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## Reducing Opioid Use in Endocrine Surgery through Patient Education and Provider Prescribing Patterns

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### Abstract

**Background**—Postoperative opioid use can lead to dependence, contributing to the opioid epidemic in the U.S. New persistent opioid use after minor surgeries occurs in 5.9% of patients. With increased documentation of persistent opioid use postoperatively, surgeons must pursue interventions to reduce opioid use perioperatively.

**Methods**—We performed a prospective cohort study to assess the feasibility of a preoperative intervention via patient education/counseling and changes in provider prescribing patterns to reduce postoperative opioid use. We included adult patients undergoing thyroidectomy and parathyroidectomy from 1/22/2019-2/28/2019 at a tertiary referral, academic endocrine surgery practice. Surveys were administered to assess pain and patient satisfaction postoperatively. Prescription, demographic, and comorbidity data were collected from the electronic health record.

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#### AUTHOR CONTRIBUTIONS

Stephanie Kwan participated in the collection of data, design of data collection tools, drafting and editing of the manuscript. Elizabeth Lancaster participated in study design, data analysis, and critical review and edits to the manuscript. Anjali Dixit, Christina Inglis-Arkell, and Solmaz Manuel, and Carolyn Seib participated in study design, creation of intervention tools, design of data collection tools, critical review and edits of manuscript. Insoo Suh and Wen Shen provided input on study design and edits to the abstract and manuscript.

#### DISCLOSURE

The authors report no proprietary or commercial interest in any product mentioned or concept discussed in this article.

**Results**—66 patients (74.2% women, mean age 58.6 [SD 14.9] years) underwent thyroidectomy (n= 35), parathyroidectomy (n=24), and other cervical endocrine operations (n= 7). All patients received a preoperative educational intervention in the form of a paper handout. 90.9% of patients were discharged with prescriptions for non-opioid pain medications and 7.6% were given an opioid prescription on discharge. Among those whom received an opioid prescription, the median quantity of opioids prescribed was 135 (IQR 120-150) oral morphine equivalents. On survey, four patients (6.1%) reported any postoperative opioid use and 94.6% of patients expressed satisfaction with their preoperative education and postoperative pain management.

**Conclusions**—Clear and standardized education regarding postoperative pain management is feasible and associated with high patient satisfaction. Initiation of such education may support efforts to minimize unnecessary opioid prescriptions in the endocrine surgery population.

### Keywords

Opioid; endocrine surgery; patient education; pain control

## INTRODUCTION

Opioid pain medication is commonly used after surgery to achieve adequate pain control. Historically, it was routine for patients undergoing major and minor surgery to be discharged home with an opioid prescription.<sup>1</sup> Among cervical endocrine operations (thyroid and parathyroid surgeries), documented postoperative opioid prescription rates prior to 2018 ranged from 84 to 97%.<sup>2,3</sup> However, more recent publications within the past year have demonstrated opioid prescription rates as low as 1.9-4.0% at certain institutions.<sup>4,5</sup>

Postoperative opioid use can lead to dependence and addiction, which contributes to the current opioid epidemic in the United States.<sup>6</sup> Although surgeons provide only 9.8% of all opioid prescriptions annually, their rate of prescription (36.5%) is the second highest after pain medicine specialists (48.6%).<sup>7</sup> New persistent opioid use, defined as an opioid prescription fulfillment between 90 to 180 days after surgery, in patients undergoing minor surgeries, including thyroidectomy and parathyroidectomy, occurs in 5.9% of patients, compared to 0.4% in a non-operative control group.<sup>6</sup> With increased documentation of persistent opioid use postoperatively, surgeons must begin to focus on interventions to reduce the use of opioids perioperatively, with the goal of reducing associated patient morbidity.<sup>8-11</sup>

There is significant variation in prescribing patterns among individual prescribers, even for the same procedures. Given that the quantity of opioids prescribed does not significantly correlate with specific patient (i.e. cancer diagnosis, tobacco use) or operative (i.e. admission, type of anesthesia) factors, these differences may represent a lack of awareness of appropriate prescribing patterns.<sup>11</sup> This can contribute to inadequate pain management or opioid over-prescription. Previous analyses of opioid prescribing practices at our institution for patients undergoing cervical endocrine operations utilized post discharge patient phone calls and Short Message System (SMS) texts and found that a majority of patients (83.5%) were prescribed opioids postoperatively; however, up to 52.5% of patients reported not taking opioids after discharge.<sup>12,13</sup> Patients were prescribed a wide range of opioids, from

90 to 207 oral morphine equivalents (OME, 12 to 28 oxycodone 5 mg pills), suggesting opportunities for improvement in our pain management practices.<sup>12,13</sup>

To address the issue of opioid over-prescription and persistent opioid use following endocrine surgery, we developed an Opioid Reduction Quality Improvement Initiative focused on providing non-opioid post-discharge analgesia and utilizing standardized practice guidelines with pre- and post-operative patient education on pain management. We hypothesized that pre-operative education on non-opioid pain management strategies was feasible and that the majority of patients would be satisfied with their pain management without routine opioid prescriptions.

## MATERIAL & METHODS

### Preoperative Intervention

A patient education handout (Figure 1) developed through collaboration between the Department of Surgery and the Department of Anesthesia at a tertiary referral center was provided to, and reviewed with, patients either at their preoperative clinic visit or on the day of surgery. At that time, patients were provided with a handout detailing when they could expect to receive SMS text surveys asking about their postoperative pain and how to respond to them.

### Data Collection

Patients included in this study were all adults (18 years and older) undergoing cervical endocrine operations at the University of California, San Francisco Medical Center from January 22, 2019 to February 28, 2019. There were no exclusion criteria. Preoperative opioid use (in the 30 days prior to surgery) was determined by an active, documented prescription in the patient chart or via the Controlled Substance Utilization, Review and Evaluation System (CURES) database at the time of each preoperative visit. Additional pre-operative and post-operative information, including patient demographics, persistent opiate use, and prescription refill requests, was extracted from the electronic health record (EHR).

Patient phone numbers were collected from the EHR and entered in a secure and HIPAA-compliant manner using a REDCap (Research Electronic Data Capture) database.<sup>14</sup> This was securely partnered with a cloud communication platform (Twilio Inc, San Francisco, CA) to send out automated SMS surveys that were developed in a similar but more streamlined manner to our prior study.<sup>13</sup> Automated surveys were sent via SMS text messages to all patients on postoperative days (POD) two, five, and ten. The online surveys included the same two questions assessing pain and opioid use: “On a scale of 0-10, what is your current pain level?” and “Any opioid use over the prior 24 hours? Yes/No”. All patient responses were automatically entered into the secure REDCap database. Any pain score of 8 or greater triggered an email notification to the physician on-call who could contact the patient. Patient-reported satisfaction, current pain score, and current pain medication use were evaluated by paper survey at the time of the postoperative follow-up clinic appointment, occurring one to three weeks postoperatively.

This study was approved by the University of California, San Francisco Institutional Review Board (IRB). Informed consent was not required as this study was conducted as part of a quality improvement initiative. All data were collected and managed in a secure and HIPAA-compliant manner using REDCap.<sup>14</sup>

### Outcome Variables

Primary outcome measures included the rate of postoperative opioid use and patient satisfaction regarding pain management education and postoperative analgesia.

Secondary outcomes included the percentage of patients with opioid prescriptions at discharge, mean postoperative pain score, rate of postoperative opioid use based on SMS text response, and patient characteristics associated with persistent postoperative opioid use.

### Statistical Analysis

Patients were stratified by surgery type and postoperative opioid use. Continuous variables are expressed as means with standard deviations (SD) and compared via t tests. Categorical data were compared using the Fisher's exact test or chi-squared tests.  $P < 0.05$  was considered statistically significant. All analyses were conducted using Stata statistical software, version 15.0 (StataCorp LLC, College Station, TX).

## RESULTS

We identified 66 patients who underwent thyroidectomy ( $n = 35$  [53.0%]), parathyroidectomy ( $n = 24$  [36.4%]), or other-cervical endocrine operations, such as lymph node dissections ( $n = 7$  [10.6%]), at our institution during the study period (Table 1). Forty-nine (74.2%) were female with a mean age of 58.6 years (SD 14.9). A diagnosis of cancer was present for 21 (31.8%) cases. The mean length of stay postoperatively for all patients was 14.1 hours (SD 9.0) with 31 patients (47.0%) being discharged on POD 0. In total, only 5 (7.6%) patients received an opioid prescription at discharge and 60 (90.9%) patients received a non-opioid prescription at discharge.

There were a total of six patients who received opioid prescriptions, five at the time of discharge and one at a follow-up appointment. Opioid prescriptions were provided at the discretion of the discharging provider based on their assessment of each patient's anticipated pain. Of the patients who were prescribed opioids at discharge, two had central and lateral neck dissections with lymphatic leaks that may have contributed to increased postoperative pain and one patient underwent an endoscopic transoral thyroidectomy (with pain requirements that were challenging to predict for a new operative technique). Of the same five patients, three had a current opioid prescription within 30 days before surgery. For those who were prescribed an opioid, the median quantity was 135 oral morphine equivalents (OME) (IQR 120-150), which is equivalent to 19 oxycodone 5mg tablets. One patient requested a refill at the time of follow-up appointment and one patient who had not been prescribed opioids at discharge requested a new opioid prescription postoperatively. Of the five patients that received an opioid prescription at discharge, two (40%) reported continued opioid use at the time of their follow-up visit. Mean time to follow-up visit was 14 days.

There was no significant difference in rates of opioid prescriptions for patients that were discharged on POD 0 vs. POD 1.

Of the four patients who self-reported postoperative opioid use, three of them had received a prescription at discharge and one had used opioids they had from a prior prescription. Two of these patients (50%) were taking opioids preoperatively. Two patients underwent total thyroidectomy, one underwent thyroid lobectomy with unilateral focused parathyroidectomy, and one underwent neck dissection. All four patients were female and there was no difference in age between those who reported opioid use and those who did not ( $p = 0.92$ ).

There was an 84.9% response rate ( $n=56$ ) for the postoperative clinic survey on pain medication use and patient satisfaction. For the SMS text surveys, 43 patients (65.2%) responded to any of the three text messages, with 37% responding to all three surveys, 32.6% responding to two, and 30.2% responding to only one survey. There was no difference in response rates to SMS text surveys by gender (male response rate 70.6% vs. female 63.3%,  $p = 0.58$ ) or age (mean age of responders 57.3 years vs. non-responders 60.9 years, ( $p = 0.38$ )). Mean pain scores were 1.9, 1.4, and 0.7 on postoperative days two, five, and ten, respectively. Reported mean pain scores were slightly higher in patients with postoperative opioid use (3.0, 1.0, 0, 1.8) versus patients who did not require opioids (2.0, 1.6, 0.7, 1.0), as noted on POD 2, 5, 10, and at clinic, respectively.

There was no statistically significant difference in pain scores between patients who received an opioid prescription and those who did not or between patients who reported opioid use and those who did not.

Over 90% ( $n=60$ ) of patients received cervical plexus blocks in the OR. There was no statistically significant difference in pain score between those who had received the block versus those who did not (mean pain score 1.1 vs 1.5, respectively [ $p = 0.43$ ]). No neck hematomas occurred. Overall 78.8% of patients reported using no opioids postoperatively. Of patients that completed the clinic survey, 80.4% reported taking acetaminophen and 44.6% reported taking ibuprofen after surgery for pain relief.

Of the 56 (84.9%) patients who responded to patient satisfaction questions on the postoperative clinic survey, with regards to overall postoperative pain management, 78.6% were very satisfied, 16.0% were satisfied, 1.8% were neutral, and 3.6% were dissatisfied (Figure 2). For preoperative information regarding pain and treatment, 73.2% were very satisfied, 21.4% were satisfied, and 5.4% were neither satisfied nor dissatisfied. Overall, 53 (94.6%) were satisfied or very satisfied with both pain management and pain management education.

## DISCUSSION

In this prospective pilot study of an Opioid Reduction Quality Improvement Initiative involving 66 patients undergoing cervical endocrine operations at a single academic institution, we found that standardization of postoperative pain medication prescribing with an emphasis on non-opioid analgesics is feasible and can minimize the amount of postoperative opioids prescribed to patients. In addition, our study is the first to show that

patients can have high satisfaction with non-opioid postoperative pain management if adequate preoperative patient education and counseling occurs. The rates of postoperative opioid prescriptions declined dramatically from 83.5% in our previous study, prior to the Quality Improvement Initiative, to less than 8% after. This reduction not only decreases the number of unnecessary prescriptions, but also increases patient safety. We are in the midst of an opioid epidemic which has been in part caused by over-prescription, which is known to lead to diversion and abuse.<sup>9, 15, 16</sup>

With implementation of Enhanced Recovery After Surgery (ERAS) pathways, there has been increased focus on the use of multimodal, opioid sparing techniques peri-operatively. However, with ERAS pathways alone there was little change in post-discharge opioid prescription or use.<sup>17,18</sup> Patients undergoing thyroid and parathyroid surgery at our institution are frequently discharged home within 24 hours of their operation. Therefore, it was important to reevaluate our opioid prescription practices and to implement additional interventions to reduce opioid use following ambulatory endocrine surgery in light of recent publications documenting high rates of persistent opioid use after elective minor surgery. After implementation of our protocol, up to 80% of patients reported using non-opioid pain medication after surgery.

Another perioperative analgesic technique routinely performed at our institution is the superficial cervical plexus block. This has been proven by Mayhew et al. in a recent meta-analysis to significantly reduce postoperative pain as compared to control.<sup>19</sup> In addition to non-opioid multimodal analgesia, cervical plexus blocks may have contributed to the observed low mean pain scores, as 90% of patients received either unilateral or bilateral nerve blocks. This should be considered as a routine component of perioperative pain management for cervical endocrine operations.

As a whole, our findings contribute to the expanding literature suggesting that the average opioid-naïve patient undergoing a cervical endocrine operation has a low opioid requirement<sup>2,20</sup> and is commonly overprescribed opioid medication.<sup>21</sup> Opioid naive patients who undergo endocrine operations, specifically thyroidectomies and parathyroidectomies, have low refill rates (1.8 to 7.6%) and on average require lower opioid quantities after surgery.<sup>11</sup> In our study, only one patient requested a postoperative prescription refill and another separate patient requested a new opioid prescription postoperatively, suggesting the clinical burden of standardized non-opioid analgesic pain medications is limited. These patient-reported outcomes are also important in driving management changes.

Lou et al found that 93% of patients at two large academic institutions undergoing thyroidectomy and parathyroidectomy procedures took 20 or fewer OMEs and 83% required 10 OMEs or less, but were prescribed a median of 30 OMEs (range: 0-120 OMEs).<sup>18</sup> Given that only 7.6% of our patients required an opioid prescription at discharge, we were able to target the 80% of patients requiring 10 OMEs or less and ultimately did not provide them with an opioid prescription. Patient characteristics known to be associated with increased opioid use and/or requirement include younger age (<45 years old),<sup>2,20</sup> previous opioid use,<sup>3,20</sup> and type of procedure performed.<sup>2,20</sup> Our descriptive analyses corroborate the findings of an association with previous opioid use. However, given the low number of patients

requiring postoperative opioid prescriptions, additional significant risk factors for opioid prescription and use could not be discerned. Determining which of these specific factors are associated with postoperative opioid use will be critical in our ongoing Quality Improvement (QI) initiative. Continued QI improvements and data analyses will help provide much needed information for surgeons to more confidently target or consider which of their patients may require postoperative opioids for adequate pain control and which patients should not.

The educational component in this initiative plays a central role in postoperative opioid prescription and use. The implementation of provider education and procedure-specific guidelines can lead to a significant decrease in opioids prescribed.<sup>1,21,23-25</sup> Patient education can also be equally effective in reducing postoperative opioid use,<sup>25,26</sup> as previous efforts by Shindo and colleagues led to an average 90-100 OME decrease in opioids prescribed for thyroid and parathyroid surgery patients.<sup>21</sup>

In addition, the rapidly evolving field of mobile health and telemedicine provides many opportunities for more efficient and accurate evaluation of postoperative symptoms.<sup>27</sup> In this vein, we utilized a novel approach to monitor pain scores and opioid use via automated SMS survey. This allowed for real-time gathering of data that could be crucial in resolving patients' postoperative concerns. As part of the intervention, a reported elevated pain score of 8 or greater out of 10 would display a message to the patient to contact the clinic and would also notify the on-call physician. This fail safe was never activated as no patients reported a pain score of 8 or greater, which is a testament to the adequate pain control obtained with non-opioid analgesics.

This study has limitations related to the method of data collection and practice type, many of which are inherent to studies requiring survey responses, including response and recall bias. As this was a QI initiative and distributed to all patients, they were informed before and after their surgery about the many potential surveys, but were not required or incentivized to respond.

Additionally, the response rate was on average 44.4% and may have been affected by multiple patient factors, including age, knowledge of phone/technology usage, education, socioeconomic status, primary language other than English, and type of mobile phone (smartphone vs non-smartphone), which were not all documented and may have contributed to selection bias. A small number (16.7%) of patient charts did not contain mobile phone numbers and could not be included in our SMS text surveys. These patients were not excluded from our analysis as we were able to capture many of them during the clinic follow-up. With surveys, there is also a component of recall and/or social desirability bias, which may lead patients to be hesitant to report opioid use, especially if they are aware of the opioid epidemic and provider efforts to decrease opioid prescriptions. We also did not have detailed information about the amounts of analgesic medications (opioid and non-opioid) taken by patients, which would be important to collect in future studies for additional insight into this population. Lastly, this study was performed at a single large, urban, academic institution, and the results may not be generalizable to other health settings. However, the tools and techniques we discuss for preoperative intervention can be easily

utilized and implemented. There are a multitude of online resources available for patient education regarding opioid medication including the Centers for Disease Control and Prevention (CDC)<sup>28</sup> and the American College of Surgeons.<sup>29</sup>

## CONCLUSION & FUTURE STEPS

Results from this study indicate that a predominantly non-opioid postoperative pain management strategy coupled with preoperative patient education is feasible to implement and minimizes the amount of opioid medications prescribed for cervical endocrine operations. Additionally, patient satisfaction regarding postoperative pain management is maintained even when opioid medications are not prescribed. Identifying patient and procedure characteristics associated with postoperative opioid use will be critical in ongoing data collection and QI metrics. Moving forward, we plan to continue this protocol within the section and spearhead similar initiatives within other surgical specialties. These changes are crucial to help mitigate the opioid epidemic without compromising patient care.

As we continue with our QI Initiative, we will document how decreased opioid prescribing impacts persistent opioid use and how adjunct pain management techniques, such as virtual reality and guided imagery, can enhance our pain management protocols. Our preliminary data, along with these additional studies, will improve the management of patient pain during and after cervical endocrine surgery.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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# Pain Management after Endocrine Surgery

Having some pain after surgery is normal. Our goal is to help you manage that pain so you can rest, breathe easily and get moving. The following strategies will not completely take away your pain, but will allow you to tolerate it as your body heals.



## Non-medication pain management strategies

All pain medications have side effects. Most patients also benefit from non-medication comfort measures to help limit the amount of medications they have to take. These include:

ICE PACKS: USE FOR 20 MINUTES THEN TAKE A BREAK FOR 20 MINUTES

SUCKING ON ICE OR A LOZENGE FOR SORE THROAT

TAKING A SHORT WALK

LISTENING TO MUSIC

WATCHING TV

MEDITATION

ACUPUNCTURE

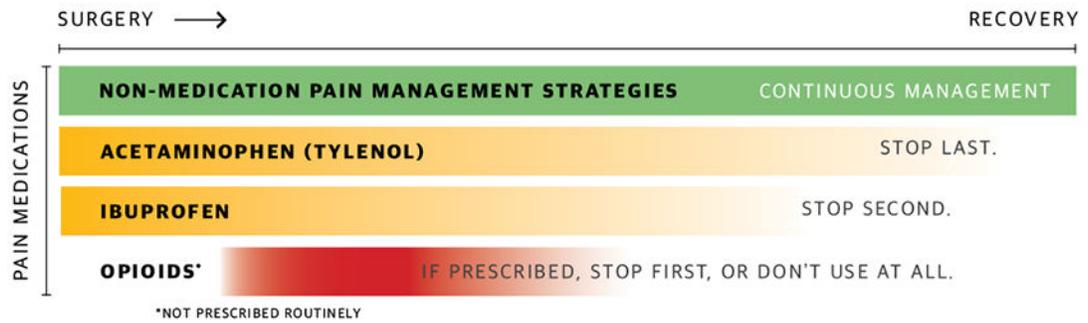
AROMATHERAPY

DRINKING TEA AND EATING HEALTHY FOOD

ANYTHING ELSE YOU USUALLY DO TO RELAX



## How to use pain medications



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### Acetaminophen (Tylenol)

- Take 1000mg **three times daily** on a regular basis (whether you think you need it or not) until all of your pain is gone, and then as needed for mild pain
- Never take more than 4000mg of acetaminophen from all medication sources in a day. Be aware that if you are prescribed Norco, Vicodin, or Percocet, these medications also include acetaminophen
- Available over-the-counter without a prescription

### Ibuprofen (Advil, Motrin)

**Take this starting post-operative day (POD) 1 if pain not controlled with Tylenol alone**

- Start taking this one day after surgery
- Take 400mg **three times daily** with food
- You may take this together with acetaminophen or in between acetaminophen doses on a regular basis
- Do not take more than 3200mg in a day
- Available over-the-counter without a prescription

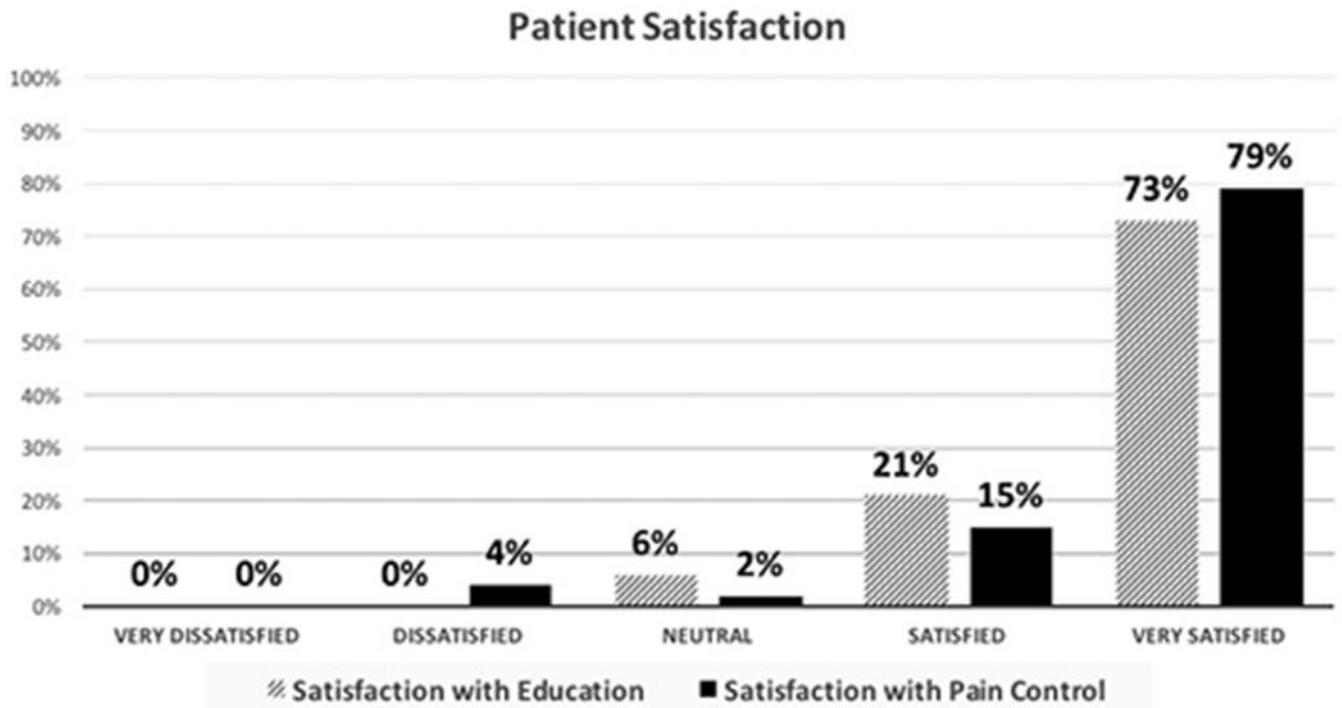
### OPIOID (e.g., tramadol, oxycodone, Norco)

Only take this if the acetaminophen and ibuprofen are not enough. It's OK to not take if you do not need it. Stop this first when pain is tolerable.

- Includes oxycodone, hydrocodone/acetaminophen (Norco or Vicodin), oxycodone/acetaminophen (Percocet), and tramadol, all only available by prescription
- Take this medication as a **last resort** if you still have uncontrolled pain despite taking acetaminophen and ibuprofen
- Take this medication as little as possible because opioid/narcotic pain medications are associated with significant side effects (dizziness, confusion, slowed breathing, constipation, etc.) and can lead to overdose and addiction
- As your pain improves, you can cut down on this medication by either cutting down the number of tablets taken or by stretching out the time between doses
- Never drink alcohol, drive, or operate heavy machinery while on this medication

If you have severe pain that is not managed with these strategies, or if you are having severe nausea, vomiting, constipation, or fevers, you should call your surgeon's office or visit urgent care.

**Figure 1:**  
Example educational handout



**Figure 2:**  
Patient satisfaction (%) regarding preoperative pain management education and postoperative analgesic

**Table 1.**

Characteristics of patients participating in the Opioid Reduction Quality Improvement Initiative and Perioperative Pain Management

	Total Number	%
<b>Total Patients</b>	<b>66</b>	
<b>Demographics</b>		
Age, mean (SD)	58.6 (14.9)	
Female Sex	49	74.2
Cancer Diagnosis	21	31.8
<b>Operation</b>		
Thyroidectomy	35	53.0
Parathyroidectomy	24	36.4
Other cervical endocrine	7	10.6
<b>Adjunct Pain Management</b>		
Received Intraoperative Superficial Cervical Plexus Block	60	90.9
Received Non-Opioid Analgesic Prescription	60	90.9
<b>Opioid Prescriptions</b>		
Received Opioid Prescription at Discharge	5	7.6
Received Opioid Prescription at Postoperative Clinic Visit	1	1.5