

Systematic Postoperative Nausea Prophylaxis Feedback Improves Clinical Performance in Anesthesiology Residents

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Original Article

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Abstract

Background: Electronic medical records can generate a wealth of information regarding compliance with perioperative clinical guidelines as well as patient outcomes. Utilizing this information to provide resident physicians with measures of their own clinical performance may positively impact residents' clinical performance. We hypothesize that providing residents with objective measures of their individual adherence to evidence based postoperative nausea and vomiting (PONV) management protocols will improve their compliance with standardized treatment methods.

Methods: We conducted a retrospective baseline analysis of junior anesthesiology residents' compliance with PONV prophylaxis guidelines for high-risk patients. This was followed by a prospective cohort study, before and after an educational intervention, a 15 minute lecture on PONV prophylaxis. The number of pharmacologic prophylactic interventions were tabulated for each operative case and reported back to individual residents in blind and anonymous fashion. The primary outcome was the use of two or more prophylactic interventions for a high-risk patient, while the secondary outcome was the use of three or more prophylactic interventions. A follow up survey was administered to participating residents regarding the use of their individualized clinical performance.

Results: After implementation of feedback, patients received a significantly higher amount of PONV prophylactic treatments ($p=0.001$, means of 1.35 vs. 1.99). Comparison of percentage compliance was 38% vs 73%, respectively ($p<0.001$). In a follow up survey, residents received the feedback intervention well and had no significant concern in the dissemination of deidentified performance outcomes publically.

Conclusions: Resident compliance with PONV treatment guidelines was improved merely by auditing performance and providing individualized feedback. High-risk patients appear to receive more prophylactic agents after performance feedback and may be more effective than a more commonly used educational intervention to address the same topic. Providing direct performance feedback may be a useful tool for integration into graduate medical education programs.

Key words: feedback, outcomes, electronic medical record, quality improvement

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Introduction

The advent of electronic record keeping has made it easier to collect data regarding compliance with perioperative clinical guidelines and patient outcomes. While the value of this information for purposes of clinician education is yet to be fully exploited, utilizing this information to provide resident physicians with measures of their own clinical performance may positively impact residents' clinical competency and performance. In a 1996 study at the University of Toronto, authors provided education and individualized feedback to physicians to reduce post-operative nausea and vomiting (PONV)¹. The primary objective was to increase anesthesiologists' adoption of preventive measures to reduce PONV. At the study hospital, there was a significant increase in the mean percentage of the anesthesiologists' female patients receiving a preventive measure. They concluded that education and individualized feedback can change anesthesiologists' practice patterns. Automated feedback to residents has recently been demonstrated as an effective tool to improve practice performance and was generally well thought of by residents receiving feedback².

PONV has well known risk factors including young age, female gender, non-smoking status, and certain types of procedures (gynecological, ophthalmologic, ear surgery).³ The pre-emptive treatment of patients with one or more risk factors is widely accepted by anesthesiologists, and a multimodal strategy for high-risk patients was suggested by the landmark IMPACT trial⁴, demonstrating that "increasing the number of antiemetics administered reduced the incidence of postoperative nausea and vomiting from 52 percent when no antiemetics were used to 37 percent, 28 percent, and 22 percent when one, two, and three antiemetics, respectively, were administered." We hypothesize that providing residents with objective measures of their individual adherence to evidence based PONV management protocols will improve their compliance with standardized treatment methods.

Methods

Overview of Study Design

This study was conducted in an academic medical center (University of Washington Medical Center, Seattle, WA). The study was determined exempt from Institutional Review Board review by the University of Washington Human Subjects Division. We conducted a pilot retrospective analysis of 13 junior (PGY-2) anesthesiology residents' compliance to PONV prophylaxis for high-risk patients (females under 50 years old undergoing gynecologic, cholecystectomy, or breast surgery via general anesthesia). This was followed by a prospective cohort study in a subsequent population of 13 PGY-2 residents examining the same outcome, before and after an educational intervention, a 15 minute lecture reviewing risk factors and appropriate prophylactic interventions based on a recent factorial randomized clinical trial, which was also disseminated via electronic mail several months after the implementation of performance feedback. An online survey was sent to participating anesthesiology residents in order to assess satisfaction and utility of feedback after the study period had ended.

Selection of Participants

De-identified data comprising of patient demographic and PONV prophylactic medication administration for a period of 1 month was obtained retrospectively from the Anesthesia Information Management System (AIMS). This was used to assess baseline compliance of 13 first year clinical anesthesiology (CA-1) residents to PONV guidelines in April 2013. Individual performance feedback was provided for PONV prophylaxis administration in high-risk patients prior to the next resident rotations in May and June via electronic mail. On the first day of the 2013-14 academic year (July 1st), incoming CA-1 residents were informed that their PONV compliance monitoring would begin in August after a month of orientation. At the end of November, residents were again provided with individual performance feedback via electronic mail. Additionally, all participants attended a 15 minute lecture delivered by one of the authors of this study (P.N.) discussing risk factors for PONV and appropriate PONV prophylaxis focusing on discussion of the IMPACT trial⁴.

Data Analysis

Raw data were extracted from the University of Washington electronic anesthesia information management system (AIMS), and de-identified by a broker not involved in the research study. Percent compliance was calculated by the research team, and the results sent to individual residents by the third-party broker for time periods before and after the intervention. After the study period had ended, an online survey was sent to participating residents. The number of PONV pharmacologic prophylactic interventions (transdermal scopolamine, dexamethasone, ondansetron, droperidol, metoclopramide, and presence of a propofol infusion) was tabulated for each operative case. An operative case for a high-risk patient was considered compliant if two or more prophylactic interventions were performed (primary outcome) We also examined a compliance definition of three or more prophylactic interventions in a secondary outcome analysis. Differences between groups were assessed using a two-sample t-test and Fisher's exact test where appropriate. Statistical analysis was performed using Stata Intercooled 12 (Statacorp, College Station, TX).

Results

Over the study period, we saw a general increase in the number of prophylactic treatments and compliance for prevention of PONV (Figure 1). Using a two-sample t-test assuming unequal variances, the total number of prophylactic interventions between the control period and the follow up period (April vs. Dec-Jan) reveals a two-sided p-value of 0.001 (means of 1.35 vs. 1.99). Percentage compliance with guidelines, as defined by administration of two prophylactic medications, comparing the same time points was 38% vs 73%, respectively (Fisher's Exact t-test yielding two sided p-value of <0.001). Percentage compliance with guidelines, as defined by administration of three prophylactic medications, comparing the same time points was 13% vs 25% (Fisher's Exact t-test yielding two sided p-value of 0.098). There was not a significant difference before and after the educational intervention (August-November vs. December-January) (p=0.56 for chi-square analysis).

Of 13 residents who were contacted with the survey, 10 (77%) responded. In general, participating residents preferred receiving their actual PONV rate rather than their compliance with PONV guidelines (Table 1). Most residents (80%) were interested in seeing how their

metrics compare with other residents in their class. Additionally, most respondees (75%) preferred that this information be de-identified when distributing to others. Lastly, most (70%) residents found receiving automated feedback helpful to their education.

To the best of our knowledge, there were no other institutional initiatives, major changes in faculty staffing or teaching, or the structure of care delivery in our institution in the study timeframe that would affect the results of the study.

Discussion

Our study demonstrates that auditing clinical performance and providing individualized feedback to the anesthesiology resident population increases the number of appropriate PONV prophylactic treatments. Compliance progressively improved, but seemed to reach a plateau near 80% compliance, despite the addition of an educational intervention. Compliance appeared to improve with respect to our secondary outcome, but this difference only trended toward statistical significance. Additionally, most residents found their performance metrics useful and would like to see how they compared to others in their training level.

The limitations of our study included a small population, possible patient contraindications to certain PONV prophylactic agents that were not accounted for, variable attending anesthesiologist influences on case management, and expected trainee improvement over time as confounder with or without intervention. Of note, not all preoperative patient characteristics that have been found to be predictors of PONV² were identified by the AIMS intraoperative extraction, i.e. nonsmoker status and history of PONV or motion sickness. However, female sex, age, type of surgery and type of anesthesia were part of the AIMS query, and the majority of such cases employ use of postoperative opioids at our institution. Therefore, our contention is that the patients identified by our protocol represent a high-risk group. Additionally, the preoperative administration of oral meclizine in some cases was reflected in an EMR separate from the AIMS, but this is thought to be a very rare event in the institution studied. Initial disclosure of our study to the subjects may have influenced pre-intervention PONV prophylaxis administration as compared to pilot data, and the primary outcome compliance appears to plateau around 75%. Analysis of our secondary outcome of high-risk patients receiving triple prophylaxis also suggests that PONV prophylaxis may not have improved in this category. Reporting the actual rate of PONV was not feasible in this study due to limitations of our electronic medical record.

Despite these limitations, this is the first study of its kind to systematically examine feedback of PONV performance metrics to anesthesiology residents and assess impact. As it is becoming easier to extract clinical data with electronic medical records, this practice could be easily adaptable to most other residency programs that use AIMS. We find it interesting that despite having a new group of residents starting in August, the compliance rates continued to increase over time. We would have thought this new group should have had a lower compliance rate than the baseline group initially measured in April. This finding could be a result of our intervention in May actually changing other factors in the system (attending anesthesiologists becoming aware of the study or a general awareness that a particular patient population is at high risk for PONV). Whether or not the intervention affected our health care delivery system or the

individual residents' practice, we still observed an increase in PONV prophylaxis, and arguably better care for this patient population. This conclusion does not take into account the side effects of the prophylactic medications used in this study, but as most of the antiemetic used in this study have a very limited side effect profile, we still believe the conclusion to be relevant.

Audit and feedback has been studied as a means to improve professional practice and healthcare outcomes. A recent Cochrane review concluded that such feedback leads to “small but potentially important improvements in professional practice”, the effectiveness of which depends on baseline performance and how the feedback is provided⁶. Our survey suggests an anonymous dissemination method with individuals knowing their rates alone and being able to see other residents' de-identified aggregate rates may be the most effective method of providing this feedback. While a similar study has been done with attending anesthesiologists⁷, this is the first study to examine providing direct performance feedback with anesthesiology residents focusing on postoperative nausea and vomiting. It should be noted that we provided this feedback via electronic mail, and other methods of feedback can be used and may be more or less effective.

Conclusion

Resident compliance with PONV treatment guidelines can be improved by auditing performance and providing individualized feedback. High-risk patients appear to receive more prophylactic agents after performance feedback and it remains unclear how effective a short lecture may be after this feedback system has been put in place. A future direction for PONV compliance improvement could involve decision support reminders via AIMS. Furthermore, continuous as opposed to one-time feedback could potentially further improve and sustain compliance rates in the resident population, and may serve as a unique educational tool.

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Table 1. Survey Responses of Residents After Participation in the Program (n=10)		
Question 1	Actual PONV Rate	Compliance with PONV Guidelines
In assessing your ability to prevent PONV, what data would be more helpful?	70%	30%
Question 2 Would you be interested in seeing how your metrics compare to other residents in your class?	Yes 70%	No 30%
Question 3 Would you be interested in seeing how your metrics compare to all other residents in the program?	Yes 80%	No 20%
Question 4 If yes, should providers be de-identified when publishing performance metrics?	Yes 75%	No 25%
Question 5 Did you find receiving personalized performance feedback about your prescribing habits for patients at risk for PONV helpful to your education?	Yes 70%	No 30%

List of Abbreviations: PONV – Postoperative Nausea and Vomiting

Aggregate Changes in PONV Prophylaxis Behavior in PGY-2 Anesthesiology Residents

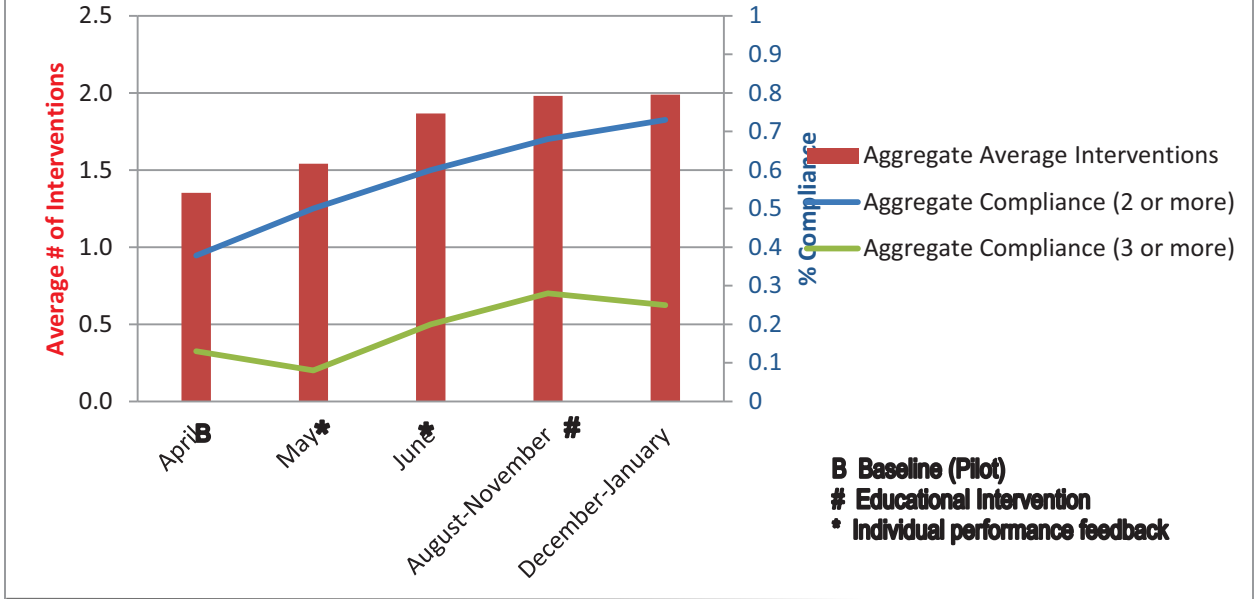


Figure 1: Aggregate Changes in PONV Prophylaxis by Number of Interventions and Aggregate Compliance