

Trends in Gastroesophageal Reflux Disease as Measured by the National Ambulatory Medical Care Survey

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Abstract

Background The prevalence of reflux disease is increasing. Health-care utilization including physician visits for this disorder is lacking. Our purpose was to analyze the trend in physician visits for GERD from the period 1995–2006 using the National Ambulatory Medical Care Survey. We also sought to determine health-care utilization for GERD indirectly by assessing prescription trends for proton-pump inhibitors and H2 receptor blockers during the period.

Methods The National Ambulatory Medical Care Survey is a survey of approximately 3,000 office-based physicians that uses a three-stage probability sampling procedure to allow extrapolation to the US population. All visits between 1995 and 2006 for symptoms and/or diagnoses compatible with GERD were combined into a single categorical variable. Weighted data was utilized for descriptive and inferential statistical analysis.

Results After weighting, there were $N = 321,513$ adult ambulatory care encounters for all diagnoses. Visits for

reflux increased throughout the examined period. Using logistic regression, visits for reflux were associated with female gender, age over 40, and calcium channel blocker use. Proton-pump inhibitor use increased substantially during the study period while H2 blocker use declined. Family practitioners and internists saw the majority of reflux patients.

Conclusions The frequency of ambulatory visits in the United States for gastroesophageal reflux disease increased significantly between 1995 and 2006. The use of PPI therapy is increasing even more substantially. Older age, female gender, and use of calcium channel blockers were associated with a higher frequency of GERD visits. Health-care utilization for this disorder is increasing perhaps due to our ever-increasing epidemic of obesity.

Keywords Gastroesophageal reflux disease · National Ambulatory Medical Care Survey · Proton-pump inhibitor

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Introduction

Gastroesophageal reflux disease (GERD) usually presents with intermittent heartburn and/or regurgitation [1]. In most epidemiologic studies, a diagnosis of GERD is given based on these symptoms without further testing [2]. Depending on the precise definition used (based on severity, frequency, and duration), the prevalence of GERD in population-based studies has ranged from 15–25% [3–7]. GERD is a chronic disease with a fluctuating course [8, 9]. In a Swedish population-based study, a symptom survey was repeated at 1 and 7 years after the initial mailing [10]. The authors found that GERD symptoms fluctuated between asymptomatic, minor, and predominant with only 10% reporting symptoms

at all three assessments. Patients experiencing predominant symptoms were more likely to have abnormal 24-h esophageal pH testing [1, 11].

The prevalence of GERD may be affected by age, gender, and race. In a population-based study in Olmsted County, the prevalence of GERD was 42.4% without significant differences when stratified by age and gender [7]. A recent study did not find a significant difference in the prevalence of GERD between white and black citizens [12]. One study found that the prevalence of GERD symptoms in Asians was substantially lower than that reported by whites and blacks [13]. However, the study was limited in that many patients were not familiar with the term “heartburn” [13].

The National Ambulatory Medical Care Survey, developed and supported by the Centers for Disease Control and Prevention (CDC), provides the unique opportunity to examine the frequency of GERD visits among patients seeking medical care in an ambulatory setting. The database provides important demographic and health-care utilization data and the results can be extrapolated to the entire United States. This differs from previous studies that attempted to survey the general population. The NAMCS provides data on individuals who actually sought care from a physician for GERD. These individuals are likely to be more symptomatic and at risk for GERD-related complications.

Therefore, our purpose was to analyze the trend in physician visits for GERD from the period 1995–2006 using the National Ambulatory Medical Care Survey. We also sought to determine the impact of gender and race on physician visits for GERD. We sought to determine health-care utilization for GERD indirectly by assessing the prescription frequency for proton-pump inhibitors and H₂ receptor blockers during the period.

Materials and Methods

NAMCS Survey

The National Ambulatory Medical Care Survey (NAMCS) is an annual survey of approximately 3,000 office-based physicians who are not employed by the federal government. Data is stratified to include 14 specialty groups and one residual group. The survey was conducted annually from 1973 to 1981, in 1985, and annually since 1989. Specially trained interviewers visit the physicians prior to their participation in the survey to provide them with survey materials and instruct them on how to complete the forms. The US Bureau of the Census acts as the field-data collection agent for the NAMCS. The actual data collection for the NAMCS is carried out by the physician aided by his/her office staff when possible, as instructed by Census field representatives.

The NAMCS uses a three-stage probability sampling procedure to allow extrapolation of survey results to the US population. The first stage consists of delineation of 112 geographic primary sampling units (PSU). The second stage consists of a probability sample of practicing physicians selected from each geographic PSU. The third stage involves the systematic random selection of visits to the sample physician during a randomly assigned 1-week reporting period, using a sampling interval designed to yield about 30 sampled visits per physician. A standardized form is completed shortly after each visit in order to minimize recall bias. The data collected for each visit includes patient demographics and up to three reasons for the patient's visit (i.e., symptoms) and three diagnoses by the participating physician. Item non-response rates are generally 5% or less. Up to eight medications prescribed, administered, or continued at the time of the visit were recorded beginning in 2002. Prior to that time, only six medications were listed. Drug data are coded using a unique classification scheme developed at NCHS. Listings of drugs by entry name (the name used by the respondent to record the drug on the patient record form) and by generic substance are available. The therapeutic class of drugs is based on the National Drug Code Directory.

The time frame chosen for this study was the period 1995–2006. The CDC currently provides micro-data for the period 1973–1994, however, there were significant inconsistencies in the coding of GERD-related symptoms and diagnoses prior to the year 1995 and therefore these years were not included.

Variable Coding

All symptoms and diagnoses compatible with GERD were combined into a single categorical variable. This included codes: 153.50 = “Heartburn and indigestion (dyspepsia)”, 787.1 = “Heartburn”, 530.11 = “Reflux esophagitis”, “530.10” = “Esophagitis, unspecified”, 530.85 = “Barrett's esophagus”, and 530.81 = “Esophageal reflux”. We were interested in identifying whether certain medication classes served as predictor variables for the presence of GERD. This included calcium-channel blockers, beta blockers, and non-steroidal anti-inflammatory drugs. We were also interested in trends in the use of proton-pump inhibitors and H₂ receptor antagonists over the study period and its relationship to the prevalence of GERD. All medications classes were aggregated into categorical variables (i.e., exposed vs. not exposed) for analysis.

Statistical Analysis

Yearly file data from the CDC was converted into a single file for analysis. Adult visits were selected by filtering out

cases of individuals <18 years. Initial analysis of raw data sets to determine visit rates per population was done on a year-by-year basis using SAS, version 9.1 (SAS Institute, Inc., Cary, NC). PROC SURVEYFREQ, with functionality that is newly available in this version of SAS, estimates the population frequency and standard error from the sample by using two masked design variables (CSTRATM and CPSUM) and the variable patient visit weight (PATWT). These design variables, which were provided for the first time with the 2002 data set, were calculated for the older data sets from the SUDAAN design variables provided in those sets, and used in the SAS programs [14].

Weighted data was utilized for descriptive and inferential statistical analysis. Demographical data was analyzed using χ^2 analysis if categorical and *t*-tests if continuous. A linear test for trend was performed to assess the change in the unadjusted rate of GERD over the period 1995–2006. Logistic regression modeling was performed to assess the association of a number of predictor variables with the dependent variable, GERD. Potential predictors were those variables found to be significantly associated with a GERD visit from univariate analysis. All statistical tests were two-tailed with a *P*-value < 0.05 considered statistically significant.

Results

Variables Associated with GERD: Univariate Analysis

After weighting, there were *N* = 321,513 adult ambulatory care encounters for all diagnoses recorded in the NAMCS from 1995 to 2006. The frequency of GERD-related physician visits for females was only slightly higher than for males (1.22 vs. 1.19% of all visits) although this reached statistical significance. In addition, GERD patients were significantly older (53.5 ± 16.5 vs. 43.9 ± 18.7 years, *P* < 0.001) than non-GERD patients. Visits for GERD increased most notably in the age group over 40 years compared to younger individuals. Treatment with calcium channel blockers or beta-blockers was associated with an increased frequency of GERD-related visits. Use of non-steroidal anti-inflammatory drugs was not associated with a GERD-related complaint or diagnosis. There were minor (although statistically significant) differences in the geographical distribution of GERD cases. Of interest, there was no difference in the visit frequency among white and black individuals (*P* = 0.69). To understand the resource impact on ambulatory care in the US, we assessed the duration of office visits. Office visits lasting more than 20 min were approximately 8% higher for the GERD group (*P* < 0.001). Patients seen for a GERD-related visit were far more likely to be treated with a PPI than non-GERD-related visits (29.1 vs. 1.3%, respectively) (Table 1).

Table 1 Demographic characteristics of study population categorized by GERD status

Variable	GERD (+) <i>N</i> = 3,906 (weighted %)	GERD (–) <i>N</i> = 317,607 (weighted %)	<i>P</i> -value
<i>Demographics</i>			
Age (year)			
<18	219 (6.0)	54,606 (20.0)	<0.0001
18–40	639 (15.4)	69,078 (21.9)	
40–65	1,808 (45.6)	109,421 (33.2)	
>65	1,240 (33.9)	84,502 (24.9)	
Gender			0.003
Male	1,635 (43.7)	135,072 (40.7)	
Female	2,271 (59.3)	182,535 (56.3)	
Race*			0.57
White	3,383 (85.6)	275,950 (86.1)	
Black	372 (9.6)	29,007 (9.7)	
Other	151 (4.8)	12,650 (4.2)	
Geographical region			0.012
Northeast	774 (20.4)	66,990 (20.9)	
South	1,474 (38.7)	105,529 (34.7)	
Midwest	911 (22.5)	69,765 (21.8)	
West	747 (18.4)	75,323 (22.5)	
<i>Risks for GERD</i>			
Calcium channel blocker			<0.0001
Yes	254 (6.9)	10,219 (3.5)	
No	3,652 (93.1)	307,388 (96.5)	
Beta-blocker			<0.0001
Yes	243 (6.7)	12,350 (3.9)	
No	3,663 (93.3)	305,257 (96.0)	
NSAID			0.76
Yes	300 (7.9)	22,027 (7.7)	
No	3,606 (92.1)	295,580 (92.3)	
<i>Health-care utilization</i>			
Length of office visits (min)			
0–20	2,770 (71.5)	234,393 (78.4)	<0.0001
>20	1,136 (28.5)	83,214 (21.6)	
PPI			<0.0001
Yes	1,135 (32.1)	4,257 (1.7)	
No	2,771 (67.9)	313,350 (98.3)	
H2 blocker			<0.0001
Yes	613 (14.3)	3,562 (1.2)	
No	3,293 (85.7)	314,045 (98.8)	

* Race: Category “other” includes: Hispanic/Asian/Native Hawaiian/Other Pacific Islander/American Indian/Alaska Native only/More than one race reported

Over the study period there was a significant increase in the number of GERD-related visits (*P* for trend < 0.001) (Fig. 1). The proportion of GERD-related visits increased from 9.1 to 16.3 per 1,000 visits between 1995 and 2006.

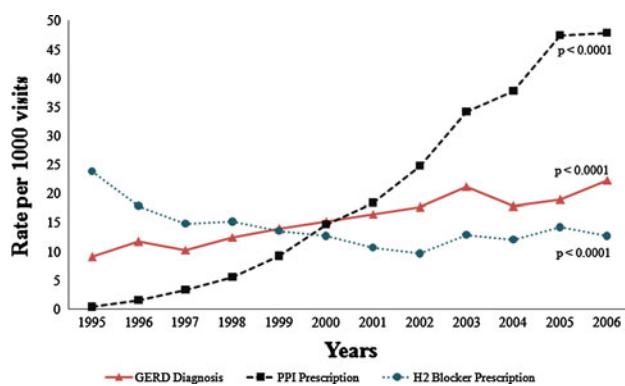


Fig. 1 Frequency of GERD-related visits and use of proton-pump inhibitor and H2 blocker therapy

An increase in the frequency of prescription and over-the-counter PPI treatment per visit demonstrated a consistent rise and reached 43.9 prescriptions per 1,000 visits in 2006. This includes patients continuing or starting this treatment at the visit. Prescription and over-the-counter H2 blocker use consistently dropped during the study period to a low of 13.3 per 1,000 visits in 2006.

Variables Associated with GERD: Multivariate Analysis

Table 2 shows the results of the multivariate analysis. The analysis was adjusted for the year of study survey to control for trends in diagnosis and prescriptions over the study period. In adjusted analysis, several factors were associated

with an increased likelihood of a visit for a GERD-related symptom or diagnosis. These included older age, female gender, use of calcium channel blockers, and tobacco consumption. There was no association between geographic region or beta blockers and GERD-related visit frequency.

GERD-Related Visits and PPI Use by Specialty

Roughly 70 adult medical and surgical specialties are included in the NAMCS. However, due to survey methodology, accurate error estimates can only be obtained for a core group of 14 specialties. From these 14, we selected a group of six core specialties. Specialties not included were psychiatry, orthopedics, pediatrics, obstetrics and gynecology, ophthalmology, urology, osteopathic medicine, pediatrics, and neurology. Table 3 highlights the proportion of visits within each specialty where GERD was coded as well as the proportion of patients who received or were continued on a PPI within the specialty. Table 3 also highlights the relationship between GERD visits and PPI use within specialty compared to the entire 1995–2006 dataset for all visits. The proportion of visits that were GERD-related was highest for internists and ENT physicians (2.9%), and lowest for cardiologists (1.1%). Roughly 64% of all visits for GERD were to either general practice physicians (32.6%) or internists (31.6%). Differences in PPI prescription patterns occurred between the specialties. Surgeons rarely prescribed or continued PPI therapy (0.8%) during office visits while cardiologists were more likely to do so (4.2%).

Table 2 Results of logistic regression analysis with GERD status as dependent variable

	Cases/controls, <i>n/n</i>	Unadjusted odds ratio	Adjusted odds ratio*	95% confidence interval*	<i>P</i> -value
Age (years)					
18–40	639/69,078	1.00 (referent)			
41–65	1,808/109,421	2.54	2.48	1.66–2.78	<0.0001
>65	1,240/84,502	1.99	1.88	1.54–2.53	<0.0001
Sex					
Male	2,271/182,535	1.00 (referent)			
Female	1,635/135,072	1.43	1.41	1.10–1.66	0.0001
Geographic region					
Northeast	774/66,990	1.00 (referent)			
Midwest	911/69,765	1.11	1.09	0.85–1.27	0.5312
South	1,474/105,529	1.32	1.29	0.99–1.44	0.2321
West	747/75,323	0.76	0.71	0.58–1.11	0.4531
Calcium channel blocker					
No	3,652/307,388	1.00 (referent)			
Yes	254/10,219	1.77	1.69	1.43–2.05	<0.0001
Beta blocker					
No	3,663/305,257	1.00 (referent)			
Yes	243/12,350	1.27	1.17	0.98–1.39	0.1014

* Adjusted for year of visit

Table 3 Frequency of GERD-related visits by specialty and frequency of proton-pump prescriptions over the period 1995–2006

Specialty ^a	Visits coded as GERD-related within specialty <i>n</i> (weighted %)	Proportion overall GERD-related visits (%) ^b	Prescribed PPI within specialty <i>n</i> (weighted %)	Proportion overall PPI prescribed (%) ^c
General/family practice	1,115 (2.1)	31.6	1,516 (2.8)	31.2
Internal medicine	896 (3.2)	31.6	921 (4.1)	29.9
Pediatrics	187 (0.7)	5.5	66 (0.3)	1.5
General surgery	231 (1.2)	1.7	196 (1.3)	1.4
Cardiovascular diseases	192 (1.2)	1.9	839 (5.9)	6.7
Otolaryngology	428 (2.6)	3.6	319 (1.9)	1.9
Total		75.9		72.6

^a Physician specialty self-reported. Reporting only 6 of 15 specialties recorded

^b Unweighted *n* = 3,906 for total number of GERD-related visits

^c Unweighted *n* = 5,392 for total number of visits at which a proton-pump inhibitors was prescribed

Discussion

Our paper describes the frequency of gastroesophageal reflux disease (GERD)-related visits in the United States over a 12-year period using the National Ambulatory Medical Care Survey (NAMCS). We found that the frequency of GERD visits increased consistently over the period. The rate nearly doubled from 1995 (9.1 per 1,000 visits) to 2006 (16.3 per 1,000 visits). Proton-pump inhibitor use rose even more dramatically perhaps driven by their OTC availability. Independent variables associated with a GERD-related visit included age >40, female gender, tobacco use, and calcium channel use. On univariate analysis we found no relationship between GERD-related visits and the patients' race. This finding is similar to those of a previous study [12]. Region of the country was related on univariate analysis (highest in the South) but this was no longer significant in multivariate logistic regression analysis. Our final analysis adjusted for year of visit to account for potential changes in medical practice during the study period. This adjustment had a minimum impact on the odds ratios for the selected predictor variables (see Table 2).

The principle strength of this study is the use of the NAMCS to estimate the burden of GERD as seen by physicians in the United States. The survey technique employed by the NAMCS allows robust data and error estimates for a core of 14 specialties of medicine and surgery. The physician practices chosen for inclusion are decided upon using a complex survey algorithm designed by the CDC. Trends identified by the NAMCS are likely to be reflective of national trends, with minimal opportunity for sampling bias. Patients analyzed in this study do not represent the general population. Rather, patients included in the NAMCS are those visiting their doctor for a GERD-related symptom or diagnosis. For our purposes, in order to capture GERD-related visits, we combined all patients reporting symptoms consistent with GERD or those

receiving a diagnosis of GERD from their physician. We suspect that misclassification rates were low and that bias was bi-directional. These patients are likely to be more symptomatic than the general population and probably represent those patients from the mid-portion of the formerly described GERD iceberg [15].

It is important to note that NAMCS data may not be a precise measurement of nationwide prevalence due to the theoretical possibility of over-sampling physicians with a biased patient profile (e.g., choosing a medical practice that is a regional center for the management of GERD patients). In addition, only a core of 14 medical specialties is surveyed and robust data for the subspecialty of gastroenterology is unavailable due to sampling methodology. Data concerning symptom frequency and results of endoscopic and pH studies are unavailable in the database. Another shortcoming of the database is that there is no mechanism to determine whether GERD was the principle reason for the office visit. Despite these shortcomings, the NAMCS provides data that accurately reflects national trends in health-care utilization. The NAMCS has previously been used to define health-care utilization for a variety of other disorders as well as for prescription patterns [16–21].

Our finding of an increasing frequency of visits for GERD parallels the results of other cross-sectional studies [7, 22]. This increase may be due to obesity, specifically central obesity, which has now been associated with GERD and its complications including Barrett's esophagus and esophageal adenocarcinoma [23, 24]. In 2005, the NAMCS began recording BMI and so adjustment for this variable will be available in the future. It is speculative as to whether an increase in the "awareness" of GERD by either patients or health-care providers had an impact on the coding frequency for the diagnosis. The marked increase in PPI use over the study period indirectly suggests that the increased frequency probably represents an increase in real disease. Adjustment for year of diagnosis in the logistic

model attempted to compensate for this trend. The minimal impact of this adjustment on the final odd ratios indirectly suggests that the coding for this diagnosis was independent of the year the patient was seen.

It is interesting that we found an association between GERD and prescriptions for calcium channel blockers. Other reports have found similar findings [25, 26]. Possible mechanisms include the common effect of obesity on both blood pressure and GERD (i.e., a potential confounder) or perhaps direct effects from this class of drug on lower esophageal sphincter function [26]. We did not find an association between beta-blocker use and GERD. This suggests (but certainly does not prove) that the effects of calcium blockers was through LES pressure reduction as beta blockers are also frequently used for obesity-related co-morbidities (hypertension, atherosclerotic cardiovascular disease). Beta-agonists, but not beta-antagonists, have been associated with the development of GERD by decreasing LES pressure [27].

It is somewhat surprising that no association between NSAID exposure and frequency of GERD was found. All prescription and OTC NSAID drugs were considered in this analysis. Our results are similar to those of a survey of citizens of Olmsted County, MN, which found no significant association between GERD and the use of aspirin [OR 0.8 (95% CI 0.4–1.7)] or NSAIDs [OR 0.9 (95% CI 0.5–1.6)] [28]. A longitudinal UK GP database study demonstrated a significant association between the incidence of GERD and current use of NSAIDs [OR 1.5 (95% CI 1.3–1.7)] but not of aspirin [OR 1.1 (95% CI 0.9–1.3)] [29]. Further studies are needed but certainly these drugs are to be avoided in patients with known erosive esophagitis or peptic stricture.

It is not surprising that the majority of GERD-related visits were to family practitioners and internists. Interestingly, the proportion of visits to ENT physicians that are GERD-related is similar to internists (2.9%) and nearly threefold more than seen by general surgeons. However, cardiologists had the highest frequency of prescribing PPI therapy (4.2%), suggesting they are using this class for other purposes (perhaps mucosal protection from aspirin).

Proton-pump inhibitor and H2 blocker use was common in individuals coded as having a GERD-related visit. This provides internal validity for the coding strategy we used and reinforces that these patients likely represented a highly symptomatic group as nearly half (46.4%) of GERD-positive patients were on either of these therapies.

In conclusion, we found that the frequency of ambulatory visits in the United States for the evaluation and treatment of gastroesophageal reflux disease nearly doubled between 1995 and 2006. Older age, female gender, use of calcium channel blockers and tobacco were associated with a higher frequency of GERD visits. Based on our study and other available epidemiologic data, it appears the GERD iceberg

is growing from the base to the top. Health-care utilization and cost for this disorder therefore continue to rise. Medical therapy will contribute to this cost as the use of PPI therapy is increasing rapidly.

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