

## ORIGINAL RESEARCH

# Postoperative opioid use following head and neck endocrine surgery: A multi-center prospective study

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## Abstract

**Background:** Opioid abuse is widespread in North America and the over-prescription of opioids are a contributing factor. The goal of this prospective study was to quantify over-prescription rates, evaluate postoperative experiences of pain, and understand the impact of peri-operative factors such as adequate pain counseling and use of non-opioid analgesia.

**Methods:** Consecutive recruitment of patients undergoing head and neck endocrine surgery was undertaken from January 1st 2020 to December 31st 2021 at four Canadian hospitals in Ontario and Nova Scotia. Postoperative tracking of pain levels and analgesic requirements were employed. Chart review and preoperative and postoperative surveys provided information on counseling, use of local anesthesia, and disposal plans.

**Results:** A total of 125 adult patients were included in the final analysis. Total thyroidectomy was the most common procedure (40.8%). Median use of opioid tablets was 2 (IQR 0–4), with 79.5% of prescribed tablets unused. Patients who reported inadequate counseling ( $n = 35$ , 28.0%) were more likely to use opioids (57.2% vs. 37.8%,  $p < .05$ ) and less likely to use non-opioid analgesia in the early postoperative course (42.9% vs. 63.3%,  $p < .05$ ). Patients who received local anesthesia peri-operatively (46.4%,  $n = 58$ ) reported less severe pain on average [2.86 (2.13) vs. 4.86 (2.19),  $p < .05$ ] and used less analgesia on postoperative day one [0 MME (IQR 0–4) vs. 4 MME (IQR 0–8),  $p < .05$ ].

**Conclusion:** Over-prescription of opioid analgesia following head and neck endocrine surgery is common. Patient counseling, use of non-opioid analgesia, and peri-operative local anesthesia were important factors in narcotic use reduction.

**Level of evidence:** Level 3.

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## KEYWORDS

endocrine, opioid, quality improvement, thyroid

## 1 | INTRODUCTION

The opioid crisis is a well-documented phenomenon which has heavily impacted North Americans over the past two decades.<sup>1,2</sup> Opioid toxicity deaths in Canada have increased steadily each year from 7.8 per 100,000 standard population in 2016 to 19.1 per 100,000 in 2021.<sup>2</sup> Postoperative use of opioids has become an integral part of peri-operative analgesia and often becomes patients' first exposure to narcotics.<sup>3-5</sup> Although the intention is for short-term use aiding in postoperative pain control, roughly one in 20 opioid-naïve patients undergoing head and neck endocrine surgery continue to use narcotics 90 days following their procedure.<sup>5</sup> With the known risks associated with long-term opioid use and misuse, quantifying over-prescription, understanding postoperative analgesic requirements, and creating prescribing guidelines become important public health priorities.

Numerous studies have described over-prescription rates in surgery broadly and Otolaryngology—Head and Neck Surgery (OHNS) specifically.<sup>6-9</sup> A previous study from our center found that 78.5% of patients undergoing an OHNS procedure were left with unused opioids following their postoperative course.<sup>10</sup> More than half of these patients kept their unused narcotics at home for future use, a known risk factor for opioid diversion and misuse.<sup>10</sup> Several public health campaigns, such as Opioid Wisely Canada™, have sought to inform practitioners and the public of the harms related to opioid use.<sup>11</sup> While such initiatives are an integral part of the solution, understanding procedure-specific analgesic requirements is a fundamental step in limiting over-prescription. Use of multi-modal analgesia (MMA) regimens, incorporating ibuprofen and acetaminophen, have been shown to reduce overall opioid consumption.<sup>12,13</sup> However, given the complexity and psychological nature of pain, there will often exist a minority of patients who report higher pain scores postoperatively, use a disproportionate amount of analgesics, and experience pain for longer periods.<sup>14</sup> The challenge becomes how to reduce overall over-prescription and unnecessary consumption while limiting the number of patients who experience unmanaged pain.

The goal of this prospective study was to quantify over-prescription rates, evaluate postoperative experiences of pain, and understand the impact of peri-operative factors such as adequate pain counseling and use of non-opioid analgesia. Given the variable rates of opioid-related morbidity across various public health jurisdictions in Canada, we elected to perform a multi-center study including four hospitals across two provinces. Incorporating multiple sites with inherently different patient populations may improve nation-wide generalizability and enable thoughtful recommendations based on the results of this study.

## 2 | METHODS

A prospective observational study was undertaken from January 1st 2020 to December 31st 2021 at four Canadian hospitals: Sunnybrook Health Sciences Centre (Toronto, ON), Mount Sinai Hospital (Toronto, ON), the Queen Elizabeth II Health Sciences Centre (Halifax, NS), and Hants Community Hospital (Windsor, NS). Ethics approval was obtained from Clinical Trials Ontario (Study ID: 1757) and the Nova Scotia Health Authority Research Ethics Board (ID: 1025431). Patients were deemed eligible for recruitment if they were 18 years of age or older, opioid naïve (defined as no opioid use in previous 6 months), had no history of opioid use disorder, and undergoing an eligible procedure (total thyroidectomy, partial thyroidectomy, parathyroidectomy, or completion thyroidectomy). Patients were excluded from participation if their procedure included central or lateral neck dissection or they had a planned admission to hospital for greater than two nights.

Eligible patients were recruited into the study at their preoperative visit. Following obtainment of informed consent, a preoperative questionnaire eliciting demographic information, medical history, and medications was administered. Moreover, patients were provided with two informational handouts (from Choosing Wisely Canada©) advising on the side effects and risks associated with opioids and the use of non-opioid analgesia.

Postoperatively, patients were asked to track the following parameters for 7 days: Daily maximum pain level (Wong-Baker pain FACES rating scale, out of 10), use of prescription pain medication, use of non-opioid analgesia, and side effects. The option was provided to track this information daily on paper forms or online on our study-specific Research Electronic Data Capture (REDCap®) database (hosted by Clinical Trial Services at Sunnybrook Health Sciences Centre). Other chart information gathered included duration of hospital admission, use of peri-operative local anesthesia, and postoperative prescription details. One week postoperatively, a final questionnaire was administered evaluating overall satisfaction with pain management counseling, requirement of prescription refills, and disposal plan of unused opioids.

The primary outcome of the study was usage of opioid medication postoperatively. Usage rates were reported as median values with corresponding inter-quartile range. Pain scores were reported as means (SD). Continuous variables were compared using two-tailed *t*-test and categorical variables using Chi-square test. Analysis was performed using SPSS® version 26.0 (SPSS, Chicago, IL).

## 3 | RESULTS

### 3.1 | Study population

During the study period, a total of 140 patients were recruited. Of these, 125 patients were included in the final analysis as they met

inclusion criteria and completed all pertinent study documentation in full (Table 1). Fifteen patients were excluded due to incomplete data ( $n = 13$ ) or hospital stay beyond two nights ( $n = 2$ ). The median age of the final cohort was 51 years (IQR 37–62), with a female predominance ( $n = 77$ , 61.6%). The most common procedure was total thyroidectomy ( $n = 51$ , 40.8%), followed by partial ( $n = 49$ , 39.2%),

parathyroidectomy ( $n = 20$ , 16.8%), and completion thyroidectomy ( $n = 5$ , 4.0%).

**TABLE 1** Patient characteristics

Age, median (IQR)	51 (37–62)
Sex, $n$ (%)	
Male	48 (36.8)
Female	77 (61.6)
Prefer not to say	2 (1.6)
Surgery type, $n$ (%)	
Total thyroidectomy	51 (40.8)
Partial thyroidectomy	49 (39.2)
Parathyroidectomy	20 (16.8)
Completion thyroidectomy	5 (4.0)

**TABLE 2** Opioid medication prescribed

Medication prescribed	$n$ (%)	Tablets prescribed median (min–max)	MME* median (min–max)
Acetaminophen/Codeine	47 (37.6)	20 (15–30)	90 (68–135)
Hydromorphone	43 (34.4)	15 (12–20)	60 (48–80)
Acetaminophen/Oxycodone	7 (5.6)	20 (20–30)	150 (150–225)
Tramadol	6 (4.8)	19 (8–30)	95 (40–150)
Oxycodone	5 (4.0)	30 (20–30)	225 (150–225)
No opioid prescription	17 (13.6)	N/A	N/A

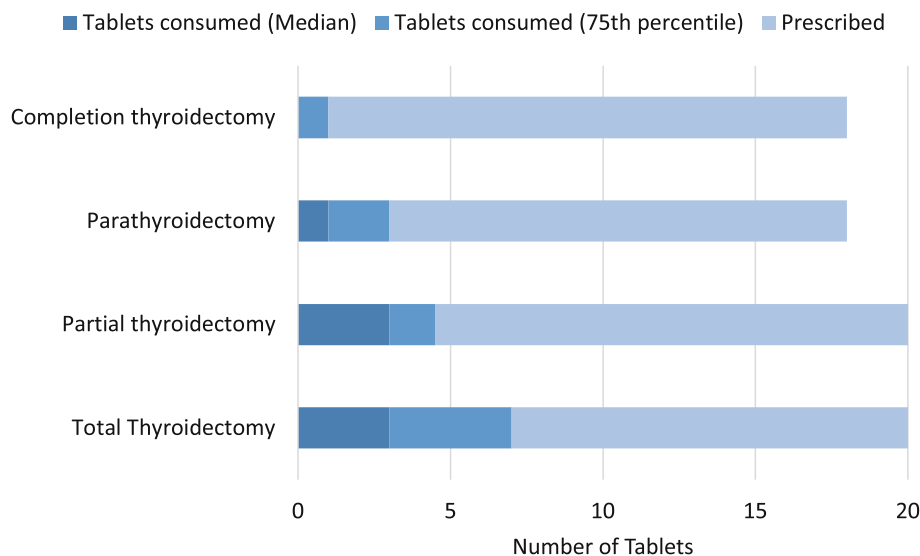
\*MME = Morphine Milligram Equivalent (mg).

### 3.2 | Postoperative analgesic use, pain scores, and side effects

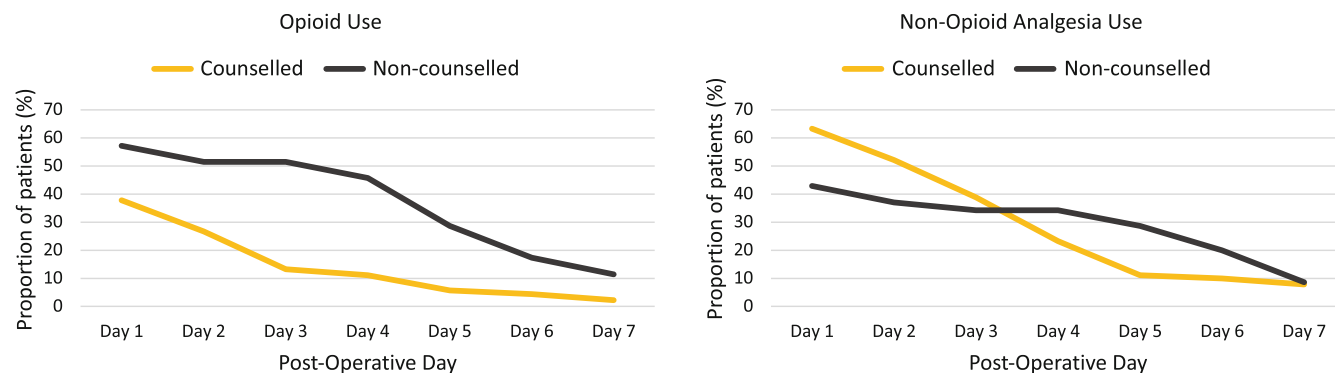
The most prescribed medication was Acetaminophen/Codeine ( $n = 47$ , 37.6%), with the distribution of opioid analgesics detailed in Table 2. Seventeen patients did not receive a prescription postoperatively (13.6%). Of those that did receive a prescription ( $n = 108$ , 86.4%), the median morphine milligram equivalents (MME) prescribed was 80 mg (IQR 48–90). Median use of postoperative opioid analgesia was 8 mg (IQR 0–16) MME, with a median number of 2 (IQR 0–4) tablets (Figure 1). Mean postoperative use was 12.49 mg (SD 19.83) MME.

Non-opioid analgesia was used by 68.8% of patients ( $n = 86/125$ ), with more patients using acetaminophen ( $n = 82$ , 65.6%) over ibuprofen ( $n = 14$ , 11.2%). Two patients reported use of gabapentin. In total, 72.0% ( $n = 90$ ) of patients were satisfied with their peri-operative pain management counseling. Patients who reported inadequate counseling ( $n = 35$ , 28.0%) were more likely to use opioids (57.2% vs. 37.8%,  $p < .05$ ) and less likely to use non-opioid analgesia in the early postoperative course (42.9% vs. 63.3%,  $p < .05$ ; Figure 2).

Median pain score reported on postoperative day one was 4 (IQR 2–5.25), with roughly 10.4% ( $n = 13$ ) of patients reporting severe pain (score 7–10). Recorded pain scores followed a steady downtrend with 76.0% ( $n = 95$ ) of patients reporting only mild pain (score 0–3) by postoperative day 4. Patients who received local anesthesia pre-precision with lidocaine 1% with 1:100,000 epinephrine (46.4%,  $n = 58$ ) reported less severe pain on average [2.86 (2.13) vs. 4.86 (2.19),  $p < .05$ ] and used less analgesia on postoperative day 1 [0 MME (IQR 0–4) vs. 4 MME (IQR 0–8),  $p < .05$ ]. No use of bupivacaine or cervical plexus blocks were reported. Reported pain scores and analgesic use was similar between groups on postoperative day 2 and beyond.



**FIGURE 1** Opioid medications prescribed and consumed in the postoperative period. Bars detail median tablets consumed, 75th percentile of tablets consumed, and median tablets prescribed for each corresponding procedure



**FIGURE 2** Opioid and non-opioid analgesia use in patients who received adequate counseling versus those who did not. Proportion (%) of total patients is reported for each of the first seven postoperative days

**TABLE 3** Leftover prescription opioid disposal plan

Disposal plan	N (%)
Keep at home for future use	45 (36%)
Did not fill prescription	33 (26.4%)
Garbage	9 (7.2%)
Return to pharmacy	11 (8.8%)
Return to physician	0
No prescription given	17 (13.6%)
Unsure what to do	5 (4%)
No medication left	5 (4%)

Overall, 40.8% ( $n = 51$ ) of patients reported at least one side effect, with the most common being constipation (32.8%,  $n = 41$ ), weakness/fatigue (16%,  $n = 20$ ), and nausea (13.6%,  $n = 17$ ). There were no severe adverse medication reactions reported.

### 3.3 | Unused opioids, disposal plans

Most opioid analgesic tablets prescribed were unused in the immediate postoperative period ( $n = 1648/2072$ , 79.5%). There were 50 patients who either did not fill their prescription ( $n = 33$ , 26.4%) or did not receive one from their physician ( $n = 17$ ,  $n = 13.6\%$ ). No patients in the study phoned in for a prescription refill. Regarding disposal of unused opioids, most patients elected to keep at home for future use ( $n = 45$ , 36%). Other disposal plans are detailed in Table 3.

## 4 | DISCUSSION

Opioid-related morbidity and mortality has increased dramatically in Canada in the past 5 years.<sup>2</sup> In 2021, opioid toxicity deaths reached an all-time high of 19.1 per 100,000 amongst Canadians.<sup>2</sup> In the United States, these numbers are even more dramatic, with over 50,000 Americans dying annually due to opioid overdose.<sup>15</sup> Physicians play a

vital role in limiting the number of prescription opioid medications available to only what is necessary. This is particularly important as up to 80% of chronic narcotic users were first exposed through prescription opioids.<sup>16,17</sup> The problem of over-prescription has been well-documented in the literature.<sup>6,7,16</sup> Despite increased national public health efforts and physician awareness of the harms associated with opioid misuse since our previous study,<sup>10</sup> we continued to observe significant over-prescription. In total, 79.5% of prescribed opioids in this study were unused in the postoperative period, with a median use of only 2 pills per patient, regardless of opioid type. Adequate peri-operative pain counseling and use of non-opioid analgesia were associated with reduced use of narcotics. These opioid-protective measures were underutilized with only 42.9% of inadequately counseled patients using non-opioid analgesia postoperatively.

This multi-center study revealed ongoing over-prescription broadly despite targeted provincial and national programs to tackle this issue.<sup>11</sup> Interestingly, there was a wide range of prescribing practices, with 13.6% of patients receiving no opioid prescription, while some patients receiving upwards of 225 morphine milligram equivalents. Presence of an initial prescription was not a predictor of who sought out further medication as no patients requested a refill. Even though all patients received two informational handouts about postoperative pain management and opioids, it was clear that this was not a substitute for pain management counseling. The 28% of patients who reported inadequate counseling were more likely to report pain, more likely to consume opioids, and less likely to use non-opioid analgesia. Standardized peri-operative counseling for every patient, while time consuming, has a demonstrable effect on reducing opioid consumption for head and neck endocrine surgery.<sup>14</sup> Our findings support previous studies that note that the patient education and empowerment may be the most important factor in reducing narcotic use.<sup>14,18</sup> Peri-operative use of local anesthesia was also associated with reduced opioid use on the first postoperative day. Although the daily trajectory of pain experienced was similar between those who received local anesthesia and those who did not, adequate pain management in the early postoperative period is crucial to recovery.<sup>19,20</sup> Patients who report lower pain are more likely to ambulate, remain hydrated, and obtain adequate

nutrition.<sup>19-21</sup> Such parameters are especially important when moving toward outpatient endocrine surgery.

The lack of uniformity in prescribing and counseling within the four centers in this study may act as a catalyst for the implementation of formalized programs or policies. Enhanced recovery after surgery (ERAS) protocols are an example of such policy and have been associated with reduced opioid consumption.<sup>20</sup> ERAS implementation often involves patient education, preoperative administration of non-opioid analgesia and anti-emetics, and judicious use of postoperative narcotics.<sup>20,21</sup> In our study, we found that only 11.2% of patients used ibuprofen postoperatively. Given the understanding that ibuprofen is a safe and valuable analgesic option, a formalized policy, such as an ERAS protocol, could serve to educate patients and improve usage rates. Similar outcomes could be expected with other important analgesic modalities such as gabapentin, which was utilized by only 1.6% of patients. This is in line with the recent consensus statement from the American Head and Neck Society (AHNS), which strongly supports multimodality non-opioid regimens as first line management for head and neck endocrine surgery.<sup>22</sup>

The capture of patients in this study, spanning two provinces and four hospitals, supports the generalizability of these data and serves as a basis for practice-changing recommendations. First, consistent peri-operative pain management counseling encouraging the use of non-opioid analgesia is fundamental. Second, the implementation of formalized ERAS protocols and/or MMA regimens can serve as an important component of a head and neck endocrine practice. Moreover, use of local anesthesia, especially when patients are planned for same day surgery, may serve as a useful adjunct for early postoperative recovery. This includes long-acting anesthetic agents and superficial cervical plexus blocks. Third, judicious prescribing of opioids, such as a few tablets (<5) for breakthrough pain only should be encouraged. And lastly, guidance on the appropriate disposal of unused opioids, by returning unused pills to the pharmacy, should be a core component of patient education.

This study has some important limitations. Known factors that could influence opioid use such as mental health diagnoses and socioeconomic status were not accounted for in this study. Recruitment of a larger sample of patients in addition to obtaining these demographic data may have allowed for statistical analyses that control for confounders. Although the study was prospective in nature, each patient was responsible for tracking their postoperative pain and medication use. Similarly, patients were asked to indicate whether they received appropriate counseling. While all patients received the standardized handouts, the definition of what constitutes appropriate counseling may vary from patient to patient. Therefore, there was a heavy reliance on individual patients for complete and accurate data capture. This limitation was partially addressed by sending daily email reminders through REDCap<sup>®</sup> software. Finally, this study did not explore reasons for over-prescription despite a national push away from opioid use. Ultimately, the findings detailed in this study illustrate how ingrained over-prescription has become and the importance of evidence-based solutions in influencing practice change.

## 5 | CONCLUSIONS

In this prospective multi-center study, over-prescription of opioid analgesia following head and neck endocrine surgery was common, with patients using a median 2 tablets of their 20 prescribed during their postoperative course. Patient counseling, use of non-opioid analgesia, and peri-operative local anesthesia were important factors in narcotic use reduction. Formalized protocols focused on these factors and reducing the volume of opioids prescribed may serve to decrease narcotic consumption, thereby reducing the risk of opioid misuse.

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### CONFLICT OF INTEREST STATEMENT

Antoine Eskander has obtained research funds from Merck and is a consultant for Bristol-Myers Squibb. The rest of the authors declare that they have no conflict of interests.

### DATA AVAILABILITY STATEMENT

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request

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