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Do Hospitalists Overuse Proton Pump Inhibitors? Data From a Contemporary Cohort

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Proton pump inhibitors (PPIs) are commonly used to treat acid-related disorders but are associated with an increased risk of pneumonia and *Clostridium difficile*-associated diarrhea.[1,2] Initiation of PPIs in hospitalized patients should therefore be limited to specific clinical situations, such as upper gastrointestinal bleeding or stress ulcer prophylaxis in the critically ill.[3] Prior studies suggest significant overuse of PPIs in hospitalized patients exists,[4–7] but these were published before the widespread implementation of local and national quality improvement efforts targeted at reducing PPI use in medical inpatients (eg, Society of Hospital Medicine's Choosing Wisely list[8]). We aimed to determine the frequency of inappropriate use of PPIs in a contemporary cohort of hospitalized patients in a tertiary care academic medical center.

METHODS

We conducted a retrospective cohort study of 297 patients admitted to a tertiary care center hospitalist service comprised of teaching and nonteaching medical patients who were not critically ill, were admitted between January 1, 2012 and March 31, 2012, and received a PPI during their hospital stay. Three internists used American College of Gastroenterology and the American Society for Gastrointestinal Endoscopy and prior studies to develop criteria to identify appropriate and inappropriate PPI use (Table 1).[4–7] Appropriate indications included gastrointestinal (GI) bleeding, esophagitis, gastritis, gastroesophageal reflux (GERD), and continuation of home PPI (abrupt discontinuation can trigger reflux symptoms).[9] We extracted the medical records of included patients, applying our prespecified criteria to determine whether use was appropriate. In patients in whom PPI was a continued home medication, we also extracted 2 years of data prior to the index date to determine if the medication was started during a prior hospital admission and, if so, whether this initiation was appropriate. We used descriptive statistics and χ^2 tests to compare patient characteristics and indications for PPI use.

RESULTS

Of 297 patients, the mean age was 64.4 years (standard deviation 16.3 years), most were white (69%), and 56% were women (Table 2). PPI use was appropriate in 231 (78%, 95% confidence interval: 72.6%-82.4%) patients. Of these, a majority (172, 75%) of patients received a PPI because it was a continued home medication. Only 40 of the 172 patients had the medication started during a recent hospitalization, and in half of those cases (20) the PPI use was appropriate.

The second most common appropriate diagnosis was GERD (31%), followed by history of GI bleeding (19%) and treatment for esophagitis or gastritis (18%). Among the 66 patients receiving a PPI inappropriately, the majority of patients (56%) had no documented reason for PPI use, and only 11 patients (17%) were receiving PPI for stress ulcer prophylaxis (Figure 1).

TABLE 1. Appropriate and Inappropriate PPI Uses

Appropriate PPI use	Inappropriate PPI use
History of upper GI bleeding	No reason given
Endoscopic evidence of peptic ulcer disease	Unspecified GI prophylaxis
Esophagitis	Nonspecific abdominal pain
Gastritis and duodenitis	Heartburn (nonchronic)
Eradication of *H pylori*	Acute pancreatitis
GERD	Anemia
Barrett's esophagus	Heparin use for DVT prophylaxis
Continued on home PPI	Use of aspirin, NSAID, steroids or Coumadin (as a single agent)
Acute esophageal variceal bleeding	
NSAID used in patient >65 years-old	
High-risk groups; combination of 2 or more of aspirin, NSAID, clopidogrel, or Coumadin	

NOTE: Developed from guidelines of the American College of Gastroenterology, American Society for Gastrointestinal Endoscopy, and prior studies.[4,6] **Abbreviations:** DVT, deep venous thrombosis; GERD, gastroesophageal reflux disease; *H pylori*, *Helicobacter pylori*; NSAID, nonsteroidal anti-inflammatory drug; PPI, proton pump inhibitor.

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TABLE 2. Baseline Characteristics of Hospitalized Patients With Prescribed PPI

Demographics	PPI Not Indicated, N = 66		PPI Indicated, N = 231		Total = 297	
Age, y, mean (SD)	62.5	(16.2)	64.9	(16.3)	64.4	(16.3)
Sex, % No.						
Female	51.5%	34	56.7%	131	55.6%	165
Male	48.5%	32	43.3%	100	44.4%	132
Race, % No.						
Asian	0.0%	0	0.9%	2	0.7%	2
Black	10.6%	7	9.1%	21	9.4%	28
Hispanic	18.2%	12	19.5%	45	19.2%	57
Unknown	0.0%	0	2.2%	5	1.7%	5
White	71.2%	47	68.4%	158	69.0%	205
Insurance, % No.						
Insured	95.5%	63	87.4%	202	89.2%	265
Uninsured	0.0%	0	0.9%	2	0.7%	2
Unknown	4.5%	3	11.7%	27	10.1%	30
Service, % No.						
Teaching	25.8%	17	32.9%	76	31.3%	93
Nonteaching	74.2%	49	66.7%	154	68.4%	203
Unknown	0.0%	0	0.4%	1	0.3%	1
Chronic disease, % No.						
Cardiac disease	16.7%	11	13.4%	31	14.1%	42
Pulmonary disease	16.7%	11	14.7%	34	15.2%	45
Gastrointestinal disease	13.6%	9	19.5%	45	18.2%	54
Hepatic disease	7.6%	5	3.9%	9	4.7%	14
Stroke	1.5%	1	5.2%	12	4.4%	13
Sepsis	12.1%	8	13.0%	30	12.8%	38
Other	33.3%	22	29.4%	68	30.3%	90
PPI status, % No.						
Continued home PPI	0.0%	0	74.5%	172	58.1%	172
Started on PPI in hospital	100%	65	25.5%	59	41.9%	124
Discharged on AST, % No.						
Yes	36.4%	24	89.6%	207	22.2%	231
PPI	87.5%	21	96.6%	200	95.7%	221
Brand	52.4%	11	59.5%	119	58.8%	130
Generic	47.6%	10	40.5%	81	41.2%	91
H2 blocker	12.5%	3	3.4%	7	4.3%	10
Brand	0.0%	0	71.4%	5	50.0%	5
Generic	100.0%	3	28.6%	2	50.0%	5
Medications, % No.						
Aspirin	36.4%	24	43.7%	101	42.1%	125
NSAID	10.6%	4	6.5%	15	6.4%	19
Corticosteroids	13.6%	9	16.9%	39	16.2%	48
Warfarin	0.0%	5	19.0%	44	16.5%	49
Clopidogrel	12.1%	8	10.8%	25	11.1%	33

NOTE: **Abbreviations:** AST, acid suppressive therapy; NSAID, nonsteroidal anti-inflammatory drug; PPI, proton pump inhibitor; SD, standard deviation.

Five patients (8%) were treated prophylactically because of steroid or anticoagulant use. We observed no differences in age, gender, race, or reason for admission between the patients treated appropriately versus inappropriately.

DISCUSSION

In a contemporary cohort, chronic PPI use prior to admission was the most common reason PPIs were prescribed in the hospital. About 20% of hospitalized patients were started on a PPI for an inappropriate indication, the majority of whom lacked documentation concerning the reason for use. Among patients treated inappropriately, 36% were discharged on acid-suppressive therapy.

The prior literature has reported a much higher percentages of unnecessary PPI use in hospitalized patients.[4–7] Gupta et al. found that 70% of patients admitted to an internal medicine service received acid-suppressive therapy, 73% of whom were treated unnecessarily.[5] Similarly, Nardino et al. found that 65% of acid-suppressive therapy in hospitalized medical patients was not indicated.[4] If we had excluded patients on home PPIs from our study cohort, we would have found a higher rate of inappropriate use due to a smaller overall patient population. However, we chose to include these patients because they represented the

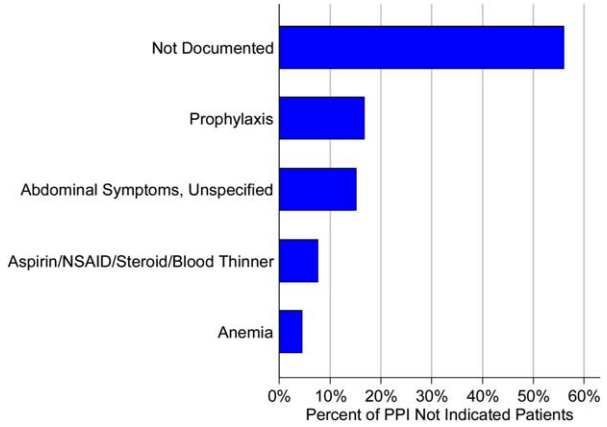

FIG. 1. Reasons for inappropriate proton pump inhibitor (PPI) prescription. Abbreviations: NSAID, nonsteroidal anti-inflammatory drug.

vast majority of hospitalist-prescribed PPIs. Notably, most of these prior prescriptions were not written during a recent hospital stay, indicating that the majority were initiated by outpatient physicians.

Our study is limited by its small sample size, single-center design, and inability to determine the indications for outpatient PPI use. Still, it has important implications. Prior work has suggested that focusing efforts on PPI overuse may be premature in the absence of valid risk-prediction models defining the patient populations that most benefit from PPI therapy.[10] Our work additionally suggests that hospital rates of inappropriate initiation may be relatively low, perhaps because hospitalist culture and practice have been affected by both local and national quality improvement efforts and by evidence dissemination.[8] Quality improvement efforts focused on reducing inpatient PPI use are likely to reveal diminishing returns, as admitting hospitalists are unlikely to abruptly discontinue PPIs prescribed in the outpatient setting.[9] Hospitalists should be encouraged to assess and document the need for PPIs during admission, hospitalization, and discharge processes. However, future efforts to reduce PPI overuse among hospitalized patients should predominately be focused on reducing inappropriate chronic PPI use in the outpatient setting.

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