Evaluation of Pantoprazole Continuous Infusion at an Academic Institution

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INTRODUCTION

- Continuous proton-pump inhibitor infusions are commonly utilized in the management of upper gastrointestinal bleeding (UGIB)
- Data suggests that twice daily dosing is as efficacious as a continuous infusion pantoprazole (Sachar et al. 2014[1])
- The University of Kansas Health System (TUKHS) implemented a pantoprazole optimization protocol on July 17th, 2019, favoring pantoprazole twice daily dosing over continuous infusion (CI) unless specific criterion were met to warrant the use of a drip strategy. Per the protocol, the patient must be NPO and meet ≥1 of the three following criteria:
  - Post-Endoscopic GI bleed
  - Visible vessel
  - Adherent clot
- During and before the duration of this study, pantoprazole was on national shortage, further prompting action for resource-conservation
- This study was performed to assess compliance of this pantoprazole utilization protocol in the setting of UGIB

[1]Sachar H, Vaidya K, Laine L. Intermittent vs continuous proton pump inhibitor therapy for high-risk bleeding ulcers: a systematic review and meta-analysis. *JAMA Intern Med*. 2014 Nov;174(11):1755-62.

METHODS

Primary outcome: Pre- and post-protocol comparison of mean CI hours per patient case without an approved indication
Secondary outcome: Pre- and post-protocol analysis of pantoprazole costs and number of empiric CI versus twice daily dosing

- Retrospective chart review was performed in patients with confirmed UGIB six weeks pre- and post- protocol implementation
- Patients identified by screening for pre-determined ICD-10 codes frequently associated with UGIB whom also received pantoprazole CI and/or twice daily dosing during the twelve-week study period
- Included ICD-10 codes: K92.2, K29.71, K25.4, K26.4
- Data collection included initial CI versus twice daily dosing, and those receiving a CI were also evaluated for empiric versus criteria-confirmed initiation, criteria for CI met or unmet, total duration of CI, duration of CI without approved criteria, and presence of transition to twice daily dosing
- Student's t-test was used to compare results of the primary end point

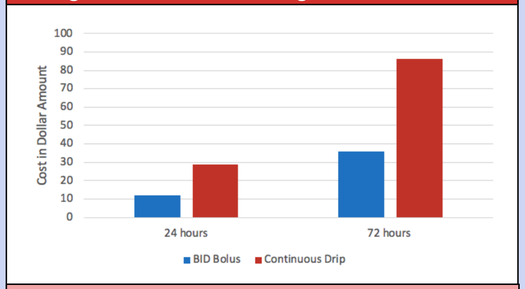
RESULTS & DISCUSSION

Table 1. Pantoprazole Usage Pre- and Post-Protocol Implementation

	Pre-Protocol Implementation	Post-Protocol Implementation
Number of CI administered	28	24
Number of twice daily dosing administered	74	40
Overall mean hours of CI per patient	36.80	33.79
Mean hours CI per patient without indication	17.99	12.75
Percentage of empiric twice daily (of total twice daily dosing)	83.78%	67.5%
Percentage of empiric CI dosing (of total CI dosing)	64.29%	83.33%

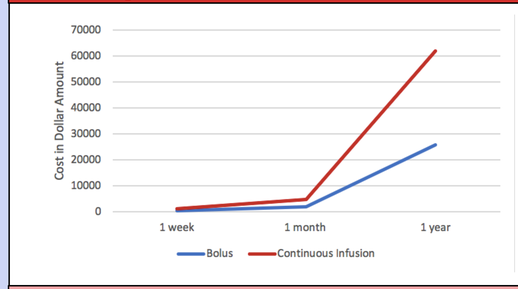
Empiric use was defined as CI ordered before UGIB confirmed via EGD. Empiric use was assessed as conservation-protocol was hopeful to decrease the utilization of CI ordered empirically, as the protocol would require an EDG to be performed to meet any of the established criteria. Consequently, empiric twice daily dosing was believed to increase if the protocol was being followed.

Figure 1. Acquisition Costs of Twice Daily vs CI Dosing for Treatment of a Single Patient



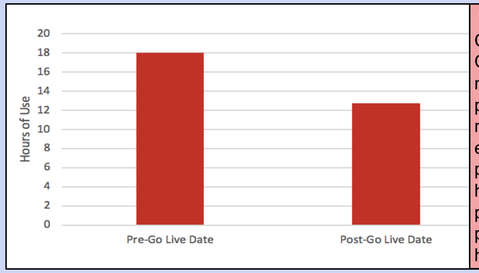
Cost estimates were based on the raw acquisition cost of $6 for one vial of 40 mg pantoprazole for injection. Twice daily dosing (40 mg BID) would utilize two vials over a 24 hours period. The CI is comprised of an 80 mg/100 ml IVPB lasting 10 hours, translating to a dose of 192 mg in a 24-hour period.

Figure 2. Projected Treatment Costs of Twice Daily vs CI dosing Over Time



Projected treatment costs were estimated based on the total number of UGIB patients over the 12-week time frame of the study. Costs were based on the average number of UGIB patients estimated if all were to be treated with either twice daily or CI dosing for a full treatment duration of 72 hours each.

Figure 2. Continuous Infusion Use Without Protocol Criteria Met



"Against Protocol Criteria" was defined as CI ordered without patient meeting prespecified protocol criteria. The number of hours of use is expressed in mean hours per patient. The mean hours per patient pre-policy was 17.99, and post-policy was 12.75 hours.

LIMITATIONS

- Underpowered to reach statistical significance
- Small sample size
- Only examined three ICD-10 codes, didn't include UGIB patients classified under other codes, thereby underreporting the incidence of UGIB
- Limited time frame of study, unable to capture long-term compliance of protocol

DISCUSSION

- No statistically significant difference was found between the mean hours per patient of CI pantoprazole used without appropriate indication before versus after the protocol implementation (17.99 vs 12.75 hours, 95% CI 3.70 to 14.17, p = 0.24)
- While no significance was found in the difference between mean hours of CI administered, there was a downward trend, confirming further study is indicated to assess long-term utilization past initial 6 weeks post-protocol implementation
- The existing data does not support that the protocol served to decrease the number of CIs used empirically, nor does it support that it increased the number of twice daily dosing used empirically
- A majority of the CI ordered without indication after the protocol implementation had the first selectable criteria (A. Post-Endoscopic GI bleeding ulcer) chosen, despite the patient not truly having the selected indication, perhaps indicating that to accelerate order verification and patient treatment, ordering providers were selecting the first option they saw in the order set without additional consideration

CONCLUSIONS & APPLICATIONS

- Protocol implementation did not significantly reduce the number of CI pantoprazole ordered to treat UGIB during the study period
- Empiric use of CI increased following protocol implementation
- Analysis of current protocol suggests additional changes are needed; potential options include defaulting all PPI orders for UGIB to twice daily dosing, adjusting of CI ordering restrictions, and additional staff education regarding the equivalent efficacy of the two
- Cost savings of twice daily versus CI dosing represents a financial incentive for both patient and hospital without compromising outcomes or quality of patient care