

## Introduction

Stress ulcers are a major complication for critically-ill patients, seen in up to 39% of patients in the ICU setting<sup>1</sup>. The American Society for Hospital Pharmacists (ASHP) published guidelines in 1999 for stress ulcer prophylaxis (SUP) with Proton Pump Inhibitors (PPI) or Histamine Type-2 Receptor Antagonists (H2RA)<sup>1</sup>. However, the misuse and over prescription of PPIs and H2RAs have been well documented – 76% in a teaching hospital in New York City, 85% in a university-affiliated community hospital, and 90% in a hospital in Michigan<sup>3</sup>. In addition, 27-69% of patients had SUP medications inappropriately continued at discharge<sup>1,2,3</sup>. The overuse of PPIs and H2RAs have led to many side effects, including pneumonia, *Clostridia difficile* diarrhea, gastric cancer, bone fractures, and B12 deficiency<sup>1</sup>.

The COVID-19 pandemic has also added stress on the healthcare system and its best practices due to limitation of resources and overburdening of personnel with more critically-ill patients<sup>4</sup>. In fact, studies have seen stress ulcers in 5.2% of hospitalized patients with COVID-19 and have documented gastrointestinal bleeding by endoscopy in as early as 2 days from admission<sup>5,6</sup>. However, SUP use as a part of COVID-19 management has been controversial, leading to even more variability in institutional best practices<sup>7</sup>.

Thus, this Quality Assessment (QA) study aims to review the appropriateness of SUP use at University Hospital during the COVID-19 pandemic from 3/1/2020 to 5/31/2020 and identify important areas of improvement to minimize the misuse of PPIs and H2RAs.

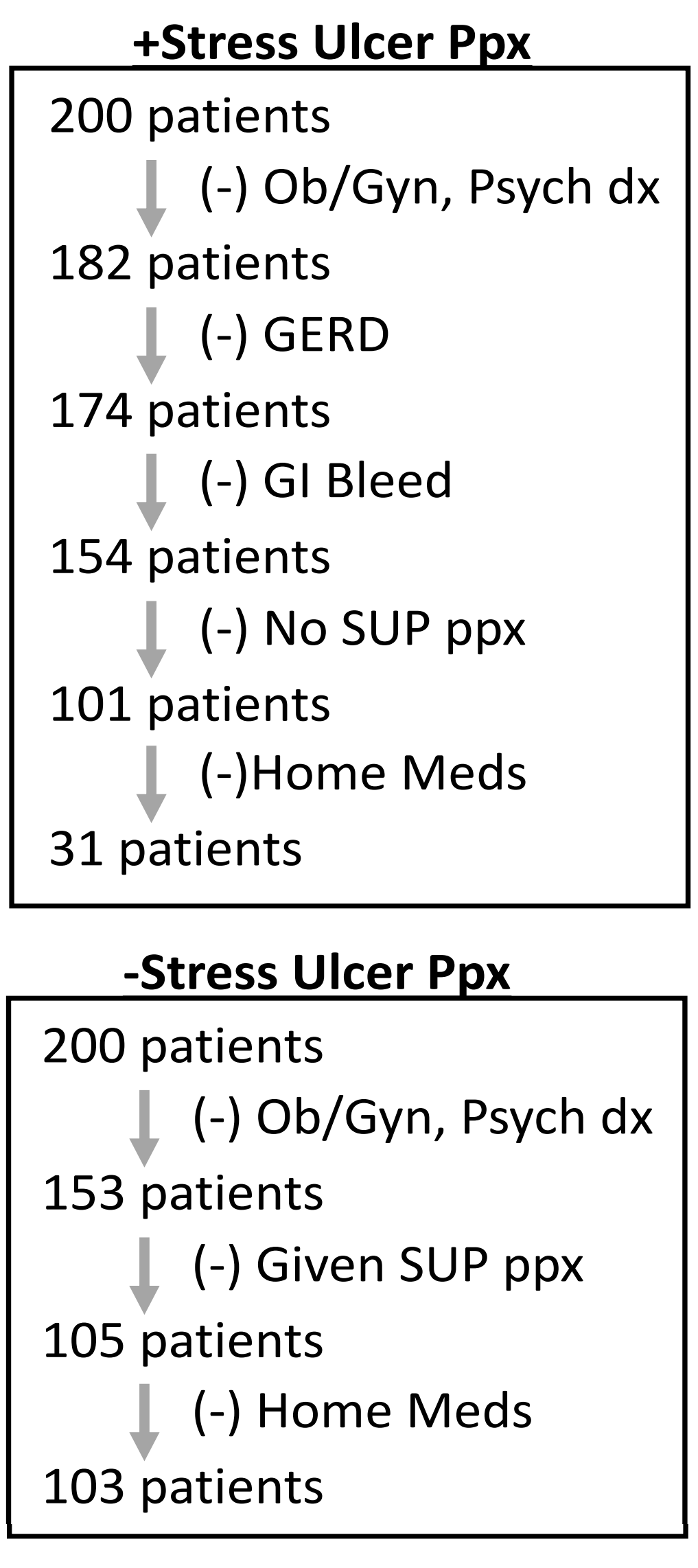
## Methods

Randomized charts of patients on PPI/H2RAs (n=200) and not on PPI/H2RAs (n=200) were reviewed for the appropriateness of SUP use based on the 1999 American Society for Hospital Pharmacists guidelines. Charts were then excluded if patients were admitted to OB/Gyn or Psychiatry, had a history of GERD or GIB, was on a PPI/H2RA as an outpatient, or was incidentally included in the wrong group of charts.

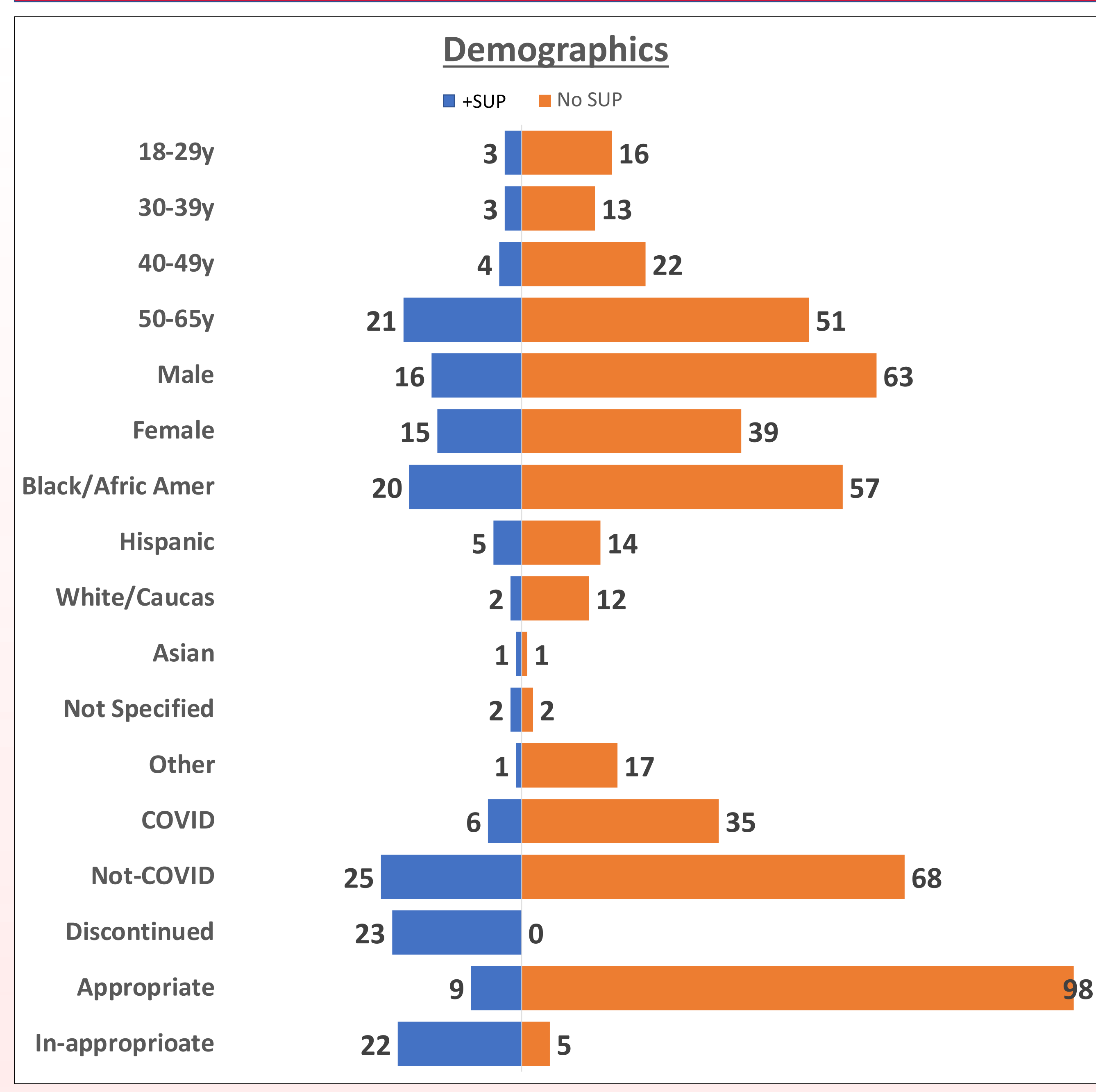
Risk Factor	Level of Recommendation
General ICU populations (medical, surgical, respiratory)	A = H2RA, antacids B = sucralfate
Head injury with GCS <= 10 or inability to follow commands	B = H2RA D = antacids, sucralfate
Thermal injury >35% of BSA	B = antacids D = H2RA, sucralfate
Partial hepatectomy	C = H2RA D = antacids, sucralfate
Hepatic or renal transplantation	D = H2RA, antacids, sucralfate
Multiple trauma with Injury Severity Score >= 16	D = H2RA, antacids, sucralfate
Spinal Cord Injury	D = H2RA, antacids, sucralfate
Hepatic failure	D = H2RA, antacids, sucralfate
History of gastric ulceration or bleeding during year before admission	D = H2RA, antacids, sucralfate
Presence of at least two of the following: sepsis, ICU stay >1 week, occult or overt bleeding for >=6 days, corticosteroid therapy (>250 mg of hydrocortisone or equivalent daily)	D = H2RA, antacids, sucralfate

A = At least 2 RCT or 1 RCT with alpha <=0.5 and power >=0.8, homogenous results
B = RCT with heterogenous results but still significant, alpha <= 0.5
C = Nonrandomized studies or case series with alpha <= 0.5
D = Expert opinion



## Results



	+SUP		No SUP	
	Total	Inappr. (%)	Total	Inappr. (%)
Hypertension	19	13 (68.4)	35	2 (5.7)
Diabetes	9	5 (55.6)	17	1 (5.9)
CVA	1	0	6	0
Uremia	6	4 (66.7)	3	0
Malignancy	4	2 (50)	8	0
Cirrhosis	2	1 (50)	2	0
Heart Failure	2	2 (100)	2	0
Coronary Artery Disease	5	3 (60)	2	0
COPD	3	3 (100)	7	0

\*p-values were not significant using Fisher's exact test, indicating no association was found

	+SUP		No SUP	
	Inappr. (%Tot)	Inappr. (%Tot)	Inappr. (%Tot)	Inappr. (%Tot)
Primary Dx	p=0.432	p = 0.003		
Respiratory	9 (81.8)	0	SUP Med	p=0.456
Cardiovascular	1 (25)	1 (50)	H2RA	11 (78.6)
Gastroent.	1 (100)	0	PPI	11 (64.7)
Gen.Urin.	1 (100)	0	D/C status	p=0.660
Nephrology	1 (100)	0	Not D/C'd	17 (73.9)
Neurology	4 (66.7)	0	D/C'd	5 (62.5)
MSK/Rheum	2 (50)	2 (8)	Inappropri.	22 (70.9)
Endocrine	2 (66.7)	1 (50)		5 (4.8)

## Discussion

- Limited sample size – many of our patients were excluded because they had an Ob/Gyn or psychiatric diagnosis, were using PPI/H2RAs for treatment, or had them as home medications, affecting the significance of our results.
- Age, gender, ethnicity, COVID status, primary diagnosis in +SUP group, type of SUP medication used, discontinuation status, and co-morbidities were not significantly associated with appropriateness – limited due to the small sample size, but also indicates there was no diagnostic biases when physicians prescribed SUP.
- The only significant difference was between primary diagnoses when patients were inappropriately not started on SUP with the majority of these patients having respiratory diagnoses, which could've been influenced by the timing of the pandemic.
- When comparing the inappropriateness of use in the PPI group (78.5%) vs. H2RA (64.7%) group (Z=0.8464, p=0.395), there was no significant difference, indicating that there was no preference in prescribing either medication
- Inappropriate SUP use and medication reconciliation rates were similar to reported values at other hospitals during non-pandemic dates.

## Conclusions

Overall, we had similar reported values of appropriateness of SUP use at University Hospital during the pandemic compared to those at other hospitals. Unfortunately, our data was primarily limited by our small sample size, which could be rectified by doing more patient chart reviews. The timing of our study also made a difference since published data from other hospitals were not done during a time of crisis, so we would need to extend our study to look at patients hospitalized before the pandemic. Our hospital serves the inner-city, lower socioeconomic status patients in New Jersey, so patients may have different co-morbidities affecting the justification of SUP medication use as well. In addition, a majority of our patients most likely did not fit the strict ASHP definitions for prophylaxis despite being critically ill and given non-invasive mechanical ventilation. The introduction of non-invasive positive pressure ventilation was used as a means to avoid intubation as much as possible due to a lack of supplies, staff, and ICU beds. Therefore, this study has raised many intriguing ideas for the future to evaluate and improve stress ulcer prophylaxis use given outdated guidelines, controversial use of SUP in the non-ICU setting, and unclear PPI/H2RA outcomes in COVID-19.

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