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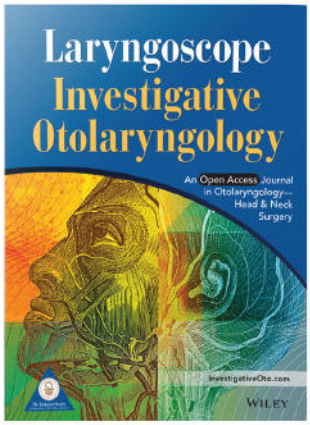


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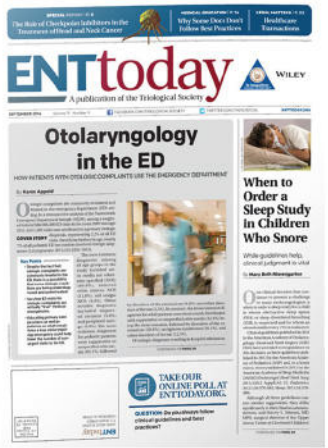


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ORIGINAL RESEARCH

Laryngoscope Investigative Otolaryngology

Assessment of narcotic use in management of post-op pain after functional endoscopic sinus surgery

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Abstract

Objectives: Pain and analgesic requirements after functional endoscopic sinus surgery (FESS) vary widely. This study aims to quantify pain after routine FESS and determine the most commonly used pain management regimen.

Methods: Retrospective chart review of 100 patients who underwent FESS from Oct 2017 to May 2019. Patients prospectively completed a daily pain diary and reported pain levels that were categorized into no pain (0), mild (1-3), moderate (4-7), or severe (8-10). Patients were categorized into narcotics, non-narcotics, combination, or none based on type of analgesic used.

Results: Sixty-nine patients were included. Majority of patients reported either mild (39%) or no pain (28%) during the first 5 PODs. Mean POD1 pain score was 3.98, which decreased with each subsequent POD. On POD1, 37% used opioids (n = 37), 32% used non-opioids (n = 32), 22% used a combination (n = 22), and 9% used no pain meds (n = 9). Mean number of narcotic pills used within the first 5 PODs was 2 pills on any given day. Age was inversely associated with reported POD1 pain scores (P = .003) and use of preoperative steroids in patients with sinonasal polyposis was associated with lower POD1 pain scores (P = .03).

Conclusions: Even on POD1, majority of patients experienced either mild or no pain, and this decreases with each POD. Narcotics are grossly overprescribed and underutilized by patients postoperatively after FESS. We advocate for more judicious prescribing habits of narcotics by Otolaryngologists after FESS, and emphasize relying on non-narcotic alternatives like Acetaminophen or NSAIDS to diminish narcotic use and abuse in the postoperative period.

Level of Evidence: 4.

KEYWORDS
adult rhinology, allergy/rhinology, clinical practice guidelines

Kurren S. Gill and Chandala Chitguppi contributed equally.

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1 | INTRODUCTION

For several years, the United States has been suffering from a progressively worsening opioid crisis. In an effort to curtail the amount of narcotics made available for potential abuse, a recent emphasis has been placed on decreasing or avoiding the routine prescription of narcotics in the postoperative setting. Health care providers and patients alike are seeking alternatives to narcotics for postoperative pain control. Media coverage of the opioid epidemic has brought to light many unnecessary prescribing habits of narcotics, and many providers are prescribing significantly less narcotics or opting for equally effective alternatives for postoperative pain control.

Functional endoscopic sinus surgery (FESS) is among the most common surgeries that Otolaryngologists perform, with over 250 000 surgeries performed annually in the United States.[1] The most common indication for FESS is chronic rhinosinusitis (CRS), which affects 12% of the adult population.[2] Hydrocodone combination analgesic products are commonly prescribed after FESS, but unfortunately were involved in almost 100 000 abuse-related emergency department visits in the United States in 2011.[3] Prescribing habits after FESS among Otolaryngologists vary widely. In a survey among members of the American Academy of Otolaryngology-Head and Neck Surgery, the number of narcotics prescribed ranged widely from 0 to 60, with most respondents (66%) prescribing between 11 and 30 tablets after FESS.[4] A recently published prospective case series of 64 patients by Ndon et al demonstrated that the average number of narcotic pills consumed over a 7-day postoperative period was 7.7 (SD 7.6). This study identified no demographic or surgical risk factors but did find that narcotic use correlated with higher POD1 pain scores ($P < .001$).[5] Studies in the literature assessing pain levels after FESS and non-narcotic pain management alternatives, however, remain sparse. This study aims to quantify pain after routine FESS and determine the most commonly used pain management regimen.

2 | MATERIALS AND METHODS

This study was an IRB-approved retrospective chart review of 100 consecutive patients who underwent endoscopic sinus surgery between October 2017 and May 2019 performed at a single tertiary care facility. The postoperative pain data was first collected in a prospective fashion, and then retrospectively reviewed and analyzed.

2.1 | Patient selection

One hundred patients were initially included for the study, and after chart review of each patient, 31 patients were excluded. Reasons for exclusion included: non-completion of the pain diary, lack of adequate follow-up data, revision surgery, and non-CRS indications for surgery (fungal sinusitis, anterior cranial base surgery for infectious etiology, inverted papilloma, sinonasal malignancies, orbital decompression, concurrent rhinoplasty). Patients with chronic rhinosinusitis (CRS) with or without sinonasal polyposis (CRSwNP) were included. These patients underwent a combination of procedures that included maxillary antrostomy, anterior and/or posterior ehtmoidectomy, sphenoidotomy, frontal sinusotomy, septoplasty, and inferior turbinate reduction. Turbinate reduction was carried out with use of a Medtronic Xomed microdebrider whereby the lateral most aspect of the inferior turbinate was microdebrided and suction bovie cautery was used to achieve hemostasis and shrink the turbinate after resection. All patients were NG suctioned at the end of every case.

Additional patient information collected included patient demographics, extent of surgery, intraoperative nasal packing and its type, and use of pre- and post-operative steroids. Patients were instructed to complete a daily pain diary up to six postoperative days (PODs) after surgery (see Figure 1), and these were collected at the first postoperative visit. Only those patients who reported pain levels on at least one POD were included in the study. Patients were instructed to record their pain level immediately prior to the analgesic taken if one was taken, and also record their pain level after the medication had its effect. Only the highest pain level on a given day was taken into account for data analysis since there could be multiple different pain levels reported on a single day. Data from POD0 was ultimately excluded from our analysis given the confounding factor of TIVA or Remifentanyl use intraoperatively; no patients were administered Toradol perioperatively. Ultimately, 69 patients were included in the study for analysis. Primary outcome measures of the study included patient-reported pain levels using a visual analog scale (range 0-10) before and after analgesic use, and the type of analgesic agent used.

2.2 | Classification of patients

All patients were prescribed on average 10 to 15 pills of hydrocodone-acetaminophen 7.5 to 325 mg, 1 pill (7.5 morphine mg equivalent [MME]) every 4 hours as needed for postoperative pain control after FESS. Patients were also allowed to use acetaminophen or NSAIDs for pain control, however all included patients defaulted to using only acetaminophen as an alternative to narcotics. On any POD, if narcotics alone were taken, that patient was classified into a "narcotic group." If non-narcotics alone were taken, the patient was classified into "non-narcotic" group. If both narcotic and non-narcotic analgesics were taken on the same day then the patient was classified as "combination." Those who used no pain meds were appropriately classified as "none."

2.3 | Statistical analysis

Descriptive statistics were used to describe patient characteristics and outcomes. Comparative analysis was performed using either student *t*-test (for continuous variables) or Pearson chi-square test (for categorical variables). Spearman correlation co-efficient was used to assess correlation between age of patient and pain intensity levels. All statistical analyses were conducted using SPSS version 25.0 (SPSS Inc., Chicago, Illinois). A *P*-value of less than 5% was considered significant.

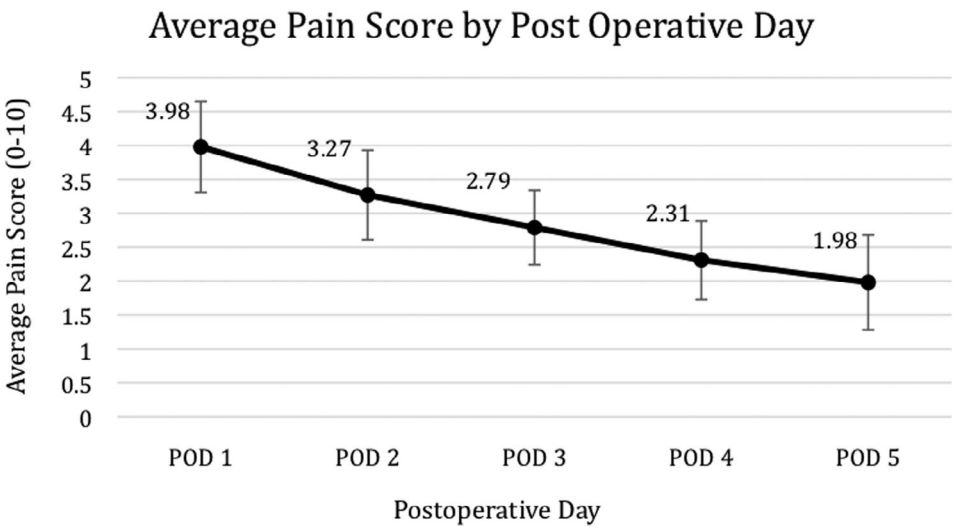


FIGURE 1 Postoperative pain scores

3 | RESULTS

3.1 | Demographics

Out of 100 patients reviewed, 69 patients with CRS who underwent FESS were included in the study. The mean age at the time of surgery was 47.6 years (range 17-86, SD, 18.4 years). The majority of patients were female (57%) with a female to male ratio of 1:0.76. History of smoking (current/past) was present in 37.6%. Sinonasal polyps were present in 43% of patients (n = 30). Intraoperatively, the ethmoids (n = 67, 97%) and maxillary sinuses (n = 68, 98.5%) were the most commonly addressed sinuses. The frontal (n = 43) and sphenoid (n = 36) sinuses were less commonly addressed, 62.3% and 52%, respectively. Concurrent septoplasty and turbinate reduction were performed in 51% (n = 35) and 68% (n = 47), respectively.

3.2 | Perioperative management

Preoperative steroids were reserved for CRSwNP patients (30 patients), who were placed on 40 mg of prednisone for 5 days preoperatively. This was typically followed by a postoperative taper to be decreased by 10 mg every 3 days. The majority (n = 23, 77%) of the CRSwNP patients had a documented use of preoperative steroids, while for the remaining, no details were available. Postoperative steroid usage was noted in the majority (91%; n = 63) of patients (regardless of indication for surgery). A medrol dose pack was used by 52% (n = 36) and tapering steroids (similar to preoperative steroid regimen) in 39% (n = 27). Postoperative use of Propel (Intersect ENT Inc. Menlo Park, California) stents in frontal sinuses was documented in 39% (n = 27), while nasal packing with Nasopore (Stryker Neuro Spine ENT, Kalamazoo, Michigan) was used in all but one patient. Postoperative antibiotics were only prescribed if there was evidence of infection at the time of surgery. Postoperative antibiotics were used in 52% of patients (n = 36) for a mean duration of 3.64 days (SD, 1.88) (range, 5-10). The most common antibiotic prescribed was Cefdinir (n = 24), followed by Clindamycin (n = 3), Bactrim (n = 4), Minocycline (n = 2) and Augmentin (n = 3). All patients were advised to perform saline sinus irrigation rinses starting on POD1.

3.3 | Postoperative pain levels

All patients completed the pain diaries during the postoperative period. Pain intensity levels were rated from 1 (least pain) to 10 (maximum pain). As expected, pain scores were noted to reduce with each subsequent POD (Figure 1). Overall, mean pain score on POD 1 was 3.98 ± 2.72 (Figure 1).

3.4 | Classification of patients based on pain intensity levels and type of analgesic used

The total number of postoperative days (PODs) where pain levels were reported was 338 and this denominator was used in the following analysis. Pain intensity levels on any given POD were classified into: no pain (score of 0; n = 95; 28.1%), mild (score of 1-3; n = 132; 39.05%), moderate (score of 4-5; n = 62; 18.34%), moderately-severe (score of 6-7; n = 35; 10.35%) and severe (score of 8-10; n = 14; 4.14%). All the postoperative days (with data on pain levels) were classified based on these pain intensity levels. It was noted that, on majority of PODs, patients either had no pain or reported only mild pain levels. For mild and moderate pain, acetaminophen was the most common analgesic used, while for severe pain, hydrocodone-acetaminophen 5 to 325 mg was more frequently used. Interestingly, it should be noted that even for patients who reported "no pain" analgesics were still used: non-narcotic (acetaminophen) was used on 11 days and narcotics on 2 days (one during each of the first 2 PODs).

3.5 | Factors affecting the pain levels on POD1

As expected, POD1 had the highest overall pain scores reported, with a mean of 3.98 (SD, 2.72), which is in the mild to low-moderate range.

Therefore, POD1 pain levels (that were reported before use of any analgesic) were used to analyze the potential effect of various factors. It was noted that the patients' age at the time of surgery had significant inverse relationship with mean POD1 pain scores, that is, older patients were significantly more likely to report lower pain scores and younger patients higher pain scores on POD1 ($r = -.35$, $P = .003$). The rest of the patient and disease-related factors have been shown below (Table 1). It was observed that usage of preoperative steroids, which uniformly consisted of 40 mg prednisone for 5 days in CRSwNP patients, was associated with lower POD1 pain levels ($P = .03$) when compared to non-CRSwNP patients who did not receive preoperative steroids.

3.6 | Usage of analgesic agents

Overall, patients were stratified into the following three groups based on type of analgesic used: narcotics, non-narcotics, combination and no pain medications used. Among all the narcotics used, hydrocodone-acetaminophen 7.5 to 325 mg (7.5 MME per tablet) was the most frequently used (75.8%) followed by 5 mg oxycodone (7.5 MME per tablet) (14.5%), and percocet (5-325 mg oxycodone-acetaminophen) (7.5 MME per tablet) (9.6%). Acetaminophen was the only non-narcotic used per patient preference. When analyzing patients based on PODs, the proportion of patients who used narcotics reduced with every subsequent POD, while patients who did not use any analgesics gradually increased (Figure 2).

3.7 | Amount of pain medications used

The number of tablets used each day by the patient was calculated. As expected, the number of tablets used by all 3 groups gradually reduced with each subsequent POD. Additionally, the mean number of tablets used on POD1 (the POD with the highest pain intensity levels) was: 3.22 ± 1.85 for non-narcotic group, 2.25 ± 1.29 for narcotic group, and 2.64 ± 1.49 for the combination group (Figure 3).

TABLE 1 Factors affecting POD1 pain levels (before analgesic usage)

Variable	Mean POD1 pain levels	SD for POD1 pain levels	*P*-value
Gender			
Male	3.76	2.88	.92
Female	3.83	2.76	
Smoking			
Ever	3.76	3.25	.91
Never	3.83	2.51	
Maxillary antrostomy			
Yes	3.84	2.79	NA[a]
No	1.00	NA	
Ethmoidectomy (total)			
Yes	3.81	2.79	.87
No	3.5	3.53	
Frontal sinusotomy			
Yes	3.29	2.85	.05
No	4.61	2.53	
Sphenoidotomy			
Yes	3.35	2.66	.17
No	4.27	2.88	
Septoplasty			
Yes	3.91	2.99	.75
No	3.69	2.60	
Turbinate reduction			
Yes	4.01	3.04	.34
No	3.38	2.19	
Preoperative steroids			
Yes	3.08	2.87	.03
No	5.00	2.86	

[a]Since all patients underwent maxillary antrostomy, *P*-value could not be obtained.

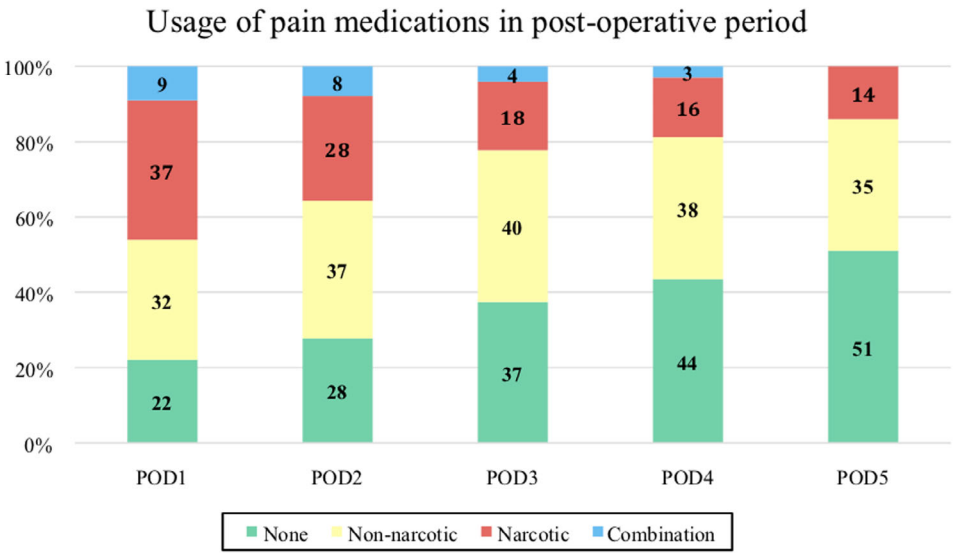


FIGURE 2 Proportion of patients using different pain control modalities from POD 1-5

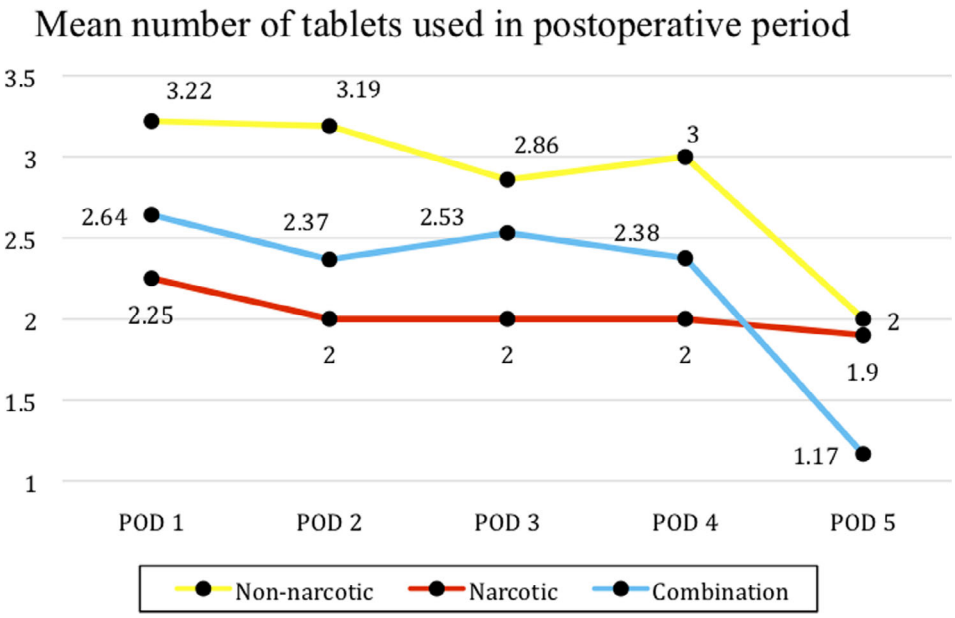


FIGURE 3 Comparison of mean number of tablets used in POD1-5 (*for combination medications, the number of tablets of both medications, narcotics and non-narcotics (acetaminophen) have been added together)

3.8 | Comparison of effectiveness of pain medications

To compare the change in pain scores following use of pain medication, patients who took either narcotics or non-narcotics (acetaminophen) were compared both *before* and *after* usage. Of note, patients in the combination group were excluded from this analysis since the order of usage of medications (narcotics followed by acetaminophen or vice versa) and time gap between the two medications was not uniform. When comparing pain scores of the narcotic and non-narcotic groups before usage of these medications, the narcotic group tended to report slightly higher pain scores than the non-narcotic group but this difference was not statistically significant on 3 of the 5 PODs (Table 2). Similarly, when pain scores were assessed *after* analgesic agent usage between the two groups, the

TABLE 2 Comparison of pain scores *prior* to use of either acetaminophen or narcotics

	Pain levels			
Postoperative day		**Non-narcotic**	**Narcotic**	***P*-value**
POD1	Mean	3.55	5.13	**.03**
	SD	2.19	2.26	
POD2	Mean	3.22	4.11	.21
	SD	1.69	2.69	
POD3	Mean	2.82	4.25	.06
	SD	1.96	2.07	
POD4	Mean	2.52	5.00	.002
	SD	1.56	2.59	
POD5	Mean	2.5	5.28	.07
	SD	1.63	3.40	

TABLE 3 Comparison of pain scores *after* acetaminophen or narcotic use

		Pain levels		
Postoperative day		Non-narcotic	Narcotic	*P*-value
POD1	Mean	1.65	2.22	.33
	SD	2.69	1.53	
POD2	Mean	1.4	1.68	.5
	SD	1.15	1.4	
POD3	Mean	1.34	2.3	.08
	SD	1.35	1.63	
POD4	Mean	1.18	2.33	.15
	SD	1.00	2.12	
POD5	Mean	1.34	2.8	.23
	SD	1.01	2.28	

difference between pain scores was not statistically significant on all five PODs (Table 3).

4 | DISCUSSION

With the United States amidst an opioid epidemic, a paradigm shift towards more cautious prescribing habits of narcotics is already underway. Astoundingly, 91 Americans die from a narcotic overdose every day.[6] Since 1999, narcotic prescriptions and deaths from prescription narcotics have quadrupled.[6] This is the result of most people not properly disposing of unused narcotic medications or locking them in secure locations. The victims are often not the recipients of narcotic prescriptions, and people who use narcotics for nonmedical reasons frequently report obtaining them from family and friends.[6] Even a short course of narcotic use can have future detrimental effects with addictive potential. Eight out of 10 new heroin users report first using and abusing prescription narcotics before transitioning to heroin.[2] These shocking statistics underscore the importance of limiting the prescription of narcotics and seeking non-narcotic alternatives to treating pain, especially in the postoperative setting.

The aim of this study was to quantify pain after routine FESS and determine the most commonly used postoperative pain management regimen. When evaluating postoperative pain after sinonasal surgery, Wise et al. found that the pain level was generally low with little analgesic needed.[7] Becker et al. found that the number of narcotic pain pills prescribed to patients after sinonasal surgery could be reduced without altering patient care.[2] More recently, in a series of 364 patients, Newberry et al found that excess narcotics were prescribed 84.9% of the time. Among patients, 11.8% reported using no narcotics, 52.1% used <50%, and 36.1% used >50% of their narcotic prescription.[8] In the pursuit of finding non-narcotic alternatives to pain control after sinonasal surgery, Kemppainen et al[9] conducted a clinical trial that concluded acetaminophen alone is a highly effective pain treatment regimen after FESS. A retrospective review of 136 patients by Raikundalia et al revealed that 31 patients (23%) took no narcotics, 61 patients (45%) took 1 to 5 tablets, and 44 patients (32%) took >5 tablets. Patients who had concurrent septoplasty (without use of nonabsorbable packing or septal splints) ($P < .01$) or were of younger age ($P = .01$) had a statistically higher odds of taking >5 tablets.[10] Another retrospective chart review of 155 patients by Sethi et al showed that among the 67 patients who reported the number of tablets they had used at the time of first follow-up appointment, 73.1% reported taking no narcotics at all.[11]

In this study, we found that pain after FESS is generally mild to moderate in nature, with a mean pain score of 3.8 on POD1 (Figure 1), which conceivably would be the most painful day for most patients. As anticipated, the number of patients using no analgesics gradually increased with each POD, while the proportion of those requiring narcotics decreased with each POD (Figure 2). When comparing narcotic and acetaminophen users, reported pain scores *before* analgesic usage were comparable for three of the first five postoperative days; only POD1 ($P = .03$) and POD4 ($P = .002$) were significantly different. Furthermore, pain scores *after* analgesic usage were comparable on all five PODs, showing that the degree of pain relief between the two groups was also not significantly different. This demonstrates that the decision to take narcotics for pain control is somewhat arbitrary based on whether patients feel as though their mild to moderate pain scores warrant narcotic usage over acetaminophen. Interestingly, analgesic usage varied from narcotic to acetaminophen to no analgesic despite patients reporting similar pain scores.

It can be difficult to anticipate which patients may ultimately require narcotics compared to those who will not. Based on our data, there does not appear to be a logical explanation based on perceived pain level before or perceived benefit after pain medication use that would predict a reliable use of narcotics. It is possible that patients may be taking narcotics in anticipation of more severe pain even though, at the time, they are not reporting pain severe enough to warrant narcotic use. This is evidenced by the fact that even though patients reported having no pain, they still took narcotics (n = 2) or acetaminophen (n = 11).

When assessing for factors that may correlate to POD1 pain scores, we found that preoperative steroid use, which consisted of 40 mg prednisone daily for 5 days in CRSwNP patients, was significantly associated with decreased POD1 pain scores ($P = .03$) when compared to non-CRSwNP patients (who would not have been prescribed preoperative steroid) or CRSwNP patients who had no documented use of preoperative steroids. However, in contrast to studies that found concurrent septoplasty to be associated with increased pain and therefore more narcotic use,[10] this study did not find that to be a statistically significant risk factor ($P = .75$). Other factors assessed, such as gender, smoking status, concurrent turbinectomy, or number of sinuses addressed were similarly not significant in predicting higher POD1 scores ($P > .05$). Interestingly, age appeared to be inversely associated with mean POD1 pain scores: older patients were significantly more likely to report lower pain scores compared to younger patients on POD1 ($r = -.35$, $P = .003$).

As depicted in Figure 3, the mean number of narcotic pills patients consumed in the first five PODs never exceeded 2.25 pills. Patients were instructed to return all unused pills to our clinic during their follow-up visit. However, due to patient noncompliance or failure to remember to do so, no significant data was obtained, although it appeared that almost all patients used less than five narcotic pills total based on reports from the distributed surveys. As a result of this study, our institution has changed our prescribing habits to a regimen of five pills of hydrocodone-acetaminophen 7.5 to 325 mg (37.5 MME) for postoperative pain control after routine FESS.

Limitations of this study include the subjective nature of survey-based data collection and the inherent variability associated with patients quantifying a given perceived pain level. Although pain diaries were collected in a prospective fashion, the retrospective analysis of this data presents another limitation of this study. Patients who had more extensive surgery, including frontal or sphenoid sinus surgery, thereby had more aggressive disease, and this potential confounder was not controlled for in our analysis. Additionally, heterogeneity in the postoperative regimen may also contribute as a confounder. Our institution's rate of prescribing postoperative steroids (91%) exceeds the rate at which steroids are prescribed by most Otolaryngologists or Rhinologists, and this certainly makes our results more difficult to generalize. We also acknowledge the intraoperative use of TIVA or Remifentanyl as a possible confounding factor, and therefore elected to exclude data from POD0 from our analysis. Another limitation is the power of this study, as only 69 patients met inclusion criteria for analysis. A multi-center study combining data across several institutions and also including more extensive or revision surgeries would significantly improve the power of studies such as this to corroborate generalizations about pain after FESS. With more institutions reporting patient's postoperative pain levels and physicians' narcotic prescribing habits, clinical guidelines for Otolaryngologists can ultimately change and play a role in addressing the national opioid crisis. Further randomized controlled trials can help to elucidate and corroborate our conclusions.

5 | CONCLUSION

Patients typically report no or mild pain after FESS, and reported pain scores are inconsistent with the decision to use narcotics over acetaminophen for postoperative pain control. Our findings suggest narcotic use is often unnecessary after FESS, and its variable use may be attributable to reasons other than actual perceived pain level such as fear of anticipated pain or difficulty sleeping. The results of our study suggest that narcotics may not be necessary after routine FESS and that in many cases, non-narcotics alone like acetaminophen may be an adequate regimen to manage postoperative pain.

CONFLICT OF INTEREST

No financial disclosure or conflicts of interest to report for any authors.

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