Published in final edited form as:

Ann Surg Oncol. 2019 July ; 26(7): 2011–2018. doi:10.1245/s10434-019-07321-y.

Educating Surgical Oncology Providers on Perioperative Opioid Use: Results of a Departmental Survey on Perceptions of Opioid Needs and Prescribing Habits

Heather A. Lillemoe, MD, Timothy E. Newhook, MD, Timothy J. Vreeland, MD, Elsa M. Arvide, MS, Whitney L. Dewhurst, MS, Elizabeth G. Grubbs, MD, MPH, Thomas A. Aloia, MD, Jean-Nicolas Vauthey, MD, Jeffrey E. Lee, MD, Ching-Wei D. Tzeng, MD

Department of Surgical Oncology, University of Texas MD Anderson Cancer Center, 1515 Holcombe Boulevard, Unit 1484, Houston, TX 77030, USA

Abstract

Introduction: Patients undergoing oncologic surgery are at risk for persistent postoperative opioid use. As a quality improvement initiative, we sought to characterize provider perceptions regarding opioid prescribing after oncologic procedures.

Methods: Surgical oncology attending physicians, clinical fellows, and advanced practice providers (APPs) at a high-volume cancer center were surveyed before and after educational sessions focusing on the opioid epidemic with review of departmental data.

Results: Pre-education response rates were 72/103 (70%): 22/34 (65%) attendings, 19/21 (90%) fellows, 31/48 (65%) APPs. For 5 index operations (open abdominal resection, laparoscopic colectomy, wide local excision, thyroidectomy, port), fellows answered that patients should be off opioids sooner than attendings/APPs. For 4/5 procedures, APPs recommended higher discharge opioid prescriptions than attendings/fellows. Forty-six providers (45%) responded to both pre- and post-education surveys. After the intervention, providers recommended lower numbers of opioid pills and indicated that patients should be off opioids sooner for all procedures. Compared to pre-education, more providers agreed that discharge opioid prescriptions should be based on a patient's last 24 hours of inpatient opioid use (83% vs. 91%, $p=0.006$). Providers who did not attend a session showed no difference in perceptions or recommendations on repeat assessment.

Conclusions: Variation exists in perioperative opioid prescribing among provider types, with those most involved in daily care and discharge processes generally recommending more opioids. After education, providers lowered discharge opioid recommendations and felt patients should be off opioids sooner. Next steps include assessing for quantitative changes in opioid prescribing and implementing standardized opioid prescription algorithms.

Keywords

Postoperative Opioid Use; Surgical Care Providers; Perceptions; Cancer Surgery; Needs Assessment

INTRODUCTION

The death rate from prescription opioid use has quadrupled in the last twenty years.¹ It is estimated that one out of every 25 Americans now uses opioids daily, a trend that started over a decade ago as the number of opioid prescriptions began increasing by 35% annually from 2000–2009.² Surgeons and surgical care providers play a critical role in this epidemic, as opioids are frequently prescribed to alleviate postoperative pain. Prescribing opioids to naïve patients in the perioperative period can lead to long-term use, with rates of new persistent opioid use as high as 6.5%.^{3,4} For cancer patients undergoing oncologic resection, up to 15% of previously opioid-naïve patients become persistent users.^{5,6}

Efforts such as “Enhanced Recovery After Surgery” (ERAS®) have been shown to decrease inpatient postoperative opioid use,^{7–9} but have done little to directly address the volume of opioids prescribed at discharge.¹⁰ Recent trends in postoperative opioid prescriptions reveal considerable variation in the quantity of opioids prescribed for a given procedure, and that surgeons often over-prescribe.^{11–13} This likely translates to increased rates of chronic opioid use and, more directly, results in excess opioid dissemination to the public. These and related findings have led to the development of opioid-prescribing guidelines for providers.^{14,15} Currently, few guidelines apply specifically to patients undergoing oncologic resection, despite this patient population’s increased risk for long-term opioid use.

As a quality improvement effort with the ultimate goal of creating opioid-prescribing guidelines for surgical oncology, we aimed to evaluate provider understanding of the current opioid epidemic and perceptions surrounding opioid use. Further, we sought to educate providers about both the national opioid crisis and our own institutional practices and to assess the effectiveness of our educational session via pre- and post-education surveys.

METHODS

Study Population

Study participants were recruited from the Department of Surgical Oncology at the University of Texas MD Anderson Cancer Center in August 2018. All attending surgeons, clinical fellows, and advanced practice providers (APPs) within the department were surveyed. This study was approved by the Quality Improvement Assessment Board (QIAB).

Study Design & Survey Development

The study consisted of two online surveys administered via REDCap® before and after an educational intervention specific to perioperative opioid practices (Supplemental Appendices A and B).¹⁶ Both surveys addressed opioid prescribing habits, perceptions surrounding perioperative pain management, and general knowledge related to the opioid epidemic. Five oncologic operations were included in the survey to assess opioid-prescribing habits: open abdominal resection, laparoscopic colectomy, wide local excision with sentinel lymph node biopsy, total thyroidectomy, and port placement. The post-intervention survey repeated these questions and included additional fields regarding plans to change prescribing habits. The survey tool was developed by the research team [authors HAL, TEN, TJV, CDT] then vetted

by an additional attending surgeon, Complex General Surgical Oncology (CGSO) fellow, and APP. The first survey was administered over a two-week period preceding the intervention. The educational sessions took place over one week, and the follow-up survey was sent approximately two weeks after the intervention over a two-week period.

Educational Intervention

The intervention consisted of an educational session held in three different settings to ensure adequate availability and exposure to each provider group. As the intervention took place at the beginning of the academic year, one session was directed toward incoming fellows. A second educational session was given at the monthly “Surgical Physician Assistant Continuing Education” (SPACE) conference. The final session was a departmental grand rounds presentation. A video recording of the grand rounds presentation was subsequently disseminated to the department via email. Presentations were given by a CGSO fellow [author TEN] and an attending surgical oncologist [author CDT]. Each 1-hour interactive session included background information on extent of the opioid epidemic, both generally and specific to the cancer population. A retrospective cohort study of opioid discharge practices using departmental data was a key component of each presentation, so that providers could quantify, for the first time, our actual current practice.¹⁷ Finally, future prospective quality improvement and research projects targeting perioperative opioid practices were discussed.

Statistical Analyses

Categorical variables are shown as numbers and percentages and were compared using chi-square or Fisher’s exact test, as appropriate. Continuous variables are shown as median (interquartile range, [IQR]) and were compared using the Wilcoxon Rank-Sum or the Kruskal-Wallis test. Paired pre- vs. post-intervention data were compared with Wilcoxon Signed-Rank test or McNemar’s test. All p values were two-sided, and $p < 0.05$ was statistically significant. All statistical analyses were performed using JMP Pro software (version 12; SAS Institute Inc., Cary, NC).

RESULTS

Study Participants: Pre-Education Cohort

For the pre-education survey, 72 of 103 total providers participated for an overall response rate of 70%. The breakdown of provider types was 43% APPs, 31% attendings, and 26% fellows. Response rates based on clinical role were: 22/34 (65%) attendings, 19/21 (90%) fellows, 31/48 (65%) APPs. Details regarding participants’ clinical role, subspecialty, and years in practice is shown in Figure 1. Participants were well-distributed among the surgical oncology disease-site subspecialties. Among fellows, 15 (79%) were CGSO fellows and 4 (21%) were non-CGSO subspecialty fellows.

Pre-Education Opioid Practices, Perceptions, and Knowledge

Prior to any educational sessions, participants were surveyed about opioid-prescribing habits and perceptions surrounding opioid use for common oncologic procedures (Table 1). APPs recommended a higher number of opioid pills than fellows and attendings for all procedures

except open abdominal resection. Fellows indicated that patients should be weaned off opioids at a shorter postoperative interval than attendings and APPs for all procedures. Fellows also responded with higher perceived patient-reported pain scores at the time of discharge for open abdominal resection. For other procedures, providers responded similarly regarding pain scores.

A high proportion of all provider types agreed that non-opioid adjuncts decrease opioid use (median total agreement 100% [IQR 92, 100]) and regional nerve blocks are useful adjuncts for postoperative pain (96% [IQR 84, 100]). Attendings and fellows had higher agreement than APPs regarding regional blocks (Table 2). Agreement was slightly lower for basing discharge opioid prescriptions on the last 24 hours of inpatient opioid use (80% [IQR 67, 100]). The median agreement was lowest for the statement that patients who do not require opioids in the 24 hours prior to discharge should not receive a discharge opioid prescription (56% [IQR 30, 85]).

When asked which non-opioid adjuncts they use for inpatient management, 62 (86%) providers indicated acetaminophen, 45 (63%) ketorolac, 30 (42%) gabapentin and/or pregabalin, 48 (67%) ibuprofen or another oral NSAID, 26 (36%) celecoxib, and 43 (60%) methocarbamol or cyclobenzaprine. For outpatient management, 60 (83%) of providers indicated using acetaminophen, 14 (19%) gabapentin and/or pregabalin, 55 (76%) ibuprofen or another oral NSAID, 10 (14%) celecoxib, and 25 (35%) methocarbamol or cyclobenzaprine.

General knowledge questions were also asked of providers. Prior to the intervention, most providers correctly classified fentanyl (93%) and oxycodone (100%) as opioids. However, 29% of providers failed to identify tramadol as an opioid. Two providers (3%) thought that ketorolac is an opioid. Regarding new persistent opioid use in patients undergoing potentially curative oncologic resection, 71 of 72 providers responded and 34 (48%) chose the correct answer: 10%.⁵ For the question pertaining to drug overdose deaths, 35 providers (49%) chose correctly: 50–75%.¹

Pre- vs. Post-Education Survey Responses

Forty-five percent of providers (46/103) completed both pre- and post-education surveys. Comparative analysis was performed using only these providers. The group was comprised of 39% APPs, 28% attendings, 33% fellows. Individual provider response rates were: 13/34 attendings (38%), 15/21 fellows (71%), 18/48 APPs (38%). The distribution of clinical specialty and years in practice was similar to the larger pre-education cohort. Eleven (73%) fellows were CGSO and 4 (27%) were training in another oncologic subspecialty. Twenty-seven (46%) of this group attended the grand rounds session, 5 (8%) watched the grand rounds video but did not attend in-person, 14 (24%) attended the SPACE session, 6 (10%) attended the orientation session, and 7 providers (12%) did not attend any session. Several providers attended more than one session.

Post-education, respondents answered the same questions regarding opioid needs and prescribing habits for common oncologic procedures. Compared to pre-education, post-education responses recommended lower numbers of opioid pills for all procedures (Table

3). After the intervention, providers also responded that patients should be off opioids sooner for every procedure type. Perceived patient pain scores at discharge were similar. A post hoc subgroup analysis performed for the 7 participants who indicated they did *not* attend an educational session showed similar pre- vs. post-education responses ($p > 0.05$) for each question for all five procedures.

As in the pre-education survey, most of the providers agreed with the statements regarding non-opioid adjuncts and regional nerve blocks on the post-education survey. When asked about basing discharge opioid prescriptions on the last 24 hours of inpatient use, the median agreement for the 46 providers who took both surveys increased from 83% (IQR 69, 100) to 91% (IQR 77, 100; $p = 0.006$). Agreement that patients should not receive a discharge opioid prescription if they do not require opioids during the previous 24 hours increased from 58% (IQR 32, 85) to 77% (IQR 52, 90; $p = 0.008$). Analysis performed on the subgroup of providers who did not attend any session revealed that agreement did not change for any of the questions pre- vs. post-education. Comparison of those who did vs. did not attend the sessions is shown in Figure 2. For those who participated in the educational intervention, 96% reported plans to decrease opioid prescriptions compared to only 54% of non-participants.

For those who completed both surveys, responses to the repeated knowledge questions were similar (McNemar's test, $p > 0.05$). Although not statistically significant, more providers did respond correctly to both multiple choice questions. Similarly, more providers responded correctly that tramadol was an opioid medication on the post-education survey: 76% to 85% ($p = 0.157$).

DISCUSSION

Given the current opioid crisis, efforts must be made to reduce opioid prescriptions. The perioperative period is an important venue for opioid prescribing, with patients undergoing oncologic resection at increased risk for long-term opioid use after surgery.^{5,6} To better understand provider perceptions related to opioid use after cancer surgery, we surveyed surgical oncology providers at a high-volume comprehensive cancer center and informed providers about the extent of the opioid problem, focusing on actual institutional data and prospective plans for improvement in a learning healthcare system model. We found variation in perioperative opioid prescribing habits among provider types, with those most involved in the daily care and discharge process recommending more opioids. After educational interventions, the same providers lowered recommended discharge opioid amounts and felt that patients should be off opioids sooner.

Our pre-intervention data regarding provider perceptions of patient-reported postoperative pain and the duration of opioid requirements after various oncologic procedures showed variation among provider types. Specifically, fellows indicated that patients should be off opioids sooner than attendings and APPs, while APPs recommended higher numbers of opioid pills after every procedure type. This may reflect the amount of time the provider spends with patients at various time points of their perioperative care. For example, APPs generally spend the most time with patients during the index hospitalization (responding to

inpatient requests), on the day of discharge (educating patients), and in clinic (responding to refill requests). Fellows perform these tasks less frequently, with requests rarely reaching the attending surgeons. Perhaps the increased pill number at discharge indicated by APPs reflects more patient-centric prescribing pattern given the increased direct patient contact during this time, erring on the side of over-prescription. APPs are also more likely to be the providers actually writing the discharge prescriptions. Fellows have the least long-term follow-up with surgical patients given the monthly rotation schedule. This may account for fellows' perception of shorter postoperative durations of opioid requirement, as they deal with refill requests and medicine reconciliations during outpatient visits less frequently. While different patterns were seen in a recent study assessing quantitative opioid discharge prescriptions after general surgery procedures, variation between attendings, trainees, and APPs was also found.¹⁸ This variation highlights the importance of involving all types of surgical care providers in educational initiatives. Specific focus on inter-provider communication would also be beneficial. Finally, key to understanding why provider prescribing habits differ is determining what motivates providers to prescribe more opioids (e.g. perceived empathy for patients or pragmatic worry for refill requests) and what barriers exist to implementing opioid reduction strategies.

After our intervention, providers indicated that they would prescribe lower amounts of discharge opioids and that patients should require them for shorter time intervals after surgery for every procedure type. We attribute these findings to our educational sessions. A unique feature of our presentations was the incorporation of data from our own department in addition to general information regarding the opioid epidemic. Anecdotally, sharing this institution-level data led to increased discussion among surgical providers on the topic of opioids during this time period. Specifically, there was sharing of opioid weaning strategies from services with low opioid use to those on the higher end of the spectrum. This was thought to be clinically relevant given that prior to the intervention, there was very little general group discussion on this topic. Meanwhile, though a small number, the providers who indicated they did *not* attend a session had no change in their opioid prescribing habits or agreement with opioid-related questions on the post-education survey.

Future planned steps include a repeat survey assessment to understand the long-term effect of our educational intervention. Additionally, we are assessing for quantitative changes in actual opioid prescribing habits based on procedure type in order to implement standardized multimodal pain management protocols for index operations.

We must acknowledge the possibility of response bias, as it is possible that participants answered questions in a manner they thought would be pleasing to the research group. Similarly, the increased publicity that the opioid epidemic has received from the media and in the surgical literature may have played a synergistic role. However, the sessions themselves appeared to impact participants, given that no difference was seen in the perceptions of non-participants. Notably, non-participating providers reported only 54% agreement regarding plans to decrease opioid prescribing, compared to nearly 100% for participants. While the relatively small number of participants may have limited this comparison, the provider group that responded to both surveys was representative of our entire cohort in regards to subspecialty and years in practice, and significant differences

between the responses were still found. Despite these limitations, this study represents an important step forward in understanding opioid prescribing patterns and offers a successful example of department-wide opioid education having a clinically relevant impact on provider perceptions.

Conclusions

There is considerable variation in perioperative opioid prescribing habits among surgical provider types, with those most involved in daily patient care and discharge processes recommending more opioids. After educational interventions, all provider types lowered the quantity of opioids recommended at discharge and indicated shorter durations of postoperative opioid use. Next steps include assessing for quantitative changes in opioid prescriptions at our institution and implementing inpatient weaning strategies and standardized discharge opioid prescription algorithms.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Funding Sources: Dr. Heather Lillemoe is supported by National Institutes of Health grant T32CA009599 and the MD Anderson Cancer Center support grant P30 CA016672.

This study will be presented on March 30, 2019 in a Parallel Session Oral Presentation at the Society of Surgical Oncology 2019 Annual Cancer Symposium, San Diego, California.

REFERENCES

1. Rudd RA, Aleshire N, Zibbell JE, Gladden RM. Increases in Drug and Opioid Overdose Deaths-United States, 2000–2014. *MMWR Morbidity and mortality weekly report*. 2016;64(50–51): 13781382.
2. Kenan K, Mack K, Paulozzi L. Trends in prescriptions for oxycodone and other commonly used opioids in the United States, 2000–2010. *Open medicine : a peer-reviewed, independent, open access journal*. 2012;6(2):e41–47.
3. Hah JM, Bateman BT, Ratliff J, Curtin C, Sun E. Chronic Opioid Use After Surgery: Implications for Perioperative Management in the Face of the Opioid Epidemic. *Anesth Analg*. 2017;125(5): 17331740.
4. Brummett CM, Waljee JF, Goesling J, et al. New Persistent Opioid Use After Minor and Major Surgical Procedures in US Adults. *JAMA Surg*. 2017;152(6):e170504.
5. Lee JS-J, Hu HM, Edelman AL, et al. New Persistent Opioid Use Among Patients With Cancer After Curative-Intent Surgery. *Journal of Clinical Oncology*. 2017;35(36):4042–4049. [PubMed: 29048972]
6. Tuminello S, Schwartz R, Liu B, et al. Opioid use after open resection or video-assisted thoracoscopic surgery for early-stage lung cancer. *JAMA Oncology*. 2018;4(11):1611–1613. [PubMed: 30264153]
7. Alvarez MP, Foley KE, Zebley DM, Fassler SA. Comprehensive enhanced recovery pathway significantly reduces postoperative length of stay and opioid usage in elective laparoscopic colectomy. *Surgical endoscopy*. 2015;29(9):2506–2511. [PubMed: 25480622]
8. King AB, Spann MD, Jablonski P, Wanderer JP, Sandberg WS, McEvoy MD. An enhanced recovery program for bariatric surgical patients significantly reduces perioperative opioid consumption and postoperative nausea. *Surgery for obesity and related diseases : official journal of the American Society for Bariatric Surgery*. 2018.

9. Grant MC, Sommer PM, He C, et al. Preserved Analgesia With Reduction in Opioids Through the Use of an Acute Pain Protocol in Enhanced Recovery After Surgery for Open Hepatectomy. *Regional anesthesia and pain medicine*. 2017;42(4):451–457. [PubMed: 28525409]
10. Brandal D, Keller MS, Lee C, et al. Impact of Enhanced Recovery After Surgery and Opioid-Free Anesthesia on Opioid Prescriptions at Discharge From the Hospital: A Historical-Pro prospective Study. *Anesth Analg*. 2017;125(5):1784–1792. [PubMed: 29049123]
11. Thiels CA, Anderson SS, Ubl DS, et al. Wide Variation and Overprescription of Opioids After Elective Surgery. *Ann Surg*. 2017;266(4):564–573. [PubMed: 28697049]
12. Hill MV, McMahon ML, Stucke RS, Barth RJ, Jr. Wide Variation and Excessive Dosage of Opioid Prescriptions for Common General Surgical Procedures. *Ann Surg*. 2017;265(4):709–714. [PubMed: 27631771]
13. Eid AI, DePesa C, Nordestgaard AT, et al. Variation of Opioid Prescribing Patterns among Patients undergoing Similar Surgery on the Same Acute Care Surgery Service of the Same Institution: Time for Standardization? *Surgery*. 2018;164(5):926–930. [PubMed: 30049481]
14. Overton HN, Hanna MN, Bruhn WE, Hutfless S, Bicket MC, Makary MA. Opioid-Prescribing Guidelines for Common Surgical Procedures: An Expert Panel Consensus. *J Am Coll Surg*. 2018;227(4):411–418. [PubMed: 30118896]
15. Thiels CA, Ubl DS, Yost KJ, et al. Results of a Prospective, Multicenter Initiative Aimed at Developing Opioid-prescribing Guidelines After Surgery. *Ann Surg*. 2018;268(3):457–468. [PubMed: 30004924]
16. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. *Journal of biomedical informatics*. 2009;42(2):377–381. [PubMed: 18929686]
17. Newhook TE, Vreeland TJ, Dewhurst WL, et al. Clinical Factors Associated With Practice Variation in Discharge Opioid Prescriptions After Pancreatectomy. *Ann Surg*. 2018.
18. Lev R, Lee O, Petro S, et al. Who is prescribing controlled medications to patients who die of prescription drug abuse? *The American Journal of Emergency Medicine*. 2016;34(1):30–35. [PubMed: 26476578]

SYNOPSIS

In an effort to better understand opioid-prescribing practices and provider perceptions of perioperative opioid use, we surveyed surgical oncology providers at a high-volume cancer center before and after an educational intervention.

Figure 1. Pre-Educational Intervention Survey Participants

A breakdown of respondents' clinical role, clinical specialty*, and years in practice* are shown. *Clinical specialty and years in practice apply only to attending surgeons and advanced practice practitioners [APPs]. Respondents could select more than one specialty if appropriate.

Figure 2. Pre- vs. Post-Educational Intervention Agreement Questions, based on Participation
Includes responses from only those participants who responded to both the pre- and post-education surveys. Median agreement is shown for each agreement question, with comparisons of pre- vs. post-intervention values using Wilcoxon's Signed-Rank test. Question stems are abbreviated from original survey [Supplementary Appendix B].

Table 1.**Pre-Education Provider Perceptions of Opioid Prescribing Habits**

	Pain Score at Discharge* (0–10)	Opioid Rx at Discharge* (# pills)	Postoperative Day Off Opioids* (days)
Open Abdominal Resection			
Attending	3 (2, 3.25)	30 (11, 30)	10 (6.75, 14)
Fellow	4 (3, 4)	30 (20, 30)	7 (5, 10)
APP	3 (3, 4)	30 (20, 40)	14 (10, 21)
P-value	0.011	0.099	<0.001
Laparoscopic Colectomy			
Attending	2 (2, 3)	20 (8.75, 30)	6.5 (5, 7)
Fellow	3 (2, 3)	20 (15, 20)	5 (3, 7)
APP	3 (2, 3)	28 (15, 30)	7 (5, 14)
P-value	0.075	0.043	0.015
Wide Local Excision with Sentinel Lymph Node Biopsy			
Attending	2 (1, 2)	10 (10, 20)	5 (3, 6.5)
Fellow	3 (2, 3)	10 (10, 20)	3 (2, 4)
APP	2 (2, 3)	20 (11, 29.5)	7 (3, 10)
P-value	0.059	0.043	0.001
Total Thyroidectomy			
Attending	2 (1, 2)	15 (0, 20)	5 (2, 5)
Fellow	3 (2, 3)	10 (5, 15)	3 (2, 3)
APP	2 (2, 3)	17.5 (10, 28)	6 (3.75, 10)
P-value	0.084	0.025	<0.001
Port Placement			
Attending	1 (1, 2)	0 (0, 10)	2 (0, 3)
Fellow	2 (1, 3)	5 (0, 10)	1 (0, 2)
APP	2 (1, 2)	10 (3.75, 15)	3 (1, 5)
P-value	0.576	0.033	0.019

Values shown as median (IQR); Kruskal-Wallis test; bold indicates $p > 0.05$

* **numerical score** in 0–10 pain scale; **pills** with 1 standard pill=5mg hydrocodone=50mg tramadol; **days** post-operation

APP, advanced practice provider

Table 2.**Pre-Education Provider Perceptions Regarding Perioperative Pain Management**

	% Agreement (0–100)
The use of non-opioid adjuncts for postoperative pain management results in decrease opioid use.	
Attending	100 (100, 100)
Fellow	
APP	100 (100, 100)
P-value	96 (90, 100) 0.111
Regional nerve blocks are useful adjuncts for postoperative pain.*	
Attending	100 (88.75, 100)
Fellow	100 (90, 100)
APP	94 (75, 98)
P-value	0.043
For an inpatient procedure, the amount of opioids prescribed should be based on the patient's opioid use in the last 24 hours.	
Attending	88 (62.5, 100)
Fellow	80 (68, 100)
APP	75.5 (51.25, 94)
P-value	0.426
After an inpatient procedure, a patient who has not required opioids for 24 hours prior to discharge should not receive a discharge opioid prescription	
Attending	70 (38.75, 100)
Fellow	
APP	50 (32, 85)
P-value	61 (20, 80) 0.134

Values shown as median (IQR); Kruskal-Wallis test; bold indicates $p > 0.05$

* Attending vs. fellow ($p=0.989$), Attending vs. APP (**$p=0.027$**), APP vs. fellow (0.058) using Wilcoxon Rank-Sum test.

APP, advanced practice provider

Table 3.Perceptions of Opioid Needs and Prescribing Habits, Pre- vs. Post-Educational Intervention^{*}

	Pre-Education	Post-Education	<i>P</i> value
Open Abdominal Cancer Resection			
Pain Score at Discharge	3 (3, 4)	3 (3, 4)	0.959
# Opioid Pills at Discharge	28 (20, 30)	20 (10, 22)	<0.001
Postop Day off Opioids	10 (7, 14)	7 (5, 10)	<0.001
Laparoscopic Colectomy			
Pain Score at Discharge	3 (2, 3)	2 (2, 3)	0.235
# Opioid Pills at Discharge	20 (11, 27)	10 (5, 20)	<0.001
Postop Day off Opioids	5 (4, 7)	5 (3, 7)	0.008
Wide Local Excision with Sentinel Lymph Node Biopsy			
Pain Score at Discharge	2 (2, 3)	2 (1, 3)	0.569
# Opioid Pills at Discharge	10 (10, 20)	10 (5, 10)	0.005
Postop Day off Opioids	5 (3, 7)	3 (2, 5)	<0.001
Total Thyroidectomy			
Pain Score at Discharge	2 (2, 3)	2 (2, 3)	0.266
# Opioid Pills at Discharge	10 (7, 20)	6 (0, 10)	<0.001
Postop Day off Opioids	3 (2, 6)	3 (1, 4)	0.005
Port Placement			
Pain Score at Discharge	2 (1, 3)	2 (1, 2)	0.726
# Opioid Pills at Discharge	6 (0, 10)	0 (0, 8)	<0.001
Postop Day off Opioids	2 (0, 3)	1 (0, 2)	0.022

Median (interquartile range, IQR); Kruskal-Wallis test; bold indicates $p > 0.05$ ^{*}
numerical score in 0–10 pain scale; **pills** with 1 standard pill=5mg hydrocodone=50mg tramadol; **days** post-operation