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Low-Value Proton Pump Inhibitor Prescriptions Among Older Adults at a Large Academic Health System:

Harmful Proton Pump Inhibitors in Older Adults

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Abstract

Background: Older adults are particularly vulnerable to complications from proton pump inhibitor (PPI) drugs. We sought to characterize the prevalence of potentially low-value PPI prescriptions among older adults in order to inform a quality improvement (QI) intervention.

Methods: We created a cohort of patients ≥65 years old receiving primary care at a large academic health system in 2018. We identified patients currently prescribed any PPI using the electronic health record (EHR) medication list (current defined as September 1st, 2018). A geriatrician, gastroenterologist, QI expert, and two primary care physicians (PCPs) created multidisciplinary PPI appropriateness criteria based on evidenced-based guidelines. Supervised by a gastroenterologist and PCP, two internal medicine residents conducted manual chart reviews in a random sample of 399 patients prescribed PPIs. We considered prescriptions potentially low-value if they lacked a guideline-based (1) short-term indication (GERD/peptic ulcer disease/H. Pylori gastritis/dyspepsia) or (2) long-term (>8 weeks) indication (severe/refractory GERD/erosive

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esophagitis/Barrett's esophagus/esophageal adenocarcinoma/esophageal stricture/high gastrointestinal bleeding risk/Zollinger-Ellison Syndrome). We used the Wilson score method to calculate 95% confidence intervals on low-value PPI prescription prevalence.

Results: Among 69,352 older adults, 8,729 (12.6%) were prescribed a PPI. In the sample of 399 patients prescribed PPIs, 63.9% were female; mean age was 76.2 years, and they were seen by 169 PCPs. Of the 399 prescriptions, 143 (35.8% [95% CI 31.3–40.7%]) were potentially low-value—of which 82% began appropriately (e.g., GERD) but then continued long-term without a guideline-based indication. Among 169 PCPs, 32 (18.9%) contributed to 59.2% of potentially low-value prescriptions.

Conclusion: One in eight older adults were prescribed a PPI, and over one-third of prescriptions were potentially low-value. Most often, appropriate short-term prescriptions became potentially low-value because they lacked long-term indications. With most potentially low-value prescribing concentrated among a small subset of PCPs, interventions targeting them and/or applying EHR-based automatic stopping rules may protect older adults from harm.

INTRODUCTION

Proton pump inhibitor (PPI) drugs are associated with complications such as C. difficile infections or kidney toxicity, and older adults are particularly vulnerable to such adverse events.[1–6] Moreover, PPIs contribute to polypharmacy, prescription drug costs, and aging-related complications (e.g., osteoporotic fractures).[7,8]

Despite these harms, many PPI prescriptions are potentially low-value, meaning they lack an evidenced-based indication.[9,10] Promisingly, six randomized PPI de-intensification trials in a meta-analysis found that deprescribing can reduce PPI use and pill burden.[11] Other well-designed quality improvement studies attempting to reduce potentially low-value PPI prescriptions have found mixed results[12,13] and importantly none of the six randomized trials were conducted among older Americans.

We sought to characterize the prevalence of potentially low-value PPI prescriptions among older adults at the University of California Los Angeles (UCLA) Health, a large academic health system, in order to inform a randomized quality improvement (QI) intervention.

METHODS

Study Design and Cohort Selection

We performed a chart review on a subset of older adults prescribed PPIs at UCLA Health in 2018 (Supplementary Figure S1). First, we identified the total cohort of patients ≥65 years old meeting any of the following criteria: (1) ≥2 UCLA primary care physician (PCP) visits in the past 3 years; (2) ≥1 UCLA preventive care PCP visit in the past year; (3) current membership in UCLA's medical group insurance plan. We identified patients currently prescribed any PPI using the electronic health record (EHR) medication list (Supplementary Table S1), with "current" defined as September 1st, 2018. We excluded PPIs included historically on the medication list that were prescribed by non-UCLA clinicians or bought

over the counter (n=3,317) because our proposed intervention to reduce PPI use will focus on UCLA clinician prescribing.

Because our expected low-value prescription rate was 30% (based on literature[9,10] and an exploratory chart review, data not shown), we determined that a chart review sample size of 357 would ensure an estimate precision of 5% (i.e., half width of 95% confidence interval ≤5%).

Supervised by a board-certified gastroenterologist and general internist, two internal medicine residents performed standardized chart review on a small training set to assess inter-rater agreement for appropriateness (>90% agreement on the cases is considered excellent agreement).[14] Next, the residents performed the standardized chart review on a random sample of 399 patients from the larger cohort to obtain demographic, clinical, and physician practice data. We also collected information on medication adherence (see the Supplemental Appendix for these results).

Appropriateness Measurement

A multidisciplinary committee (geriatrician, gastroenterologist, QI expert, two general internists) created guideline-based appropriateness criteria based on the American Geriatrics Society Beers Criteria, American Gastroenterological Association, and American College of Gastroenterology Practice Guidelines.[15–17] The committee reviewed each recommendation and strength of evidence; all recommendations were accepted based on group discussion and consensus. We determined appropriateness by reviewing charts for problem lists, diagnoses, medications, visit notes, and endoscopy reports based on two categories of appropriateness: short-term and long-term PPI prescriptions from January 1, 2013—March 21, 2019 (Supplementary Table S2). Regarding evidenced-based indications for short-term (≤8 weeks) PPI prescriptions, we looked for GERD, peptic ulcer disease, H. Pylori gastritis, and dyspepsia diagnoses. Regarding evidenced-based indications for long-term (>8 weeks) PPI prescriptions, we reviewed the chart for erosive esophagitis, refractory/severe GERD, high risk for GI bleeding (e.g., on chronic non-steroidal anti-inflammatory drugs), Barrett's esophagus, esophageal stricture, esophageal adenocarcinoma or Zollinger-Ellison Syndrome diagnoses. Reviewers deemed prescriptions lacking evidence-based indications as potentially low-value.

Analysis

We performed an exploratory analysis to assess whether any demographic characteristics are associated with potentially low-value prescriptions using Chi square tests and student t-tests. We also used the Wilson score method to calculate 95% confidence intervals on low-value PPI prescription prevalence. We created histograms of potentially low-value PPI prescription rates among all PPI prescriptions ranked by the patients' primary care practice and the patients' PCP. All analyses were completed using SAS, version 9.4 (SAS Institute Inc). The UCLA Health Institutional Review Board approved this retrospective quality improvement study.

RESULTS

Among 69,352 older adults, 8,729 (12.6%) were prescribed a PPI. In the chart review sub-sample (n=399), 63.9% of patients were female; mean age was 76.2 years; patients were seen by 169 PCPs (Table 1). After reviewing the guideline-based criteria, the two blinded reviewers independently agreed 100% of the time on whether the PPI prescription was low-value in the training set (n=9), indicating excellent inter-rater agreement.

Of the 399 prescriptions, 143 (35.8% [95% CI 31.3–40.7%]) were potentially low-value—of which 82% began appropriately (e.g., GERD) but then continued long-term without a guideline-based indication (Table 2).

Among the 41 primary care practices, 16 (39.0%) contributed to 72.4% of the potentially low-value prescriptions (Figure 1). Among 169 PCPs, 32 (18.9%) contributed to 59.2% of potentially low-value prescriptions.

DISCUSSION

One in eight older adults were prescribed a PPI, and over one-third of prescriptions were potentially low-value. Most often, appropriate short-term prescriptions became potentially low-value because they lacked long-term indications. With most potentially low-value prescribing concentrated among a small subset of PCPs, interventions targeting them[18] and/or applying EHR-based automatic stopping rules may protect older adults from harm.

Our results are concordant with prior studies assessing the rate of potentially low-value PPI prescriptions among older adults (ranging from 20–40%).[9,10] Previous research highlights inpatient prescriptions as a major source of potentially low-value PPI prescriptions,[19] suggesting that this is a major problem for post-acute and primary care providers who are trying to determine if and when the PPI can be discontinued, and is a major reason for ongoing low-value use. This work also suggests that requiring indications on post-acute care transfer forms could curb potentially low-value PPI prescriptions.

Our study adds to the literature by focusing on clinician-level performance data as a means for targeted QI as well as highlighting the dynamic nature of low-value care. For example, because most potentially low-value prescriptions began appropriately but then continue without an indication, an EHR choice architecture automatically defaulting prescriptions to the lowest dose, 8 weeks' duration, and no refills could reduce needless long-term PPIs with minimal clinical workflow disruption.[20] However, these defaults may inadvertently stop necessary PPIs if they lack clinical nuance.[21,22] Therefore, the EHR defaults must be targeted precisely for low-value prescriptions to avoid unintended consequences such as GI bleeding that might have been prevented by PPIs.[22,23]

This study has important limitations. First, findings from this single institution study may not generalize to other health systems. Second, the lack of a documented indication does not exclude the possibility that there was an undocumented evidenced-based indication. Prompting clinicians to document an indication for long-term prescriptions can mitigate this

clinical uncertainty while simultaneously improving documentation and the quality of care.[12,24]

Conclusions

Older adults are receiving PPI prescriptions at an alarmingly high rate, often against guidelines. This study suggests that potentially minor changes in EHR-based stopping rules and/or targeted physician profiling could have a substantial impact on reducing low-value prescribing. These findings will directly inform a system-level QI intervention to curb potentially low-value long-term PPI prescriptions among older adults.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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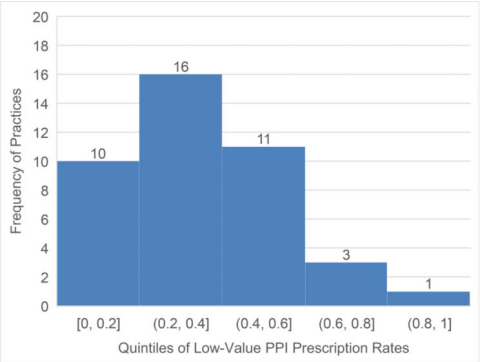

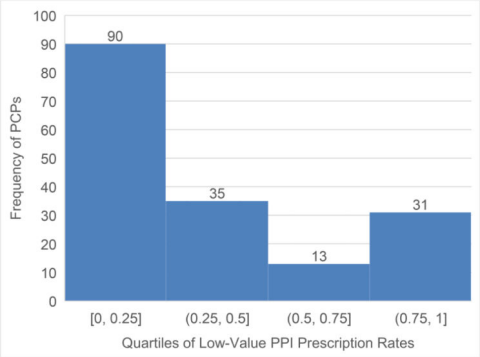

Figure 1.

Rates of Potentially Low-Value PPI Prescriptions Among All PPI Prescriptions Ranked by Primary Care Practice and Primary Care Physician (PCP)

Figure 1A. Quintiles of Low-Value Prescribing Rates Ranked by Primary Care Practices (n=41)

Figure 1B. Quartiles of Low-Value Prescribing Rates Ranked by PCP Prescribers (n=169 PCPs)

Table 1.

Characteristics of Patients in Subsample Prescribed PPIs Stratified by Appropriateness (n=399)

	Potentially Low-Value (n=143) n (%)	Appropriate (n=254) n (%)	Total (N=399) n (%)
Age (Mean ± SD)	76.0 ± 8.7	76.2 ± 8.3	76.2 ± 8.5
Gender			
Male	46 (32.2)	97 (38.2)	144 (36.1)
Female	97 (67.8)	157 (61.8)	255 (63.9)
Race			
White	93 (65.0)	176 (69.3)	271 (67.9)
Black	5 (3.5)	17 (6.7)	22 (5.5)
Asian	18 (12.6)	23 (9.1)	41 (10.3)
AI/AN	2 (1.4)	0 (0.0)	2 (0.5)
Other	21 (14.7)	31 (12.2)	52 (13.0)
Unknown	4 (2.8)	7 (2.8)	11 (2.8)
Ethnicity			
Hispanic	27 (18.9)	41 (16.1)	69 (17.3)
Not Hispanic	113 (79.0)	205 (80.7)	319 (79.9)
Unknown	3 (2.1)	8 (3.1)	11 (2.8)
Median household income			
Mean	$83,910	$89,665	$87,524
Median	$79,242	$84,937	$82,630
<$50,000	14 (9.8)	23 (9.1)	37 (9.3)
[$50,000, $75,000)	35 (24.5)	58 (22.8)	94 (23.6)
[$75,000, $100,000)	50 (35.0)	93 (36.6)	144 (36.1)
>=$100,000	42 (29.4)	74 (29.1)	116 (29.1)
Unknown	2 (1.4)	6 (2.4)	8 (2.0)

Analyses with chi square tests and t-tests found no stastically significant differences between patients with potentially low-value vs appropriate PPI use by age, gender, race, ethnicity, and zip code derived household income.

PPI = Proton Pump Inhibitor; SD = Standard Deviation; AI/AN = American Indian/Alaska Native

Table 2.

Categories of Initial PPI Indication and Long-Term Indication Stratified by Appropriateness

	Potentially Low-Value (n=143) n (%)	Appropriate (n=254) n (%)	Total (N=399) n (%)
Categories of Initial Indication for PPI (%)			
GERD	95 (66.4)	163 (64.2)	258 (65.0)
Peptic ulcer disease	5 (3.5)	15 (5.9)	20 (5.0)
Chronic cough	5 (3.5)	4 (1.6)	9 (2.3)
Atypical GERD symptoms	4 (2.8)	7 (2.8)	11 (2.8)
Dyspepsia	4 (2.8)	7 (2.8)	11 (2.8)
Laryngopharyngeal reflux	3 (2.1)	3 (1.2)	6 (1.5)
Suspected Upper GI bleed	3 (2.1)	2 (0.8)	5 (1.3)
Ulcer bleeding prophylaxis	3 (2.1)	5 (2.0)	8 (2.0)
H. pylori eradication	1 (0.7)	1 (0.4)	2 (0.5)
Unable to determine	14 (9.8)	14 (5.5)	28 (7.1)
Anticoagulation	0 (0.0)	1 (0.4)	1 (0.3)
Other	6 (4.2)	32 (12.6)	38 (9.6)
Categories of Potentially Low-Value PPI (%)			
Use extended long-term for a short-term indication	116 (81.1)	NA	116 (81.1)
No identifiable indication for use	18 (12.6)	NA	18 (12.6)
Use for indication not recommended by guidelines	6 (4.2)	NA	6 (4.2)
Started inpatient and continued to outpatient without indication	1 (4.2)	NA	1 (4.2)
Other	1 (0.7)	NA	1 (0.7)
Unknown	1 (0.7)	NA	1 (0.7)

PPI = Proton Pump Inhibitor; GI = Gastrointestinal; GERD = Gastroesophageal Reflux Disease