Determining the Cost and Prescribing Patterns Associated with the Appropriate Use of Proton Pump Inhibitors (PPIs) in an Outpatient Medical Center

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Background

Proton pump inhibitors (PPIs) are one of the most widely use class of medications for stomach acid suppression therapy, resulting in an estimated $13 billion in global sales. PPIs are used to manage or prevent a variety of gastrointestinal disease, including gastroesophageal reflux disease (GERD), dyspepsia, reflux esophagitis, peptic ulcer disease, hypersecretory conditions (Zollinger-Ellison syndrome), H. pylori, and ulcers. Although PPIs are well-tolerated and have been shown to be more efficacious compared to other acid suppression therapies like histamine receptor-2 antagonist (H2RA), long-term use of PPIs have been associated with increased risk of infection like pneumonia and C. difficile, nutritional and vitamin deficiencies like Vitamin B-12, magnesium, and calcium, and osteoporosis. There are few clinical guidelines that address appropriate use and length of treatment therapy, which can lead to over utilization and adverse events associated with long-term use.

Currently, there are few studies that examine the cost and utilization of PPIs in an ambulatory outpatient care setting. In addition, health plan payers have strong incentives to understand the cost associated with the appropriate use of PPIs to ensure safe and cost-effective health care services.

Objectives:

- Primary Outcome: To determine prescribing patterns and cost associated with the appropriate use of proton pump inhibitors in UCSF outpatient clinics.
- Secondary Outcome: To determine if patient demographics such as gender, age, ethnicity, race, education or patient characteristics such as total number of ICD-10-CM diagnosis codes are associated with appropriate prescribing practices of proton pump inhibitors in UCSF outpatient clinics.
- Hypothesis:
  - There is overutilization of PPIs in this ambulatory care population
  - PPI therapy prescribed do not have a clear indication
  - Dose of PPI prescribed is higher than indicated
  - Duration of PPI therapy is longer then clinically recommended

Methods

A retrospective data analysis of University of California, San Francisco's (UCSF) outpatient self-funded payer plans from January 1st, 2015 – December 31st, 2019 was collected and matched to the patients' electronic medical record (EMR). This study was approved by the UCSF Institutional Review Board on November 20th, 2019, approval #19-28543.

Data Collection

- UC Data Warehouse
  - Claims data for a list of paid prescriptions for any brand or generic PPI defined as omeprazole (Prilosec), lansoprazole (Prevacid), pantoprazole (Protonix), rabeprazole (Aciphex), esomeprazole (Nexium), or dexlansoprazole (Dexilant) were generated and filtered to specifically include patients who received their care at UCSF
- APeX (UCSF's EMR)
  - Patient demographic information
  - Patient medical record information (ICD-10-CM diagnosis codes, medication lists, notes from health care providers regarding symptoms and treatment that pertain to PPI usage, provider type and clinic where PPI therapy was prescribed)

Determining Appropriateness of PPI Therapy

- Criteria of PPI appropriateness was created using:
  - American Gastroenterological Association (AGA)
  - American College of Gastroenterology (AGC)
  - 2010 ACCF/ACG/AHA expert consensus document regarding use of proton inhibitors in patients with dual antiplatelet therapy
  - Clinical recommendations from published studies
- Using the patient's EMR and list of paid prescription data claims, study authors independently assessed if PPI therapy was prescribed appropriately based on their documented ICD-10 diagnosis code, dose, and duration of therapy

Data Analysis – *In Progress*

- *Appropriateness of PPI Therapy:*
  - Cohen's kappa statistic for inter-rater reliability will be used to determine agreement of PPI appropriateness between study authors
- *Reimbursement amount per a patient's unit of medication associated with appropriate PPI therapy:*
  - Amount paid by the insurance divided by to the quantity and day supply of each prescription
- *Prescribing patterns associated with appropriate PPI therapy:*
  - Univariate ($\chi 2$) and multivariate logistic regression models will be used to identify if type of prescriber (MD, DO or NP), clinic (primary care or specialty), or patient demographic/characteristics (gender, age, race, or education) are associated with appropriate PPI prescribing patterns

Baseline Patient Demographics and Prescription Data

Inclusion Criteria:
- Age: 18 years and older
- ≥1 insurance paid PPI prescription claim

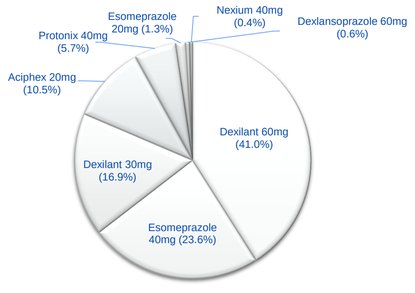
Exclusion Criteria:
- Unable to locate patient's EMR information
- PPI prescribed for short-term acute post-operation procedure

Total Number of Patients: n=60
Total Number of Prescriptions: 537

Inclusion Criteria: n=55, Total Number of Prescriptions: 522

Exclusion Criteria: n=5, Total Number of Prescriptions: 15

Patient Demographic (n=55)	
Gender	
Male	17 (30.9%)
Female	38 (69.1%)
Age (years)	53.8 (18.7-85.8)
Ethnicity	
Hispanic or Latino	6 (10.9%)
Non-Hispanic or Latino	45 (81.8%)
Unknown/Declined	4 (7.3%)
Race	
Asian	7 (12.7%)
Black or African-American	3 (5.5%)
White of Caucasian	37 (67.3%)
Other	6 (10.9%)
Declined	2 (3.6%)
Education	
Some College	3 (5.5%)
College/Trade School Degree	10 (18.2%)
Master Degree	2 (3.6%)
Doctor Degree	12 (21.8%)
Unknown	28 (50.9%)



Prescription Characteristics (Total Number: 522)	
Prescribing Provider	
MD	342 (41.8%)
DO	5 (1.0%)
NP	175 (33.5%)
Clinic of Provider	
Primary Care	251 (48.1%)
Specialty Clinic: Gastroenterology	258 (49.4%)
Specialty Clinic: Other	13 (2.5%)

Patient Characteristics (n=55)	
Number of ICD-10-CM Dx Codes	
≤ 10	23 (41.8%)
11-20	24 (43.6%)
>20	8 (14.6%)
Dose of PPI Prescribed	
Low	5 (9.0%)
Standard	37 (67.3%)
High	4 (7.3%)
Combination of Dose	9 (16.4%)
Administration Frequency	
Once daily	40 (72.7%)
Twice daily	8 (14.6%)
Combination of Frequencies	7 (12.7%)
Documented Discussion Regarding Risks of Long-term PPI Therapy with Patient	
Yes	33 (60.0%)
No	22 (40.0%)

Appropriateness of PPI Therapy Assessment Questions

Based on patient's EMR and prescription claims information, study investigators individually assessed for each patient:

1. Does the patient have an appropriate documented indication for PPI use?
2. Is the dose of PPI appropriate for the patient?
3. Is the duration of PPI prescribed appropriate for the patient?

Study Strengths

Most studies solely examine cost or appropriateness of PPIs and utilize EMR generated PPI prescribing orders which may not accurately reflect if a patient receives the prescription medication at the pharmacy. Due to limited availability and access to prescription claims data bases, many studies incorporate the use of wholesale drug cost or pharmacy cash price to evaluate cost. This study is unique as it incorporates true health care dollars spent by insurance payers on cost of prescription medication that is appropriately prescribed.

Study Limitations

A key limitation of this study is utilizing retrospective EMR data to determine if PPI therapies were appropriately prescribed. Misclassification can occur due to incomplete medical record notes, missing documentation including undocumented verbal conversations regarding PPI therapy, time-lapse in patient care due to change of insurance coverage or receiving care in a different health setting that is not incorporated to the EMR database that this study had access to. This can lead to underestimating the number of appropriate PPIs that were prescribed.

Research Application

The information from this study may help health plan payers and health institutions:

- Identify target areas to evaluate how PPIs are prescribed in a health care setting
- Establish prescribing guidelines to provide cost-efficient and safe health care practices for its patients