Evaluation of Stress Ulcer Prophylaxis in a Family Medicine Residency Inpatient Service

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Abstract

• **Objective:** To determine if stress ulcer prophylaxis (SUP) is being used in accordance with the best current evidence and to evaluate if appropriate use can be improved with educational interventions.
• **Methods:** A prospective, observational study was conducted at a regional not-for-profit hospital with an affiliated family medicine residency program. Eligible patients were ≥ 18 years of age and the family medicine residency inpatient service was the admitting team. Patients were excluded if they had acid peptic disease or were taking a proton pump inhibitor (PPI) or histamine-2-receptor antagonist (H2RA) prior to admission. Appropriate SUP use was defined based on the 1999 ASHP SUP guidelines. Data collection took place at baseline and at 1 and 4 months after an educational intervention.
• **Results:** Data were collected for 100 consecutive patients in each data collection period. A statistically significant decrease in inappropriate use of SUP was noted throughout the study (baseline, 19 cases; at 1 month, 11; at 4 months, 2; *P* < 0.002). One patient in the 4-month data collection period was determined to have an appropriate indication for SUP and did appropriately receive SUP. The most common acid suppression agent used for prophylaxis or treatment was a PPI.
• **Conclusion:** Stress ulcer prophylaxis was inappropriately being prescribed in our family medicine inpatient service prior to educational intervention. Educational interventions regarding the appropriate use of SUP can decrease inappropriate use on a family medicine inpatient service.

The presence and development of gastric ulcers has been studied in critically ill patients since the 1800s [1]. Studies conducted during the late 20th century confirmed the increased incidence of gastric ulcers secondary to stressful environments and a decreased incidence of the events when the gastric pH was raised with histamine-2-receptor antagonists (H2RAs) and proton pump inhibitors (PPIs), leading to the development and implementation of stress ulcer prophylaxis in critical care settings [1].

Current guidelines indicated that stress ulcer prophylaxis (SUP) is appropriate in patients requiring mechanical ventilation for at least 48 hours, with a coagulopathy (INR > 1.5 without warfarin, prothrombin time (PTT) > 2 times normal, or platelets < 50,000), or those with a history of gastrointestinal (GI) ulceration or active GI bleeding within 1 year prior to admission. SUP is also appropriate in patients with at least 2 of the following: sepsis, intensive care unit (ICU) stay > 1 week, occult bleeding for > 6 days, or receiving high-dose corticosteroids (ie, prednisone ≥ 60 mg daily or methylprednisolone ≥ 50 mg daily) [1].

Despite established guidelines for proper SUP, studies have shown that up to half of all patients being admitted are subsequently started on prophylactic therapy [2,3]. Other studies investigating the use of SUP have indicated that roughly 50% of patients started on acid-reducing therapies are continued on these medications upon discharge [3–5]. This practice has been shown to place an increased burden on both the patients and the health care system. In addition, long-term use of acid suppression therapy with H2RAs and PPIs has been linked to an increased risk of comorbid conditions, such as hip fractures [6], Clostridium difficile infections [7], and community-acquired pneumonia (CAP) [8], which increases the risk for rehospitalization and subsequently potentially avoidable health care costs [3,4].

The study presented evaluated SUP prescribing practices by physicians in a family medicine practice residency program. In addition, we assessed the effect of educational interventions on proper prescribing practices to help reduce the inappropriate use of stress ulcer prophylaxis.
This was a prospective, observational study conducted at a regional not-for-profit hospital with an affiliated family medicine residency program. The residency has an inpatient service that provides care to patients admitted to the hospital from 5 of their outpatient family medicine clinics. The family medicine inpatient service consists of 3 attending physicians, 1 hospitalist, 2 clinic-based physicians who rotate weekly, 5 to 6 resident physicians who rotate monthly, and a pharmacist affiliated with a local pharmacy school. The average daily census is approximately 30 patients. This study was approved by the hospital's institutional review board.

Patients were included in the study if they were at least 18 years of age and the family medicine residency inpatient service was the primary admitting team. Patients were excluded if they had acid peptic disease, defined as documented history of peptic ulcer disease, or were taking an H2RA or PPI prior to admission. Appropriate SUP was based on the 1999 ASHP SUP guidelines and defined as follows: receiving mechanical ventilation > 48 hours; had a coagulopathy (INR > 1.5 [without warfarin], PTT > 2 times normal or platelets < 50,000/L); history of GI bleed or ulceration within 1 year of admission; or if the patient had 2 or more of the following: sepsis, ICU stay > 1 week, occult bleeding for > 6 days, or receiving high-dose corticosteroids (ie, prednisone ≥ 60 mg daily or methylprednisolone ≥ 50 mg daily) [1].

One hundred consecutive patient charts were reviewed for inclusion in the study using a standardized form during 3 data collection periods. Baseline data collection on SUP use was followed by an educational intervention provided by the study physician in the form of a 1-hour lecture to the family medicine residents about the appropriate use of SUP. After the initial intervention, the pharmacist provided weekly mini-educational sessions lasting 5 minutes that included both attending and resident physicians on the family medicine inpatient service for the duration of the study. All members of this service received a pocket card with SUP appropriate use criteria and hospital formulary options. Data on SUP use was collected again at 1 month and 4 months after the initial educational intervention.

Descriptive statistics were used for the population data and inferential statistics were used for all other data. Chi-square tests were used for nonparametric data and ANOVA for continuous data. All tests were 2-tailed with an alpha of 0.05.

Results
A total of 156 of the 302 patients identified across 3 data collection periods were included (51.65%; baseline, 59; 1 month, 51; 4 months, 46). All excluded patients were receiving an acid suppression agent (H2RA or PPI) prior to admission (baseline, 42; 1 month, 49; 4 months, 55); 15 of these patients had a diagnosis of acid peptic disease (baseline, 5; 1 month, 6; 4 months, 4). Of the 146 excluded patients, 45 (30%) did not have a documented history of acid peptic disease or gastroesophageal reflux disease (GERD). No statistical differences were noted between the 3 groups based on patient demographics (Table 1).

A statistically significant decrease in the inappropriate use of SUP was noted over the course of the study (baseline, 19 patients inappropriately receiving SUP; 1 month, 11; 4 months, 2; P = 0.002; Table 2). The 19 patients determined to be receiving acid suppression therapy for treatment (baseline, 9; 1 month, 6; 4 months, 4) were included with the appropriate use of SUP category. During the study, no patients met criteria for appropriate SUP due to mechanical ventilation > 48 hours or having a coagulopathy. Only 1 patient in the 4-month data collection period was determined...
to have an appropriate indication for SUP due to a GI bleed or ulceration within 1 year of admission and appropriately received SUP. The most common acid suppression agent used for prophylaxis or treatment was a PPI; only 1 patient in the 1-month data collection period received an oral H2RA. Upon discharge, 20 patients (baseline, 7; 1 month, 7; 4 months, 6) appropriately received a prescription for an acid suppression agent, while 2 patients in the 1-month data collection period inappropriately received a prescription for acid suppression therapy.

Discussion

The findings of our study suggest that SUP was not being used in accordance with best current evidence, since approximately 32% of patients at baseline received prophylaxis inappropriately. Four months after the initial educational intervention we found a statistically significant decrease in inappropriate use to less than 5% when compared with baseline. This reduction of inappropriate use was consistent with a similar study done on an internal medicine residency service [2]. We thought it was important to educate the attending physicians on the inpatient service using the weekly mini-educational sessions since the initial educational intervention was given to only the resident physicians. These weekly mini-educational sessions also served to reinforce the information the residents had been provided at the initial intervention. The weekly mini-educational sessions were provided throughout the entire study duration, including periods when no data collection was taking place, by the pharmacist to ensure all resident and attending physicians received the education. Our study demonstrates that education and reinforcement of education can decrease inappropriate use of SUP.

Only 1 patient appropriately received SUP for a history of GI bleed or ulceration within the year prior to admission based on current guidelines. Acid suppression agents prescribed for treatment purposes were considered appropriate use; the most common reasons for treatment were new-onset GERD, GI bleeding, and new diagnosis Barrett’s esophagus or peptic ulcer disease.

SUP started in the hospital can be overlooked and inappropriately continued when a patient leaves the hospital [2,4,10,11]. In our study, 2 patients inappropriately receiving SUP were continued on the acid suppression agent at discharge; both were initially started on the prophylaxis due to high-dose steroids. This is a substantially lower number of patients being continued on inappropriate therapy than in previous studies [2,4,10,11]. The educational interventions decreased the overall number of patients receiving inappropriate prophylaxis which in turn decreased the number of patients leaving with inappropriate prophylaxis. Of the remaining 20 patients who received a prescription for acid suppression therapy at discharge, 19 of them were receiving the agents for treatment, not prophylaxis, and 1 patient developed gastroesophageal reflux symptoms during the hospital stay and was deemed a treatment case as well (this patient did not receive prophylaxis on admission).

Many physicians consider acid suppressive therapies, especially PPIs, to be relatively benign medications in terms of adverse events. PPIs are one of the most commonly prescribed medications and may be overprescribed. In our study, 30% of excluded patients who were on acid suppression therapy prior to admission did not have a documented reason. Several studies in recent years have looked at potential complications of using PPIs. An increased risk of hip fracture in patients taking long-term PPIs has been demonstrated in several studies [6,12,13]; however, there have also been conflicting studies that have not demonstrated this increased risk [14]. There has also been an increased risk of C. difficile-associated diarrhea (CDAD) [7,15-17] and recurrent CDAD [18] in patients taking acid suppressive therapy. Most of the studies with CDAD looked at only PPIs [7,17,18];
however, a few have looked at acid suppressive therapy in general, which includes H2RAs [15,16]. Pneumonia, community-acquired and nosocomial, has also been studied as a complication in patients receiving acid suppressive therapies. Several studies have found an increase in risk of pneumonia in patients receiving acid suppressive therapies [8,19–21], especially in those patients who recently started therapy [19,20]. This is of particular interest in regards to SUP because if it is inappropriately started, there may be an increased risk of the patient developing pneumonia, which could increase the length of hospital stay. While there is conflicting data for most of these complications associated with acid suppressive therapy, decreasing the inappropriate use of SUP will likely help decrease the chance of patients developing them.

Inappropriate use of SUP has been the topic of many articles. In addition to this, several studies have been published looking at the economic impact of SUP [10,22–25]. According to these studies, SUP is overutilized and increases health care costs. Based on our study, repeated education directed at the family medicine inpatient service physicians resulted in an increase in appropriate SUP usage. To ensure this appropriate use continues, additional education will be planned for all physicians as well as implementation of a SUP order form containing appropriate use criteria.

One limitation of our study is that during each collection period the resident and attending physicians were not always the same due to the nature of service coverage. However, this can also be viewed as a strength because we did see a decrease in inappropriate use of SUP in each data collection period, which supports the use of the repeated educational interventions and pocket cards that all resident and attending physicians received. Since the patients were part of a family medicine residency inpatient service that focuses on teaching, it may not be possible to extrapolate these results to other types of services where teaching may be less of a priority. Another limitation of the study is that patients not receiving SUP were not followed to determine how many developed an adverse event, such as a GI bleed requiring transfusion, from lack of prophylaxis.

In conclusion, SUP was being prescribed inappropriately on our family medicine inpatient service prior to our educational interventions. Our study demonstrates that educational interventions regarding the appropriate use of SUP can decrease the inappropriate use on a family medicine inpatient service when both resident and attending physicians are educated.

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References

### Table 3. Breakdown of Stress Ulcer Prophylaxis Use

<table>
<thead>
<tr>
<th></th>
<th>Baseline (n = 59)</th>
<th>1 Month (n = 51)</th>
<th>4 Months (n = 46)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appropriate use, n</td>
<td>40</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td>No prophylaxis</td>
<td>31</td>
<td>34</td>
<td>39</td>
</tr>
<tr>
<td>Appropriate indication</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Treatment</td>
<td>9</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Inappropriate use, n</td>
<td>19</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>High-dose steroids*</td>
<td>1</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Sepsis*</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Inappropriate acid suppression prescription at discharge, n</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

*Only factor in these patients; 2 factors needed per guidelines.