>
</tr>
</tbody>
</table>

| Location/teaching status |      |      |      |      |      |      |      |     |
| Urban nonteaching | 40.6  | 37.0-44.3 | 42.7 | 39.1-46.4 | 43.5 | 39.9-47.2 | 43.1 | 39.2-47.2 | 39.7 | 35.7-43.9 | 41.0 | 37.6-44.6 | 38.7 | 34.9-42.7 | 0.40 |
| Urban teaching    | 35.6  | 31.6-39.8 | 32.8 | 29.0-36.9 | 32.2 | 28.4-36.2 | 31.7 | 27.3-35.9 | 35.8 | 31.5-40.4 | 35.5 | 31.9-39.9 | 39.0 | 34.6-43.7 | 0.08 |
| Rural             | 23.8  | 20.8-27.1 | 24.5 | 21.8-27.4 | 24.3 | 21.5-27.4 | 25.2 | 21.3-29.7 | 24.5 | 20.3-29.2 | 23.5 | 20.1-26.2 | 22.3 | 19.7-25.0 | 0.40 |

* Percentages may not equal 100 due to rounding. † Comorbidity was defined as at least 1 Elixhauser comorbidity measure.

Personal non-commercial use only. The Journal of Rheumatology Copyright © 2016. All rights reserved.
For US ED visits, rates of ED visits for gout among adults

**DISCUSSION**

In our analysis of a large, nationally representative database for US ED visits, rates of ED visits for gout among adults increased by 14% from 2006 to 2012. The rate of ED visits for gout did not decrease after 2009, suggesting that the management of chronic gout remains suboptimal despite new gout drug approvals since 2009. As expected, adults aged ≥ 65 had the highest rate of ED visits for gout, indicating that elderly patients substantially contribute to national healthcare costs for gout. Concurrent with the overall increase in gout ED visit frequency was an 80% increase in the national charges for gout ED visits. Our findings build upon studies that reported substantial charges attributable to ED use because of gout. Together, these findings suggest an important effect of suboptimal gout care in the outpatient setting, and reinforce the urgent need to improve gout management in the context of existing effective therapies to limit further increases in healthcare use owing to gout.

Of interest in our finding is that the rate of ED visits for gout significantly increased among middle-aged adults, including women. Although women are thought to develop gout at a later age than men, our results suggest that middle-aged women are also at increased risk of developing gout. The reasons for this pattern are not entirely clear, but may include increasing gout incidence/severity, increasing prevalence of gout risk factors, and differences in gout management or healthcare use for chronic gout. We observed greater prevalence of comorbidities including obesity, hypertension, diabetes, and renal failure over the study period, suggesting that an increasing burden of risk factors for gout may have contributed to the increased healthcare use for gout. We were unable to assess whether...
change of insurance within the study population contributed to the study findings, although distribution of insurance coverage did not change drastically during the study period. We could not evaluate whether treatment for gout was optimal across different age groups because NEDS does not contain these data. Interestingly, our finding that mean charges for gout increased over the study period are in contrast to a simultaneous decline in median household income in the United States during the study period, which adjusted for inflation declined from $54,894 to $51,017.8. While ED visits for gout increased 14% during the study period, there was only a 6.4% increase in ED visits overall, suggesting that the increase in gout visits is not solely attributable to increased use in general. Further studies are warranted to determine the reasons for increased incidence for ED visits among middle-aged men and women and to assess the use of specific gout management strategies.

Our present study had several limitations. Diagnoses of gout relied on ICD-9 code and we were unable to confirm through laboratory data such as presence of monosodium urate crystals in synovial fluid. Additionally, we were not able to examine changes in coding/billing practices over time. It is theoretically possible that diagnostic transfer may partly explain an increase in application of gout as a primary diagnosis, but this alone would not affect the large increase in charges reported in our study. Second, NEDS contains event-level records, not patient-level records. Therefore, we could not perform patient-level analyses such as adjustment for patient-level gout risk factors. Third, we estimated charges attributable to gout-related ED visits and not the actual health costs because charge-cost ratios are not available in NEDS. Fourth, NEDS does not include laboratory or medication data, prohibiting further analysis of acute gout management patterns.

Despite the limitations, our study provides valuable insight into the patterns of healthcare use for gout. The increasing number and rate of ED visits has implications for healthcare systems and providers. The 80% increase in charges for patients with gout during the study period likely reflects an important effect on patients, payers, and society in general.

REFERENCES