Why Do PhysiciansPrescribe Stress Ulcer Prophylaxis to General Medicine Patients?

Syed Hussain, MD, Mihaela Stefan, MD, Paul Visintainer, PhD, and Michael Rothberg, MD, MPH

Background: Little is known about why physicians prescribe inappropriate stress ulcer prophylaxis (SUP) among nonintensive care unit (ICU) hospitalized patients without supporting evidence. This study seeks to understand which factors influence physician prescribing behavior regarding SUP.

Design: We designed a cross sectional web-based survey to assess physicians’ knowledge, beliefs, and behavior surrounding the prescribing of SUP for non-ICU patients. The survey was emailed to internal medicine residents and hospitalists at a university-affiliated tertiary care hospital. Clinically relevant bivariable associations were examined in logistic regression to determine whether these associations remained after adjustment for potential confounding factors.

Results: Sixty-nine percent of physicians reported prescribing SUP to ≥25% of patients. In multivariable analyses, the following factors were associated with higher level of prescribing (≥25%) of SUP: fear of gastrointestinal bleeding (OR = 2.7, 95% CI 1.07, 7.28) and of the legal repercussions of not prescribing SUP (OR = 3.02, 95% CI 1.07, 8.56), whereas knowledge of SUP indications (OR = 0.39, 95% CI 0.20, 0.74) and concern about side effects (OR = 0.24, 95% CI 0.09, 0.61) were associated with low prescribing behavior. Level of training was not associated with prescribing rate. Less than half of respondents were able to identify a single side effect of proton pump inhibitor therapy.

Conclusion: Fear of legal repercussions and ignorance of the side effects of acid suppressive therapy were strongly associated with inappropriate prescribing of SUP. Educating physicians about the adverse effects of acid suppression therapy and about existing national guidelines might reduce inappropriate prescribing.

Key Words: acid suppressive therapy, inappropriate prescribing, proton pump inhibitors, side effects

Upper gastrointestinal bleeding resulting from stress ulceration is often encountered in critically ill patients, and, as a consequence, stress ulcer prophylaxis (SUP) with either a proton pump inhibitor or a histamine-2 blocker is the standard of care in the intensive care unit (ICU) setting. In 1999, the American Society of Health-System Pharmacists (ASHP) published the only existing guidelines on the use of SUP. The guidelines identify the following risk factors for stress ulcer bleeding: major trauma, severe head injury, multiple organ failure, coagulopathy, prolonged mechanical ventilation, burns covering more than 25–30% of the body, and major surgical procedures.

Despite the fact that SUP is recommended only for selected ICU patients, use of stress ulcer prophylaxis has spread to noncritically ill patients. Multiple studies demonstrate that as many as 25% of hospitalized patients outside of the ICU receive SUP. Moreover, agents prescribed in the hospital for SUP are frequently continued at the time of discharge. Proton pump inhibitors (PPI) and histamine-2 receptor blockers (H2A) are generally considered safe and well tolerated. However, recent studies have linked the use of proton pump inhibitors to increased risk of community-acquired Clostridium difficile-associated disease, osteoporosis, pneumonia, and interstitial nephritis.

Key Points

- Inappropriate stress ulcer prophylaxis is a common occurrence among a teaching hospital service, consistent with prior studies.
- Factors such as poor knowledge of appropriate indications and lack of awareness of potential side effects of therapy are associated with inappropriate prescribing.
- Physician education and quality improvement initiatives may be required to decrease inappropriate prescribing of stress ulcer prophylaxis.

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In light of these potential complications and lack of accepted indications for SUP in general medical patients, the continued widespread use of SUP remains unexplained. We surveyed hospital-based physicians to identify physician beliefs and other factors that might influence their prescribing of SUP.

Methods

We designed a cross-sectional internet-based survey of physician knowledge and behavior surrounding SUP. The survey was e-mailed to 150 physicians (53 internal medicine residents, 31 internal medicine-pediatrics residents, 19 incoming interns in their first 2 weeks of practice, and 47 hospitalists) from the Baystate Medical Center, a university-affiliated tertiary care hospital. The anonymous survey was emailed between May 2008 and August 2008. Reminders were sent at 2 week-intervals and participants were personally encouraged to complete the survey. The study was approved by the institutional review board of Baystate Medical Center.

The survey was created by the investigators (Appendix) and pilot-tested for clarity. The introductory paragraph stated that all the questions referred to patients on a general medical ward, not in the ICU. The survey contained 24 questions regarding physicians’ background, self-perception of SUP prescribing behavior, familiarity with SUP guidelines, side effects of SUP, and personal prescribing behavior. Demographic questions included place of medical training (United States vs. international) and years of medical experience. To assess knowledge about appropriateness of SUP, we presented 4 patient scenarios and, for each one, asked respondents if SUP was indicated. We then constructed a knowledge score of 0–4 correct answers, based on the recommendations in the ASHP guideline.2

Self-reported rate of prescribing SUP in non-ICU patients was the primary outcome. Participants were asked: “When you round on non-ICU hospitalized patients, how often do you prescribe SUP?” Choices included <25%, 25–49%, 50–74%, and ≥75%. For purposes of the analysis, respondents were categorized as either low (<25% of the time) or high (≥ 25% of the time) prescribers.

The data were collected using a web-based interface, SurveyMonkey.com™, (Palo Alto, CA) and analyzed using Stata® (StatCorp v. 10.2, College Station, TX). Preliminary analyses were conducted using Fisher’s exact test for associations between inappropriate prescribing and categorical variables. Nonparametric tests for trend were used to determine prescribing trends across ordered groups.18 Clinically relevant bivariable associations were examined in logistic regression to determine whether these associations remained after adjustment for potential confounding factors.

Results

Of 150 physicians who received invitations, 98 physicians (32 hospitalists and 66 residents) completed the survey (response rate 65%). Demographic information is included in Table 1. Two thirds of the respondents were residents and 44% of them were international medical graduates. Of the 98 respondents, most prescribed less than 50% of the time, while 18% prescribed more than 75% of the time. Both residents and hospitalists reported learning about SUP in medical school (66%), from attending physicians (68%), and in the ICU (60%). Although 79% of the respondents felt that SUP was effective for preventing gastrointestinal bleeding, only 44% of them believed that their

<table>
<thead>
<tr>
<th>Table 1. Demographic information and responses of survey participants*</th>
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<tbody>
<tr>
<td><strong>Variable</strong></td>
</tr>
<tr>
<td>Sex</td>
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<tr>
<td>Medical training</td>
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<td></td>
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<tr>
<td>Residents</td>
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<td></td>
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<tr>
<td>Hospitalists</td>
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<tr>
<td>Self-reported prescribing rate of SUP in non-ICU patients</td>
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<td></td>
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<tr>
<td>Believe prescription of SUP is evidence based</td>
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<tr>
<td>Prescribe according to a guideline</td>
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<tr>
<td>Continue SUP at discharge</td>
</tr>
<tr>
<td>Reprimanded</td>
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<tr>
<td></td>
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<tr>
<td>Learned about SUP from</td>
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*PGY, post graduate year; SUP, stress ulcer prophylaxis; ICU, intensive care unit; GIB, gastrointestinal bleeding.

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opinion was evidence-based. Of the 32% of respondents who reported prescribing SUP according to a guideline, only 5% of those said they used the AHSP guideline, while the remainder identified guidelines that do not exist (e.g., American College of Physicians).

When presented with hypothetical scenarios, most respondents said they would prescribe SUP for high risk patients—94% would prescribe SUP for a patient on mechanical ventilation for \(\geq48\) hours and 82% for a patient with sepsis and coagulopathy. Many would also prescribe for lower risk patients taking medications generally associated with gastrointestinal bleeding—72% would prescribe SUP for a patient receiving corticosteroid therapy for chronic obstructive pulmonary disease and 46% for a patient taking warfarin for atrial fibrillation.

Less than half of the respondents could correctly identify any potential side effects of proton pump inhibitor therapy (Fig.), and 28% of physicians reported having managed a non-ICU patient who was not prescribed SUP and subsequently developed GI bleeding. Physicians were slightly more likely to have been reprimanded by senior colleagues for not prescribing SUP (32%) than for prescribing it (27%). The majority (77%) believed that having esomeprazole as part of our institutional computerized order set makes them more likely to prescribe it, and 18% of respondents reported that they would discharge patients on SUP once started in the hospital.

For purposes of the analysis, SUP prescribing was categorized as high (\(\geq25\%\) of the time) or low (\(<25\%\) of the time; Table 2). Sixty-nine percent of physicians were high prescribers. High prescribing behavior was associated with fear of gastrointestinal bleeding (\(P = 0.04\)) and of the legal repercussions of not prescribing SUP (\(P = 0.04\)), whereas knowledge of SUP indications (\(P = 0.007\)) and concern about side effects (\(P = 0.002\)) were associated with low prescribing behavior. There was no difference by level of training; in fact, interns in the first 2 weeks of training reported SUP rates similar to those of practicing hospitalists. Although many believed that order sets increased their prescribing, those who held this belief did not have higher prescribing rates than those who did not. Neither belief in the efficacy of SUP, nor receipt of positive or negative reprimands was associated with reported prescribing rates. The four factors identified in bivariable analysis remained significant in multivariable analysis (Table 3). Considering these factors, high pre-

![Graph](image)

**Fig.** Responses of participants when asked about potential side effects of proton pump inhibitors; y-axis, percentage of respondents; x-axis, potential side effects.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Prescriber rate no. respondents (%)</th>
<th>(&lt;25%)</th>
<th>(\geq25%)</th>
<th>(P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>30 (31)</td>
<td>68 (69)</td>
<td>0.66</td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td>14 (28)</td>
<td>36 (72)</td>
<td>0.66</td>
</tr>
<tr>
<td>Medical training</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td></td>
<td>18 (33)</td>
<td>37 (67)</td>
<td>0.66</td>
</tr>
<tr>
<td>International</td>
<td></td>
<td>12 (28)</td>
<td>31 (72)</td>
<td>0.98</td>
</tr>
<tr>
<td>PGY level</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>PGY-1</td>
<td></td>
<td>6 (26)</td>
<td>17 (74)</td>
<td>0.75</td>
</tr>
<tr>
<td>PGY-2</td>
<td></td>
<td>7 (32)</td>
<td>15 (68)</td>
<td>0.22</td>
</tr>
<tr>
<td>PGY-3</td>
<td></td>
<td>5 (36)</td>
<td>9 (64)</td>
<td>0.22</td>
</tr>
<tr>
<td>PGY-4</td>
<td></td>
<td>2 (29)</td>
<td>14 (71)</td>
<td>0.22</td>
</tr>
<tr>
<td>Attending</td>
<td></td>
<td>10 (31)</td>
<td>22 (69)</td>
<td></td>
</tr>
<tr>
<td>Knowledge</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use evidence-based medicine</td>
<td></td>
<td>13 (48)</td>
<td>24 (52)</td>
<td>0.11</td>
</tr>
<tr>
<td>Knowledge score&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td>0.007</td>
</tr>
<tr>
<td>100%</td>
<td></td>
<td>11 (73)</td>
<td>4 (27)</td>
<td></td>
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<tr>
<td>75%</td>
<td></td>
<td>8 (21)</td>
<td>30 (79)</td>
<td></td>
</tr>
<tr>
<td>50%</td>
<td></td>
<td>10 (26)</td>
<td>28 (74)</td>
<td></td>
</tr>
<tr>
<td>25%</td>
<td></td>
<td>0</td>
<td>2 (100)</td>
<td></td>
</tr>
<tr>
<td>Beliefs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fear legal repercussions</td>
<td></td>
<td>6 (22)</td>
<td>27 (82)</td>
<td>0.07</td>
</tr>
<tr>
<td>Concerned about side effects</td>
<td></td>
<td>18 (51)</td>
<td>17 (49)</td>
<td>0.002</td>
</tr>
<tr>
<td>Fear GIB without SUP</td>
<td></td>
<td>8 (22)</td>
<td>29 (78)</td>
<td>0.04</td>
</tr>
<tr>
<td>SUP prevents GIB</td>
<td></td>
<td>22 (25)</td>
<td>60 (75)</td>
<td>0.22</td>
</tr>
</tbody>
</table>

<sup>a</sup>PYG, post graduate year; GIB, gastrointestinal bleeding; SUP, stress ulcer prophylaxis.

<sup>b</sup>Knowledge score based on score on 4 questions asking respondents to either prescribe or not prescribe SUP in certain clinical scenarios.
scribing attending physicians were more likely than residents to voice fears of gastrointestinal bleeding (56% vs. 33%, $P = 0.29$) and legal repercussions (50% vs. 27%, $P = 0.07$), whereas residents demonstrated less concern for side effects (35% vs. 41%, $P = 0.67$).

**Discussion**

In this study of residents and hospitalists at an academic medical center, rate of self-reported prescribing of SUP for general medical patients exceeded 25% but did not differ by level or place of training. High rates of prescribing were linked to fears about bleeding and its legal repercussions, as well as to a lack of concern about side effects and poor knowledge about indications for its use. Most respondents believed SUP was effective, but only 44% of those respondents thought that their belief was evidence-based.

Numerous studies document use of SUP for non-ICU patients.3-4,19 Two cross-sectional studies5,20 reported that 20–25% of general medical patients receive SUP, and rates in our study were even higher, with less than one-third of physicians reporting rates less than 25%. Although the practice is common, little is known about why physicians continue to prescribe SUP in the absence of evidence or specific recommendations. On the contrary, most authors recommend against the use of SUP.3-5,19,21

Our results suggest several reasons that physicians continue to prescribe SUP for general medicine patients. Firstly, physicians fear that noncritically ill patients who are not on SUP will develop gastrointestinal bleeding. More than a quarter of respondents reported having this experience. However, studies report that such bleeding is rare. In a retrospective case-control study of noncritically ill patients, clinically relevant bleeding occurred in only 0.4% of those studied.21 Even in the ICU, where SUP is recommended, important bleeding occurs in 3.7% of patients with risk factors but only in 0.1% patients without risk factors.1,22

Secondly, physicians prescribe SUP out of fear of legal repercussions in the case of a patient experiencing GI bleeding but not receiving SUP. It is unclear where such beliefs originate, as no physician at our institution has ever been sued for this reason. Interestingly, the internet is full of advertise-

![Image](image-url)

**Table 3. Multivariable analysis of factors associated with higher prescribing**

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fear of legal repercussions</td>
<td>3.02</td>
<td>1.07–8.56</td>
</tr>
<tr>
<td>Fear of GIB without SUP</td>
<td>2.70</td>
<td>1.01–7.28</td>
</tr>
<tr>
<td>Knowledge</td>
<td>0.39</td>
<td>0.20–0.74</td>
</tr>
<tr>
<td>Concern of side effects</td>
<td>0.24</td>
<td>0.09–0.61</td>
</tr>
</tbody>
</table>

*OR, odds ratio; CI, confidence interval; SUP, stress ulcer prophylaxis. BOR calculated based on quartiles of increasing knowledge score (0, 25%, 75%, and 100%).

Thirdly, physicians were either unaware or unconcerned about the side effects of the agents used for stress ulcer prophylaxis. This is particularly troubling since recent reports have linked SUP agents with increased risk for *C difficile* colitis,8,9 osteoporosis,10,11 pneumonia,12-14 and interstitial nephritis.15-17

Finally, physicians were generally unaware of the indications for SUP. Nevertheless, most physicians believed that SUP was effective in general medicine patients. Only two randomized controlled studies23,24 have examined the effectiveness of acid suppressive therapy in non-ICU patients. One24 compared an antacid to placebo and showed a significant reduction in gastrointestinal bleeding in the treatment group. However, although the patients were on general medicine wards, many were severely ill and already had established risk factors for stress ulcer bleeding. Furthermore, the diagnosis of bleeding included occult blood in the stool; only a minority of the patients had clinically significant bleeding. A more recent randomized controlled trial25 found that SUP did not decrease the incidence of stress related bleeding in high risk/critically ill patients. Finally, a retrospective study21 of patients admitted to a general medicine ward did not show any benefit of prophylaxis in preventing GI bleeding. A recent consensus statement published after the conclusion of our study recommends outpatient use of PPIs for certain high-risk patients taking aspirin or nonsteroidal anti-inflammatory drugs.26 However, it does not serve as a guideline for stress ulcer prophylaxis for general medicine inpatients.

Our study has several limitations. First, we studied the responses of physicians within a single hospital, and the results may not be representative of all physicians. However, high rates of SUP in medical patients appear widespread. Second, we cannot know whether the 1/3 of physicians who failed to respond were similar to those who completed the survey. Because this number is small, we do not believe our results have substantial bias. Finally, we relied on self-reported prescribing rates, which may be susceptible to recall bias. Because our goal was to understand physician motivation, in this case, perception may have been as important as reality.

**Conclusion**

Our study confirms that the use of SUP for general medical patients is widespread and that physicians are generally unaware of the indications for SUP and fears the legal repercussions of not prescribing it. At the same time, they overestimate the risk of stress-induced GI bleeding and underestimate potential harms associated with the use of SUP. At least one practice-based educational intervention at an internal medicine residency program has been shown to reduce inappropriate prescribing of SUP.27 Thus, individual institutions may wish to develop prescribing protocols, allowing physicians to feel they are providing the standard of care, while at the same time educating them about the indications for SUP.
Appendix

1. What is your gender?
   a. Female
   b. Male

2. Where did you attend medical school?
   a. US
   b. International Graduate

3. Are you currently a resident physician?
   a. Yes
   b. No

4. What is your PGY level?
   a. PGY 1
   b. PGY 2
   c. PGY 3
   d. PGY 4

5. How many years has it been since you completed residency?

6. I have learned about stress ulcer prophylaxis with acid suppression therapy from: (please check all that apply)
   a. Medical school
   b. Intensive Care Unit (ICU) rotation
   c. Reading Journals
   d. Personal experience
   e. Resident physicians
   f. Attending physicians
   g. Drug company representatives
   h. Formal education (CME/lectures/grand rounds)
   i. Gastrointestinal (GI) elective
   j. Quality improvement initiative

7. When you round on non-ICU hospitalized patients, how often do you prescribe stress ulcer prophylaxis?
   a. 0–25%
   b. 25–49%
   c. 50–74%
   d. 75–100%

8. Which one of the following would you choose most often for stress ulcer prophylaxis? (please choose only one)
   a. Nexium® (esomeprazole) (AstraZeneca, Wilmington, DE)
   b. Prilosec® (omeprazole) (AstraZeneca, Wilmington, DE)
   c. Maalox® (aluminum hydroxide) (Novartis, Parsippany, NJ)
   d. Prevacid® (lansoprazole) (Takeda Pharmaceuticals North America, Inc., Deerfield, IL)
   e. Protonix® (pantoprazole) (Pfizer, New York, NY)
   f. Sucralfate
   g. Zantac® (ranitidine) (Boehringer Ingelheim Pharmaceuticals, Inc., Ridgefield, CT)
   h. Tagamet® (cimetidine) (GlaxoSmithKline, Brentford, United Kingdom)
   i. Pepcid® (Famotidine) (Johnson & Johnson/Merck Consumer Pharmaceuticals Co., New Brunswick, New Jersey and Whitehouse Station, NJ)

9. Did you ever have a non-ICU patient who did not receive stress ulcer prophylaxis and developed gastrointestinal bleeding?
   a. Yes
   b. No

10. Have you ever been reprimanded by senior colleagues because you did not prescribe stress ulcer prophylaxis?
    a. Yes
    b. No

11. Have you ever been reprimanded by senior colleagues because you did not prescribe stress ulcer prophylaxis?
    a. Yes
    b. No

(Appendix continues)
12. Compared with your colleagues do you prescribe stress ulcer prophylaxis?
   a. More often
   b. About the same
   c. Less often

13. Do your colleagues prescribe stress ulcer prophylaxis?
   a. Too often
   b. About right
   c. Not often enough

14. Do you feel your use of stress ulcer prophylaxis is evidence-based?
   a. Yes
   b. No

15. Please choose True/False for each of the following questions: (Reminder: all questions refer to non-ICU patients)
   a. I am afraid that without stress ulcer prophylaxis, my patient will have a GI bleed
   b. I am afraid of the legal repercussions if I do not prescribe stress ulcer prophylaxis
   c. I think stress ulcer prophylaxis is effective in preventing GI bleeding
   d. There is a quality improvement initiative to increase the use of stress ulcer prophylaxis
   e. I am concerned about side effects of stress ulcer prophylaxis
   f. Having stress ulcer prophylaxis in the computerized order set makes me more likely to order it
   g. A pharmacy student has recommended I discontinue stress ulcer prophylaxis

16. Would you prescribe stress ulcer prophylaxis in the following scenarios? Please check yes or no
   a. 92 year old nursing home resident with community-acquired pneumonia
   b. 56 year old female day 2 after hip replacement on Coumadin for chronic atrial fibrillation
   c. 68 year old man on systemic steroids for a chronic obstructive pulmonary disease exacerbation
   d. 58 year old patient in the ICU on the ventilator with coagulopathy

17. For which of the following patients is stress ulcer prophylaxis indicated?
   a. Patient in ICU on mechanical ventilation more than 48 hours
   b. Patient admitted to the ICU with gram negative sepsis and coagulopathy
   c. Non-ICU patient started on intravenous heparin for deep vein thrombosis
   d. Non-ICU patient on intravenous steroids for Crohn exacerbation

18. I prescribe stress ulcer prophylaxis according to a guideline?
   a. Yes
   b. No

19. Please specify which guidelines for stress ulcer prophylaxis do you follow?
   a. American College of Physicians
   b. Society of Hospital Medicine
   c. American Gastroenterology Association
   d. American Society of Health-System Pharmacists
   e. Other

20. Indicate which of the following side effects are associated with acid suppression therapy with proton-pump inhibitors
   a. Community-acquired pneumonia
   b. Hyperglycemia
   c. Iron deficiency
   d. Clostridium difficile colitis
   e. Osteoporosis
   f. None of the above
   g. I don’t know

21. If you started acid suppression therapy in the hospital, would you continue it at discharge?
   a. Yes
   b. No

(Appendix continues)
Continued

22. If you continue acid suppression therapy when you discharge the patient, which medication would you prescribe?
   a. Nexium (esomeprazole)
   b. Prilosec (omeprazole)
   c. Maalox (aluminum hydroxide)
   d. Prevacid (Lansoprazole)
   e. Protonix (pantoprazole)
   f. Sucralfate
   g. Zantac (ranitidine)
   h. Tagamet (cimetidine)
   i. Pepcid (Famotidine)

23. The cost of p.o. Nexium to the hospital per inpatient stay is:
   a. $0.60
   b. $3.00
   c. $6.00
   d. $10.00

24. The cost of p.o. Nexium to the insurer per outpatient stay is:
   a. $0.60
   b. $3.00
   c. $6.00
   d. $10.00

References


