Medical and Nursing Staff Education Reduces Use of Prophylactic Ondansetron With Opioids in the Emergency Department

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Contribution to Emergency Nursing Practice

- The current state of scientific knowledge on the provision of intravenous (IV) analgesia in the emergency department indicates that prophylactic antiemetic therapy is not beneficial.
- The main finding of this research is that interdisciplinary education involving nursing, medical, and pharmacy staff yielded a significant reduction in the use of prophylactic ondansetron for patients receiving IV opioids for acute pain in the emergency department.
- Key implications for emergency nursing practice from this research are to increase awareness of the benefits of collaboration among emergency medicine nursing, pharmacy, and medical staff and to eliminate prophylactic administration of ondansetron with IV opioids.

Abstract

Introduction: We aimed to evaluate the effect of a pharmacist-led educational intervention on administration of ondansetron in patients receiving IV opioid analgesia in the emergency department.

Methods: This study is a retrospective chart review undertaken in a single-community emergency department. During October and November 2015, emergency medicine pharmacists completed an educational initiative targeting medical and nursing staff designed to reduce prophylactic administration of ondansetron. The multifaceted educational initiative comprised of a link to an animated video, posters at strategic locations in the department, e-mail reminders, brief presentations during shift change, and 1-on-1 discussion (see https://www.youtube.com/watch?v=Uvx8zKJBCCI). All patients who received IV morphine or hydromorphone during September and December 2015 were identified using pharmacy dispensing records, and 150 patients from each period were randomly selected for retrospective chart review. The primary outcome was the change in the proportion of prophylactic administration of ondansetron with IV opioids for acute pain in the emergency department.

Results: The proportion of patients administered prophylactic ondansetron decreased from 41% in the preintervention period to 26% in the postintervention period (difference 95% confidence interval [CI] 4.8 to 25.9, $P = 0.005$). Therapeutic use for documented nausea or vomiting upon presentation decreased marginally from 44% to 35% (difference 95% CI –2.3 to 19.7, $P = 0.1$). An overall decrease in the incidence of administration of ondansetron from 85% to 61% was observed (difference 95% CI 14.4 to 33.6, $P < 0.001$). No patient required rescue antiemetic administration.

Conclusions: Medical and nursing staff education yielded a significant reduction in the administration of prophylactic ondansetron for patients receiving IV opioids in the emergency department.

Key words: Emergency department; Pharmacist; Nurse; Ondansetron; Education; Opioids

Introduction

Concurrent administration of antiemetic prophylaxis with IV opioids for acute pain is common practice in the emergency department despite published data demonstrating a lack of benefit and an American Academy of Emergency

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Medicine recommendation against this practice.[1-5] In fact, nausea (3.7% to 10.4%) and vomiting (1.7% to 6.5%) are uncommon after IV opioid analgesia in the emergency department, even when no prophylactic antiemetic is offered.[1-3,6-8] Randomized prospective comparisons with placebo did not identify any benefit to prophylactic metoclopramide, promethazine, or ramosetron and concluded that antiemetic administration should be reserved for patients who develop nausea or vomiting.[1-4] No difference in the incidence of nausea or vomiting was identified in a recent prospective observational comparison of patients receiving ondansetron prophylaxis compared with IV opioid monotherapy.[9]

Ondansetron is the second most frequently administered medication in the emergency department despite evidence equating antiemetic treatment with placebo in adult ED patients presenting with nausea or vomiting.[10] Although ondansetron has been shown to be effective in the treatment of opioid-induced nausea and vomiting, there does not appear to be a role for prophylactic ondansetron.[11] Use of ondansetron is associated with headache, fatigue, sedation, pruritus, QTc prolongation, and the development of torsades.[12-15] The use of prophylaxis with morphine is widely reported, and, in our experience, ED clinicians regularly refer to "4 and 4" indicating morphine 4 mg and ondansetron 4 mg given concurrently.[1,3,5,16] Anecdotally, we have also observed that nursing requests for antiemetic prophylaxis lead some providers to add ondansetron to an existing order for opioid monotherapy. In summary, despite no evidence of benefit, and a potential for harm, prophylactic use of ondansetron continues to be a common practice, suggesting a need for provider and nursing staff education to bring practice in line with current evidence and professional society recommendations.

A previous study demonstrated an 18.5% absolute reduction in the prophylactic administration of metoclopramide after a multifaceted educational initiative targeting ED physicians and nurses in an Australian emergency department.[17] The research team included a pharmacist, but it is not reported which team members provided the education. Current guidelines from The American Society of Health Systems Pharmacists (ASHP) list the provision of education among the desirable services of an Emergency Medicine Pharmacist (EMP).[18] Although pharmacists possess medication therapy expertise and are regarded by ED staff as valuable educators, the effectiveness of an EMP in this role has not been documented.[19,20]

The purpose of this study is to evaluate the effect of a pharmacist-led educational intervention on administration of ondansetron in patients receiving IV opioid analgesia in the emergency department. We hypothesized that education delivered by EMPs to medical and nursing staff would reduce the incidence of prophylactic administration of ondansetron.

Methods

STUDY DESIGN AND POPULATION

This study is a retrospective chart review undertaken in a single-community emergency department with an estimated annual census of 70,000. An EMP who is responsible for both clinical and distributive services is present in the emergency department from 14:00 to 22:30, daily. The study received approval from the institutional review board.

During the preintervention period—September 2015—baseline data on the administration of ondansetron were collected. The study intervention was introduced over a 2-month period in October and November 2015. During the postintervention period—December 2015—data were collected to determine changes in the administration of ondansetron.

STUDY INTERVENTION

EMPs provided a multifaceted educational initiative targeting ED medical and nursing staff. The goal of the intervention was to reduce the administration of prophylactic ondansetron. The intervention comprised an emailed link to a 2-minute animated video (see https://www.youtube.com/watch?v=Uvx8zKJBCCI), posters at strategic locations in the department, brief presentations during nursing shift change report, and 1-on-1 discussion. Although the intervention was designed to reach all ED staff, no attempt was made to record completion rates, and no additional resources beyond normal EMP coverage were expended.

SUBJECT IDENTIFICATION AND DATA COLLECTION

The study included all patients aged 18 to 89 years who received IV morphine or hydromorphone for acute pain during ED visits. Patients who were given ondansetron prior to (>10 min) IV opioids, use of prophylactic antiemetics other than ondansetron, or documented prehospital opioid or antiemetic use were excluded. Subjects were identified using pharmacy dispensing records (Pyxis, Becton Dickinson, and Company, East Rutherford, New Jersey). Each subject was assigned a randomly generated number, and consecutive subjects were assessed for eligibility and included until the total number of patients in each period

reached 150. A single investigator abstracted data by chart review to determine the incidence of prophylactic administration of ondansetron, demographic information, and documentation of nausea or vomiting.

OUTCOME MEASURES

The primary outcome was the change in the proportion of prophylactic administration of ondansetron with IV opioids for acute pain in the emergency department. Prophylactic administration was defined as administration of ondansetron within 10 minutes after the first opioid dose to patients without pre-existing nausea or vomiting or known opioid sensitivity. Therapeutic use was defined as using ondansetron for documented nausea or vomiting before the use of opioids. Documented rescue was defined as ondansetron >10 minutes after opioid administration for documented nausea or vomiting. Presumed rescue was defined as ondansetron >10 minutes after opioid administration without documentation of nausea or vomiting. Secondary outcomes included the change in the proportion of overall use of ondansetron and appropriate administration. Appropriate administration was defined as using ondansetron therapeutically, for documented rescue, or for presumed rescue.

DATA ANALYSIS

The incidence of prophylactic administration of ondansetron in our institution was unknown but estimated to be at least 25%. Yeoh et al identified an 80% relative reduction with a similar educational intervention.[17] A total of 149 patients would provide 80% power to detect a more conservative effect size of a 50% relative reduction. As the inclusion criteria would presumably capture some patients with ondansetron used therapeutically—that is, patients presenting with acute pain and nausea—the sample size was further increased to a total of 300 patients. The $\chi 2$-test was used to analyze categorical data and a Student's *t*-test was used for age. The test of proportions (Z-test) was used to determine differences and 95% CIs. Our a priori level of significance was 0.05. All calculations were performed using Stata (StataCorp LP, Stata Statistical Software: Release 14. College Station, Texas).

Results

A total of 824 and 877 patients who received IV opioids were identified in the pre- and postintervention groups, respectively. A total of 15 patients met exclusion criteria in each study period. Reasons for exclusion in the pre- and postintervention groups included administration of ondansetron prior to opioid (8, 3), alternative prophylactic antiemetic (4, 4), or prehospital opioid (3, 8), respectively. Data collection was completed for 300 randomly selected patients. The demographic data are summarized in Table 1. In both pre- and postintervention periods, morphine was the preferred analgesic, and nausea or vomiting prior to opioid use was documented in less than half of patients. Indication for opioid analgesia was most commonly abdominal (44%), musculoskeletal (22%), flank (8%), or chest pain (8%) and did not differ between the pre- and postintervention periods (P = NS).

Table 2 describes use of ondansetron during the study periods. A significant decrease in the proportion of patients administered prophylactic ondansetron was observed in the postintervention period, with a corresponding decrease in overall administration of ondansetron. Therapeutic use for documented nausea or vomiting was not significantly affected. Ondansetron prophylaxis did not differ significantly among patients treated with morphine and hydromorphone in the pre- (41 vs. 41%; $P = 1.00$) and postintervention (24 vs. 29%; $P = 0.55$) groups, respectively. No cases of documented or presumed rescue antiemetic therapy were identified.

TABLE 1
Baseline patient characteristics

	Preintervention (n = 150)	Postintervention (n = 150)	P value
Female, n (%)	98 (65)	93 (62)	0.54
Mean age (year) ± standard deviation	48 ± 19	53 ± 18	0.02
White race, n (%)	140 (93)	145 (97)	0.12
IV opiate, n (%)			
Morphine	104 (69)	112 (75)	0.33
Hydromorphone	46 (31)	38 (25)	0.54
Established nausea/vomiting, n (%)	69 (46)	58 (39)	0.43

TABLE 2
Administration of ondansetron during the study period

	Pre-intervention (n = 150)	Post-intervention (n = 150)	95% Confidence interval*	P value
Prophylactic administration, n (%)	62 (41)	39 (26)	4.8 to 25.9	0.005
Overall administration, n (%)	128 (85)	92 (61)	14.4 to 33.6	<0.001
Appropriate administration, n (%)				
Therapeutic	66 (44)	53 (35)	–2.3 to 19.7	0.1
Documented rescue	0	0		
Presumed rescue	0	0		
Total	66 (44)	53 (35)	–2.3 to 19.7	0.1

* 95% confidence interval of the difference between pre- and postintervention periods.

Discussion

Our study aimed to minimize ED administration of prophylactic ondansetron through the provision of education to medical and nursing staff. The most important finding was a significant reduction in the administration of prophylactic ondansetron without the requirement of rescue antiemetic administration. This indicates that the reduction in prophylactic ondansetron postintervention did not lead to nausea or vomiting and confirms previous research suggesting that IV opioid use does not necessitate concurrent antiemetics. A strength of our study was the identification of patients with baseline nausea or vomiting. This enabled early use of ondansetron to be classified correctly as either therapeutic or prophylactic. No significant reduction in therapeutic use occurred, supporting the conclusion that the overall reduction in administration of ondansetron was the result of a reduction in prophylaxis not avoidance of ondansetron altogether.

The incidence of prophylactic ondansetron in our baseline cohort was considerably higher than that reported with metoclopramide (22%) and also exceeds that reported with ondansetron (52%).[9,16] Of the 81 patients who presented to our department during the baseline period without preexisting nausea or vomiting, 62 (77%) received ondansetron prophylaxis. Reasons for this are uncertain, and between-study comparisons are not straightforward. The extensive use of ondansetron for other indications, coupled with the absence of distressing side effects such as akathisia, may explain an increase over metoclopramide. As there is no documented clinical benefit and a clinical practice statement recommending against this practice, efforts to reduce ondansetron prophylaxis in our institution appear to be warranted.

The absolute reduction in antiemetic prophylaxis was similar between the current study (15%) and that of Yeoh et al (18%). The difference in relative reduction (37 vs. 82%) may be due to several factors including the difference in the baseline incidence of prophylaxis, staff perceptions about the margin of safety with ondansetron compared with metoclopramide, or the effectiveness of the intervention itself. There is a high degree of similarity between the educational interventions, suggesting the difference may be best explained by the baseline incidence, perceptions about safety, or the implementation of the intervention.

Adequate in-service training can be time consuming and challenging. The educational intervention was designed to be simple, easy to replicate, and use existing pharmacy services. To our knowledge, this is the first study to document a change in clinical practice as a result of emergency medicine pharmacy services, and our results support current ASHP practice recommendations. Our study may also facilitate the design of future educational interventions. Further study to determine if similar results could be obtained using only part of the intervention may elucidate even simpler effective methods to change prescribing practices in the emergency department.

Limitations

Our study has several limitations inherent to a single-center retrospective design. Administration of ondansetron concurrent with IV opioids was assumed to be prophylactic unless nausea or vomiting was documented. We believe this assumption to be valid because nausea and vomiting are prominent symptoms that would generally be recorded when present. The observed incidence of prophylactic

ondansetron may not be generalizable to all emergency departments and patient populations. As the intervention was not mandatory, and no effort was made to track rates of completion, it is likely that some staff members did not receive all components of the intervention. This is a possible explanation for the smaller magnitude of reduction seen in our study compared with the stuy by Yeoh et al, in which medical staff members were required to complete the web-based course. Furthermore, it is not possible for our data to determine the effect of any individual component of the composite intervention. Because our follow-up period occurred immediately after the intervention, we are unable to determine if the reduction in prophylactic administration was sustained. Nonetheless, our results suggest that antiemetic prophylaxis remains widespread and confirms the findings of Yeoh et al that education delivered by pharmacists can improve medication use in the emergency department.

Conclusion

Pharmacist-provided education yielded a significant reduction in the use of prophylactic ondansetron for patients receiving IV opioids analgesia in the emergency department.

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