Prevalence of the Chronic Sinusitis Diagnosis in Olmsted County, Minnesota

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Background: Commonly cited estimates from the National Health Interview Survey rank chronic sinusitis as one of the most prevalent chronic diseases in the United States. These data rely on patient self-reporting of the disease. However, chronic sinusitis is difficult to diagnose because its symptoms overlap those of many other disease processes. As such, these prevalence data may be unreliable.

Objective: To provide an estimate of the prevalence of chronic sinusitis based on assigned International Classification of Diseases, Ninth Revision (ICD-9) codes for the year 2000 in a population-based sample. This study establishes the individual patient as the unit of measure vs previous ICD-9–based estimates that measured physician encounters.

Design: Using existing databases, we identified all residents of Olmsted County, Minnesota, who were assigned an ICD-9 diagnosis code for chronic sinusitis (473.x) in the year 2000.

Setting: Primary care and referral center serving the general community.

Participants: All residents of Olmsted County who provided research authorization were eligible.

Main Outcome Measure: Age- and sex-specific prevalence of chronic sinusitis based on assigned ICD-9 diagnosis codes.

Results: In the year 2000, 2405 residents of Olmsted County were given an ICD-9 diagnosis code for chronic sinusitis. Among these, 1627 (67.7%) were female and 778 (32.3%) were male. The overall age- and sex-adjusted prevalence per 100000 was 1955 (1.96%). The mean (SD) age at the time of diagnosis was 39.4 (17.6) years (age range, 4.2 months to 94 years). Eighty-seven percent were diagnosed at Mayo Clinic, and the balance were from the Olmsted Medical Center. At Mayo, family practitioners and internists diagnosed most of the cases (70%); only 8% were diagnosed by the Department of Otolaryngology. The diagnosis code 473.9 for unspecified chronic sinusitis made up 95% of cases.

Conclusions: Current prevalence estimates of chronic sinusitis may be exaggerated. Chronic sinusitis has been reported to affect 14% to 16% of the US population according to a National Health Interview Survey. In Olmsted County, we found a much lower prevalence (1.96%) of chronic sinusitis using ICD-9 codes as an identifier.


Chronic sinusitis is estimated to be one of the most prevalent chronic diseases in the United States. Commonly cited data from the National Health Interview Survey maintain that chronic sinusitis is one of the most frequently reported chronic diseases in the United States, affecting 14% to 16% of the US population. These data come from the Centers for Disease Control and Prevention and rely on a large probability sample survey conducted by trained interviewers. The interviewer asks patients to recall whether they have ever been told by a physician or health care provider that they have chronic sinusitis. These data are one step removed from the physician’s diagnosis and rely totally on patient self-reporting. Many problems are obvious with this sort of data collection to estimate prevalence of disease: (1) It relies solely on patient recall for the diagnosis. (2) Patients may have symptoms that they attribute to chronic sinusitis, but they may never have received such a diagnosis. This would be especially germane to chronic sinusitis since there has been great confusion in the diagnosis of this disease. (3) Patients may have received a diagnosis of chronic sinusitis in error. (4) Patients might have had chronic sinusitis in the distant past that has since resolved or been treated, but they may still report the disease on a survey.

Another accepted epidemiologic method of estimating the prevalence of dis-
ease is to tabulate International Classification of Diseases, Ninth Revision (ICD-9) diagnostic billing codes. This would seemingly bypass any patient misinformation or misinterpretation by using physicians’ diagnoses directly. The Centers for Disease Control and Prevention creates Vital and Health Statistics regarding health care encounters in the settings of inpatient hospital care, office-based care, outpatient hospital care, and emergency department care. These surveys use ICD-9 codes to identify disease-specific discharges.2-6 For example, the National Hospital Ambulatory Medical Care Survey for 2000 estimated that 1.3 million hospital outpatient visits (of 83.3 million total visits) were for chronic sinusitis, equaling 1.5% of all visits.3 The National Hospital Discharge Survey for 1998 described an even smaller percentage of patients dismissed with the primary diagnosis of chronic sinusitis.3

There is difficulty in dealing with these data. In addition to the above-mentioned physician diagnosis problems, the unit of observation is patient visits or physician/health care provider encounters. This method does not identify the individual patient. A single patient might have multiple visits—in the emergency department, in the hospital outpatient setting, in the physician’s office, or other settings. In this way, patients are certainly overcounted. A better method would involve bundling all provider encounters (inpatient, outpatient, and emergency department care) by identifying and counting the individual patient.

Chronic sinusitis is associated with high health care utilization. Ray et al7 reported in 1996 that more than 26 million physician visits, hospital admissions, and emergency department visits were related to sinusitis (acute and chronic). In 1992, 13 million prescriptions were written for acute and chronic sinusitis.8 In addition to direct health care costs (ie, those related to medications, hospitalizations, doctor visits, and surgery), a 1992 survey reported that indirect costs (ie, time off from work and lost productivity) translated to 73 million days of restricted activity per year associated with chronic sinusitis.9 Furthermore, quality of life is negatively affected by reductions in general health, vitality, and physical and social functioning.10

A more accurate method is needed to estimate the prevalence of this disease to better define health care expenditures. This could be done using a population-based study. We hypothesize that the prevalence of chronic sinusitis is less than that estimated in the National Health Interview Survey. The purpose of the present study is to estimate the prevalence of chronic sinusitis (based solely on assigned ICD-9 diagnosis codes) within the Olmsted County, Minnesota, population.

METHODS

Olmsted County contains a centrally located city, Rochester, surrounded by 13 small towns. This geographic characteristic facilitates epidemiologic research in that most of the medical care is delivered by a few providers. Most of the county’s medical care is provided by the Mayo Clinic, which pools inpatient and outpatient data. These data are indexed and readily available. They include information on inpatient and outpatient visits, emergency department visits, and nursing home care.11 Furthermore, medical record data from other medical facilities in and around Rochester, including Olmsted Medical Center and the area’s few private medical practitioners, are also indexed and available. Thus, the medical record data regarding virtually all Olmsted County residents are indexed through the Rochester Epidemiologic Project (REP).12

Our study sample included all patients who (1) were diagnosed in the year 2000 with chronic sinusitis, (2) were residents of Olmsted County at the time of their diagnosis, and (3) had provided authorization to use their medical records for research purposes. Chronic sinusitis was identified using the REP resources by the following ICD-9 codes: 473.0, 473.1, 473.2, 473.3, 473.8, and 473.9. These codes represent chronic maxillary sinusitis, chronic frontal sinusitis, chronic ethmoidal sinusitis, chronic sphenoethmoidal sinusitis, other chronic sinusitis (pansinusitis), and unspecified chronic sinusitis (NOS).

We estimated the age- and sex-specific prevalence of chronic sinusitis in Olmsted County based solely on patients’ assigned ICD-9 codes for chronic sinusitis in the year 2000. We calculated prevalences assuming that the entire population of Olmsted County was at risk. The denominator was estimated from the decennial census data for Olmsted County for 2000. Rates were age and sex adjusted to the population structure of United States whites in 2000. (This population structure was chosen because 97% of the population under study was white.) Ninety-five percent confidence intervals for the rates were calculated assuming a Poisson error distribution.

In the year 2000, 2405 residents of Olmsted County were given an ICD-9 diagnosis code for chronic sinusitis (ICD-9 code 473.x). Among these, 1627 (67.7%) were female and 778 (32.3%) were male. The mean (SD) age at the time of diagnosis was 39.4 (17.6) years (age range, 4.2 months to 94 years). The age- and sex-specific prevalences of chronic sinusitis are summarized in Table 1. The overall age- and sex-adjusted prevalence per 100000 was 1955 (1.96%).

Analysis of the various codes under the chronic sinusitis general heading revealed that 94.8% of the diagnosis codes were “unspecified chronic sinusitis/chronic sinusitis NOS.” The other specific ICD-9 diagnoses assigned are listed in Table 2.

A total of 87% of the patients were diagnosed at Mayo Clinic, and the balance were from the Olmsted Medical Center. At Mayo, family practitioners and internists diagnosed most of the cases (70%), while only 8% were diagnosed in the Department of Otolaryngology. The breakdown by specialty group at Mayo Clinic is listed in Table 3. The database at Olmsted Medical Center does not allow for meaningful breakdown by medical specialty.

Previous studies have estimated the prevalence of chronic sinusitis based on patient self-reports.1 These data describe chronic sinusitis as one of the most prevalent chronic diseases in the United States, affecting 14% to 16% of the population. Based on assigned ICD-9 diagnosis codes, we estimated the number of individuals with the chronic sinusitis diagnosis at 1955 per 100000 population in the
The prevalence of chronic sinusitis has been substantially lower than previous estimates.1,2 What are the possible reasons for such a large discrepancy in these prevalence values? Patient self-reporting lends itself to inaccuracy and likely overestimation. It relies on patient recall and is removed from the physician’s diagnosis. Patients may erroneously attribute their symptoms to chronic sinus disease, or they may have had the disease in the past but do not at the time they report the symptoms.

The treating physician may not apply the diagnostic criteria. General practitioners, who make the chronic sinusitis diagnosis 70% of the time by our estimates, may not apply or even know these guidelines. Guidelines for diagnosis are summarized in Table 4.13 For that matter, board-certified otolaryngologists may not apply the criteria. Thus, how can we expect patients to be clear on this diagnosis when their physicians are not?

There are problems with defining the disease and making the diagnosis. The criteria are quite broad and could be confused with other common nasal and paranasal pathologic conditions. For instance, a patient with perennial allergic rhinitis may manifest the symptoms of nasal obstruction and facial congestion for 8 to 10 months. This patient meets the broad diagnostic criteria for chronic sinusitis. Likewise, a patient with a deviated nasal septum and allergic rhinitis or a patient with a deviated nasal septum and migraine headache may meet the criteria for chronic sinusitis. The lack of specificity in these symptoms may lead to confusion in diagnosis on the part of the patient and the physician.

This is supported by recent findings by Stankiewicz and Chow.14,15 Of those individuals referred to them with the diagnosis of chronic sinusitis (N = 78), 45% had

### Table 1. Prevalence of an ICD-9 Diagnosis of Chronic Sinusitis (473.x) per 100 000 Persons by Age and Sex in Olmsted County, Minnesota, in 2000

<table>
<thead>
<tr>
<th>Age Group, y</th>
<th>Female No. of Cases</th>
<th>Prevalence</th>
<th>Male No. of Cases</th>
<th>Prevalence</th>
<th>Both Sexes No. of Cases</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-9</td>
<td>57</td>
<td>659</td>
<td>60</td>
<td>647</td>
<td>117</td>
<td>653</td>
</tr>
<tr>
<td>10-19</td>
<td>126</td>
<td>1486</td>
<td>60</td>
<td>633</td>
<td>116</td>
<td>1052</td>
</tr>
<tr>
<td>20-29</td>
<td>204</td>
<td>2332</td>
<td>93</td>
<td>1184</td>
<td>286</td>
<td>2228</td>
</tr>
<tr>
<td>30-39</td>
<td>396</td>
<td>3950</td>
<td>187</td>
<td>1881</td>
<td>583</td>
<td>2920</td>
</tr>
<tr>
<td>40-49</td>
<td>355</td>
<td>3479</td>
<td>177</td>
<td>1813</td>
<td>532</td>
<td>2664</td>
</tr>
<tr>
<td>50-59</td>
<td>227</td>
<td>3371</td>
<td>94</td>
<td>1498</td>
<td>321</td>
<td>2467</td>
</tr>
<tr>
<td>60-69</td>
<td>99</td>
<td>2350</td>
<td>56</td>
<td>1437</td>
<td>155</td>
<td>1912</td>
</tr>
<tr>
<td>≥70</td>
<td>127</td>
<td>1546</td>
<td>51</td>
<td>1362</td>
<td>144</td>
<td>1476</td>
</tr>
<tr>
<td>Overall</td>
<td>1627</td>
<td>2576</td>
<td>778</td>
<td>1292</td>
<td>2405</td>
<td>1949</td>
</tr>
</tbody>
</table>

| Age adjusted (95% CI)† | . . . | 2585 (2459-2711) | . . . | 1322 (1227-1417) | . . . | 1966 (1887-2045) |
| Age and sex adjusted (95% CI)† | . . . | . . . | . . . | . . . | 1955 (1876-2033) |

Abbreviations: CI, confidence interval; ICD-9, International Classification of Diseases, Ninth Revision.
*Not adjusted to the age or sex structure of the US white population in 2000.
†Adjusted to the 2000 US white population.

### Table 2. Distribution of ICD-9 Diagnoses of Chronic Sinusitis (473.x)

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>No. (%) of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>473.0 Maxillary</td>
<td>57 (2.4)</td>
</tr>
<tr>
<td>473.1 Frontal</td>
<td>6 (0.2)</td>
</tr>
<tr>
<td>473.2 Ethmoidal</td>
<td>10 (0.4)</td>
</tr>
<tr>
<td>473.3 Sphenoidal</td>
<td>0</td>
</tr>
<tr>
<td>473.8 Other chronic</td>
<td>53 (2.2)</td>
</tr>
<tr>
<td>473.9 Unspecified</td>
<td>2279 (94.8)</td>
</tr>
</tbody>
</table>


### Table 3. Distribution of Diagnoses by Specialty at Mayo Clinic

<table>
<thead>
<tr>
<th>Specialty</th>
<th>No. (%) of Diagnoses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family medicine</td>
<td>931 (44.2)</td>
</tr>
<tr>
<td>Internal medicine</td>
<td>553 (26.3)</td>
</tr>
<tr>
<td>Otolaryngology</td>
<td>174 (8.3)</td>
</tr>
<tr>
<td>Emergency department</td>
<td>110 (5.2)</td>
</tr>
<tr>
<td>Allergy</td>
<td>79 (3.8)</td>
</tr>
<tr>
<td>Pediatrics</td>
<td>51 (2.4)</td>
</tr>
<tr>
<td>Other</td>
<td>206 (9.8)</td>
</tr>
</tbody>
</table>

### Table 4. Criteria for Chronic Rhinosinusitis Based on the American Academy of Otolaryngology–Head and Neck Surgery Task Force in 1996

**Major factors**
- Facial pain/pressure
- Facial congestion/fullness
- Nasal obstruction/blockage
- Nasal discharge/purulence/postnasal drainage
- Hyposmia/anosmia
- Purulence in nasal cavity on examination

**Minor factors**
- Headache
- Fever
- Halitosis
- Fatigue
- Dental pain
- Cough
- Ear pain/pressure/fullness

Duration of symptoms ≥12 wk with either ≥2 major factors, 1 major factor and 2 minor factors, or nasal purulence on examination
negative findings on nasal endoscopy and computed tomography. Furthermore, only 48% had positive findings on computed tomography, indicating demonstrable sinusitis. This calls into question the adequacy of the current symptom-based definition of chronic sinusitis.

Other epidemiologic studies have described the prevalence of chronic sinusitis using ICD-9 codes. These have studied ambulatory vs inpatient care but not at the level of the individual. These data from the Department of Vital and Health Statistics have quantified, for example, the number of times a physician has diagnosed chronic sinusitis in the emergency department. The flaw in this method is that individuals might be counted multiple times when they are seen in the emergency department, the ambulatory care setting, and/or the inpatient setting. This method creates great difficulty in figuring prevalence for the given population.

In contrast, our method involves the use of databases to analyze a massive amount of data for a defined population. Such data can be easily tabulated and analyzed to present prevalence data. In contrast to the data from the Vital and Health Statistics, the present study used the REP database to compile all medical care encounters together. The patient, by means of his or her unique medical record number, was the unit of measure. The REP database allowed a unique opportunity to obtain a cohort to analyze the population of Olmsted County in which 95% of the medical care is provided by the Mayo Clinic or Olmsted Medical Center.

Critics of these data may argue that not all patients who experience symptoms of chronic sinusitis seek medical care. These patients would not be counted using the ICD-9 method of estimating for 1 year (2000). We have made the assumption that all patients with significant disease associated with sinusitis sought some treatment during this time period. If patients were truly afflicted with chronic sinusitis, the evidence would suggest that their symptoms would be bothersome enough for them to seek medical care. If their symptoms are not bothersome enough for them to seek medical care, then one may wonder whether they truly have this disease at all.

Another limitation of this study is that those who see medical providers may receive incorrect diagnoses, depending on their physicians’ biases, specialties, and levels of training. This may have caused a systematic underestimate in the prevalence of chronic sinusitis in the present population-based study. However, this limitation also applies to the study of any other disease and any previously used method for estimating prevalence.

Another limitation of this study is the demographic profile of this small Midwestern community, which is predominantly white. There is always a question whether these data are generalizable to the US population at large. Moreover, there may be differences in health care delivery throughout the country that would influence utilization of resources. For instance, if utilization of resources is higher in Olmsted County than it is nationally, then the estimate of chronic sinusitis may be erroneously high.

In conclusion, current prevalence estimates of chronic sinusitis that rely on patient reporting may be exaggerated. Chronic sinusitis has been reported to affect 14% to 16% of the US population according to a National Health Interview Survey. In Olmsted County, where 95% of the medical care is provided by 2 providers and records of all encounters are indexed in a database, we found a much lower prevalence (2%) of the chronic sinusitis diagnosis in the year 2000 using ICD-9 codes as an identifier.

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REFERENCES