Proton Pump Inhibitor Prescriptions and Subsequent Use in US Veterans Diagnosed with Gastroesophageal Reflux Disease

Andrew J. Gawron, MD, PhD[1,2,3], John E. Pandolfino, MD, MS[1], Scott Miskevics, BA[3], and Sherri L. LaVela, PhD, MPH, MBA[2,3]

[1]Division of Gastroenterology & Hepatology, Feinberg School of Medicine, Northwestern University, Chicago, IL, USA; [2]Center for Healthcare Studies, Feinberg School of Medicine, Northwestern University, Chicago, IL, USA; [3]Center for Management of Complex Chronic Care, Department of Veterans Affairs, Edward Hines, Jr. VA Hospital, Hines, IL, USA.

BACKGROUND: Empiric proton pump inhibitor use is common for gastroesophageal reflux disease (GERD), but initial proton pump inhibitor (PPI) prescription patterns in Veterans are unknown.

OBJECTIVE: The study aims were to determine initial PPI prescriptions in Veterans diagnosed with GERD, and to characterize subsequent PPI use over the 2 years following initial prescription.

DESIGN: We conducted a retrospective study using Veteran's Administration (VA) administrative data and chart review.

STUDY POPULATION: Patients diagnosed with GERD and provided an initial PPI prescription at Hines VA Hospital from 2003 to 2007, with 2 year follow-up for each patient (through 2009).

MEASURES AND OUTCOMES: Initial PPI prescriptions were categorized as standard total daily dose or high total daily dose, and accuracy was confirmed by manual chart review. Descriptive statistics were calculated and bivariate analyses were used to assess for differences in demographics, prescriptions, and subsequent use by initial PPI dosage category.

RESULTS: Of the 1,621 patients included in the study, 378 (23.3 %) had high total *daily* dose initial PPI prescriptions and 1,243 (76.7 %) patients had standard total *daily* dose initial prescriptions. The majority of patients (65.8 %) received a 90-day or greater initial prescription. Over the 2 years following the initial PPI prescription, 13.0 % of patients with initial standard *daily* dose prescriptions had evidence of step-up therapy. Only 7.1 % of patients with initial high *daily* dose PPI prescriptions had evidence of step-down therapy. A large majority of patients (83.8 %) had at least one refill over 2 years, and the overall medication possession ratio was 0.86.

CONCLUSIONS: Many Veterans receive high total daily dose PPI prescriptions as initial therapy for a GERD diagnosis, and few patients have evidence for cessation or reduction of therapy. These results provide detailed data on prescribing and use of PPIs to help guide efforts for optimal PPI use in US Veterans.

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KEY WORDS: drug; GERD; prescriptions; Veteran Health Affairs.

Abbreviations

GERD	Gastroesophageal reflux disease
PPI	Proton pump inhibitor
H2RA	Histamine receptor 2 antagonists
VA	Veteran's administration
NSAID	Non-steroidal anti-inflammatory drug
DSS	Decision support system
NDE	National data extracts
MPR	Medication possession ratio
CCR	Computerized clinical reminders
ABIM	American Board of Internal Medicine
AGA	American Gastroenterology Association

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INTRODUCTION

Proton pump inhibitors (PPI) are the mainstay of treatment for gastroesophageal reflux disease (GERD) and account for over 50 % of prescriptions for *all digestive diseases*, resulting in more than $11 billion in annual direct health care costs in the US.[1] PPIs are highly effective for treating erosive reflux disease and have improved the quality of life for millions of patients.[2–4] PPI overuse has been documented in numerous studies, [5–7] which may lead to unnecessary cost, risks and side effects.[8–10] If empiric or escalated PPI dosing does not control GERD symptoms within the recommended 4-8 weeks, the medication should be stopped and alternative options assessed.[11] This approach is a top priority in the "Choosing Wisely" campaign initiated by the American Board of Internal Medicine (ABIM) and American Gastroenterology Association (AGA).[12] In the case of persistent symptoms despite active PPI treatment, systematic efforts should be made to evaluate other potential causes of symptoms and alternative approaches to therapy.[13]

Studies evaluating PPI prescriptions for GERD have focused on overutilization,[5,7,14–16] chronic use,[17,18] and adherence.[19,20] Prior work on the US Veteran population has focused on the appropriate use of PPIs in the setting of non-steroidal anti-inflammatory drugs (NSAID) use.[21] El-Serag et al. focused specifically on comparing PPI prescriptions for GERD with and without Barrett's esophagus.[22] Another study evaluated appropriateness of PPI use in Veteran's administration (VA) ambulatory care, based on associated diagnoses and symptoms.[7] However, there are limited data on PPI prescriptions in Veterans with a new diagnosis of GERD. In light of the enormous cost and associated risks related to long term PPI use, evaluation of PPI prescriptions in this cohort with high GERD prevalence is warranted, especially at the point patients are started on these medications.[23] The purpose of this study was to determine how PPIs are initially prescribed in Veterans diagnosed with GERD, and to characterize subsequent PPI use over 2 years after the initial prescription.

METHODS

Study Design

We conducted a retrospective study using VA administrative data and chart review at Edward J Hines, Jr VA Hospital (Hines, IL). The study was approved by the institutional review board (IRB) at Edward Hines, Jr. VA Hospital, Department of Veterans Affairs.

Study Population

Veterans 18 to 90 years of age with at least one encounter with a clinical outpatient diagnosis of GERD (ICD-9 codes: 530.81, 530.11) during 2003–2007 and evidence of a new PPI prescription within 30 days after the GERD diagnosis were included in the study. PPI use was evaluated 2 years after the initial prescription (e.g. up to 2009 for patients included from 2007). We used only outpatient data to identify the GERD diagnoses due to potential confounding indications for inpatient PPI prescriptions.

Exclusion Criteria

Patients with a prior PPI prescription (but no GERD diagnosis) during the preceding 12 months were excluded from the study, as this definition was previously used to define "long-term" PPI use.[24,25] Exclusion criteria was applied for 12 months prior to the GERD diagnosis (e.g. 2002 for patients diagnosed in 2003) for both inpatient and outpatient encounters. Patients with another indication associated with PPI use were excluded, including: a history of upper gastrointestinal (GI) tract bleeding (578.9), ulcer disease (532.0-532.9, 531.0-531.9, 530.2-530.21), *H. Pylori* infection (041.86), Barrett's esophagus (530.85), achalasia (530.0), eosinophilic esophagitis (530.13), stricture (530.3), and esophageal adenocarcinoma (151.0, 211.0, 230.1). Patients with use of high dose non-steroidal anti-inflammatory drugs (NSAIDS) were also excluded, as standard professional guidelines advocate PPI use with these medications in patients at high risk of ulcer disease and bleeding. These drugs included diclofenac, diflusinal, etodolac, fenoprofen, ibuprofen, indomethacin, ketoprofen, ketorolac, meclofenamate, meloxicam, nabumetone, naproxen, oxaprozin, pheynlbutazone, piroxicam, sulindac, tometin, celecoxib, rofecoxib, valdecoxib, or salicylates $\geq$ 325 mg during the study period, for a minimum duration of 14 days. This definition was previously used to define high-dose NSAID use in the VA study population.[26] Patients with thienopyridine use during the study period ($\geq$ 30 days) were excluded, due to controversies surrounding possible interactions with concomitant PPI use.[27]

Data Sources

Administrative data sources included the VA Medical SAS administrative datasets and Decision Support System (DSS) Pharmacy National Data Extracts (NDE). PPIs were identified by a variable in the pharmacy product tables (FEED_KEY variable), which contains the 12-digit format of the National Drug Code. Using this variable, a total of 62 possible PPI products were identified. Since DSS Pharmacy NDEs do not contain dosing instructions, we conducted a targeted medical chart review of a 15 % random sample of included patients to confirm PPI dosing categories. The chart review was conducted by a single individual (A. Gawron), and data was entered into an database by a research assistant. We evaluated both the encounter note and actual PPI prescription order. We also collected body mass index (BMI), clinic/specialty, PPI type, dose(mg), dosing frequency (e.g., once daily, twice daily), dosing instructions, documented symptoms, and any evidence the patient was already taking a PPI (if prior use was mentioned in encounter note or included "continue" wording).

Measures and Outcomes

The *Initial PPI prescription* was defined as the first outpatient PPI prescription within 30 days after the GERD diagnosis. We defined *Standard* and *High daily dose* prescriptions using the variables available from the pharmacy data sets: [Dose X (Quantity of medication / Day's supply)]. These categories were validated as representing *Standard* and *High* daily dose PPIs via the manual chart review. Refill data and the medication possession ratio

(MPR=total days' supply/study time (730 days)) was calculated overall and by PPI dosing category. Multiple methods exist to measure adherence, all with limitations. We calculated MPR to maintain uniformity with prior literature evaluating PPI adherence with this metric.[18,28,29] We evaluated Histamine 2-Receptor Anatagonists (H2RA)use prior to and after the initial PPI prescription (cimetidine, ranitidine, famotidine, and nizatidine). Evidence of *step-up* and *step-down* therapy was determined by evaluating for changes in *total daily dose* in those patients with at least one refilled prescription of the same PPI.

Statistical Analyses

Overall descriptive statistics were calculated for demographics, initial PPI prescriptions, and PPI use and reported as proportions of the total sample. Charlson Comorbidity Indices (CCI) were calculated using appropriate diagnoses codes.[30] Descriptive statistics were calculated for all manual chart review measures. The accuracy of initial dosing categories was determined by comparing the manual chart review and administrative dosing data and agreement determined with a Kappa statistic. Bivariate analyses assessed differences in measures by initial PPI dosing category using t tests for continuous variables and chi squared or Fisher's exact tests for categorical variables. Statistical analyses were performed with SAS 9.2 (SAS Institute Inc., Cary, NC).

RESULTS

Patient Sample and Initial PPI Dosing Categories

As shown in Fig. 1, after exclusion criteria were applied, a total of 1,621 patients were included in the study. The total patient sample was mostly male (97.4 %), white non-Hispanic (73.5 %), married (60.5 %), and 64.6 years of age, on average (Table 1). Patients were classified as having standard daily (N=1,243, 76.7 %) and high daily dose (N=378, 23.3 %) initial PPI prescriptions (Fig. 1). We found 98.7 % of prescriptions classified as "standard daily dose" had a total daily dose of 20 mg or less and the majority of these were for omeprazole or rabeprazole. Conversely,

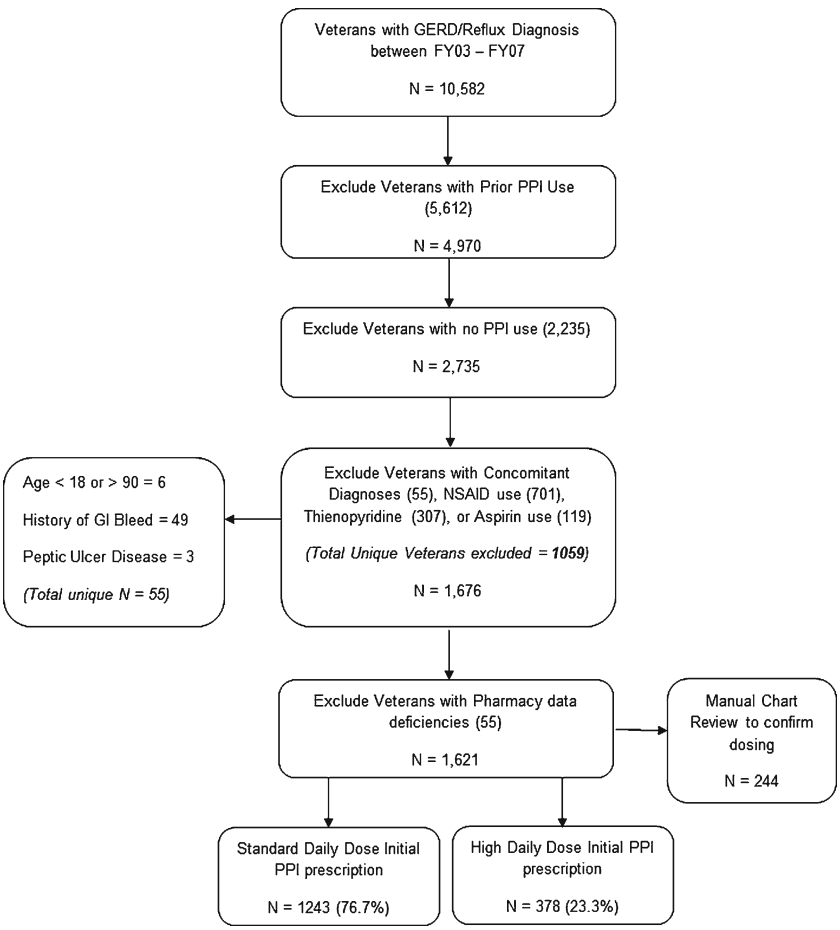

Figure 1. Patient sample and classification of initial proton pump inhibitors (PPI) prescriptions.

Table 1. Demographics and Clinical Characteristics in Veterans Diagnosed with Gastroesophageal Reflux Disease (GERD) and Provided a Proton Pump Inhibitor (PPI) Prescription

	All patients (*N*=1,621)	Initial Standard daily dose (*N*=1,243)	Initial High daily dose (*N*=378)	*P* value*
Demographics				
Age				0.5
Mean (SD), years	64.6 (14.2)	64.7 (14.3)	64.1 (14.8)	
Sex				0.8
Male	1579 (97.4 %)	1210 (97.4 %)	369 (97.6 %)	
Female	42 (2.6 %)	33 (2.7 %)	9 (2.4 %)	
Race/Ethnicity†				0.3
White	1093 (73.5 %)	848 (74.1 %)	245 (71.4 %)	
Black	145 (9.7 %)	106 (9.3 %)	39 (11.4 %)	
Hispanic	230 (15.5)	173 (15.0 %)	57 (16.6 %)	
Other, Non-Hispanic	20 (1.3 %)	18 (1.6 %)	2 (0.6 %)	
Marital status‡				0.2
Not married	637 (39.5 %)	760 (61.4 %)	215 (57.3 %)	
Married	975 (60.5 %)	477 (38.6 %)	160 (42.7 %)	
Clinical characteristics				
Mean Charlson Comorbidity Index (SD)§	1.3 (1.8)	1.3 (1.8)	1.4 (2.0)	0.08
H2RA use prior to PPI prescription	89 (5.5 %)	68 (5.5 %)	21 (5.6 %)	0.9

* *Initial standard daily vs. high daily dose;*
† *133 missing;*
‡ *nine missing;*
§ *Calculated over the 2-year study period after initial PPI prescription*

99.7 % of prescriptions classified as "high daily dose" included a total daily dose of 40 mg or higher. The medical chart review of the random sample (N=244 out of 1,621) showed excellent agreement of > 99 % for both initial dosing categories (standard and high) (Kappa statistic= 0.99). All PPI prescriptions initially categorized as "standard daily dose" were correctly identified as being the lowest available PPI dose (mg) provided daily. Prescriptions defined as high daily dose from the administrative data were found to represent a mix of standard daily dose PPI prescriptions given twice daily (N=24), or double dose once daily (N=15). There was only one patient that could not be classified in the chart review (the patient was classified as having a "standard daily dose" via the administrative data).

Initial PPI Prescriptions and Subsequent Use

Demographic characteristics were similar between the two initial dosage categories (Table 1, all *P* values > 0.05). Patients with standard and high daily dose initial prescriptions had similar Charlson comorbidity indices (1.3 vs. 1.4, *P*=0.08). Overall, prescribed H2RA use was low (5.5 %) in all patients. There was no difference in H2RA prescriptions prior to the initial PPI prescription (5.5 % vs. 5.6 %, *P*=0.9).

Omeprazole (71.2 %) and rabeprazole (26.7 %) were the most common PPIs prescribed in the entire patient sample (Table 2, N=1621). The majority of patients (65.8 %) received a 90-day or greater initial prescription supply, and 16.2 % received only the initial prescription (without evidence of changes or refills) during the two years after the initial prescription. Overall, the mean number of annual refills was 2.9 with a Medication Possession Ratio (MPR) of 0.86. During the 2-year study period after each initial prescription, 386 (23.8 %) patients were changed to a different PPI. The majority (312, 81 %) of these patients were switched from rabeprazole to omeprazole in 2004-2006, which was the immediate period after the corresponding formulary change within the VA. Excluding changes in PPI type, a total of 14.7 % of patients had evidence of "step-up" therapy, and 3.3 % had evidence of "step-down" therapy.

The overall proportions of PPI brand prescribed were statistically different between the two groups, as shown in Table 2 (*P*<0.0001). The standard daily dose group compared to the high daily dose group had a lesser proportion of omeprazole prescriptions (69.3 % vs. 77.5 %) and greater proportion of rabeprazole prescriptions (29.3 % vs. 18.0 %). A greater proportion of patients with standard daily dose initial prescriptions were provided equal or greater than 90-day initial supply (68.4 % vs. 57.1 %, *P*<0.0001).

Patients with a standard daily dose initial prescription had a similar number of mean annual refills (2.9 vs. 2.6, *P*= 0.3,) but greater total days' supply provided (231.0 vs. 198.3, *P*<0.0001) than patients with a high daily dose initial prescription (Table 2). The mean medication possession ratio (MPR) was similar in the standard daily dose compared to high daily dose group (0.86 vs. 0.84, *P*=0.1). Over 2 years, a greater proportion of the standard daily dose group had evidence of step-up therapy than the high daily dose group (18.3 % vs. 2.7 %, *P*<0.0001). A lower proportion of the standard daily dose group had evidence of step-down therapy than those in the high daily dose

Table 2. Proton Pump Inhibitor (PPI) Prescriptions and Use Over 2 Years After Initial Prescription

	All patients (N=1,621)	Initial Standard daily dose (N=1,243)	Initial High daily dose (N=378)	*P* value*
Initial PPI Prescriptions				
PPI type				< 0.0001
Omeprazole	1155 (71.2 %)	862 (69.3 %)	293 (77.5 %)	
Rabeprazole	432 (26.7 %)	364 (29.3 %)	68 (18.0 %)	
Pantoprazole	15 (0.9 %)	0 (0 %)	15 (4.0 %)	
Esomeprazole	1 (0.1 %)	1 (0.1)	0 (0 %)	
Lansoprazole	18 (1.1 %)	16 (1.3 %)	2 (0.8 %)	
Initial days' supply provided				< 0.0001
< 90	555 (34.2 %)	393 (31.6 %)	162 (42.9 %)	
= or >90	1066 (65.8 %)	850 (68.4 %)	216 (57.1 %)	
Total days' supply (annual)				< 0.0001
Mean (s.d.)	223.7 (135.3)	231.4 (135.5)	198.2 (132.8)	
PPI use over 2 years after initial prescription				
Number of refills (annual)				
Mean (s.d.)	2.9 (2.5)	2.9 (2.4)	2.7 (2.5)	0.3
Prescription changes during 2 yrs after initial prescription				
Initial prescription only (no refills)	263 (16.2 %)	194 (15.6 %)	69 (18.3 %)	0.2
Change to different PPI	386 (23.8 %)	314 (25.3 %)	72 (19.1 %)	0.04
Evidence of "step-up" therapy	238 (14.7 %)	228 (18.3 %)	10 (2.7 %)	< 0.0001
Evidence of "step-down" therapy	53 (3.3 %)	8 (0.6 %)	45 (11.9 %)	< 0.0001
Medication Possession Ratio (MPR)				
Mean (s.d.)	0.86 (0.20)	0.86 (0.20)	0.84 (0.20)	0.1
H2RA use after PPI prescription	80 (4.9 %)	55 (4.4 %)	25 (6.6 %)	0.09

**Standard daily vs. high daily initial dose*

group (0.6 % vs. 11.9 %, $P<0.0001$). H2RA prescriptions were still low (overall 4.9 %), but slightly higher (but not significant) in patients with high daily dose PPI prescriptions (6.6 % vs. 4.4 %, $P=0.09$).

Supplemental Clinical and Prescribing Data

The supplemental chart review showed the majority of patients received their initial prescription from providers in Internal Medicine/Primary care (70.9 %) and Emergency Medicine (11.1 %) (Table 3). Specialists prescribed the remaining prescriptions, with Otolaryngology (7.0 %) accounting for the greatest proportion of prescriptions. Documented dosing instructions for initial PPI prescriptions as obtained from the chart review varied (Table 3). Over 80 % of prescriptions had no specific timing documented, with the most common instructions being to "take one capsule (or tablet) once daily" (65.2 %). Of those with specific timing instructions, the majority instructed patients to take their PPI within a range of 15 to 60 min before breakfast (17.6 %).

PPIs were also prescribed for a variety of symptoms. A total of 78 (32.0 %) patients complained of esophageal symptoms, including heartburn, acid taste, and regurgitation. Extra-esophageal symptoms were present in 119 (48.8 %) patients (e.g. abdominal pain, cough, sore throat, globus, nausea, hoarseness, belching, bloating, vomiting). A substantial proportion of patients (N=89, 36.5 %) had no symptoms documented at time of PPI prescription. There was evidence that 62 patients (25.4 %) were taking a PPI prior to their initial prescription at the VA. These patients were more likely to be older (67.6 yrs vs. 60.0 yrs, $P=0.0008$) and white (41 [80.4 %] vs. 102 [61.1 %]), $P=0.01$). However, there was no difference in these groups when comparing the proportion of patients that received a standard or high daily dose PPI initial prescription. Patients with evidence of prior PPI use had a similar proportion of high daily dose initial prescriptions (14.5 %) as those patients without evidence of prior PPI prescription (16.5 %, $P=0.7$).

DISCUSSION

Our study is the first of its kind to evaluate initial PPI prescriptions in US Veterans diagnosed with GERD. Many Veterans are prescribed high total daily doses, despite evidence and recommendations against this strategy.[4] The majority of patients were also given≥90 days' supply with their initial prescription. Our results suggest substantial variability in initial and continued PPI dosing regimens in US Veterans diagnosed with GERD.

Notably few patients started on high daily dose PPI therapy had any evidence of decreased dosing. Similarly, an Australian cohort study found that only 1/3 of new high strength PPIs were discontinued within recommended time intervals.[31] Inadomi et al. demonstrated that ~ 80 % of patients on high dose PPI therapy could be "stepped down" to standard dose therapy without symptom recurrence and with significant cost savings.[32] A systematic review of interventions to decrease PPI use reached a similar conclusion, in that 26-71 % of GERD patients could be

Table 3. Clinical Data, Provider Type, and Prescription Instructions Obtained from Supplemental Chart Review

	N=244 patients
BMI	
Median (range)	27.7 (17.9-71.6)
Clinic/Encounter associated with PPI Prescription	
Internal Medicine/Primary Care	173 (70.9 %)
ER (Emergency)	27 (11.1 %)
Otolaryngology	17 (7.0 %)
Gastroenterology	9 (3.7 %)
Other clinic/encounter*	18 (7.3 %)
Proton pump inhibitor type	
Omeprazole	182 (74.6 %)
Rabeprazole	60 (24.6 %)
Lansoprazole	1 (0.4 %)
Pantoprazole	1 (0.4 %)
Specific dosing instructions documented	
Take one capsule (or tablet) once daily	159 (65.2 %)
Take one capsule (or tablet) twice daily	21 (8.6 %)
Take two capsules (or tablets) once daily	14 (5.7 %)
Take before breakfast (range 15 to 60 min)	43 (17.6 %)
Take before dinner (range 30 to 60 min)	1 (0.4 %)
Take before bedtime	3 (1.2 %)
Other instructions†	2 (0.8 %)
Not available	1 (0.4 %)
Evidence that patient was taking PPI at time of encounter (outside of VA prescription benefit)	63 (25.8 %)

* *Endocrinology, Geriatrics, Hematology/Oncology, Mental Health, Psychiatry, Pulmonary, Rheumatology, Spinal Cord, Telephone contact, Women's clinic*

† *Included: "Take by mouth daily for H pylori, Take one tablet by mouth every morning"*

"adequately managed" with less than continuous daily PPI treatment. This approach was highlighted in the recent "Choosing Wisely" campaign initiated by the ABIM and AGA.[12] Challenges exist to reach this goal, as highlighted by a systematic review that found very limited research on effective interventions to stop prescribing of unwarranted medications, including PPIs.[33] Our results provide baseline data for assessing the effect of this campaign on PPI prescriptions.

After the initial prescription, the majority of patients continued PPI therapy over the defined time period (2 years after their initial prescription) and appeared relatively adherent to therapy, regardless of initial dosing category. The appearance of high adherence with minimal change in dosing practices could reflect characteristics of the VA pharmacy system, which includes default PPI ordering preferences, rather than conscious decision-making, to provide large quantities of PPIs. Proactive efforts should be made to ensure practitioners prescribe the minimum effective PPI dose and prevent unnecessary PPI prescriptions for Veterans. This could include decision support in the electronic health record via automatic alerts and the need for justification when physicians attempt to prescribe high dose PPIs. The quantity and days' supply of PPI prescriptions could be limited to specific durations and fewer refills (< 90 days), in order to encourage provider reevaluation after empiric therapy rather than prolonged continuation of high dose PPIs. These would be relatively low cost interventions with the potential to change national VA prescribing practices and PPI use.

While we could not completely determine appropriateness of prescriptions, other patient comorbidities do not likely explain our results, as the patient sample was relatively healthy with very few chronic conditions. H2RA use both before and after the initial PPI prescription was also similar between patients with standard and high daily dose prescriptions. The chart review suggested primary care encounters account for the majority of initial PPI prescriptions in the VA. Very few gastroenterologists provided initial PPI prescriptions, likely because gastroenterologists typically see patients who have not responded to PPI therapy.[34] Many PPIs were given largely for atypical symptoms that have questionable associations with true reflux disease and are less likely to respond to PPI therapy.[35]

The chart review also suggested that specific instructions were not included in ~ 80 % of prescriptions, and even when specific timing was instructed, it was not always correct (30-60 min before meals to obtain physiologic acid suppression).[36] Poor symptom and instruction documentation may be related to evidence of prior PPI use, with the encounter serving as a way to obtain the VA prescription drug benefit. If many patients are being given PPIs based on prior use and non-VA provider recommendations, VA healthcare professionals should still be routinely evaluating the appropriateness of the dose and continuing therapy.

There are numerous limitations of this study. We used administrative data from a single center, which may limit the generalizability of our findings. Patients were identified as having GERD using ICD-9 codes, which may have been inaccurate due to the heterogeneity of symptoms that are sometimes attributed incorrectly to GERD. Patients that were given a PPI for symptoms of GERD but not coded as such would have been excluded from the analysis. It is common for Veterans to have multiple encounters coded on the same date, so we could not reliably attribute one provider to each PPI prescription from the administrative data. Other conditions not documented may have also accounted for PPI prescribing. The chart review provided insight into symptoms, but rarely was there detailed information regarding severity or burden of symptoms.

Patients may have been misclassified as incident PPI users, as revealed by our chart review. We were unable to account for over the counter (OTC) use of PPIs; however, if anything, this would underestimate PPI use in our population as omeprazole became available OTC in 2003. We used administrative data to classify dosing and this may have resulted in some misclassification of dosing; however, the categorization agreed remarkably with actual dosing as confirmed by the manual chart review. Our data did show that a high proportion of patients received refills. This may represent failure to attempt discontinuation of therapy or actual appropriate use in patients with persistent symptoms,

as we do not know what practitioners communicated to patients verbally regarding use of PPIs. Patients may have been provided prescriptions for "on demand therapy", in which case it may have been appropriate to provide patients with greater than 4 weeks supply.

Our results provide insight into how PPI prescriptions are initiated for GERD and continued over time in the VA system. These findings could be used to guide attempts to decrease unnecessary PPI use and modify prescribing practices within the VA. When PPIs are started empirically, providers should be vigilant in ensuring appropriate dosing, and timely assessment of response and opportunities to decrease or stop therapy. Future work should include further characterization of providers that may more liberally prescribe PPIs and disproportionately escalate therapy. Further identification of factors associated with chronic PPI use could highlight potential strategies to ensure PPI prescriptions are "chosen wisely"[12] in the Veteran population. This warrants further study in a large scale national VA sample.

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Corresponding Author: *Andrew J. Gawron, MD, PhD; Division of Gastroenterology Hepatology and Center for Healthcare Studies, Feinberg School of Medicine, Northwestern University, 750 N Lake Shore Drive 10th Floor, Chicago, IL 60613, USA (e-mail: agawron@fsm.northwestern.edu).*

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