Received: 26 September 2022 | Revised: 13 November 2022 | Accepted: 20 November 2022

DOI: 10.1002/lio2.990

ORIGINAL RESEARCH

Laryngoscope Investigative Otolaryngology

# Postoperative opioid-prescribing practices in otolaryngology: Evidence-based guideline outcomes

Tanvi Rana BS[1] | Kelly Daniels MD[1,2] | Sophia Dang MD[1,2] | Jonathan C. Li MD[1] | Cecilia G. Freeman BS[1] | Alexander Duffy MD[3] | Joseph Curry MD[3] | Adam Luginbuhl MD[3] | Elizabeth Cottrill MD[3] | David Cognetti MD[3]

[1]Sidney Kimmel Medical College at Thomas Jefferson University, Philadelphia, Pennsylvania, USA

[2]Department of Otolaryngology–Head and Neck Surgery, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania, USA

[3]Department of Otolaryngology–Head and Neck Surgery, Thomas Jefferson University, Philadelphia, Pennsylvania, USA

**Correspondence**
Sophia Dang, Department of Otolaryngology, Eye & Ear Institute, University of Pittsburgh, Suite 500, 203 Lothrop St, Pittsburgh, PA 15213, USA.
Email: dangs2@upmc.edu

## Abstract

**Objectives:** We previously reported that >50% of postoperative opioids prescribed at our institution went unused for common otolaryngologic procedures. Based on these findings, we instituted multimodal, evidence-based guidelines for postoperative pain management. In the second part of our multiphasic study, we evaluated the effects of these guidelines on (1) quantity of unused opioids, (2) patient satisfaction, and (3) institutional perceptions toward the opioid epidemic and prescribing guidelines.

**Methods:** Standardized, procedure-specific opioid prescription guidelines were created using prospective data from the first phase of our study and evidence from current literature. Again, we examined sialendoscopy, parotidectomy, parathyroidectomy/thyroidectomy, and transoral robotic surgery (TORS). Patients were surveyed at their first postoperative appointment. Groups from Phases I and II were compared. Attending physicians were surveyed before the start of the multiphasic project and after prescribing guidelines were implemented.

**Results:** Prescribing guidelines led to an average reduction in prescribed morphine milligram equivalents (MME) per patient by: 48% (sialendoscopy), 63% (parotidectomy), 60% (para/thyroidectomy), and 42% (TORS). Average used MME per patient for parotidectomy was significantly reduced (64%). The proportion of unused MME per patient and patient satisfaction scores did not significantly change after guidelines were implemented.

**Conclusion:** Implementation of opioid-prescribing guidelines and the use of multimodal analgesia substantially reduced the amount of opioids prescribed across all procedures without impacting patient satisfaction.

**Level of Evidence:** 2

KEYWORDS

evidence-based guidelines, head and neck, multimodal analgesia, otolaryngology, pain management, para, parotidectomy, postoperative opioid, sialendoscopy, thyroidectomy, thyroidectomy, TORS, transoral robotic surgery

## 1 | INTRODUCTION

We previously reported that more than 50% of postoperative opioids prescribed by our otolaryngology department for common otolaryngologic procedures went unused.[1] Specifically, 65% of morphine milligram equivalents (MME) following parotidectomy went unused, 66% following parathyroidectomy and thyroidectomy, 67% following sialendoscopy, and 38% following transoral robotic surgery (TORS). We also assessed pain trends following these procedures using a visual analog scale (VAS). Mean VAS scores on postoperative day (POD) 1 for all procedures averaged 4.0–5.5 with highest pain following TORS and lowest following parotidectomy. All non-TORS procedures showed a steady decline in pain after procedure with mean VAS scores ranging between 1.7 and 2.3 by POD 8–9. Pain trends following TORS procedures peaked on POD 1 with a mean VAS score of 6.8 before a steady decline to a mean VAS score of 4.7 on POD 8. Oxycodone was the most commonly prescribed opioid after TORS and hydrocodone-acetaminophen after non-TORS procedures. Male gender, smoking history, and prior use of psychotropic medications were all risk factors for increased opioid requirements.[1] This initial study was spurred by the paucity of prospective evidence regarding postoperative pain and pain management following common otolaryngologic procedures. As such, evidence-based guidelines were absent and were subsequently identified as a means for quality improvement.

Based on the prospective data obtained during Phase I of our study, we developed and implemented prescribing guidelines at our institution to reduce unused opioids. Below, we report the impact of these guidelines on: (1) the quantity of unused opioids, (2) patient satisfaction, and (3) beliefs regarding the opioid epidemic and the value of institutional prescribing guidelines.

## 2 | MATERIALS AND METHODS

### 2.1 | Development of guidelines

Our prescribing guidelines for multimodal postoperative analgesia (Table 1) were based on patient-reported data from Phase I[1] and other studies that evaluated postoperative opioid use in otolaryngology.[2–7] Both phases of this study were approved by the IRB at our institution.

### 2.2 | Patient cohort

Adult patients (≥18 years) who underwent an elective procedure in our department from May 28, 2019 to May 28, 2020 were eligible, and the same inclusion criteria from Phase I were applied.[1] Included elective procedures were sialendoscopy (including sialodochoplasty and transoral excision of stone), superficial/total parotidectomy, total/partial thyroidectomy or parathyroidectomy (combined for analysis), and TORS for oral cavity and oropharyngeal lesions. We categorized patients undergoing concurrent neck dissections with their primary procedures. Patients were excluded if they had a chronic opioid use disorder or hospitalization >7 days.

### 2.3 | Clinical data collection

Within the study period from May 2019 to May 2020, prescribing guidelines were implemented within the Department of Otolaryngology at Thomas Jefferson University to guide physicians on postoperative prescription quantities at discharge. Patients were counseled on expected pain following surgery and discharged with an educational handout on multimodal pain management and a pain survey to be returned at their postoperative visit. Data were collected on quantities of pain medications prescribed and used, pain scores, and satisfaction scores using the Postoperative Pain Questionnaire (POPQ) and a modified version of the Anonymous Patient Satisfaction Survey (APSS) from Phase I of this study.[1] In the Phase II APSS, additional questions were included to assess the ease of following the prescribed regimen and satisfaction with educational materials provided at discharge.

### 2.4 | Attending physician survey

At the start of Phase I, we surveyed otolaryngology faculty at our institution using anonymous paper surveys. The survey assessed

**TABLE 1** Discharge prescription guidelines for postoperative pain management.

| Procedures | First-line treatment | For breakthrough pain |
|---|---|---|
| Sialendoscopy<br>Parotidectomy<br>Parathyroidectomy or thyroidectomy | **Medication**: Ibuprofen 600 mg<br>Acetaminophen 500 mg<br>**Dose:** 1 tablet of Ibuprofen Q6h<br>1 tablet of Acetaminophen Q6h<br>Staggered every 3 h | **Medication:** Oxycodone 5 mg<br>**Dose**: 1 tablet Q4h<br>**Dispense**: 5 tablets (37.5 MME) |
| TORS | **Medication**: Acetaminophen liquid suspension 160 mg/5 ml;<br>**Dose**: 480 mg/15 ml (3 teaspoons) Q6h<br>**Dispense**: 840 ml (14 days)<br><br>**Medication**: Gabapentin 300 mg<br>**Dose**: 1 tablet Q8h<br>**Dispense**: 42 tablets | **Medication**: Oxycodone liquid 5 mg/5 ml<br>**Dose**: 5 mg/5 ml (1 teaspoon) Q4h<br>**Dispense**: 140 ml = 28 doses (210 MME) |

Abbreviations: h, hours; MME, morphine milligram equivalents; TORS, transoral robotic surgery.

(1) willingness to follow an evidence-based guideline for prescribing postoperative pain medications and (2) perspectives on the overprescription (OP) of opioids at national and institutional levels. A similar anonymous follow-up survey was readministered at the end of Phase II via Qualtrics. Both surveys utilized a 5-point Likert scale with 1 = agree, 2 = somewhat agree, 3 = neutral, 4 = somewhat disagree, and 5 = disagree.

### 2.5 | Statistical analysis

MedCalc® and Microsoft Excel Data Analysis Toolpack were used to calculate mean, SD, and range for demographic metrics, pain scores, MME prescribed, MME used, patient satisfaction scores, and attending survey data. Comparison of means and comparison of proportions used a *p*-value of ≤0.05 to determine statistical significance. The term "pills" will be used to represent a standard 5 mg unit of oxycodone.

### 2.6 | Subgroup analyses

We performed subgroup analyses within procedural groups if at least 10% of patients required refills (RF). RF data were not collected in Phase I. We compared those who requested RF to those who did not in order to determine if there were differences that could help guide future prescribing practices. Clinicians at our institution provided RF by renewing the original discharge prescription. Opioid consumption data were not collected for RF. We also performed a subanalysis of procedure complexity between groups. Procedure complexity was determined with a scoring system using anatomic location(s) of the procedure (i.e., for TORS, the categories of: tonsillectomy, hypo/pharyngeal mass removal, base of tongue resection, and neck dissection). Points were assigned within each category: one point if unilateral and two points if bilateral.

## 3 | RESULTS

### 3.1 | Non-TORS

Seventeen patients underwent sialendoscopy. When compared with Phase I, there were no significant differences in demographics (age, gender, race, comorbid conditions, smoking status, medication history, and hospital length of stay), time to follow-up, or pain scores (Tables S1, S2, and Figure 1). Most patients received multimodal analgesia with acetaminophen, steroids, and/or nonsteroidal anti-inflammatory drug (NSAIDs; Table S2). Approximately half (52.9%) reported using nonopioid analgesia as directed. On average, 42.6 less MME (5 pills) was prescribed per patient and 23.2 less MME (3 pills) was used per patient (Table 2). The change in the proportion of unused MME per patient was not significant (83% went unused, 16% increase from Phase I). Zero patients requested a RF.

Twenty-two patients underwent parotidectomy. When compared with Phase I, there were no significant differences in demographics (except for a significantly higher incidence of angiotensin converting enzyme [ACE] inhibitor use), time to follow-up, or pain scores (Tables S3, S4, and Figure 1). Most patients received multimodal analgesia with acetaminophen and steroids; NSAIDs were infrequently used (Table S4). Most patients (70.0%) reported using nonopioid analgesia as directed after discharge. There was a significant reduction in

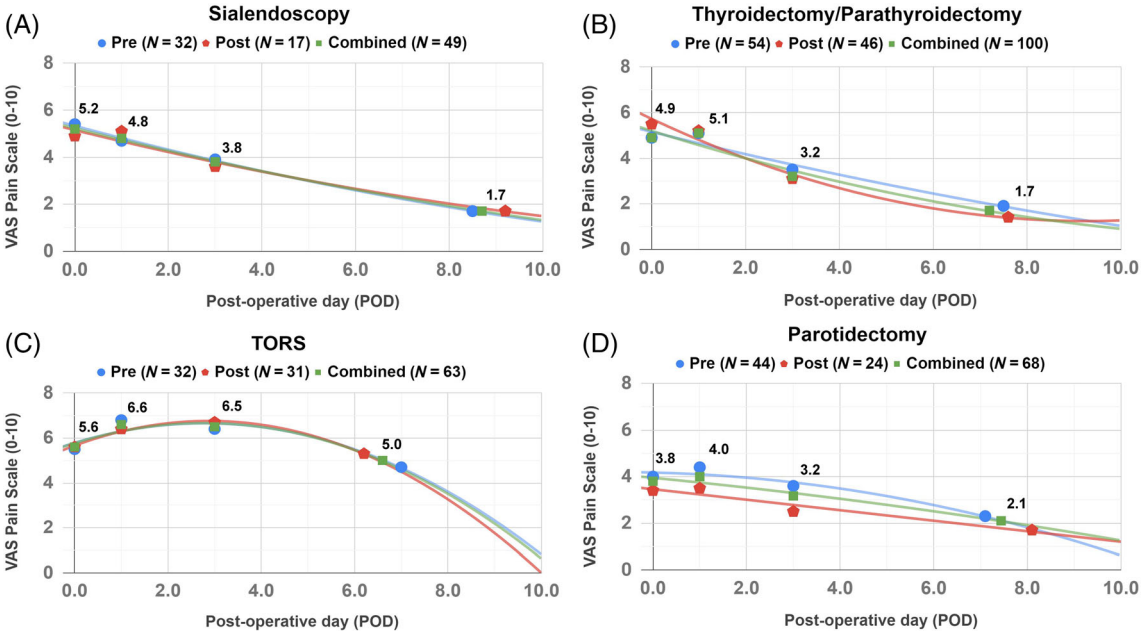


**FIGURE 1** Pain trends for sialendoscopy (A), thyroidectomy/parathyroidectomy (B), transoral robotic surgery (TORS) (C), and parotidectomy (D) in Phases I and II. Labeled data points correspond to the combined cohort

**TABLE 2** Comparison of opioids prescribed/used for all procedures in Phases I and II.

| | Sialendoscopy Phase I ($n = 32$) vs. Phase II ($n = 17$) | Parotidectomy Phase I ($n = 44$) vs. Phase II ($n = 24$) | Para/thyroidectomy Phase I ($n = 54$) vs. Phase II ($n = 48$) | TORS Phase I ($n = 32$) vs. Phase II ($n = 31$) |
|---|---|---|---|---|
| | Mean ± SD (range), $n^{\dagger}$ vs. mean ± SD (range), $n^{\dagger}$<br>Mean difference [95% CI]<br>*p*-value | | | |
| Average MME prescribed per patient | 88.7 ± 89.6 (22.5–400.0), 29 vs. 46.1 ± 14.9 (37.5–75.0), 16<br>−42.6 [−88.3, 3.14]<br>$p = .07$ | 118.1 ± 86.4 (15.0–450.0), 37 vs. 43.8 ± 14.0 (25.0–75.0), 21<br>−74.3 [−112.5, −36.1]<br>$p < .001$ | 105.9 ± 74.7 (50.0-450.0), 48 vs. 42.1 ± 13.4 (0.0–7.5), 40<br>−63.8 [−87.6, −40.0]<br>$p < .0001$ | 352.5±241.8 (75.0-750.0), 22 vs. 203.8 ± 64.4 (37.5-375.0), 28<br>−148.7 [−244.4, −53.0]<br>$p = .003$ |
| Average no. of pills prescribed per patient | 11.8 ± 11.9 (3.0–53.3) vs. 6.2 ± 2.0 (5.0–10.0)<br>−5.60 [−11.7, 0.48]<br>$p = .07$ | 15.7±11.5 (3.6-4.8) vs. 5.8 ±1.9 (3.3-10.0)<br>−9.9 [−14.9, −4.8]<br>$p < .001$ | 14.1±10.0 (6.7-60.0) vs. 5.6 ±1.8 (0.0-10.0)<br>−8.5 [−11.7, −5.3]<br>$p < .0001$ | 47±32.2 (10.0-100.0) vs. 27.2 ±8.6 (5.0-50.0)<br>−19.8 [−32.5, 7.1]<br>$p = .003$ |
| Mean % reduction in MME prescribed per patient | 48.0% | 62.9% | 60.2% | 42.2% |
| Average MME used per patient | 31.0 ± 46.0 (0.0–165.0), 29 vs. 7.8 ± 12.4 (0.0–37.5), 16<br>−23.2 [−47.0, 0.56]<br>$p = .06$ | 42.9 ± 53.0 (0.0–225.0), 37 vs. 15.5 ± 14.6 (0.0–37.5), 21<br>−27.4 [−51.2, −3.7]<br>$p = .02$ | 30.3 ± 37.5 (0.0–140.0), 48 vs. 17.4 ± 21.4 (0.0–75.0), 40<br>−12.9 [−26.2, 0.40]<br>$p = .06$ | 212.4 ± 219.2 (0.0–720.0), 22 vs. 148.5 ± 80.8 (0.0–300.0), 28<br>−63.9 [−153.9, 26.1]<br>$p = 0.16$ |
| Average no. of pills used per patient | 4.1 ± 6.1 (0.0–22.0) vs. 1.0 ± 1.7 (0.0–5.0)<br>−3.1 [−6.26, 0.06]<br>$p = .05$ | 5.7 ± 7.1 (0.0–30.0) vs. 2.06 ± 1.95 (0.0–5.0)<br>−3.64 [−6.82, −0.46]<br>$p = .03$ | 4.0 ± 5.0 (0.0–18.7) vs. 2.3 ± 2.9 (0.0–10.0)<br>−1.7 [−3.5, 0.08]<br>$p = .06$ | 28.3 ± 29.2 (0.0–96.0) vs. 19.8 ± 10.8 (0.0–40.0)<br>−8.5 [−20.5, 3.5]<br>$p = .16$ |
| Average % MME unused per patient | 67% ± 36% (0%–100%), 29 vs. 83% ± 27% (0%–100%), 16<br>0.16 [−0.05, 0.37]<br>$p = .13$ | 59%±38% (0-100%), 37 vs. 60%±39% (0-100%), 21<br>0.01 [−0.20, 0.22]<br>$p = .92$ | 66% ± 34% (0%–100%), 48 vs. 62% ± 42% (0%–75%), 40<br>−0.04 [−0.20, 0.12]<br>$p = .62$ | 38% ± 39% (0%–100%), 22 vs. 23% ± 35% (0%–100%), 28<br>−0.15 [−0.36, 0.06]<br>$p = .16$ |

*Note*: If applicable, $n^{\dagger}$ denotes the sample size after removing missing values.
Abbreviations: MME, morphine milligram equivalents; Pills, 5 mg oxycodone tablets; TORS, transoral robotic surgery.

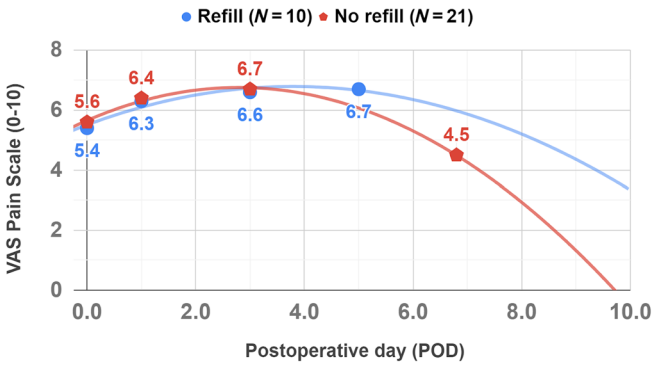


**FIGURE 2** Comparison of pain scores between RF and NRF TORS patients; NRF, no refill; RF, refill; TORS, transoral robotic surgery

the amount of opioids prescribed and used (Table 2). On average, 74.3 less MME (9 pills) was prescribed per patient and 27.9 less MME (3 pills) was used per patient. The change in the proportion of unused MME per patient was not significant (60% went unused, 1% increase from Phase I). Five patients reported that they did not require pain medication after discharge. One patient requested a RF.

Forty-eight patients underwent thyroidectomy and/or parathyroidectomy. When compared with Phase I, there were no significant differences in demographics (except for significantly higher incidences of ACE inhibitor use, acetaminophen use, prior/current prescription opioid use, and neuropathic medication), time to follow-up, or pain scores (Tables S5, S6, and Figure 1). Most patients received multimodal analgesia with acetaminophen and steroids; NSAIDs were less frequently used (Table S6). Most patients (64.4%) reported using

nonopioid analgesia as directed after discharge. There was a significant reduction in the amount of opioids prescribed (Table 2). On average, 63.8 less MME (8 pills) was prescribed per patient and 12.9 less MME (1 pill) was used per patient. The change in the proportion of unused MME per patient was not significant (62% went unused, 4% decrease from Phase I). Two patients requested a RF.

### 3.2 | Transoral robotic surgery

Thirty-one patients underwent TORS. When compared with Phase I, there were no significant differences in demographics (except for a significantly higher incidences of ACE inhibitor use and prescription opioid use), time to follow-up, or pain scores (Tables S7, S8, and Figure 1). Most patients received multimodal analgesia with acetaminophen, steroids, and gabapentinoids; NSAIDs were infrequently used (Table S6). Almost all patients (89.3%) reported using nonopioid analgesia as directed after discharge. There was a significant reduction in the amount of opioids prescribed (Table 2). On average, 148.7 less MME (19 pills) was prescribed per patient and 63.9 less MME (8 pills) was used per patient. The change in the proportion of unused MME per patient was not significant (23% went unused, 15% decrease from Phase I). Ten patients requested a RF. There were significantly more RF among TORS patients than non-TORS patients (32% vs. 3.42% [95% CI: 13.6%–46.3%], $p < .0001$).

A few significant differences in baseline characteristics were observed between RF and nonrefill (NRF) groups. In the RF group, there was a higher incidence of documented alcohol abuse diagnoses (20% vs. 0%, $p = .04$) and a lower incidence of ACE inhibitor use (10% vs. 52.4%, $p = .03$). The RF group also had a shorter time to follow-up from discharge (5 vs. 6.8 days, $p = .02$) and had higher pain scores (6.7 vs. 4.5, $p = .03$) on the day of follow-up (Figure 2). Complexity of procedure did not differ significantly between RF and NRF groups (2.3 ± 0.67 vs. 2.0 ± 0.55, $p = .20$).

### 3.3 | Adherence to prescribing guidelines

Among sialendoscopy patients, about a third received an overprescription (OPs). Overprescriptions were defined as incidences where patients were prescribed greater quantities of opioids than recommended by our study's guidelines. Based on patient-reported use, enough excess opioids were prescribed to fill an additional 3.7x guideline-recommended prescriptions (GPs). Among parotidectomy patients, about a quarter received OPs, which resulted in enough excess opioids to fill 3.5x GPs. Among thyroidectomy/parathyroidectomy patients, less than a quarter received OPs, which resulted in enough excess opioids to fill 3x GPs. Among TORS patients, over a quarter received OPs, which resulted in enough excess opioids to fill 1.4x GPs. Please refer to Table 3 for the full analysis.

### 3.4 | Satisfaction

There were more completed responses to the APSS than to the POPQ. In Phase II, patients were satisfied with the overall care and pain management that they received (Table 4). We observed a small but significant change in the incidence of 1 (Extremely unsatisfied) and 2 (Unsatisfied) ratings for pain management. This did not significantly affect overall satisfaction scores between Phase I and Phase II cohorts. Additionally, patients were overall satisfied/extremely satisfied with their pain expectations in Phase II, and most found the multimodal pain regimen to be easy/somewhat easy to follow. Two patients were excluded from analysis in Phase II as they rated all 1's (extremely unsatisfied) but reported minimal medication use and pain scores suggesting erroneous responses.

### 3.5 | Institutional attitudes on opioid prescription practices

More faculty responded to the survey in Phase II. In both phases, there was overall agreement that opioid OP is present at the national

**TABLE 3** Descriptive statistics of patients given an OP.

| Procedure, GP (*n*) | % patients with OP (*n*/total) | % OP patients who used less than GP (*n*/total) | Average % of OP used ± SD (range) | Total excess MME (No. × GP) |
|---|---|---|---|---|
| Sialendoscopy, 37.5 MME = 5 pills ($n = 17$) | 35.3 (6/17) | 83.3 (5/6) | 14 ± 21 (0–50) | 137. 5 MME = 18 pills (3.1 × GP) |
| Parotidectomy, 37.5 MME = 5 pills ($n = 22$) | 27.3 (6/22) | 83.3 (5/6) | 23 ± 26 (0–60) | 132.5 MME = 18 pills (3.5 × GP) |
| Para/thyroidectomy 37.5 MME = 5 pills ($n = 48$) | 16.7 (8/48) | 50.0 (3/6) | 65 ± 42 (0–100) | 112.5 MME = 15 pills (3.0 × GP) |
| Non-TORS 37.5 MME = 5 pills ($n = 87$) | 23.0 (20/87) | 76.5 (13/17) | 36 ± 38 (0–100) | 382.5 MME = 51 pills (10.2 × GP) |
| TORS 210 MME = 28 pills ($n = 31$) | 29.0 (9/31) | 62.5 (5/8) | 53 ± 43 (0–100) | 300 MME = 40 pills (1.4 × GP) |

Abbreviations: GP, guideline-recommended prescription; MME, morphine milligram equivalents; OP, overprescription (sum of GP + excess); Pills, 5 mg oxycodone tablets; TORS, transoral robotic surgery.

**TABLE 4** Comparison of APSS results between Phases I and II.

| | 1 (Extremely unsatisfied) + 2 (Unsatisfied) | 3 (Neutral) | 4 (Satisfied) + 5 (Extremely satisfied) | Average score mean ± SD |
|---|---|---|---|---|
| Q1: How satisfied were you with the overall care you received? | | | | |
| Phase I ($n = 150$) vs. Phase II ($n^{\dagger} = 131$) | 1 (0.7%) vs. 5 (3.8%) | 6 (4.0%) vs. 3 (2.3%) | 143 (95.3%) vs. 123 (93.9%) | 4.6 ± 0.6 vs. 4.6 ± 0.8 |
| | $p = .07$ | $p = .42$ | $p = .57$ | $p = 1.00$ |
| Q2: How satisfied were you with your pain management? | | | | |
| Phase I ($n^{\dagger} = 147$) vs. Phase II ($n^{\dagger} = 129$) | 2 (1.4%) vs. 10 (7.8%) | 9 (6.1%) vs. 5 (3.9%) | 136 (92.5%) vs. 114 (88.3%) | 4.5 ± 0.7 vs. 4.4 ± 1.1 |
| | **$p = .01$** | $p = .41$ | $p = .24$ | $p = .37$ |
| Q3: How satisfied were you with pain expectations educational materials? | | | | |
| Phase II ($n^{\dagger} = 121$) | 6 (5.0%) | 17 (14.0%) | 98 (81.0%) | 4.3 ± 1.3 |
| | **1 (Easy) + 2 (Somewhat easy)** | **3 (Neutral)** | **4 (Somewhat difficult) + 5 (Difficult)** | **Average score mean ± SD** |
| Q4: How manageable was it to follow the combination pain regimen? | | | | |
| Phase II ($n^{\dagger} = 87$) | 77 (88.5%) | 6 (6.9%) | 4 (4.6%) | 1.5 ± 0.9 |

*Note*: For Q1, Q2, and Q3, satisfaction scores range from 1 (extremely unsatisfied) to 5 (extremely satisfied). For Q4, please note the scale change, where scores range from 1 (easy) to 5 (difficult). If applicable, $n^{\dagger}$ denotes the sample size after removing missing values.

and local level, that faculty were up-to-date on the literature regarding postoperative opioid-prescribing practices, and that they (and/or their residents) were prescribing appropriate amounts of opioids. Faculty were neutral regarding their certainty of prescribed opioids being used by only "the patient" and in their ability to screen patients for signs of addiction or withdrawal. Additionally, they were unsure if prescribing fewer opioids would affect pain control or patient satisfaction scores.

In Phase I, a majority of faculty did not believe that there was adequate patient education regarding the disposal of unused opioids, but this perspective improved in Phase II. Faculty in both phases disagreed with the idea of enforcing disposal contracts in place of changing prescribing habits. Most agreed that they would be willing to follow an evidence-based guideline for postoperative pain prescriptions in their practice, but only if there was an easy way to provide RF. Most also agreed that it would be a good idea to develop prescribing guidelines for residents.

In Phase II, 14 faculty physicians responded that they followed prescribing guidelines, whereas 2 were unsure. A majority of the physicians in Phase II agreed that the guidelines reduced the number of opioids prescribed at our institution, but they were unsure if the guidelines impacted patient satisfaction scores. These results are provided in detail in Table S9.

## 4 | DISCUSSION

Implementing evidence-based postoperative opioid-prescribing guidelines decreased the amount of opioid prescribed without affecting patient satisfaction among four major head and neck surgeries. Below, we discuss the guidelines' impact on: (1) opioid-prescribing practices, (2) patient satisfaction, and (3) institutional perceptions on the opioid epidemic and prescribing guidelines. Ultimately, our data support the known phenomenon that patients will use a set percentage of their opioid prescription regardless of the total number of pills prescribed.[7]

### 4.1 | Impact of guidelines on opioid-prescribing practices

#### 4.1.1 | Non-TORS

For sialendoscopy, our guidelines reduced the average percent of opioids prescribed by 52.9%, yet contrary to our expectations, the proportion of unused MME increased by 16% compared with Phase I. Although not statistically significant, these findings suggest that the amount of prescribed opioids for sialendoscopy can be further reduced. This is consistent with conclusions drawn from other groups suggesting that most patients after sialendoscopy experience mild-to-no pain postoperatively and, therefore, do not require large quantities of opioids.[8] Based on our findings, we continue to recommend that a maximum of 37.5 MME (5 pills) be prescribed for sialendoscopy procedures, but suspect that patients can be adequately managed on an entirely nonopioid regimen. Emphasis should be placed on educating patients about the importance of maximizing nonopioid medication schedules while reserving opioids for breakthrough pain.

Among parotidectomy patients, there was a significant reduction in prescribed MME (−62.9% from Phase I) and MME usage without a change in the proportion of unused opioids or pain scores. Although

there were more patients on ACE inhibitors in Phase II, there is no literature indicating a clinically relevant impact of ACE inhibitors on pain; therefore, we do not believe this baseline difference contributed to our opioid use outcomes. Furthermore, despite prescribing fewer opioids, pain trends did not change between phases. Therefore, we continue to recommend that a maximum of 37.5 MME (5 pills) be prescribed for parotidectomy procedures, but suspect that nonopioid analgesia may be adequate. This is consistent with other studies reporting that pain from superficial parotidectomies can be managed with mild analgesics.[9]

In the thyroid/parathyroidectomy cohort, there was a significant reduction of prescribed MME by 63.8%, but the amount of used opioids and proportion of unused opioids was not changed. Therefore, we continue to recommend that a maximum of 37.5 MME (5 pills) be prescribed for thyroid/parathyroidectomy procedures, but again suspect that nonopioid analgesia may be adequate. This is consistent with literature suggesting that patients undergoing these surgeries need little-to-no postoperative opioids.[10]

#### 4.1.2 | Transoral robotic surgery

TORS is a high-pain procedure,[1,11,12] likely due to the disruption of mucosal neurovasculature.[13] Ultimately, we found that 28 doses of liquid oxycodone (equivalent to 28 pills) provided adequate analgesia for 68% of the TORS population. For the remaining 32% of patients, pain was adequately controlled with one RF. Therefore, we continue to recommend that 210 MME (28 pills) be initially prescribed for TORS procedures in conjunction with nonopioid analgesia. RF should be provided as needed.

There was a significantly higher RF rate among TORS patients than non-TORS patients. However, we did not collect data on the opioid usage of these RF. Therefore, our data likely underestimates the true amount of opioids prescribed and used for TORS. Among the RF group, there was a higher incidence of alcohol use disorder but lower incidence of ACE-inhibitor use. Alcohol use disorder has been associated with increased postoperative opioid use[14,15]; nonetheless, only 20% had this diagnosis documented. Additional explanations for the refill rate may include the surgical indication and the extent of resection. Further research is needed to better understand how clinicians can identify patients who may experience prolonged postoperative pain and require additional analgesia.

#### 4.1.3 | Multimodal analgesia

Some studies have shown acetaminophen and NSAIDs to be better or equivalent to opioids; thus, failure of patients to use nonopioid medications appropriately may lead to more opioid use.[16] Among the procedures we studied, acetaminophen/NSAIDs usage ranged between 53% and 89.3%, suggesting that multimodal analgesia was underused as per our guidelines and that adherence to the initial postoperative nonopioid analgesia regimen can be further improved. Efforts should be made to provide adequate counseling to patients regarding the importance of scheduled nonopioid analgesia in order to maximize pain control and prevent breakthrough pain.

### 4.2 | Impact of guidelines on patient satisfaction

Patient satisfaction with our care did not change after guideline implementation. Regarding pain management, there was no overall significant difference in satisfaction; however, there was a small but significant increase in dissatisfaction between the two phases of our study. Since these data were collected anonymously, we cannot be certain of the factors that explain this difference.

Most patients (88.5%) found our guidelines at least somewhat easy to follow and most (84.5%) were also satisfied with the education materials that set pain expectations. Since the data were collected anonymously, we were unable to assess whether satisfaction scores were impacted by perceived complexity of the regimen. As we strive to optimize pain control and reduce opioid use by providing multimodal analgesia in lieu of opioids, medications regimens become inherently more complicated and difficult to follow. It is essential to continue assessing patients' health literacy and likelihood of adhering to complex pain regimens. Patients may not want to admit that they found the regimen difficult or may be unaware that they followed it incorrectly.

Health literacy has been shown to independently predict greater medication regimen comprehension and adherence.[17,18] Additionally, several studies have demonstrated that visual aids improve medication regimen comprehension and adherence.[17,19–21] This effect is especially evident among elderly patients, patients with low health literacy, and patients with polypharmacy.[17,21,22] Development of tools and visual aids to assist with more complex regimens may be worth pursuing to further optimize patient outcomes and pain control.

### 4.3 | Impact of guidelines on institutional perceptions

The only significant change that we observed among faculty attitudes was in regards to patient education of proper opioid disposal. Since this was not a facet of our guidelines, we suspect this change was due to other initiatives. The majority of faculty were supportive of evidence-based guidelines for prescribing postoperative opioids for themselves and their residents, but they were unsure how these guidelines impacted patient satisfaction. Our findings allow physicians to take comfort in the fact that reducing the quantity of prescribed opioids will not affect patients' pain control or satisfaction scores.

### 4.4 | Limitations

The limitations associated with survey studies are applicable, particularly response bias, recall bias, and attrition bias secondary to the

nonresponse rate. We suspect that the nonresponse rate was primarily due to challenges in delivering paper surveys within the typical work-flow of a busy clinical practice. In an attempt to reduce recall bias, patients were provided the POPQ immediately upon discharge to follow their pain experience; however, patients were also given the opportunity to fill out a new POPQ at their first postoperative visit if they did not bring their completed form. It should be noted that from May 2019 to March 2020, participants completed in-office paper surveys, while telephone surveys were conducted from April 2020 to May 2020 due to the Coronavirus disease 2019 pandemic. Although the use of telephone surveys reduced the nonresponse rate, those patients surveyed over the phone did lose the visual aids of the paper survey, which can influence survey responses.[23,24]

## 5 | CONCLUSION

Implementation of opioid-prescribing guidelines and use of multimodal analgesia substantially reduced the amount of opioids prescribed across all procedures without changing the proportion of unused opioids. Pain control and patient satisfaction were also overall unchanged. Therefore, our findings suggest that 37.5 MME for non-TORS procedures and 210 MME for TORS procedures are appropriate recommendations. Approximately 30% of TORS patients required one RF, suggesting that there may be room for further optimization based on patient characteristics. There remains room for the development of additional guidelines and improvement in the use of nonopioid analgesia.

### ACKNOWLEDGMENTS

We thank Zach Gandee for his dedication and contributions to Phase I of this study and support in the continuation of Phase II. We also thank Jennifer Wilson for her editorial expertise and dedication toward supporting medical writing. Publication made possible in part by support from the Thomas Jefferson University Open Access Fund.

### ORCID

*Kelly Daniels* https://orcid.org/0000-0001-6938-512X
*Sophia Dang* https://orcid.org/0000-0002-4721-4415
*Jonathan C. Li* https://orcid.org/0000-0002-0916-6678
*Alexander Duffy* https://orcid.org/0000-0001-6847-442X
*Adam Luginbuhl* https://orcid.org/0000-0001-7682-3108
*Elizabeth Cottrill* https://orcid.org/0000-0001-5861-5428

### REFERENCES

1. Dang S, Duffy A, Li JC, et al. Postoperative opioid-prescribing practices in otolaryngology: a multiphasic study. *Laryngoscope*. 2020;130(3):659-665. doi:10.1002/lary.28101
2. Thiels CA, Ubl DS, Yost KJ, et al. Results of a prospective, multicenter initiative aimed at developing opioid-prescribing guidelines after surgery. *Ann Surg*. 2018;268(3):457-468. doi:10.1097/SLA.0000000000002919
3. Militsakh O, Lydiatt W, Lydiatt D, et al. Development of multimodal analgesia pathways in outpatient thyroid and parathyroid surgery and association with postoperative opioid prescription patterns. *JAMA Otolaryngol Neck Surg*. 2018;144(11):1023-1029. doi:10.1001/jamaoto.2018.0987
4. Li RJ, Li ML, Leon E, et al. Comparison of opioid utilization patterns after major head and neck procedures between Hong Kong and the United States. *JAMA Otolaryngol Neck Surg*. 2018;144(11):1060-1065. doi:10.1001/jamaoto.2018.1787
5. Carpenter PS, Shepherd HM, McCrary H, et al. Association of Celecoxib use with Decreased Opioid Requirements after Head and Neck Cancer Surgery with Free Tissue Reconstruction. *JAMA Otolaryngol Neck Surg*. 2018;144(11):988-994. doi:10.1001/jamaoto.2018.0284
6. Townsend M, Liou T, Kallogjeri D, et al. Effect of perioperative gabapentin use on postsurgical pain in patients undergoing head and neck mucosal surgery: a randomized clinical trial. *JAMA Otolaryngol Neck Surg*. 2018;144(11):959-966. doi:10.1001/jamaoto.2018.0282
7. Howard R, Fry B, Gunaseelan V, et al. Association of opioid prescribing with opioid consumption after Surgery in Michigan. *JAMA Surg*. 2019;154(1):e184234. doi:10.1001/jamasurg.2018.4234
8. Jokela J, Haapaniemi A, Mäkitie A, Saarinen R. Sialendoscopy under local anaesthesia. *Acta Otolaryngol (Stockh)*. 2017;137(3):310-314. doi:10.1080/00016489.2016.1230681
9. Foghsgaard S, Foghsgaard J, Homøe P. Early post-operative morbidity after superficial parotidectomy: a prospective study concerning pain and resumption of normal activity. *Clin Otolaryngol*. 2007;32(1):54-57.
10. Shindo M, Lim J, Leon E, Moneta L, Li R, Quintanilla-Dieck L. Opioid prescribing practice and needs in thyroid and parathyroid surgery. *JAMA Otolaryngol Neck Surg*. 2018;144(12):1098-1103. doi:10.1001/jamaoto.2018.2427
11. Scott SI, Madsen AKØ, Rubek N, Channir HI, Kehlet H, von Buchwald C. Time course of subacute pain after transoral robotic surgery (TORS) for oropharyngeal squamous cell carcinoma versus traditional bilateral tonsillectomy in adults - a case-control study. *Acta Otolaryngol (Stockh)*. 2018;138(9):837-842. doi:10.1080/00016489.2018.1461238
12. Slama K, Slouka D, Slipka J, Fischer S. Short-term postoperative distress associated with open vs. transoral robotic surgery (TORS) in patients with T1-T2 carcinomas of the tongue base and supraglottis. *Biomed Pap*. 2016;160(3):423-428. doi:10.5507/bp.2016.015
13. Chesné J, Cardoso V, Veiga-Fernandes H. Neuro-immune regulation of mucosal physiology. *Mucosal Immunol*. 2019;12(1):10-20. doi:10.1038/s41385-018-0063-y
14. Hah JM, Cramer E, Hilmoe H, et al. Factors associated with acute pain estimation, postoperative pain resolution, opioid cessation, and recovery: secondary analysis of a randomized clinical trial. *JAMA Netw Open*. 2019;2(3):e190168. doi:10.1001/jamanetworkopen.2019.0168
15. Zhao S, Chen F, Feng A, Han W, Zhang Y. Risk factors and prevention strategies for postoperative opioid abuse. *Pain Res Manag*. 2019;2019:7490801. doi:10.1155/2019/7490801
16. Moore RA, Derry S, Aldington D, Wiffen PJ. Single dose oral analgesics for acute postoperative pain in adults - an overview of Cochrane reviews. *Cochrane Database Syst Rev*. 2015;9:CD008659. doi:10.1002/14651858.CD008659.pub3
17. Schillinger D, Machtinger EL, Wang F, Palacios J, Rodriguez M, Bindman A. Language, literacy, and communication regarding medication in an anticoagulation clinic: a comparison of verbal vs visual assessment. *J Health Commun*. 2006;11(7):651-664. doi:10.1080/10810730600934500
18. Miller TA. Health literacy and adherence to medical treatment in chronic and acute illness: a meta-analysis. *Patient Educ Couns*. 2016;99(7):1079-1086. doi:10.1016/j.pec.2016.01.020
19. Katz MG, Kripalani S, Weiss BD. Use of pictorial aids in medication instructions: a review of the literature. *Am J Health Syst Pharm*. 2006;63(23):2391-2397. doi:10.2146/ajhp060162
20. Machtinger EL, Wang F, Chen L-L, Rodriguez M, Wu S, Schillinger D. A visual medication schedule to improve anticoagulation control: a randomized, controlled trial. *Jt Comm J Qual Patient Saf*. 2007;33(10):625-635. doi:10.1016/S1553-7250(07)33072-9
21. Yeung DL, Alvarez KS, Quinones ME, et al. Low–health literacy flashcards & mobile video reinforcement to improve medication adherence in patients on oral diabetes, heart failure, and hypertension

medications. *J Am Pharm Assoc*. 2017;57(1):30-37. doi:10.1016/j.japh.2016.08.012
22. Kripalani S, Schmotzer B, Jacobson TA. Improving medication adherence through graphically enhanced interventions in coronary heart disease (IMAGE-CHD): a randomized controlled trial. *J Gen Intern Med*. 2012;27(12):1609-1617. doi:10.1007/s11606-012-2136-z
23. Jones T, Baxter M, Khanduja V. A quick guide to survey research. *Ann R Coll Surg Engl*. 2013;95(1):5-7. doi:10.1308/003588413X13511609956372
24. Kempf AM, Remington PL. New challenges for telephone survey research in the twenty-first century. *Annu Rev Public Health*. 2007;28:113-126. doi:10.1146/annurev.publhealth.28.021406.144059

## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

**How to cite this article:** Rana T, Daniels K, Dang S, et al. Postoperative opioid-prescribing practices in otolaryngology: Evidence-based guideline outcomes. *Laryngoscope Investigative Otolaryngology*. 2023;8(1):313-321. doi:10.1002/lio2.990