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Improving Multimodal Analgesic Use After Otolaryngologic Surgery—A Single-Institution Experience of 9000 Patients

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Abstract

Objective. This study aims to assess a quality improvement intervention to decrease opiate prescriptions at discharge and improve patient access to multimodal analgesics (MMA) after otolaryngologic surgery.

Study Design. Longitudinal quality improvement initiative with retrospective prescription trend review and prospective patient questionnaire collection.

Setting. An academic medical center.

Methods. Opioid, acetaminophen, and non-steroidal anti-inflammatory drug (NSAID) discharge prescriptions after otolaryngologic procedures were reviewed. Two annual department-wide workshops were carried out to review the literature on published MMA protocols and develop standardized post-operative pain medication instructions to reduce opioid use. Concurrently, a patient survey was distributed to evaluate discharge pain medication use and satisfaction with pain control.

Results. Discharge pain medications were reviewed for 9064 procedures between January 2021 and May 2024. After the interventions above, the percentage of patients receiving opioids at discharge decreased from 61.4% to 46.8% ($P < .00001$). Concurrently, acetaminophen and NSAID discharge prescriptions increased from 24.3% and 10.2% to 67.4% and 46.1%, respectively (both $P < .00001$). Among 100 patients surveyed, satisfaction with post-operative pain control was high before and after the implementation of standardized discharge instructions, even though fewer post-intervention patients received opioids at discharge (49.1% compared to 76.6% pre-intervention, $P = .007$). Notably, 27% of patients prescribed opioids reported not taking them and 23% reported saving unused opioids for future use.

Conclusion. Implementation of standardized post-operative pain medication instructions at discharge after otolaryngologic procedures led to a substantial decrease in opioids prescribed while maintaining patient satisfaction with post-operative pain management. A significant proportion of patients reported saving unused opioids for future use despite standardized safe disposal instructions.

Keywords

multimodal analgesia, opioid stewardship, pain management, post-operative pain, quality improvement

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Surgeons are the second largest group of opioid-prescribing practitioners after pain specialists.[1] In recent studies, as much as 75% of the post-operatively prescribed opiates were unused after otolaryngologic procedures.[2,3] This carries the risk of future inappropriate opiate use and development of opiate use disorder, which cost the health care system an estimated $1 trillion in 2017 and accounted for over 80,000 deaths in 2022.[4,5] Protocols that employ multimodal analgesia (MMA) or multiple pharmacological classes of analgesics to treat post-operative pain have shown improved patient-reported pain scores while decreasing opioid prescriptions at discharge after endocrine, salivary, transoral robot-assisted oropharyngeal, and head and neck free flap reconstructive surgeries.[6-11] As a result,

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the Clinical Practice Guidelines from the American Academy of Otolaryngology–Head and Neck Surgery recommend MMA protocols and non-opiate agents for first-line pain management in the post-operative setting.[3]

Several studies have examined barriers to more widespread adoption of MMA protocols and opioid stewardship. Among them are limited and variable exposure to education on opioid prescribing practices during medical school and residency training, lack of institutional and/or national evidence-based opioid prescription guidelines, limited provider familiarity with non-opioid analgesic agents, and uncertainty about how reducing opioid prescriptions may affect patient-reported pain control and satisfaction.[12-14] While the recent Consolidated Appropriations Act of 2023 now mandates a minimum 8-hour educational curriculum to all Drug Enforcement Agency-registered providers, further efforts are needed to promote more widespread adoption of MMA strategies for post-operative pain management.[15]

To address these barriers, our institution implemented a quality improvement initiative to increase MMA use and optimize opioid stewardship in prescribing practices after otolaryngologic surgery. We performed a longitudinal assessment of discharge pain medications prescribed after 9064 procedures performed between January 2021 and May 2024 at a single academic medical center. During this time, 2 annual department-wide workshops were held to review existing evidence on enhanced recovery after surgery (ERAS) pathways and develop procedure-specific, standardized post-operative MMA protocols. To assist patients with MMA adherence, standardized discharge pain medication instructions were created with a sample medication schedule and directions for the safe disposal of unused opioids. Finally, a patient survey was administered before and after the implementation of standardized discharge instructions to evaluate satisfaction with post-operative pain control and how patients reported taking the pain medications prescribed.

Methods

The study was approved by the University of California San Francisco Institutional Review Board (#24-41986).

Departmental Quality Improvement Initiative

We implemented the "Plan-Do-Study-Act" framework to critically evaluate and design interventions to improve MMA use in post-operative pain management after otolaryngologic surgery (**Figure 1**). In February 2022 and 2023, 2 department-wide workshops were held to review the institutional use of MMA in post-operative pain management. Groups of resident and attending physicians as well as advanced practice providers within each subspecialty division were tasked with analyzing published pain management protocols and developing a consensus for pain medication regimen (including quantity of opioids prescribed at discharge) for most commonly performed procedures. In tandem, an audit of discharge pain medications prescribed for 9064 procedures within the Department of Otolaryngology–Head and Neck Surgery was performed between January 2021 and May 2024. Of these, 7337 (80.9%) were outpatient surgeries. The proportions of patients receiving acetaminophen, non-steroidal anti-inflammatory drugs (NSAIDs), and opioids as well as the mean quantity of opioids prescribed in 5 mg oxycodone equivalents were reported using Tableau, a data visualization platform communicating with our institutional electronic health record (Salesforce Inc.).[16] Department-wide update about discharge pain medication prescribing trends was provided quarterly for provider review.

Based on proposed MMA medication regimens developed in the departmental workshops, a task force of providers (M.L.D., J.H., J.L.C., A.N.G., and R.S.) developed standardized pain medication discharge instructions, which were integrated and disseminated as an electronic health record dot phrase for provider use. The dot phrase presented a sample medication dosing schedule based on MMA agents selected, provided guidance on avoiding medication-related adverse effects, advised how to safely dispose of any unused opioid medications, and linked resources to non-pharmacologic adjuncts for pain control, such as massage therapy, acupuncture, and guided imagery (Supplemental Information S1, available online).

Patient Experience Questionnaire

As the majority of surgeries performed by our department were outpatient procedures, a 30-item questionnaire was distributed to patients undergoing outpatient surgery within the divisions of General Otolaryngology, Sleep Surgery, Rhinology, and Otology between September 2023 and April 2024 (Supplemental Information S2, available online). The questionnaire assessed patient satisfaction with post-operative pain control and reported the use of opioids before and after the launch of the discharge instruction dot phrase (January 11, 2024). Patients were invited to submit responses at least 1 week after their procedure. Patient questionnaire responses were collected using the Research Electronic Data Capture (REDCap) database, a secure and encrypted web-based platform.

Statistical Analysis

Fisher's exact or chi-square tests were used for all categorical variable comparisons where appropriate. The Wilcoxon rank-sum test was used for nonparametric 2-sample comparisons. The threshold for statistical significance for all reported 2-sided tests was set at $P < .05$. Statistical analysis was performed using Stata Release 17 (StataCorp LLC). Figure design and

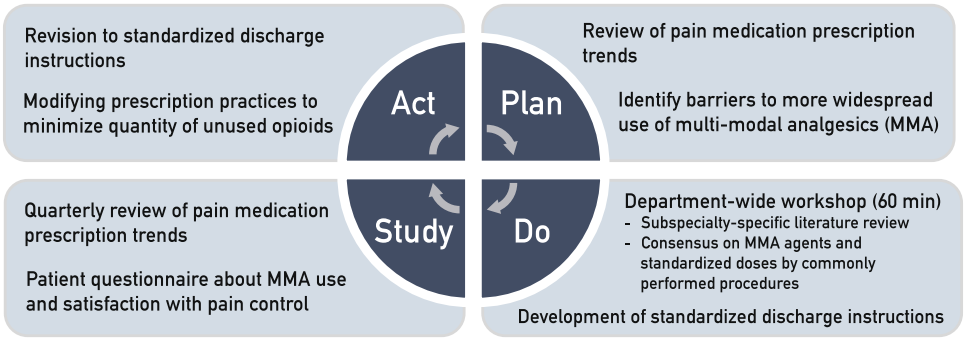

Figure 1. The "Plan-Do-Study-Act" quality improvement initiative designed to evaluate and improve patient access to multi-modal analgesia (MMA).

preparation were performed using Stata Release 17 and Adobe Illustrator (Adobe Inc.).

Results

Pain Medication Prescription Trends Over Time

Across the 9064 procedures performed between January 2021 and May 2024, we observed a significant decrease in proportion of patients receiving opioids at discharge from 61.4% in the first quarter of 2021 (2021Q1) to 46.8% in the second quarter of 2024 (2024Q2, $P < .00001$; **Figure 2A**). Meanwhile, acetaminophen and NSAID discharge prescriptions increased from 24.3% and 10.2% to 67.4% and 46.1%, respectively (both $P < .00001$). For outpatient surgeries (N = 7337), opioid prescriptions at discharge decreased from 60.8% to 43.3% ($P < .0001$); acetaminophen prescription rates rose from 21.1% to 65.1% ($P < .0001$), whereas NSAIDs prescriptions increased from 11.2% to 49.3% ($P < .0001$).

For patients discharged after inpatient surgery (N = 1727), opioid prescriptions remained comparably high (64.1% vs. 67.0%; $P = .701$; **Figure 2B**). However, acetaminophen prescriptions increased from 37.8% to 80.5% and NSAID prescriptions from 5.9% to 27.2% (both $P < .001$).

For inpatient surgery, the median quantity of opioids prescribed at discharge did not significantly change from 23 tablets of oxycodone 5 mg (172.5 morphine milligram equivalents, MME) in 2021Q1 to 20 tablets (150 MME) in 2024Q2 ($P = .197$). However, the median quantity of opioids prescribed after outpatient surgery decreased significantly from 13 tablets of oxycodone 5 mg (97.5 MME) to 10 tablets (75 MME; $P = .045$).

Among patients prescribed opioids at discharge, we examined the proportion of those who received a co-prescription with acetaminophen or NSAIDs. Over the examined time period, acetaminophen-opioid co-prescription rates rose from 11.6% to 32.9% ($P < .0001$), whereas NSAID-opioid co-prescriptions increased from 3.8% to 20.9% ($P < .0001$), representing a significant shift in prescribing practices.

Patient Questionnaire Responses

A total of 335 patients were invited to participate in post-operative pain management satisfaction questionnaire between September 2023 and April 2024. Of those, 100 patient questionnaire responses were collected: 47 of these were before the implementation of the standardized discharge instructions (pre-intervention), and 53 responses represented the post-intervention group. Of the respondents, 47 (47%) were male. There were no significant differences in the subspecialty procedures that were represented by the pre- and post-intervention groups ($P = .949$, **Table 1**). Notably, 10 patients reported baseline pain medication use at the time of their surgery.

Significantly fewer post-intervention respondents were prescribed opioids post-operatively compared to the pre-intervention group (49.1% post vs. 76.6% pre, $P = 0.007$; **Table 2**). Notably, 27% of respondents reported either taking none of the prescribed opioid medication or not filling their opioid prescription at the pharmacy; 32% reported taking opioid medications for 3 or fewer days. Similarly, the majority required less than 10 tablets of 5 mg oxycodone or its morphine equivalent dose. While there were no significant differences in reported quantity of opioids used by surgery type, patients undergoing sinus or otologic procedures were able to stop opioid use within 3 or fewer days after surgery compared to sleep surgery patients (otology: 24, 73%; sinus: 11, 65%; sleep: 1, 10%; $P = .03$). Among patients with unused opioid tablets, 14 (23%) reported saving the remainder of their prescription for future use; this proportion did not significantly change despite standardized discharge instructions for how to safely dispose of unused opioids, highlighting possible area for future intervention.

Four domains were assessed for patient satisfaction: (1) satisfaction with instructions for timing of taking pain medications; (2) adequacy of information provided for

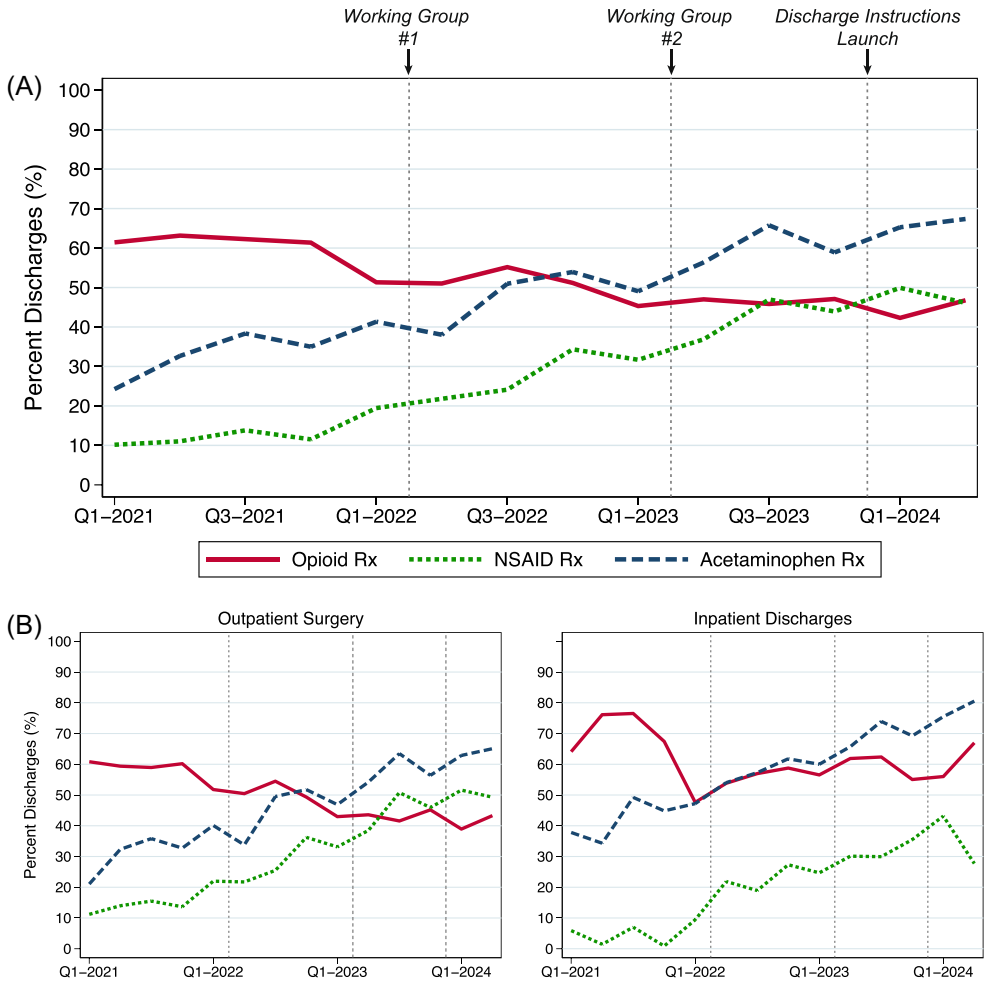

Figure 2. (A) Discharge pain medication trends for 9064 procedures performed between January 2021 and May 2024. (B) Proportion of patients discharged with acetaminophen, NSAID, and opioid prescriptions after inpatient (N = 1727) and outpatient surgery (N = 7337).

side effects of pain medications prescribed; (3) satisfaction with the overall pain management after surgery; and (4) satisfaction with clarity of discharge instructions for multi-modal pain management. Distribution of Likert-scale responses for all 4 domains was comparable pre-and post-intervention, with all items indicating at least 85% of patients who were neutral or satisfied with post-operative pain management and discharge instructions (all $P > .05$). All 4 items showed a decrease in the proportion of patients who reported dissatisfaction (**Figure 3**), although this did not reach statistical significance.

Discussion

The integration of MMA in post-operative ERAS protocols has repeatedly demonstrated its efficacy in reducing opioid prescriptions and improving patient-reported pain scores after otolaryngologic surgery. Published MMA-based regimens for the management of pain after transoral robotic surgery, head and neck free flap reconstruction, and endocrine surgery have led to meaningful decreases both in proportion of patients requiring opioids in the post-operative setting as well as the opioid quantity needed to achieve adequate pain control.[6,9,10] Among those undergoing head and neck free flap reconstruction, chronic opioid use was reported in as many as 42% of patients at 1 year after surgery.[17] As a result, in addition to improving patient post-operative experience and recovery, these interventions may play a key role in mitigating opportunities for diversion of unused opioids and long-term opioid dependence.

With over 9000 discharges reviewed, our study is among the largest to date to evaluate how longitudinal quality improvement initiatives focused on reducing opioid prescriptions and improving patient access to MMA can achieve a meaningful shift in prescribing practices. In our quality improvement effort, it was imperative to obtain buy-in from all providers to develop subspecialty- and procedure-specific MMA-based pain regimens that would have high prescriber adherence. Nevertheless, these workshops required only 2 hours of provider participation, showcasing that substantial changes in practice may not necessitate significant time commitment.

Prior work reporting successful reduction of discharge opioid prescriptions with MMA protocols in the

Table 1. Questionnaire Respondent Characteristics (N = 100)

	Pre-intervention (N = 47)		Post-intervention (N = 53)		
	N	%	N	%	*P*
Sex					.232
Male	26	55.3	21	39.6	
Female	20	43.6	31	58.5	
Declined to answer	1	2.1	1	1.9	
Surgery subspecialty type					.949
Otology[a]	20	42.5	25	47.2	
Sinus[b]	18	38.3	19	35.8	
Sleep[c]	7	14.9	6	11.3	
Other	2	4.3	3	5.7	
Pre-operative use of analgesics					.897
Yes	4	8.5	6	11.3	
No	42	89.4	45	84.9	
Declined to answer	1	2.1	2	3.8	

[a]Procedures included tympanoplasty, stapedectomy, cochlear implantation, and tympanomastoidectomy.
[b]Procedures included endoscopic sinus surgery, septoplasty with or without turbinate reduction.
[c]Procedures included tonsillectomy, uvulopalatopharyngoplasty, and inspire placement.

Table 2. Patient Questionnaire Responses Regarding Post-operative Opioid Use and Disposal

	Pre-intervention		Post-intervention		
	N	%	N	%	*P*
"Were you prescribed opioids after surgery?"					**.007**
Yes	36	76.6	26	49.1	
No	11	23.4	26	49.1	
Declined to answer	0	0	1	1.8	
"When did you stop taking prescribed opioids?"					.469
Never took prescribed opioids	10	27.8	7	26.9	
Less than 3 days after surgery	12	33.4	8	30.8	
3-7 days after surgery	7	19.4	8	30.8	
>7 days after surgery	7	19.4	2	7.7	
Declined to answer	0	0	1	3.8	
"How many tablets[a] of opioids did you take after surgery?"					.333
<5 tablets	18	50.0	13	50.0	
5-10 tablets	6	16.7	9	34.6	
11-20 tablets	2	5.5	0	0.0	
21-40 tablets	5	13.9	3	11.5	
Declined to answer	5	13.9	1	3.9	
"How did you dispose of any unused opioids?"					.941
Discarded at pharmacy or drop-off point	9	25.0	5	19.2	
Discarded at home	6	16.6	6	23.0	
Saved for future use	9	25.0	5	19.2	
Unsure how to discard	2	5.6	1	3.9	
Not applicable (never filled or took all tablets prescribed)	8	22.2	8	30.8	
Declined to answer	2	5.6	1	3.9	

[a]The quantity of tablets was reported as 5 mg of oxycodone.

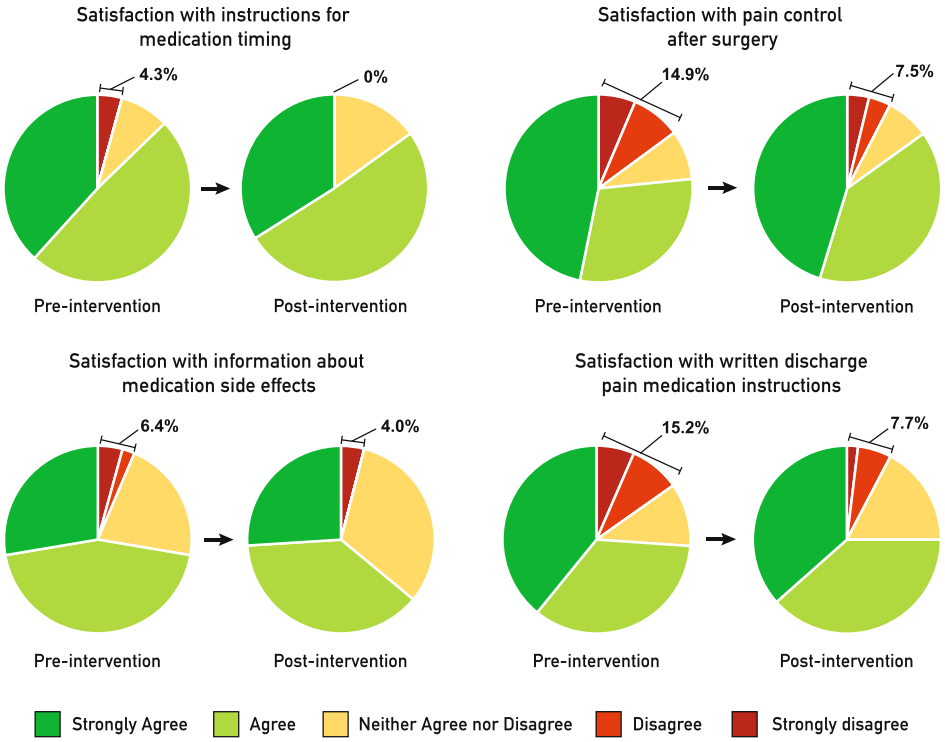

Figure 3. Patient-reported satisfaction in 4 questionnaire domains. Responses were collected before (N = 47) and after (N = 53) the implementation of standardized discharge pain medication instructions. No significant changes were observed between pre- and post-intervention responses.

post-operative setting has emphasized standardization of prescription practices. Discrepancies in the quantity of opioids prescribed between residents and attending physicians are well-documented and can stem from factors such as differential exposure to non-opioid analgesia during medical training.[18,19] Several investigators have proposed effective interventions to standardize MMA prescriptions and optimize patient safety. Horton et al showed that the utilization of a standardized electronic medical record order set for outpatient pediatric tonsillectomy achieved not only a reduction in opioids prescribed at discharge but also effectively decreased variability in quantity of opioids prescribed by different providers and did not adversely impact readmission rates and patient-reported pain control.[20] A resident-led effort by Meyer et al to standardize post-operative analgesic protocols after common otolaryngologic procedures reduced both total quantity of opioid prescribed as well as the number of patients requesting refills of opioid prescriptions.[21] Our initiative aimed to further systematize how patients were encouraged to use MMA agents prescribed through standardized discharge instructions. In the patient questionnaire, the items evaluating satisfaction with information about medication timing, side effects, and overall quality of the discharge instructions showed decrease in proportion of patients reporting dissatisfaction, although this did not reach statistical significance. In our cohort, despite a statistically significant decrease in opioid prescriptions, patient-reported satisfaction with post-surgical pain management remained unchanged.

The crux of post-operative pain management is prescribing sufficient quantity of opioids to appropriately provide analgesia after surgery while mitigating quantity of unused opiates. Over-prescription of opioid medications to treat acute pain is the principal driver of opioid diversion in the United States.[22,23] In the ambulatory otolaryngologic surgical setting, tendency to prescribe higher opioid quantities may stem from worries about patient dissatisfaction; however, Elsharydah et al have shown that patient-reported satisfaction with post-operative pain control was associated with neither the presence nor the quantity of opioid medication prescribed.[24] In our study, 27% of patients reported not taking any of the prescribed opiates and 23% reported saving the remaining unused opioids for future use despite the inclusion of safe opioid disposal options in the standardized discharge instructions. This echoes rates of unused opioid prescriptions reported by other studies in the otolaryngology literature, which range from 17% to 69%.[2,24] One systematic review identified that educational interventions and providing patients with in-home opioid disposal product at the time of discharge can significantly increase disposal rates of unused opioids up to 71%, presenting a possible harm reduction intervention.[25] In the "Plan-Do-Study-Act" cycle, over-prescription of opioids presents the next frontier for our quality improvement initiative.

There are several limitations to our study. This quality improvement initiative was created to address the lack of standardized post-operative pain medication regimens; as a result, there is a lack of pre-intervention baseline for opioid prescriptions or multimodal analgesic use as it was subject to variability by prescribing physicians. The Tableau discharge pain medication dashboard presents de-identified data in aggregate, which precludes sub-analyses for discharge pain medication trends by specific procedures, trainee participation, disease subtypes, or outliers in trends observed. It also reflects pain medications prescribed at discharge but does not account for any subsequent pain medication prescriptions requested by patients via phone calls or visits that may have been required after discharge. The dashboard does not report prescription rates for other commonly prescribed MMA agents, such as gabapentin or oral steroids. Patient questionnaires administered post-operatively are subject to recall and responder biases from participants, and due to limited sample size may not be representative of the overall patient population included in this study. Similarly, the questionnaire was distributed to patients undergoing outpatient procedures within specific subspecialties (sleep surgery, rhinology, general otolaryngology, and otology); the patient-reported pain medication use may not be generalizable to post-operative course after other procedures.

Conclusions

Through the departmental workshops, standardized discharge instructions, and patient education, our quality improvement initiative successfully reduced opioid prescription rates and increased patient access to non-opioid analgesics. With decreased opioid prescription rates, patient-reported satisfaction with post-operative pain control remains comparably high. Patient retention of unused opioids prescribed in the post-operative setting remains an elusive challenge. A more effective alternative to standard education practices in opioid safety and safe disposal practices is needed. These findings highlight the value of institutional quality improvement initiatives to meaningfully affect prescribing practices and optimize patient safety.

Author Contributions

Karolina A. Plonowska-Hirschfeld, study design, data collection, data analysis, figure design, manuscript authorship; **Jasmeet Saroya**, study design, data collection, manuscript authorship, and revisions; **Jose Herrera**, study design, study instrument design, data collection, data analysis, manuscript revisions; **Jolie L. Chang**, study instrument design, data interpretation, manuscript revisions; **Andrew N. Goldberg**, study instrument design, data interpretation, manuscript revisions; **Rahul Seth**, data interpretation, manuscript revisions; **Megan L. Durr**, study design, study instrument design, data interpretation, manuscript revisions.

Disclosures

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Supplemental Material

Additional supporting information is available in the online version of the article.

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