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# Opioid Utilization in Outpatient Anorectal Surgery: An Opportunity for Improvement

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## ABSTRACT

**Introduction:** The opioid epidemic has resulted in close examination of postsurgical prescribing patterns. Little is known about postoperative opioid use in outpatient anorectal procedures. This study evaluated patient opioid use and created prescribing recommendations for these procedures.

**Methods:** One hundred and four patients undergoing outpatient anorectal procedures from January to May 2018 were surveyed on opioid consumption, surgical experience, and pain satisfaction. Patients were grouped into three tiers based on opioid usage. Multivariable models were used to determine factors associated with poor pain control.

**Results:** Patient satisfaction with pain control was 85.6%. Twenty five percent of patients reported leftover medication and 9.6% of patients requested opioid refills. Opioid prescribing recommendations were generated for each tier using 50th percentile with interquartile ranges. On multivariable modeling, the high-tier group was associated with poorer pain control.

**Conclusions:** We created opioid quantity prescribing guidelines for common outpatient anorectal procedures. A multimodal approach to pain control utilizing nonopioids may reduce healthcare utilization.

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## Introduction

The national opioid epidemic has cast a light on opioid stewardship. Despite ongoing efforts by prescribers to curb overprescribing, prescription opioid–involved death rates still

increased by 7% from 2018 to 2019, with more than 14,000 deaths attributed to prescription opioids in 2019.<sup>1</sup>

Surgical specialties are responsible for 10% of all prescribed opioids in the country.<sup>2</sup> Ninety percent of anorectal surgeries are done on an outpatient basis, leaving patients to manage

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their pain at home.<sup>3</sup> As a result, understanding postoperative pain management in this setting can be a challenge. Previous studies have noted between 47% and 56% of opioid medications go unused across all opioid analgesic prescriptions.<sup>4</sup> One study estimated that over 80% of opioids prescribed after anorectal surgery went unused.<sup>5</sup> There are limited evidence-based guidelines for postoperative pain management in those undergoing outpatient anorectal surgery, and minimal information is known about patient use or disposal of opioid medications postoperatively within this population.<sup>5–7</sup> It is likely that opioid demands will differ between anorectal procedures, as the degree of intervention and corresponding pain can vary widely.<sup>7</sup>

To address this knowledge gap, we collected dispensing information and surveyed patients after anorectal surgery about their opioid usage, postoperative course, and pain control. We hypothesize that several actionable factors will be associated with both pain control and health care utilization following outpatient anorectal procedures. From the information obtained, this project will generate novel guidelines for opioid prescribing tailored to specific anorectal procedures. Using these data, we created prescribing guidelines and aim to use these data in the context of future studies. This information is crucial to reduce opioid overprescribing while maximizing patient satisfaction.

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## Methods

### Study cohort

This was an observational, cross-sectional survey study with the aim of both describing current opioid utilization and developing guidelines for prescribing opioids after anorectal surgery. We created a cohort of patients undergoing outpatient anorectal surgery from January to May 2018 by the colorectal service at our tertiary care medical center. A survey was sent out in June 2018 for the entire cohort. Inclusion criteria were any adult patients (18 or older) undergoing an outpatient anorectal procedure by a staff colorectal surgeon. At our institution, all patients receive an anal block with lidocaine (no liposomal bupivacaine) and are encouraged to use nonopioid medications and nonmedication treatments such as sitz baths postoperatively. We excluded patients who had a history of opioid usage up to 6 mo before surgery, had major complications after surgery, were operated on by surgeons outside of the colorectal service line or did not return the survey. Strengthening the Reporting of Observational Studies in Epidemiology guidelines were followed in performing this study.<sup>8</sup> This project was reviewed and approved by Vanderbilt University Medical Center's Institutional Review Board (Study Number 181398) with a waiver of informed consent.

### Data collection

Demographic and operative information was extracted from the electronic medical record. Opioid prescribing information (type of opioid, number of tablets prescribed, dose, and total MME) was extracted from the Vanderbilt Committee on Opioid

Monitoring and Stewardship (VCOMS) database. The VCOMS is a multidisciplinary committee that maintains a database of provider prescribing practices and provided the dataset for this study. All patients treated by this provider base received the same postoperative instructions, including recommendations for opioid consumption, instructions to contact the clinic if pain was uncontrolled, and strategies for nonopioid pain management strategies. MME (morphine milligram equivalents) was used as a standardization when collecting data, so that all opioids could be converted into a standard dosage. We used oxycodone 5 mg tablets as our standard dosage. Patients that met inclusion/exclusion criteria were then contacted and requested to fill out a brief survey regarding their opioid utilization and overall pain control (Appendix 1). Study data were collected and managed using REDCap electronic data capture tools hosted at Vanderbilt University Medical Center.<sup>9</sup> Patients were compensated with entry into a drawing for three \$50 gift cards.

### Variables and outcomes

Total opioids prescribed were collected from the VCOMS database. Any refill amounts were added to the initial prescribing amount to reflect the total opioids prescribed. To more accurately observe the amount of opioids consumed, the total opioid prescription was multiplied by the self-reported percentage of opioids consumed. Any patient reporting that they did not fill their prescription was assumed to consume no opioids. For ease of reporting, total MME were converted to Oxycodone 5 mg tablets by dividing MME by 7.5.

This calculated total opioid consumption data, including refills, was used to categorize different anorectal procedures into three tiers (Low, Medium, and High). The aim behind using the total opioid consumption data was to consolidate the procedures into similar groups and provide more simplified prescribing recommendations for each group. The primary goal of the study was to describe opioid consumption for each tier to guide practitioners in future opioid prescribing. We reported the 50th percentile of opioids consumed as well as the interquartile range to allow for variation in prescribing patterns due to procedure and patient factors.

The secondary goal was to describe postoperative pain control, excess opioid management and use of nonopioid analgesics. We also sought to determine the adjusted association between tier of procedure and both pain control and health care utilization. We defined health care utilization as either an office or emergency department visit during the 30 d following the procedure.

### Statistical analysis

Summaries of categorical and continuous variable were outlined with percentages and means and medians, respectively. Univariate tests of One-way ANOVA and Fisher's Exact Test were conducted on continuous and categorical variables by procedure group, respectively. Variables of interest included pain control, pain interference with ADLs, employment status, number of days off work, side effects (constipation, diarrhea, nausea, vomiting, itching, bleeding), health care utilization (clinics, appointments, or EDs), number of days

using opioid medication, instructions on opioid disposal, disposal of left over pills, refill request, nonopioid medications (topical medication, acetaminophen, ibuprofen), and non-medication pain treatment (sitz baths, heat, massage). Only the nominal *P* values of these tests are reported and are not adjusted for multiple comparisons. Multivariable logistic regression analysis was performed to assess associations between procedure group and clinical outcomes (pain control and health care utilization), adjusted for age, gender, total MME, use of nonopioid medication (only for pain control, insufficient data for health care utilization), and use of non-medication pain treatment. For secondary univariable analyses, nominal *P* values are reported without adjustments for multiple testing. All statistical analyses were performed in R version 4.1.2.

## Results

### Description of cohort, demographics

During the study period, 148 patients underwent an outpatient anorectal procedure. Of these, 138 met criteria for enrollment and 104 patients returned a survey (75% response rate). Table 1 reports the demographics. The median age was 48 y. There was even distribution of male to females (male *n* = 52, female *n* = 52). Median BMI was 28.2. Most patients identified as White (78.8%). Most patients were currently employed (66.3%).

### Primary outcome

Patients were categorized by procedure as low (*n* = 77, 74%), medium (*n* = 7, 7%), and high (*n* = 20, 19%). Table 2 reports the

covariates by procedure group and the median and inter-quartile range of both opioids prescribed, opioids consumed, and percent overprescribed, as reported by the patients. These data are also represented in Figure 1 which will serve as a prescribing guide for future study. Figures 2 and 3 show histograms of opioids taken by tiers and opioids prescribed by tiers, respectively. The median number of pills prescribed for the low, medium, and high tiers were 12, 12, and 18 respectively. The median number of pills taken for the low, medium, and high tiers were 1.2, 8, and 15.6, respectively.

### Secondary outcomes

In our secondary analysis, we examined pain control, post-operative course, and health care utilization, as reported in Table 3. Health care utilization was defined as any unplanned visits before the patient's normally scheduled 4-wk follow-up including visits to the emergency room, urgent care, primary care physician or other provider, or unscheduled appointment in the colorectal surgery clinic. Patients used opioids for a median of 3 d (range 0-30 d). 10% of patients required refills of their prescriptions. In a stratified analysis between procedure groups and refills, we found that between the high-tier and low-tier groups, belonging to the following subgroups was a potential risk factor for requesting refills: females, total MME 75-120, and use of nonopioid pain medication. The forest plot is shown in Table 4. Overall, 86% of patients stated pain was controlled. There was a statistically significant difference in pain control between the groups, with the high tier group reporting only 65% pain control. There was a statistically significant difference between the use of topical medication (highest tier reported the most use) and the use of heat for pain (middle tier reported the most use). There was statistical significance between groups and their reported interference

**Table 1 – Patient demographics by procedure tier.**

Variable	Low (N = 77)	Medium (N = 7)	High (N = 20)	Overall (N = 104)
<b>Age</b>				
Mean (SD)	46.4 (13.4)	58.3 (17.6)	57.5 (10.6)	49.4 (14.0)
Median [min, max]	47.0 [23.0, 82.0]	55.0 [40.0, 91.0]	60.5 [37.0, 73.0]	48.0 [23.0, 91.0]
<b>Gender</b>				
Female	38 (49.4%)	3 (42.9%)	11 (55.0%)	52 (50.0%)
Male	39 (50.6%)	4 (57.1%)	9 (45.0%)	52 (50.0%)
<b>BMI</b>				
Mean (SD)	28.8 (6.09)	31.0 (7.60)	30.5 (7.43)	29.2 (6.45)
Median [min, max]	27.9 [19.9, 51.1]	30.3 [22.1, 41.9]	30.3 [20.1, 51.2]	28.2 [19.9, 51.2]
<b>Race</b>				
Asian	2 (2.6%)	0 (0%)	0 (0%)	2 (1.9%)
Black	12 (15.6%)	1 (14.3%)	4 (20.0%)	17 (16.3%)
Native American	1 (1.3%)	0 (0%)	0 (0%)	1 (1.0%)
Not reported	2 (2.6%)	0 (0%)	0 (0%)	2 (1.9%)
White	60 (77.9%)	6 (85.7%)	16 (80.0%)	82 (78.8%)
<b>Employed</b>				
No	27 (35.1%)	3 (42.9%)	5 (25.0%)	35 (33.7%)
Yes	50 (64.9%)	4 (57.1%)	15 (75.0%)	69 (66.3%)

**Table 2 – Percentile of opioids taken and prescribed.**

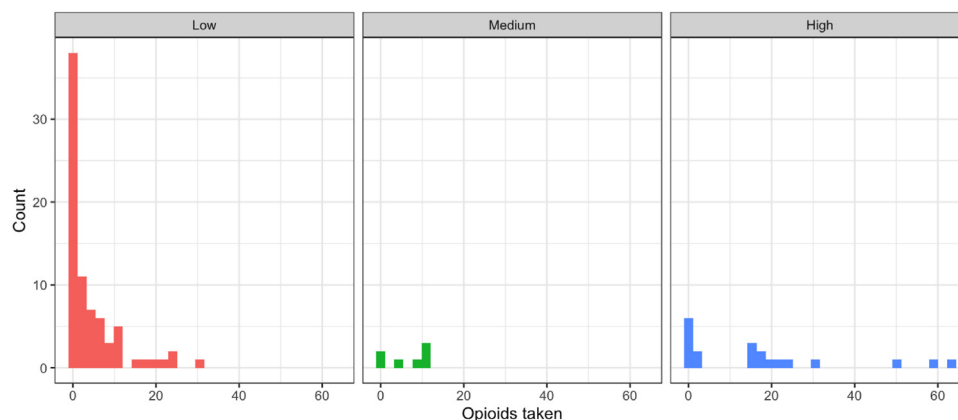
Variable	Low	Medium	High
Procedure	Transanal excision Rectal tumor Sphincterotomy External hemorrhoidectomy Seton placement Fistulotomy Fistulotomy with Seton Advancement Flap Anal Plug Excision of anal lesion	Incision and drainage of abscess LIFT (ligation intersphincteric Fistula tract)	Hemorrhoidectomy (internal/external, 1+ columns) EUA with biopsy
Opioids taken			
25%	0	2.7	0.6
50%	1.2	8	15.6
75%	6	11.4	22.5
Opioids prescribed			
25%	8	11	17.5
50%	12	12	18
75%	12.8	12	25.5
% Overprescription			
25%	100%	75.45%	96.57%
50%	90%	33.33%	13.33%
75%	53.12%	5%	11.76%

with activities of daily living (ADLs) between the low and high groups ( $P = 0.058$ ). There was no statistical significance between groups and their reported side effects, health care utilization, requests for refills, or use of nonopioid medications. There was no statistically significant difference in pain satisfaction among patients that reported usage of nonopioid medications. Of the employed patients (66%), the median

number of days taken off work was 3. There was no statistically significant difference between days off of work between the groups. There was no statistically significant difference in pain control or health care utilization based on employment status. Seventy-eight percent of patients reported using nonopioid pain control medications and 60% of patients used nonmedication pain treatments such as sitz baths, heat, and

Prescribing Recommendations For Outpatient Anorectal Procedures	
Procedure	Recommended Prescription (Number of tabs of Oxycodone 5mg)
Transanal Excision Rectal Tumor Sphincterotomy External Hemorrhoidectomy Seton Placement Fistulotomy Fistulotomy with Seton Advancement Flap Anal Plug Excision of Anal Lesion	2 (0-6)
Incision and Drainage of Abscess LIFT (Ligation Intersphincteric Fistula Tract)	8 (3-12)
Hemorrhoidectomy (Internal/external, single Column, 2+ columns) Exam Under Anesthesia (EUA) with biopsy	16 (1-23)
Recommendations show the number of pills recommended to achieve pain control in 50% of patients. The range shows the number of pills recommended to satisfy pain control in 25%-75% of patients.	

**Fig. 1 – Prescribing recommendations for outpatient anorectal procedures. The procedures are listed, as well as corresponding recommendations for opioid prescriptions to satisfy 50% of patients' postoperative pain, as well as a range to satisfy pain control in 25%-75% of patients. Reported in number of tabs of oxycodone 5 mg.**



**Fig. 2 – Histogram of opioids taken by tier (procedures grouped into low, medium, and high tiers). Reported in number of tabs of oxycodone 5 mg.**

massage. Forty two percent of patients stated they were not given instructions on how to dispose of opioids. Overall, 80% of patients reported having leftover opioids and 25% of patients reported still having their opioids at the time of the survey.

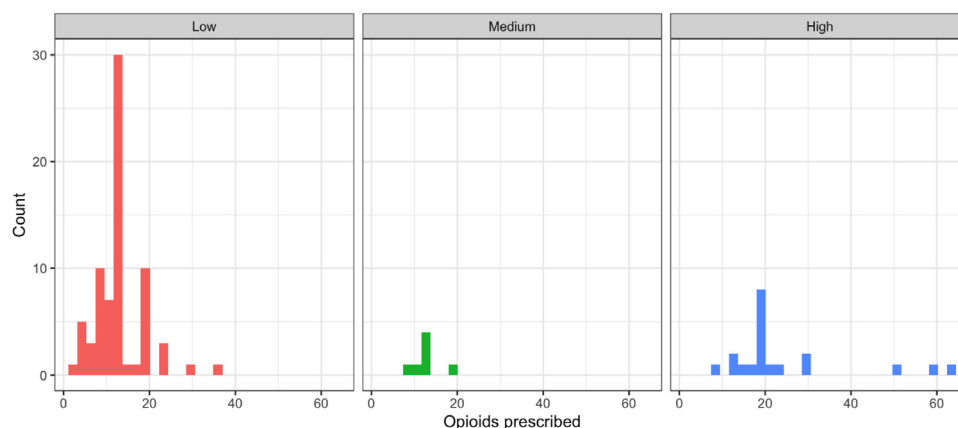
In an adjusted analysis of postoperative pain control, the only factor associated with lack of pain control was being in the high-tier group (odds ratio [OR] 0.15; 95% confidence interval [CI] 0.03-0.73;  $P = 0.01$ ) (Table 5). In an adjusted analysis of postoperative health care utilization, patients who did not use nonmedication pain treatment (sitz baths, heat, massage) are 6.5 times more likely to utilize health care than those who used non-medication pain treatment. (OR 6.50; 95% CI 1.33-31.75;  $P = 0.02$ ). No other significant associations were observed.

## Discussion

This was a single-center observational cross-sectional study aimed at developing opiate quantity prescribing guidelines based on current opioid consumption data of our patient population. Our approach was unique in its usage of patient-reported outcomes regarding the postoperative course,

including quality-of-life measures and non-medication-related treatments. We had several key findings. Our institution had uniform prescribing patterns: the median number of pills across all tiers prescribed was 8-20 tabs of oxycodone 5 mg tabs. Most of our patients were satisfied with pain control; however, we also observed that our institution overprescribes opioids. 80% of patients reported having leftover opioids and 25% of patients reported still having their opioids at the time of the survey. Forty two percent of these patients reported not receiving information on how to dispose of opioids. This study highlights the importance of providing instructions on disposing of leftover opioids and explaining the dangers of keeping leftover opioids.

Overall, there is a plethora of data acknowledging the overprescribing of opioids after surgery and its contribution to the opioid epidemic.<sup>5-7,10-12</sup> For outpatient orthopedic and otologic surgery, studies have shown that overprescribing was present and that factors contributing to opioid usage included incision type, age, and gender.<sup>13,14</sup> However, there are only a few studies looking at opioid prescribing for outpatient anorectal surgery.<sup>5-7</sup> These papers agree that current practice is widely variable, which contributes to the overprescribing of opioids.<sup>5-7,12</sup> Livingston-Rosan et al. found that most patients only require 5-10 tabs of oxycodone 5 mg or equivalent for



**Fig. 3 – Histogram of opioids prescribed by tier (procedures grouped into low, medium, and high tiers). Reported in number of tabs of oxycodone 5 mg.**

**Table 3 – Secondary analysis by tier.**

Variable	Low (N = 77)	Medium (N = 7)	High (N = 20)	Overall (N = 104)	Nominal P- value*
<b>Pain controlled</b>					
No	8 (10.4%)	0 (0%)	7 (35.0%)	15 (14.4%)	0.022
Yes	69 (89.6%)	7 (100%)	13 (65.0%)	89 (85.6%)	
<b>Pain interfere with ADLs</b>					
No	53 (68.8%)	5 (71.4%)	8 (40.0%)	66 (63.5%)	0.058
Yes	24 (31.2%)	2 (28.6%)	12 (60.0%)	38 (36.5%)	
<b>Number of days off work</b>					
Mean (SD)	6.84 (11.7)	12.0 (12.6)	9.47 (6.48)	7.71 (10.8)	0.514
Median [min, max]	2.00 [0, 60.0]	8.50 [1.00, 30.0]	10.0 [0, 21.0]	3.00 [0, 60.0]	
Missing	27 (35.1%)	3 (42.9%)	5 (25.0%)	35 (33.7%)	
<b>Side effects</b>					
No	30 (39.0%)	1 (14.3%)	6 (30.0%)	37 (35.6%)	0.399
Yes	47 (61.0%)	6 (85.7%)	14 (70.0%)	67 (64.4%)	
<b>Constipation</b>					
No	63 (81.8%)	6 (85.7%)	13 (65.0%)	82 (78.8%)	0.225
Yes	14 (18.2%)	1 (14.3%)	7 (35.0%)	22 (21.2%)	
<b>Diarrhea</b>					
No	71 (92.2%)	5 (71.4%)	17 (85.0%)	93 (89.4%)	0.136
Yes	6 (7.8%)	2 (28.6%)	2 (10.0%)	10 (9.6%)	
Missing	0 (0%)	0 (0%)	1 (5.0%)	1 (1.0%)	
<b>Nausea</b>					
No	69 (89.6%)	7 (100%)	14 (70.0%)	90 (86.5%)	0.071
Yes	8 (10.4%)	0 (0%)	6 (30.0%)	14 (13.5%)	
<b>Vomiting</b>					
No	76 (98.7%)	7 (100%)	17 (85.0%)	100 (96.2%)	0.156
Yes	1 (1.3%)	0 (0%)	2 (10.0%)	3 (2.9%)	
Missing	0 (0%)	0 (0%)	1 (5.0%)	1 (1.0%)	
<b>Itching</b>					
No	66 (85.7%)	5 (71.4%)	15 (75.0%)	86 (82.7%)	0.694
Yes	11 (14.3%)	1 (14.3%)	4 (20.0%)	16 (15.4%)	
Missing	0 (0%)	1 (14.3%)	1 (5.0%)	2 (1.9%)	
<b>Bleeding</b>					
No	40 (51.9%)	3 (42.9%)	7 (35.0%)	50 (48.1%)	0.383
Yes	37 (48.1%)	4 (57.1%)	13 (65.0%)	54 (51.9%)	
<b>Health care utilization</b>					
No	64 (83.1%)	6 (85.7%)	16 (80.0%)	86 (82.7%)	0.899
Yes	13 (16.9%)	1 (14.3%)	4 (20.0%)	18 (17.3%)	
<b>Treatment at the Vanderbilt ED</b>					
No	71 (92.2%)	7 (100%)	19 (95.0%)	97 (93.3%)	1
Yes	6 (7.8%)	0 (0%)	1 (5.0%)	7 (6.7%)	
<b>Treatment at another ED or walk in clinic</b>					
No	75 (97.4%)	7 (100%)	18 (90.0%)	100 (96.2%)	0.167
Yes	1 (1.3%)	0 (0%)	2 (10.0%)	3 (2.9%)	
Missing	1 (1.3%)	0 (0%)	0 (0%)	1 (1.0%)	
<b>Urgent appointment at the Vanderbilt colorectal clinic</b>					
No	69 (89.6%)	6 (85.7%)	17 (85.0%)	92 (88.5%)	0.649
Yes	8 (10.4%)	1 (14.3%)	3 (15.0%)	12 (11.5%)	
<b>Urgent appointment with your PCP</b>					
No	76 (98.7%)	7 (100%)	20 (100%)	103 (99.0%)	1

(continued)

**Table 3 – (continued)**

Variable	Low (N = 77)	Medium (N = 7)	High (N = 20)	Overall (N = 104)	Nominal P- value*
Yes	1 (1.3%)	0 (0%)	0 (0%)	1 (1.0%)	
Care at another healthcare provider					
No	74 (96.1%)	7 (100%)	19 (95.0%)	100 (96.2%)	0.602
Yes	2 (2.6%)	0 (0%)	1 (5.0%)	3 (2.9%)	
Missing	1 (1.3%)	0 (0%)	0 (0%)	1 (1.0%)	
Number of days using opioids					
Mean (SD)	3.74 (4.60)	4.67 (3.78)	5.47 (3.74)	4.18 (4.38)	0.397
Median [Min, Max]	3.00 [0, 30.0]	4.00 [0, 10.0]	5.00 [1.00, 14.0]	3.00 [0, 30.0]	
Missing	27 (35.1%)	1 (14.3%)	5 (25.0%)	33 (31.7%)	
Instructions on opioid disposal					
No	32 (41.6%)	4 (57.1%)	8 (40.0%)	44 (42.3%)	0.726
Yes	18 (23.4%)	2 (28.6%)	7 (35.0%)	27 (26.0%)	
Missing	27 (35.1%)	1 (14.3%)	5 (25.0%)	33 (31.7%)	
Disposal of left over pills					
Other	8 (10.4%)	1 (14.3%)	2 (10.0%)	11 (10.6%)	0.25
Still have them	21 (27.3%)	1 (14.3%)	4 (20.0%)	26 (25.0%)	
There were no left over pills	12 (15.6%)	3 (42.9%)	6 (30.0%)	21 (20.2%)	
Threw them away/Flushed them down the toilet	9 (11.7%)	0 (0%)	3 (15.0%)	12 (11.5%)	
Brought them back to clinic	0 (0%)	1 (14.3%)	0 (0%)	1 (1.0%)	
Missing	27 (35.1%)	1 (14.3%)	5 (25.0%)	33 (31.7%)	
Refill					
No	44 (57.1%)	5 (71.4%)	12 (60.0%)	61 (58.7%)	0.539
Yes	6 (7.8%)	1 (14.3%)	3 (15.0%)	10 (9.6%)	
Missing	27 (35.1%)	1 (14.3%)	5 (25.0%)	33 (31.7%)	
Nonopioid medications					
No	20 (26.0%)	0 (0%)	3 (15.0%)	23 (22.1%)	0.216
Yes	57 (74.0%)	7 (100%)	17 (85.0%)	81 (77.9%)	
Topical medication					
No	59 (76.6%)	3 (42.9%)	9 (45.0%)	71 (68.3%)	0.019
Yes	17 (22.1%)	3 (42.9%)	10 (50.0%)	30 (28.8%)	
Missing	1 (1.3%)	1 (14.3%)	1 (5.0%)	3 (2.9%)	
Acetaminophen (Tylenol)					
No	43 (55.8%)	1 (14.3%)	9 (45.0%)	53 (51.0%)	0.089
Yes	34 (44.2%)	6 (85.7%)	11 (55.0%)	51 (49.0%)	
Ibuprofen (Advil, Motrin)					
No	52 (67.5%)	4 (57.1%)	13 (65.0%)	69 (66.3%)	0.76
Yes	22 (28.6%)	3 (42.9%)	7 (35.0%)	32 (30.8%)	
Missing	3 (3.9%)	0 (0%)	0 (0%)	3 (2.9%)	
Left over opioid pain medication from another prescription					
No	74 (96.1%)	7 (100%)	19 (95.0%)	100 (96.2%)	1
Yes	2 (2.6%)	0 (0%)	0 (0%)	2 (1.9%)	
Missing	1 (1.3%)	0 (0%)	1 (5.0%)	2 (1.9%)	
Other nonopioid medication					
No	67 (87.0%)	5 (71.4%)	19 (95.0%)	91 (87.5%)	0.523
Yes	6 (7.8%)	0 (0%)	0 (0%)	6 (5.8%)	
Missing	4 (5.2%)	2 (28.6%)	1 (5.0%)	7 (6.7%)	

(continued)

**Table 3 – (continued)**

Variable	Low (N = 77)	Medium (N = 7)	High (N = 20)	Overall (N = 104)	Nominal P- value*
Nonmedication pain treatment					
No	36 (46.8%)	0 (0%)	5 (25.0%)	41 (39.4%)	0.015
Yes	41 (53.2%)	7 (100%)	15 (75.0%)	63 (60.6%)	
Sitz baths					
No	40 (51.9%)	2 (28.6%)	6 (30.0%)	48 (46.2%)	0.155
Yes	37 (48.1%)	5 (71.4%)	14 (70.0%)	56 (53.8%)	
Heat					
No	59 (76.6%)	2 (28.6%)	11 (55.0%)	72 (69.2%)	0.012
Yes	18 (23.4%)	5 (71.4%)	9 (45.0%)	32 (30.8%)	
Massage					
No	73 (94.8%)	6 (85.7%)	17 (85.0%)	96 (92.3%)	0.151
Yes	2 (2.6%)	1 (14.3%)	1 (5.0%)	4 (3.8%)	
Missing	2 (2.6%)	0 (0%)	2 (10.0%)	4 (3.8%)	
Other nonmedication pain treatment					
No	71 (92.2%)	6 (85.7%)	18 (90.0%)	95 (91.3%)	1
Yes	2 (2.6%)	0 (0%)	0 (0%)	2 (1.9%)	
Missing	4 (5.2%)	1 (14.3%)	2 (10.0%)	7 (6.7%)	

This table does not show the FDR adjusted P-values. These can be found in section 3.

\*These are the nominal P values calculated from the univariate tests of One-way ANOVA and Fisher's Exact Test for continuous and categorical variables, respectively. These P values are not adjusted for multiple comparisons.

adequate pain management post operatively,<sup>7</sup> while other studies have found that 63%-80% of pills prescribed were not used.<sup>5,6</sup> Our study strengthens this body of literature as our observations were similar. We found that the median number of pills to achieve adequate pain control ranges from two to 16 tabs of oxycodone 5 mg. At the 50th percentile, we found that for the low, medium, and high-tier groups, 90%, 33%, and 13% of their opioid prescriptions went unused.

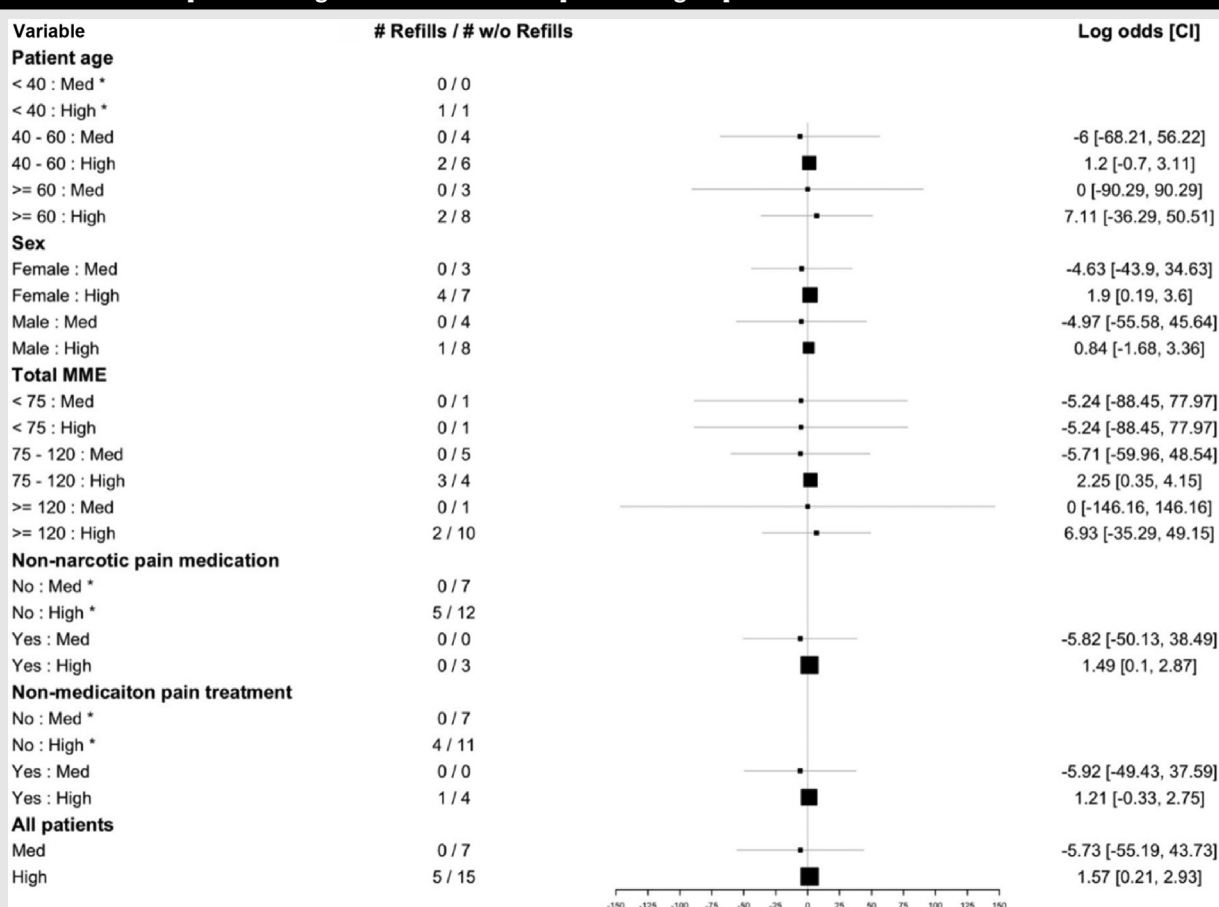
To successfully decrease the quantity of opioids we are prescribing, we must better understand our patients' pain control needs after surgery, including how nonopioid medications impact pain control. Multiple specialties have instituted prescribing protocols aimed at reducing opioids post-operatively.<sup>15,16</sup> In a study looking at ambulatory breast surgery, patients tolerated a nonopioid pain regimen well.<sup>15</sup> Within ambulatory plastic surgery, the PICASSO pain protocol was designed to restrict opioids postoperatively and was able to reduce opioid prescriptions by 20%.<sup>16</sup> While anorectal surgery may not be directly comparable to these other specialties, similar strategies can be used to decrease opioid requirements. Reif de Paula looked at outpatient hemorrhoidectomies and fistula surgeries and found that initiation of an ERAS protocol was feasible and reduced opioid use and healthcare utilization without adversely affecting pain or patient satisfaction.<sup>12</sup> These studies support our standard of practice to encourage the use of a multimodal pain control approach, even though our results did not show statistical significance in pain satisfaction with the use of nonopioid pain medications. We hope to elucidate this finding with further investigation in the future.

While 86% of our patients reported adequate pain control, there was a cohort that required additional treatment for their

pain. Ten percent of our patients required prescription refills, which is on par with previous studies. Per the CDC guidelines, between 11.7% and 30% of patients request opioid medication refills within 30 d of initial opioid prescription.<sup>4</sup> This finding indicates that there is a utilization cost to both the patient and the provider in under prescribing opioids that one must be willing to accept. While each institution may be unique in its postoperative care including refill requests, it is important to understand its own prescribing habits and postoperative healthcare utilization. Within our institution, it is common practice to have patients follow up in clinic before re-prescribing any opioids. In cases where patients cannot follow up immediately, it is common practice to prescribe a two-day course of opioid medication until patients can present to clinic.

With the knowledge that standardization is possible in the outpatient anorectal surgery setting, it is reasonable to take our data, combined with previously published data and clinical experience, to create evidence-based prescribing guidelines. Our tier system was based on predictions that patients in each tier would have similar usage of opioids and each subsequent tier would require more opioids. There were some interesting findings in patient-reported use of opioids. While it is known that a hemorrhoidectomy is one of the most painful anorectal procedures, it is interesting to note that patients undergoing exam under anesthesia and biopsy had similar postoperative opioid usage. While biopsies themselves are not necessarily painful, it can be inferred that the reason for the biopsy (ex: anal squamous cell carcinoma) can be a painful pathology. Most of our procedures fell into the lowest tier in terms of opioid usage, which is logical as most outpatient anorectal procedures require minimal postoperative opioid



**Table 4 – Forest plot showing association between procedure group and refills.**

\*Analysis not performed.

prescribing. There were a few outliers in our data, including seton placement without fistulotomy. Again, this is likely related to clinical pathology. While the actual procedure may not be inherently painful, the presence of an undrained abscess or fistula can be a painful pathology. In a study examining prescribing and usage after anorectal surgery for 42 patients, standardized prescribing recommendations with the goal of reducing opioid use were created.<sup>5</sup> Meyer et al. were able to create prescribing guidelines for four tiers of procedures (hemorrhoidectomy, fistula-in-ano, condyloma, miscellaneous), based on their study of 174 different procedures.<sup>6</sup> Interestingly, the range of opioids recommended appears at times higher than our recommendations.<sup>6</sup> Similarly, in our study, we found that we were overprescribing opioids and most patients were satisfied with pain control. While the ability to create standardized recommendations is important for the overreaching goal of minimizing opioid overprescribing, it is important to understand the opioid usage in general for these procedures as well as the patient's pain level before surgery to use best clinical judgment in prescribing.

In our secondary analysis, we found that there were no significant differences between the groups of procedures and outcomes such as pain control, interference with activities of daily living (ADLs), side effects, health care utilization, days

using opioids, and use of nonopioids. In our multivariate analysis, the use of nonmedication pain treatment was associated with an increase in healthcare utilization. The wide confidence interval suggests a high amount of variability and margin of error and as such, this result should be interpreted carefully. It is possible that the increased healthcare utilization caused an increased use of nonpharmacologic pain treatment (Ex: did the visit encourage the use of non-medication pain treatment). If so, a multimodal approach to pain control utilizing nonopioids in addition to non-pharmacological pain management can potentially reduce healthcare utilization. Another possibility is patients with poor pain control were more likely to try alternatives (non-opioid medications, nonmedication treatments) before seeking out additional postoperative visits. Given the limitations of our dataset, it is difficult to determine the true reason. Overall, our results suggest that despite differences in usage of opioids, overall, the groups behave similarly in their postoperative recovery from anorectal surgery.

Results of this study should be viewed in the context of its limitations. In this study, our sample size was small and there are some procedures that we initially included that we had minimal to no patients surveyed for that procedure (i.e.: Botox injection, sphincterotomy). There was significant variation in

**Table 5 – Multivariable analysis for pain control and health utilization.**

Variable	Odds ratio	95% CI	P value
<b>Pain controlled</b>			
Patient age	1.02	0.964-1.069	0.57
Male sex	3.03	0.79-11.623	0.11
Total MME	1.00	0.99-1.011	0.99
Medium tier group	NA	0-NA	0.79
High tier group	0.16	0.033-0.728	0.018
Positive use of nonopioid medications	0.72	0.12-4.337	0.72
Positive use of nonmedication pain treatment	1.42	0.362-5.539	0.62
<b>Health care utilization<sup>†</sup></b>			
Patient age	1.01	0.97-1.055	0.59
Male sex	0.84	0.274-2.582	0.76
Total MME	1.00	0.992-1.011	0.77
Medium tier group	0.41	0.04-4.176	0.45
High tier group	0.76	0.166-3.444	0.72
Positive use of nonmedication pain treatment	6.50	1.332-31.749	0.021

<sup>†</sup>The nonopioid medication variable was removed from this analysis since one of the cells had 0 patients.

opioid utilization, and we relied on self-reporting for opioid consumption. We excluded all patients with prior opioid use, which potentially excludes a large patient population that we do treat regularly, and this would be an area of interest for future studies. Therefore, without including this cohort in our analysis, prescribing to this cohort can remain variable. We did not collect any data on alcohol, tobacco, or illicit drug use and cannot analyze opioid usage in the setting of those potential confounders. In attempting to obtain an enrollment of 100 patients, the survey was completed up to 6 mo after the patient's procedure and therefore is subject to recall bias. There was only a 75% response rate and there could be several reasons why a patient did not respond including potential factors such as pain control dissatisfaction. Additionally, our data did not capture patient contact events outside of clinic visits or emergency room visits within 30 d. Tracking emails, electronic medical record messages, or phone calls would provide a more sensitive measure for healthcare utilization in future studies. Finally, we did not account for intersurgeon variation in our analysis. Our group has a standardized practice that includes anal blocks with lidocaine/bupivacaine, the performance of closed hemorrhoidectomies, and a postoperative handout that encourages patients to use nonopioids and nonmedication treatments postoperatively. Given this

standardization among surgeons, we do not expect significant variation that would change postoperative pain; however, we did not specifically explore this. Additionally, our policy is to provide a prescription for up to 2 d of opioid medication and to see the patient in clinic before providing further refills. This structure may be different than other colorectal practices. The guidelines developed will need implementation for testing and refinement in the future. We aim to prevent the need for refills and improve pain control across all practice structures.

### Conclusions

We found that while we were overall standardized in our prescribing habits, we still were overprescribing opioids. Eighty-six percent of patients were satisfied with pain control, 10% of patients required refills of opioids, and 42% of patients reported not receiving instructions on how to dispose of leftover opioids. There were no significant differences in patient demographics, postoperative pain satisfaction, or healthcare utilization. Our study is important because it not only looked at objective data (prescribing patterns) but considered patient-reported usage as well as patient satisfaction for pain control. Using these data, we created prescribing guidelines for 14 different anorectal procedures which should control pain in 20%-80% of patients. Surgeons can use these guidelines, plus their clinical judgment, to write more targeted opioid prescriptions, with a goal of limiting overprescribing and leftover opioids, while maximizing patient satisfaction and minimizing health care utilization postoperatively. With these data, we will be able to proceed with a prospective analysis of opioid use after anorectal procedures with the goals of standardizing prescribing habits, maximizing nonopioid pain medications and treatment options, and minimizing health care utilization in the postoperative period. A multimodal approach to pain control utilizing nonopioids should be considered to reduce healthcare utilization.

### Supplementary Materials

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.jss.2023.05.021>.

### Author Contributions

All persons who meet authorship criteria are listed as authors, and all authors certify that they have participated sufficiently in the work to take public responsibility for the content, including participation in the concept, design, analysis, writing, or revision of the manuscript. Melissa Hite was key in the conceptualization, data acquisition, analysis of results, and drafting and revising of the manuscript. Tonna McCutcheon and Michael Feng were key in the acquisition and analysis of the data, and drafting and revising of the manuscript. Molly Ford, Timothy Geiger, Benjamin Hopkins, and Roberta Muldoon contributed to the data acquisition, interpretation of results and revision of the manuscript. Andrea Fa contributed to the validation of results, and drafting and revision of the manuscript. Fei Ye and Rebecca Irlmeier were

essential in the analysis of data, methodology, and validation of results. Alexander Hawkins was essential in the conceptualization, project administration, methodology, analysis of results, and revising of the manuscript.

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## Disclosures

Dr. Hawkins is an Associate Editor for the Journal of Surgical Research; as such, he was excluded from the entire peer-review and editorial process for this manuscript.

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## REFERENCES

- Centers for Disease Control and Prevention. *Understanding the opioid overdose epidemic, United States*. Available at: <https://www.cdc.gov/opioids/basics/epidemic.html>. Accessed March 18, 2022.
- Levy B, Paulozzi L, Mack KA, Jones CM. Trends in opioid analgesic-prescribing rates by specialty, U.S., 2007-2012. *Am J Prev Med*. 2015;49:409–413.
- Smith LE. Ambulatory surgery for anorectal diseases: an update. *South Med J*. 1986;79:163–166.
- Dowell D, Ragan KR, Jones CM, Baldwin GT, Chou R. CDC clinical practice guideline for prescribing opioids for pain — United States, 2022. *MMWR Recomm Rep*. 2022;71:1–95.
- Swarup A, Mathis KA, Hill MV, Ivatury SJ. Patterns of opioid use and prescribing for outpatient anorectal operations. *J Surg Res*. 2018;229:283–287.
- Meyer DC, Hill SS, McDade JA, et al. Opioid consumption patterns after anorectal operations: development of an institutional prescribing guideline. *Dis Colon Rectum*. 2021;64:103–111.
- Livingston-Rosanoff D, Aiken T, Rademacher B, et al. Overprescription of opioids following outpatient anorectal surgery: a single-institution study. *Dis Colon Rectum*. 2020;63:1541–1549.
- Vandenbroucke JP, von Elm E, Altman DG, et al. Strengthening the reporting of observational studies in Epidemiology (STROBE): explanation and elaboration. *PLoS Med*. 2007;4:e297.
- 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. *J Biomed Inform*. 2009;42:377–381.
- Neuman MD, Bateman BT, Wunsch H. Inappropriate opioid prescription after surgery. *Lancet*. 2019;393:1547–1557.
- Serrell EC, Greenberg CC, Borza T. Surgeons and perioperative opioid prescribing: an underappreciated contributor to the opioid epidemic. *Cancer*. 2021;127:184–187.
- Reif de Paula T, Nemeth SK, Kurlansky PA, Simon HL, Miller LK, Keller DS. A randomized controlled trial examining the impact of an anorectal surgery multimodal enhanced recovery program on opioid use. *Ann Surg*. 2022;275:e22–e29.
- Qian ZJ, Alyono JC, Woods OD, Ali N, Blevins NH. A prospective evaluation of postoperative opioid use in otologic surgery. *Otol Neurotol*. 2019;40:1194–1198.
- Chapman T, Kim N, Maltenfort M, Ilyas AM. Prospective evaluation of opioid consumption following carpal tunnel release surgery. *Hand (N Y)*. 2017;12:39–42.
- Rothenberg KA, Huyser MR, Edquiang JK, et al. Experience with a nonopioid protocol in ambulatory breast surgery: opioids are rarely necessary and use is surgeon-dependent. *Perm J*. 2019;23:18–127.
- Johnson SP, Wormer BA, Silvestrini R, Perdakis G, Drolet BC. Reducing opioid prescribing after ambulatory plastic surgery with an opioid-restrictive pain protocol. *Ann Plast Surg*. 2020;84(Suppl 5):S431–S436.