

# Opioid Prescribing Practice and Needs in Thyroid and Parathyroid Surgery

Maisie Shindo, MD; James Lim, MD; Enrique Leon; Lauren Moneta, MD; Ryan Li, MD; Lourdes Quintanilla-Dieck, MD

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**IMPORTANCE** In recent years, the medical community's inadvertent contribution to opioid addiction has been recognized.

**OBJECTIVE** To determine the opioid prescribing practices and opioid needs for patients undergoing thyroid and parathyroid surgery to help reduce postoperative opioid administration.

**DESIGN, SETTING, AND PARTICIPANTS** This retrospective cohort study included 1788 opioid-naïve patients who underwent thyroid and parathyroid surgery from January 1, 2012, through December 31, 2017, at the high-volume academic endocrine surgery center at Oregon Health and Sciences University. Patients with long-term opioid treatment and those who underwent other head and neck procedures or robotic thyroidectomy were excluded. For analysis, 1765 procedures were available (723 parathyroidectomy, 400 hemithyroidectomy, and 642 total thyroidectomy).

**MAIN OUTCOMES AND MEASURES** The quantity of prescribed opioids was determined in morphine milligram equivalents (MME). Opioid refill data after discharge were also analyzed. Patients were then divided into past (1336 in group 1 [January 1, 2012, to September 30, 2016]) and current (429 in group 2 [October 31, 2016, to December 31, 2017]) prescribing practices. For each procedure, the mean quantity prescribed for each group, difference between the means, 95% CI for the difference, and effect size were calculated.

**RESULTS** A total of 1702 patients (80.0% female [n = 1361]; mean age, 51.2 years [range, 7-97 years]) undergoing 1765 procedures were included in the analysis. For parathyroidectomy, the mean (SD) opioid quantity prescribed was 176.20 (86.66) MME in group 1 vs 80.08 (74.43) MME in group 2 (effect size, 1.139); for hemithyroidectomy, 204.65 (112.24) MME in group 1 vs 112.24 (102.31) MME in group 2 (effect size, 0.842); and for total thyroidectomy, 214.87 (161.09) MME for group 1 vs 102.29 (87.72) MME for group 2 (effect size, 0.754). In the last quarter of 2017, the numbers of patients discharged without any opioid prescription were 15 of 26 (57.5%) for parathyroidectomy, 12 of 32 (37.5%) for hemithyroidectomy, and 9 of 27 (33.3%) for total thyroidectomy. Patient calls requesting pain medications for group 2 were similar or fewer, depending on the procedure. Those who were prescribed less than 75.0 MME postoperatively did not call for additional opioid prescriptions.

**CONCLUSIONS AND RELEVANCE** Our study suggests that patients undergoing thyroid and parathyroid surgery need little, if any, postoperative opioids.

**Author Affiliations:** Department of Otolaryngology-Head and Neck Surgery, Oregon Health and Science University, Portland (Shindo, Moneta, Li, Quintanilla-Dieck); Department of Surgery, Oregon Health and Science University, Portland (Lim, Leon).

**Corresponding Author:** Maisie Shindo, MD, Department of Otolaryngology-Head and Neck Surgery, Oregon Health and Science University, 3181 SW Sam Jackson Rd, Mail Code PV-01, Portland, OR 97239 (shindom@ohsu.edu).

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The epidemic of opioid abuse has continued to plague the United States. The rate of drug overdose deaths increased from 6.1 per 100 000 standard population in 1999 to 16.3 per 100 000 in 2015, with an overall mean increase of 5.5% per year.<sup>1</sup> According to the Centers for Disease Control and Prevention, approximately 64 000 deaths in the United States were due to opioid overdose in 2016.<sup>2</sup>

More recently awareness of this epidemic and recognition of the medical community's inadvertent contribution to the problem with previously accepted standard opioid prescribing practices have increased. From 2006 to 2016, the mean duration of opioid prescribed increased from 13.3 to 18.1 days per prescription, an overall 35.7% increase. The rate increased annually by 4.4% from 2006 to 2008.<sup>1</sup> Recognizing this increase as a serious health problem, the Centers for Disease Control and Prevention in 2016 issued guidelines for primary care physicians treating chronic pain with opioids.<sup>3</sup> The guidelines state that because long-term opioid dependence begins with acute pain treatment, opioid prescribing for acute pain should not exceed the quantity needed. These guidelines are particularly relevant to surgeons because most postsurgical patients will have an acute period of postoperative pain. Unfortunately, we have a paucity of surgery-specific opioid prescribing guidelines in the literature. As a result, wide variation in opioid prescribing patterns exists among surgeons of various specialties.<sup>4-7</sup> Furthermore, the amount prescribed is usually excessive, because studies have shown that as many as 71% of opioids prescribed postoperatively are not taken by the patient.<sup>4</sup> In a retrospective review of a large cohort of privately insured patients in the United States undergoing major and minor surgical procedures, Brummett et al<sup>8</sup> reported that the incidence of persistent opioid use 90 days after minor surgery in opioid-naïve patients was 6%. Within this group, the incidence of persistent opioid use in patients undergoing thyroidectomy was 4.5%; for parathyroidectomy, 6%. Underlying psychiatric conditions, such as depression, are risk factors for long-term opioid use. As such, if patients are prescribed larger quantities than their real need, they may continue to use their prescribed excess opioids to alleviate depression and emotional pain, thus increasing the risk of addiction. A paucity of research quantitatively characterizes the mean volume of opioid medication that patients are prescribed after discharge from endocrine surgery. This retrospective study was conducted to determine opioid prescribing practices and opioid needs in patients who underwent thyroid and parathyroid surgery at a single institution performing high-volume endocrine procedures.

## Methods

We performed a retrospective cohort study of all opioid-naïve patients who underwent thyroid and parathyroid operations at the Oregon Health and Science University (OHSU), Portland, from January 1, 2012, through December 31, 2017. This protocol was approved by institutional review board of OHSU, which did not require informed consent for this retrospective review.

## Key Points

**Question** What is the postoperative opioid prescribing practice and true need for opioids after thyroidectomy and parathyroidectomy?

**Findings** In a cohort study of 1702 patients undergoing 1765 thyroidectomy and parathyroidectomy procedures, the mean postoperative prescribed dose of opioids was shown to be significantly reduced after initiation of preoperative patient education and use of nonopioid medications. In the last quarter of 2017, the mean (SD) dose prescribed was 19.90 (26.60) morphine milligram equivalents for parathyroidectomy, 56.72 (61.65) morphine milligram equivalents for hemithyroidectomy, and 68.15 (68.47) morphine milligram equivalents for total thyroidectomy.

**Meaning** Results of the study suggest that patients undergoing thyroid and parathyroid surgery need little opioid treatment postoperatively.

The electronic medical record at OHSU was queried by *Current Procedural Terminology* codes 60220, 60240, 60252, 60270, and 60500 during the study period. These codes reflect the specific operations of total thyroidectomy, hemithyroidectomy, and parathyroidectomy. The quantity of opioids prescribed on discharge was then collected from each patient's discharge medication list. Those who underwent sternotomy, robotic thyroidectomy, concurrent modified neck dissection, or other head and neck procedures such as tracheotomy or tracheal resection were excluded, as well as those who were previously taking opioids for chronic pain and who were admitted for more than 2 nights. Those who underwent concurrent thyroidectomy and parathyroidectomy were categorized as undergoing thyroidectomy (hemithyroidectomy or total thyroidectomy).

In late September of 2016, several surgeons within the Thyroid and Parathyroid Center at OHSU made a concerted effort to decrease opioid prescribing in patients undergoing thyroid and parathyroid operations. Therefore, for data analysis, the groups were then subdivided into past (group 1 [January 1, 2012, to September 30, 2016]) and current (group 2 [October 31, 2016, to December 31, 2017]) prescribing practices. The concerted effort to reduce opioid prescribing included preoperative patient counselling regarding pain management, multimodality nonopioid pain management, and work with nursing on assessing pain based on functional status rather than a 1- to 10-point scale and avoiding opioid administration when possible. The following statement typifies the preoperative discussion with patients regarding postoperative pain:

*You will have some soreness around the surgical site and mild discomfort when you swallow. We typically treat that with ice packs, Tylenol, and ibuprofen. It is unlikely that you will need anything more than that. We will see how you do postop and make sure that you are doing fine with this regimen. We want to avoid opioids as much as possible with this kind of surgery because they can cause nausea and vomiting, which is not ideal with a neck incision. You may also have some sore throat, which is best treated with throat lozenges.*

Table 1. Patient Population Data

Characteristic	Data (n = 1702)
No. of female/male patients	1361/341
Age, mean (range), y	51.2 (7-97)
No. of procedures, groups 1/2 <sup>a</sup>	
Hemithyroidectomy	285/115
Total thyroidectomy	512/130
Parathyroidectomy	539/184

<sup>a</sup> Group 1 underwent procedures from January 1, 2012, to September 30, 2016; group 2, October 31, 2016, to December 31, 2017. Patients underwent 1765 procedures.

The quantity of opioids prescribed in recovery if the patient is discharged the same day or on the floor if admitted overnight was generally used to determine the quantity of opioids to be prescribed on discharge. The total quantity of opioids prescribed was calculated by multiplying the strength of the prescribed opioids by the quantity dispensed. For standardization of data analysis, the total amount prescribed was converted to morphine milligram equivalents (MME) by multiplying the total milligrams of prescribed opioid with a standard conversion factor for the specific medication (ie, 0.15 for codeine phosphate; 1.0 for hydrocodone bitartrate; 1.5 for oxycodone hydrochloride; 4.0 for hydromorphone hydrochloride; and 2.4 for transdermal fentanyl citrate). Calls for pain medications after discharge were also captured by searching the database for opioid prescriptions dispensed that are recorded in the patient's medication list within 3 weeks of discharge. All medical records meeting these criteria were individually reviewed to confirm a refill and incorporated into the analysis. The primary outcome was the median amount of MME administered as grouped by study period and operation type.

Statistical analysis was performed by determining the mean and SD using Excel (version 15.23; Microsoft Corporation) for all procedures and each type of surgery. For each type of procedure, the effect size and 95% CI were calculated for the mean difference between groups 1 and 2. Because of the sample size difference, the Hedges *g* value<sup>9</sup> was used to determine the effect size for the difference in percentage of patients in groups 1 vs 2 who called in for additional pain medication. The effect size is considered small if *g* = 0.2, medium if *g* = 0.5, and large if *g* = 0.8. The effect size for the difference in percentage of calls for opioids after discharge between groups 1 and 2 was also calculated.

## Results

During the study period, 1788 patients underwent head and neck endocrine surgery, of whom 86 were excluded owing to reasons stated in the methods section, leaving 1702 patients (1361 female [80.0%] and 341 male [20.0%]; mean age, 51.2 years [range, 9-97 years]). Sixty-three patients underwent 2 procedures, for example hemithyroidectomy followed by completion thyroidectomy at a later date. Therefore, the total

number of procedures during the entire study period included was 1765. Between the 2 periods, 1336 patients were in group 1 and 429 were in group 2. The breakdown of procedures are as follows: 723 parathyroidectomy procedures, 400 hemithyroidectomy procedures, and 642 total thyroidectomy procedures. The patient population is summarized in Table 1.

When looking at opioid prescription amounts, a large decrease in the total amount of opioids prescribed at discharge occurred between groups 1 and 2 for each procedure. For the 3 different procedures, the mean opioid quantity prescribed in each group, SD, the difference between the means, 95% CI, and effect size for the mean difference are summarized in Table 2. For each of the 3 procedures, the total MME prescribed each quarter steadily decreased for group 2 (Figure). In the last quarter of 2017, the mean (SD) quantity prescribed was 19.90 (26.60) MME for parathyroidectomy, 56.72 (61.65) MME for hemithyroidectomy, and 68.15 (68.47) MME for total thyroidectomy. During this last quarter, patients discharged without any opioid included 15 of 26 (57.7%) for parathyroidectomy, 12 of 32 (37.5%) for hemithyroidectomy, and 9 of 27 (33.3%) for total thyroidectomy. No increase in patient calls requesting refills for opioid medications occurred in the group discharged with a lower dose. The data for patients calling for additional pain medication after discharge are shown in Table 3 for each type of procedure. Overall, for group 1, 45 of 1336 (3.4%) called for additional pain medications after discharge, and 8 of 429 (1.9%) of group 2 (95% CI, -0.6% to 3.0%, continuity corrected). Patients undergoing hemithyroidectomy and total thyroidectomy (45 of 1042 [4.3%]) called in more than those undergoing parathyroidectomy 8 of 723 [1.1%], as shown in Table 3. None of the patients who were prescribed less than 75.0 MME postoperatively called in for additional opioid prescriptions.

## Discussion

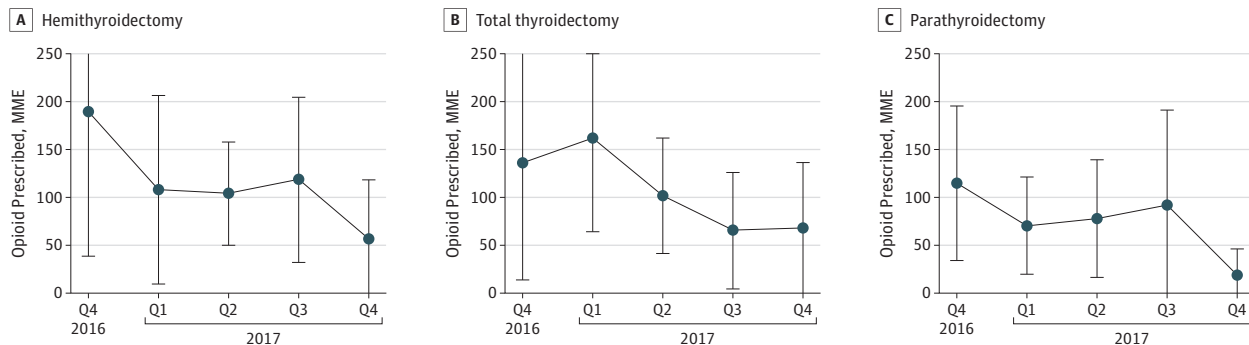
This retrospective study was conducted to determine opioid prescribing practices and opioid needs in patients who underwent thyroid and parathyroid procedures at a single institution performing high-volume endocrine surgery. We found that opioid prescribing and opioid needs for patients who underwent thyroid and parathyroid surgery can be dramatically reduced through the concerted use of preoperative patient counselling regarding pain management, multimodality nonopioid pain management, working with nursing to assess pain based on functional status rather than a 1- to 10-point scale, and avoiding opioid administration when possible. We also observed tremendous variability in patterns of opioid prescribing on review of our patient data. Part of this variability can be attributed to the fact that the responsibility of opioid prescribing largely falls on the rotating residents and fellows writing the prescriptions for discharge. This process likely resulted in a wide range of doses as well as high doses seen in group 1 patients. Most of the prescribing house officers are from the head and neck surgery service or surgical oncology service, where they may have become accustomed to prescribing higher doses of opi-

Table 2. Mean Total Opioid Quantity Prescribed at Discharge

Opioid Prescription	Hemithyroidectomy (n = 400)		Total Thyroidectomy (n = 642)		Parathyroidectomy (n = 723)	
	Group 1	Group 2	Group 1	Group 2	Group 1	Group 2
Mean (SD) quantity, MME	204.65 (112.24)	112.24 (102.31)	214.87 (161.09)	102.29 (87.72)	176.20 (86.66)	80.08 (74.43)
Absolute difference between groups (95% CI)	92.41 (68.63-116.19)		112.58 (83.8-141.36)		96.12 (83.11-109.13)	
Effect size	0.842		0.754		1.139	

Abbreviation: MME, morphine milligram equivalent.

Figure. Mean (SD) Opioid Dose Prescribed at Discharge in Group 2



Data are stratified by quarter for patients undergoing hemithyroidectomy, total thyroidectomy, or parathyroidectomy from October 31, 2016, through December 31, 2017.

oids for larger resections and generally more painful operations compared with thyroid and parathyroid procedures. Therefore, their overprescribing for the endocrine procedures is not surprising. In addition, the use of electronic medical records with preprogrammed postsurgical order sets may also have contributed to the higher amounts in group 1. The use of an automatic opioid order with a large range, such as 5 to 15 mg of oxycodone hydrochloride every 3 hours, appears to be associated with a higher number of pills prescribed. With our electronic medical record system, these orders can be turned into outpatient prescriptions. When creating the prescription, if the option of number of days to prescribe is selected rather than the actual number of pills to prescribe, the prescription automatically calculates the total number of pills based on the higher range. Although the overall prescribed doses for group 2 are significantly lower, we found a wide range in doses prescribed. This range is likely attributed again to prescriptions being written by trainees and to the fact that a few of the surgeons at our institution had yet to move toward the practice of reducing opioid prescribing for endocrine surgery.

Our data suggest that the estimated largest possible difference in the amount of opioid prescribed between groups 1 and 2 is 116.19 MME for hemithyroidectomy, 141.36 MME for total thyroidectomy, and 109.12 MME for parathyroidectomy (the upper bounds of the 95% CI reported). This difference was achieved by instituting preoperative patient counseling, working with perioperative nursing toward the same goal, and educating house officers. The significantly lower doses of opioid prescribed in group 2, particularly during the last 6 months of

the study period, suggest that the postoperative opioid need for patients undergoing thyroid and parathyroid procedures is minimal, if at all. The fact that very few patients called back for opioid refills in the group prescribed a lesser quantity supports this. A previous study by Lou and colleagues<sup>10</sup> prospectively evaluated the quantity of postoperative opioid requirements after thyroid and parathyroid surgery and found that 83% of these patients took less than 10 MME postoperatively. In the last year, several of our surgeons in our Thyroid and Parathyroid Center at OHSU moved toward reducing opioid prescribing by aggressively pursuing the use of multimodality, nonopioid pain management strategies, such as acetaminophen administration preoperatively and local anesthesia with superficial cervical blocks intraoperatively, while maintaining appropriate pain control for the opioid-naïve patients. Several prospective studies have shown the efficacy of intraoperative cervical blocks during thyroidectomy is effective in reducing postoperative opioid needs.<sup>11-14</sup> Furthermore, the use of preoperative acetaminophen has also been shown to be effective in reducing postoperative opioid needs.<sup>15</sup> Our current postoperative management also focuses on maximizing nonopioid pain management strategies such as liberal use of ice packs, throat lozenges, acetaminophen, and nonsteroidal anti-inflammatory drugs and reserving opioids for severe pain.

In our study, although the mean MME being prescribed was significantly reduced in group 2, the amounts being administered in the postoperative anesthesia care unit varied widely. This approach of judicious use of opioid required cooperation from the perioperative nursing team and educating them on how to better assess the character of postoperative pain in

Table 3. Request for Additional Pain Medication After Discharge

Treatment Group	Group 1	Group 2
Hemithyroidectomy		
No. of patients	285	115
No. of requests	14	4
Difference between groups, % (95% CI) <sup>a</sup>	1.43 (4.65-5.55)	
Total thyroidectomy		
No. of patients	512	130
No. of requests	24	3
Difference between groups, % (95% CI) <sup>a</sup>	2.38 (2.68-5.25)	
Parathyroidectomy		
No. of patients	539	184
No. of requests	7	1
Difference between groups, % (95% CI) <sup>a</sup>	0.76 (2.24-2.32)	

<sup>a</sup> Indicates with continuity correction.

this patient population. It is not uncommon for these patients to have a sore throat due to the larynx rotating around the endotracheal during retraction of the thyroid and tracheal, and posterior neck muscle ache due to neck extension, both of which could be effectively managed without opioids.

The group that was prescribed a lower dose or no opioid appeared to be less likely to call in for a refill. Thirty-four of the 53 patients who called for refills were prescribed more than 100 MME, whereas none of the patients who received less than 75 MME or were not prescribed any opioids at discharge called for an additional or a new opioid prescription. This finding is partly attributed to preoperative education on pain management and setting expectations for opioid prescriptions. Consistent preoperative discussion with the patients about what to expect with respect to postoperative pain and its management occurred most often with the 2 attending surgeons who did not prescribe any opioids. Our results indicate that to successfully implement nonopioid pain management in opioid-naïve patients, surgeons need to preoperatively educate the patient regarding postoperative pain expectation and management strategy. Research has shown that effective communication in the preoperative setting can significantly reduce postoperative opioid use and that 90% of patients who were

counselled preoperatively and received preoperative oral and written education regarding pain declined opioids postoperatively.<sup>16</sup> The ability to electronically prescribe opioids in our institution allows us to address the patient's need promptly after discharge should it be necessary. For institutions that are not allowed to prescribe electronically, sending patients home without any opioids may not be feasible. In that setting, a small quantity of opioid prescription may be necessary. Based on the study by Lou et al,<sup>10</sup> approximately 10 to 20 MME would seem reasonable.

### Limitations

The main limitation of this study is that, although it captured the prescribed dose, it did not capture the actual quantity of opioid consumed by patients at home. Prospective studies with a large cohort, ideally multi-institutional, that actually capture amount of medication consumed are needed to accurately assess what the true opioid requirements are for thyroid and parathyroid surgery. Developing an opioid prescribing guideline specific to these procedures would allow surgeons to comfortably prescribe just the minimum amount for same-day discharge. Patients receiving opioids for chronic pain are not included in this study and require a different approach to pain management. Our current approach for these patients is to work with the physician managing the patient's pain medication and formulate a plan such that the patient is prescribed very little additional opioids, if any, on discharge. Our institution is currently reviewing the data on this group of patients.

### Conclusions

Results of this study suggest that patients undergoing thyroid and parathyroid surgery need very little, if any, postoperative opioids. Preoperative counselling of patients regarding pain and adding nonopioid adjuncts can help to minimize the quantity of opioids that are used. These patients have relatively little postoperative pain that can be potentially controlled entirely with nonopioid medications. Decreasing the volume of opioid medication prescribed at discharge will decrease waste and reduce potential for addiction.

### ARTICLE INFORMATION

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**Correction:** This article was corrected on December 20, 2018, to fix the spelling of an author's surname.

**Author Contributions:** Dr Shindo had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

*Concept and design:* Shindo, Leon, Li.

*Acquisition, analysis, or interpretation of data:* All authors.

*Drafting of the manuscript:* Shindo, Leon, Moneta.

*Critical revision of the manuscript for important*

*intellectual content:* Shindo, Lim, Li, Quintanilla-Dieck.

*Statistical analysis:* Moneta.

*Administrative, technical, or material support:*

Shindo, Leon, Quintanilla-Dieck.

*Supervision:* Lim, Li.

**Conflict of Interest Disclosures:** All authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none were reported.

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**Additional Contributions:** Elizabeth Dewey, MS, Quinn LaFond, and Monica Bottleberghe, BA, assisted in part of the data acquisition for this study. Ms Dewey provided assistance with statistical analysis, for which she was not compensated. Mr LaFond did not receive financial compensation. Ms Bottleberghe was financially compensated through a summer research internship.

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## Invited Commentary

## Reduction of Opiates for Ambulatory Surgery—Endocrine Surgeons at the Cutting Edge

Brendan C. Stack Jr, MD; Riley C. Lide, MD

**According** to the US Department of Health and Human Services,<sup>1</sup> 116 people die every day in this country from an opioid-related overdose. That statistic represents more than 42 000 people a year, more than the annual number of deaths due to automobile crashes or homicides. In 2014, 47 055 drug overdose deaths occurred in the United States, and 60.9% of those involved an opioid. The following year, this number grew to 53 000 deaths and the percentage involving at least 1 opioid drug increased to 63.1%.<sup>2-4</sup> In 1999, only 180 morphine milligram equivalents (MME) per capita were sold in the United States. In 2015, 640 MMEs per capita were sold, representing a 3.6-times increase.<sup>5,6</sup>

The current opioid crisis in the United States began in the late 1990s and is a very complicated phenomenon. About this time, certain pharmaceutical companies began aggressive marketing to prescribers of new opioid preparations that promised greater efficacy of pain control while not emphasizing their abuse potential. Contributing to this crisis are health care professionals prescribing opioid-containing analgesics for patients without fully understanding the relative potency of these medications (MMEs) or the long-term implications of prescriptions written for acute, postsurgical pain.<sup>5</sup> Multiple retrospective studies of opioid-naïve patients have demonstrated that the number of pills and cumulative MMEs prescribed at hospital discharge are strongly associated with a patient's continued opioid use at 1 year.<sup>7-9</sup> Clearly, the onus of physicians in combating the opioid epidemic begins in the immediate postoperative period.

In this issue of *JAMA Otolaryngology-Head & Neck Surgery*, Shindo et al<sup>10</sup> detail the concerted effort by the Oregon Health and Sciences University group to reduce opioid prescription in their head and neck endocrine surgery population since 2016. This study allowed for a grouping of patients before (group 1) and after (group 2) the change for analysis. The report demonstrates the results of studying this issue and actively trying to reduce opioid prescriptions. For all endocrine neck surgical procedures, a reduction in MMEs occurred. In the last quarter of 2017, the number of patients discharged without any opioid was significantly increased. Patient calls requesting pain medications for group 2 were similar to or fewer than those for group 1, depending on the procedure. Those who were prescribed less than 75 MME postoperatively did not call for additional opioids. This amount represents a significantly smaller amount than was reported in a recent survey of head and neck surgeons from the Endocrine Section of the American Head and Neck Society performing these procedures (Jay Ferrell, MD, personal communication, August 18, 2018). The authors concluded that patients undergoing thyroid and parathyroid surgery need little opioid, if any, postoperatively.<sup>10</sup>

In reviewing this article and reflecting on this issue in our own practice, we have identified 3 takeaways of significance from this report:

1. This article exemplifies the successful creation and implementation of a quality initiative addressing the vexing problem of opioid abuse resulting from the gateway event of injudicious opioid use in otherwise opioid-naïve patients undergoing uncomplicated endocrine neck surgery. This re-