



## Perioperative and Outpatient Pain Management in Endocrine Neck Surgery Patients

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### Abstract

The U.S. has seen dramatic increases in opioid use and drug overdose death rates in recent years and opioids are commonly used during and after surgical procedures. Thyroid and parathyroid surgery are increasingly performed on an outpatient basis leaving patients and their caregivers responsible for carrying out a pain management plan beginning several hours after surgery. Preoperative evaluation and education are the critical first steps of developing the pain management plan. Multimodal analgesia, the use of two or more drugs working through different mechanisms of actions, should be employed in every perioperative time period. When used, opioids should be used at the lowest possible doses, for the shortest period of time. Specifically, we recommend a preoperative bilateral superficial cervical block, preoperative intravenous or oral acetaminophen in lieu of NSAIDs which may increase bleeding risk, judicious use of intraoperative narcotics and antiemetics, and beginning NSAID therapy at postoperative day 2 or 3. If necessary, outpatient opioid prescriptions should be limited in size, enough for 2 to 4 days. Future opportunities for study include standardizing locoregional anesthesia employed during endocrine neck surgery and optimizing outpatient analgesia while decreasing the risk for opioid diversion and chronic use.

### Keywords

Opiates, Outpatient, Thyroid surgery, Parathyroid surgery, Abuse, Reduction

### Introduction

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 by over 5,000 deaths and the percentage involving at least one opioid drug increased to 63.1%. This dramatic surge was largely driven by synthetic opioids such as illicitly manufactured fentanyl and heroin [1]. Likewise, opioid prescribing practices have changed in the U.S. during the new millennium. In 1999, only 180 morphine milligram equivalents (MME) per capita were sold in the U.S. In 2015, 640 MMEs per capita were sold, a decrease from a peak of 782 MMEs in 2010. Annual prescriptions per person and the average days' supply of opioids prescribed also increased from 2006 to 2015. Prescriptions for at least a 30 days' supply increased while prescriptions for a less than 30 days' supply decreased [2]. These shocking numbers are only quantitative descriptions of the opioid crisis that grips the country today. Anecdotes from communities most affected by the crisis humanize the issue and demand a call to action. Though much of the narrative surrounds chronic opioid use that leads to physical

dependence and, in some cases, illegal use, all physicians prescribing opioids shoulder, in part, the burden of the crisis at present. At this critical moment, it is necessary to evaluate all health care settings that rely on opioid therapy, focusing on the quality of opioid and non-opioid pharmacotherapy interventions for pain management.

Opioids play an important role in managing acute intraoperative and post-surgical pain, but they are not without the adverse effects of respiratory sedation, nausea, vomiting, constipation, and physical dependence. The American Society of Anesthesiologists (ASA) Task Force on Acute Pain Management recognizes that there are also

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adverse outcomes associated with the under treatment of perioperative pain: Thromboembolic and pulmonary complications, increased time in the hospital, hospital re-admission, needless suffering, impairment in health-related quality of life and chronic pain development [3]. Moreover, there is evidence that even minor surgery may lead to chronic opioid use. Brummett, et al. found that new, persistent opioid use, defined as opioid prescriptions filled 90 to 180 days postoperatively - well beyond the expected recovery period-was not significantly different in a minor surgery group, which included thyroid and parathyroid surgery, than in a major surgery group, which included colectomy, bariatric surgery and hysterectomy. Both groups had higher rates of new, persistent use than a control group who did not undergo surgery [4].

Thyroid and parathyroid surgery, not unlike many other commonly performed surgical procedures, are increasingly being performed on an outpatient basis [5] to improve the patient experience and more judiciously use healthcare resources. Furthermore, discharging these patients the same day as their surgery has not led to further rates of complications necessitating readmission or re-operation; on the contrary, a recent study found a significant decrease in unplanned 30-day readmission rate between 2012 and 2014 [5]. In 2013, the American Thyroid Association (ATA) released its statement on outpatient thyroidectomy. This statement focuses on preoperative patient selection, intraoperative considerations, and postoperative management. It did not include guidelines on pain management and did not mention postoperative pain other than listing that it should be adequately controlled with oral medications as a discharge criterion [6]. Patients do experience pain following these procedures and pain management is critical to meet other discharge criteria, like the ability to take liquids, to ambulate, to perform essential activities of daily living, and to maintain adequate oxygenation, appropriate vital signs, and blood pressure control [6].

Pain was not found to be a factor that prohibited patients from going home the same day in a study of individuals undergoing thyroid surgery [7]. Thus, pain management is largely left up to patients and their primary caregivers beginning several hours after surgery. A pain management plan that starts prior to the procedure, adequately controls pain, allows for quick return to pre-surgery function, and mitigates the adverse effects of opioids is a critical component of the care for any patient who will undergo thyroid or parathyroid surgery. Ideally, such plans are guided by the six aims of improvement set out by the Institute of Medicine in 2001. When determining pain management protocols, quality interventions included should be safe, effective, patient centered, timely, efficient, and equitable [8].

Current guidelines regarding opioid prescribing, outpatient endocrine neck surgery, postoperative pain management, and outpatient pain management exist in isolation but alone are not sufficient in the current climate of the country's opioid crisis [3,6,9-11]. These guidelines attempt to standardize current medical practice of pain management in perioperative settings. However, it is difficult to state the present role of these interventions in endocrine neck surgery because they are not specific to thyroid and parathyroid surgery patients. This review attempts to compile current literature from multiple disciplines regarding perioperative pain management and apply it to patients undergoing outpatient thyroid or parathyroid surgery in order to identify areas for improvement in quality in outpatient endocrine neck and surgery settings.

## Methods

We reviewed the literature using the MEDLINE database with the following search terms: opioid; opioid therapy; pain management; thyroid surgery, parathyroid surgery; outpatient surgery. Individual searches were combined using AND/OR searches. An additional manual search was performed and the references of retrieved articles from the database search were reviewed. Relevant articles were selected for inclusion.

## Preoperative Considerations

The importance of the preoperative consultation and evaluation cannot be overstated. The ATA, the American Pain Society (APS) and the Interagency Guidelines on Prescribing Opioids for Pain emphasize the importance of the preoperative history, which should include inquiry about health issues (including psychiatric and substance abuse history) assessment of risk for over sedation or respiratory distress, current medications (including chronic pain therapies) previous postoperative treatment and responses, and the patient's preferences for certain pain medications [6,9,11]. Patient education is also a vital component of the preoperative consultation. It is important that each patient planning for surgery has realistic expectations of the postoperative course, and any misconceptions regarding pain or pain medication use should be addressed [9]. In addition to education about the surgery, including risks, benefits, and possible postoperative complications, discussions at preoperative visits should involve pain treatment options, risks of each, tapering pain medications appropriately, and any preoperative changes in the patient's current medication regimen.

A vital piece of the patient history to be taken from the patient is whether or not the patient is on current opioid therapy. For patients on chronic opioid treatment, dose escalations should be avoided [11] and there

is no need to decrease or discontinue chronic opioid use prior to surgery [9]. Pain management decisions for such patients should be made in conjunction with the treating pain doctor [12].

A focus on preoperative patient evaluation and education focuses on quality improvements in the areas of safety, patient-centeredness, and timeliness. Perhaps most notably, the pain management plan should be patient-centered and equitable, without sacrificing the other aspects of quality. Interventions should be implemented that are respectful of and responsive to patients' preferences, needs, and values and should not vary based on an individual's personal characteristics or socioeconomic status. Families and caregivers should be involved when desired and requested. Fear and anxiety that surrounds surgical management of a condition should be relieved as much as possible [8].

### Prescription monitoring programs

There is a role for prescription monitoring programs (PMP) in deciding on a patient's postoperative pain regimen. Some states require prescribing providers to check their PMP before prescribing narcotic medications, and providers should heed the policies set forth by their state or institution. Nonetheless, there is evidence that PMPs are of benefit on at least a societal level. Between 1999 and 2013, states that implemented a program had lower opioid related death rates compared to states that did not. Additionally, programs that monitor four or more drug schedules and require data to be updated at least weekly had greater reductions in opioid related overdoses compared to states without these requirements [13]. In Florida, which had a newly implemented prescription monitoring program, the total opioid volume decreased and the mean MME per transaction decreased significantly between pre- and post-implementation periods compared to Georgia, which had not implemented a PMP during this period. The decrease was equivalent to about 500,000 tablets of hydrocodone 5 mg [14]. It can be argued that the time and effort it takes to check the PMP database for each patient is an additional administrative burden on prescribing physicians and may not have a great enough benefit on individual patients. The American College of Surgeons has committed to promoting PMP databases that are fully functional and interoperable with electronic medical records in their Statement on the Opioid Abuse [15], hopefully reducing the administrative strain associated with using PMPs. However, the population health benefits outweigh the cost of physician time and state resources it takes to run these programs, and the implementation of such programs increase patient safety.

### Preoperative pharmacotherapy

Pharmacologic pain management of postoperative

pain should begin in the immediate preoperative time period. Multimodal analgesia, using two or more pharmacologic agents with different mechanisms of action to treat pain, should be employed whenever possible. Oltman, et al. found that the majority of patients who were treated with a multimodal analgesic regimen that began preoperatively and did not intend to treat with outpatient narcotics were satisfied with their pain treatment strategy and were able to avoid opioid use as an outpatient following thyroid and parathyroid surgery [16]. The American Pain Society recommends a preoperative 200 mg to 400 mg dose of oral celecoxib, if no contraindications, 30 minutes to 1 hour before surgery [9]. Other nonsteroidal anti-inflammatory drugs (NSAIDs), both nonselective and COX-2 selective drugs, have been shown to provide analgesia in thyroid and parathyroid surgery [17,18]. However, NSAIDs are theoretically likely to increase bleeding risk, and a feared complication of central neck surgery is hematoma with subsequent respiratory compromise via airway compression. Increasing the risk of a postoperative hematoma would be counterproductive to the progress that has been made in ensuring the safety of outpatient thyroid and parathyroid surgery. Though, a large retrospective study found that older age, males, those undergoing bilateral thyroid surgery, those with thyroid malignancy, and those with recurrent thyroid disease were at increased risk for postoperative bleeding [19]. If NSAIDs, in general, are contraindicated or if the bleeding risk is deemed too high for an individual, an alternative to preoperative NSAIDs is intravenous or oral acetaminophen [9,20,21]. Additionally, a preoperative dose of gabapentin (600 mg or 1200 mg) or pregabalin (150 mg or 300 mg) one to two hours preoperatively has been recommended [9,22].

### Locoregional anesthesia

The use of locoregional anesthesia has been extensively studied and has been commented on by most of the guidelines that were reviewed for this article. The APS suggests considering site specific regional anesthetic techniques [9]. The ASA recommends that the use of perioperative regional anesthetic techniques be thoughtfully considered in terms of risks and benefits to the individual patient and should reflect the ability of the performing provider's safe application of the block [3]. For wound infiltration with local anesthesia, the APS recommends site specific determination based on evidence showing benefit for a specific surgical procedure [9]. Some suggest that surgical site analgesia with local anesthetic at the end of the procedure does not decrease opioid used in the PACU or total opioid use during the first 24 hours postoperatively [23].

Most locoregional analgesia research for endocrine

neck surgery focuses on the use of superficial and/or deep cervical plexus blocks and wound infiltration with local anesthetics in conjunction with general anesthesia as a means to reduce postoperative pain and narcotic requirements and has had varied results. There is evidence that bilateral superficial cervical plexus blocks do provide perioperative analgesia with lower reported pain scores, less intraoperative analgesia, less postoperative rescue analgesia, and longer times until postoperative analgesia was required [24-28]. However, some studies show that there was no difference between controls and patients receiving bilateral superficial cervical plexus blocks [29,30]. A single institution study showed that pre-incision bilateral superficial and deep cervical plexus blocks required less intraoperative and postoperative narcotic analgesia compared to controls [31]. However, deep cervical blocks tend to be avoided in central neck surgery due to concerns over recurrent laryngeal nerve dysfunction. A systematic review concluded that deep blocks were more likely to lead to serious life threatening complications and are more likely to fail than superficial blocks [32]. One of the most critical components of successful thyroidectomy and parathyroidectomy is avoiding injury to the recurrent laryngeal nerve. Damage to this nerve can lead to voice hoarseness and respiratory compromise. Deep cervical blocks may cause injury to the recurrent laryngeal nerve or thwart attempts at successful intraoperative nerve monitoring.

We recommend preoperative bilateral superficial nerve blocks, if no patient contraindications exist, provided that the surgeon or anesthesiologist can perform an efficacious and safe block [6]. Though the use of cervical plexus blocks has most dimensions of quality, variability in both technique and skill by providers leave room for improvements in effectiveness and efficiency [8]. Furthermore, aerosolized or swallowed topical anesthetics could impede intraoperative nerve monitoring, and should be avoided.

### Intraoperatively

While the attending surgeon should coordinate the entire care of the patient, we believe the anesthetic agents and intraoperative analgesics to be used are beyond the scope of this article and should be managed by the expertise of the anesthesiologist and anesthesia team. However, there are intraoperative considerations that should be discussed by the operating and anesthesia team. The use of locoregional anesthesia, whether performed by the surgeon or anesthesiologist, and the use of a laryngeal electromyography endotracheal tube for recurrent laryngeal nerve monitoring require interdisciplinary coordination.

Additionally, we support continuing multimodal an-

algia intraoperatively. Administration of acetaminophen, parecoxib-a selective COX-2 inhibitor-or a combination of the two prior to the end thyroidectomy or parathyroidectomy have been shown to reduce opioid requirement during the first 24 hours post-operatively [33]. We advocate for the judicious use of both intraoperative narcotics and anti-emetics, as patients undergoing thyroid or parathyroid surgery are at high risk of developing postoperative nausea and vomiting [6,34]. Postoperative nausea and vomiting are not only uncomfortable and worsen the patient's experience but may increase thoracic and abdominal pressures and cause hypertension, all which increase the risk of postoperative bleeding at the surgical site. Intravenous corticosteroids should be considered, if no contraindications exist. Dexamethasone, given intraoperatively, has been shown to be effective for postoperative nausea and vomiting prophylaxis [35-37]. Further, it has been demonstrated that dexamethasone may be protective for dissected parathyroid glands and recurrent laryngeal nerves [38]. Several studies have concluded that a single dose of dexamethasone is protective of vocal function [39,40].

## Postoperative Pain Management

### Acute post-anesthesia care

Both the APS and ASA recommend monitoring of pain in the immediate postoperative period [3,9]. The APS recommends the use of a validated pain assessment tool to monitor patient's pain, though no one tool is recommended. The patient's developmental status, cognitive status, level of consciousness, education level, and language abilities should be considered in determining which assessment tool to employ. Furthermore, it is not sufficient to evaluate the patient at rest only [9]. Following central neck surgery, pain should be assessed at rest, with swallowing, and with gentle extension and flexion of the neck. In addition to monitoring a patient's pain, appropriate monitoring of sedation, respiratory status, signs of hypoventilation or hypoxia, and other adverse events of surgery or medications should take place in the post-anesthesia unit.

Multimodal analgesia, should be continued in the outpatient setting. Multimodal analgesia should include non-opioids-like acetaminophen, NSAIDs, gabapentin, and pregabalin-and opioids, when appropriate. Acetaminophen should be scheduled around the clock beginning in the immediate postoperative period [9], bearing in mind the maximum daily dose to prevent hepatotoxicity. As in the immediate preoperative period, gabapentin and pregabalin have been shown to have significant analgesic effects in the postoperative period. In a review of double blinded placebo controlled trials that studied the effects of gabapentin on postoperative pain, a greater

proportion of patients who took gabapentin reported at least 50% pain relief compared to placebo. The treatment groups also had a lesser proportion of patients using rescue medication [41]. The APS recommends postoperative dosing of gabapentin or pregabalin, though the panel could not determine the most optimal doses [9]. Standardization of agents and dosing would lead to improvements in effectiveness and efficiency of postoperative pain regimens.

In the immediate postoperative period, opioids should be reserved for moderate to severe pain, used in the lowest possible doses, and part of a multimodal pain regimen [11]. Oral, short acting opioid medications are preferable to intravenously administered opioids, and intramuscular administration should be avoided due to pain at the injection site and unreliable absorption [9,11]. If a patient is opioid tolerant, extended release and long acting formulations should not be increased in the immediate postoperative period and the patient's chronic regimen should be resumed as soon as possible [11]. If using opioid therapy for pain management, a bowel regimen should be initiated as soon as possible to reduce opioid induced constipation and new central nervous system depressants should be avoided [11].

Other alternatives to opioids for pain management include nonpharmacological methods such as ice packs or cold compresses [42,43] to decrease incisional pain and neck stretching exercises [44].

## Outpatient pain management

Little has been written on outpatient management of surgical pain as exploration into the topic is challenging to standardize and data is difficult to gather. Education that began in the preoperative setting should be expanded upon before patients are discharged, continuing the focus on patient centeredness and equitability. Patients and their caregivers should be educated about the administration of medications, possible side effects, and appropriate tapering schedules. Patients should be counseled about opioid diversion, and the proper storage and disposal of narcotics should be discussed. Other central nervous system depressants should be avoided while using opioids, and patients should be counseled on the risks of combining these [11].

Multimodal analgesia should be continued in the outpatient setting, as well, with opioids being reserved for moderate to severe pain. Acetaminophen should continue to be scheduled around the clock, again, staying at or below the maximum daily dose in order to avoid hepatotoxicity, and NSAIDs can be added on postoperative day two or three, when the risk of bleeding and hematoma formation is lower [19]. The Interagency Guideline on Prescribing Opioids for Pain recommends not dis-

charging a patient with greater than two weeks supply of opioids, which we see as extremely excessive in thyroid and parathyroid surgery patients, and acknowledge that some surgeries require even less, such as a two to three-day course of short acting opioids. Further, they assert that some patients may require only acetaminophen or NSAIDs and can avoid narcotics altogether in the outpatient setting [11].

Lou, et al. examined narcotic medication requirements after thyroid and parathyroid surgery at two large endocrine surgery centers and found that the median prescribed oral morphine equivalents (OMEQs) was 30, with some patients prescribed 120 OMEQs following surgery. The mean number of OMEQs taken as an outpatient was 3, with some patients taking 60 OMEQs and 31.6% of patients reporting that they took no opioids once they were discharged after surgery [45]. This broad range of prescribing practices, even among just two institutions, highlights the varying practices of physicians and the need for standardization, which would improve quality in the dimensions of safety, effectiveness, and efficiency. Additionally, the broad range of patient consumption highlights the importance of the preoperative evaluation in helping one to assess patients whose pain may be difficult to manage and in creating patient-centered pain management plans. In a study assessing the feasibility and safety of multimodal analgesia without oral narcotics following thyroid and parathyroid surgery, 39% failed the intent to treat without narcotics and were prescribed outpatient opioids [16]. At present, we recommend limiting opioid prescriptions, if needed for moderate to severe pain not controlled by other agents, to 5 to 10 doses that should get the patient through two to four days, past the time period in which postoperative pain is likely to be at its peak [18]. Extra doses given "just in case" to prevent calls or visits from patients should be avoided [12]. Additionally, at this point, it is safe to use NSAIDs, as the risk of central neck bleeding has decreased, and these and acetaminophen may be used in combination for analgesia, as their use together has been shown to be more effective than either alone [16].

Non-pharmacologic methods of analgesia begun in the post-anesthesia unit, like ice packs and neck stretching exercises, should be continued in the outpatient setting. Patients who request additional narcotic medication should be seen in order to rule out complications that could be causing pain and a pain specialist may need to be consulted to handle postsurgical pain that is not typical or worse than expected [12] (Table 1).

## Future Directions

Though this review highlights the solid foundation of knowledge that exists to treat patients' pain, there is

**Table 1:** Keys to Perioperative Pain Management.

<b>Keys to Perioperative Pain Management</b>	
<ul style="list-style-type: none"> <li>• <b>Preoperatively</b> <ol style="list-style-type: none"> <li>1. Patient evaluation and education are of utmost importance in the preoperative clinic consultation.</li> <li>2. Consult the treating pain doctor for patients on chronic opioid therapy.</li> <li>3. Multimodal analgesia should begin in the preoperative setting and continued throughout all perioperative settings.               <ul style="list-style-type: none"> <li>▪ Oral celecoxib (200 mg to 400 mg) 30 minutes to 1 hour before surgery.</li> <li>▪ Gabapentin (600 mg or 1200 mg) <b>OR</b> Pregabalin (150 mg or 300 mg) 1 to 2 hours before surgery.</li> </ul> </li> </ol> </li> </ul>	
<ul style="list-style-type: none"> <li>• <b>Intraoperatively</b> <ol style="list-style-type: none"> <li>1. Consider locoregional anesthesia by evaluating patient factors and provider's expertise and experience.               <ul style="list-style-type: none"> <li>▪ Bilateral superficial cervical plexus block, wound infiltration with local anesthesia, infiltration of local anesthesia at incision site.</li> </ul> </li> <li>2. Anti-emetics should be used judiciously as post-operative nausea and vomiting can increase risk for post-operative bleeding and hematoma formation.               <ul style="list-style-type: none"> <li>▪ Intravenous dexamethasone may reduce post-operative nausea and vomiting and be protective for dissected parathyroid glands and recurrent laryngeal nerves.</li> </ul> </li> </ol> </li> </ul>	
<ul style="list-style-type: none"> <li>• <b>Postoperatively in post-anesthesia care unit</b> <ol style="list-style-type: none"> <li>1. Acetaminophen and NSAIDs should be scheduled, unless patient contraindication exists.</li> <li>2. Short-acting opioids should be reserved for moderate to severe pain and given orally, if tolerated.</li> <li>3. Do not increase extended release or long acting formulations in chronic opioid users.</li> <li>4. Avoid other CNS depressants.</li> <li>5. Consider ice packs and neck stretching exercises.</li> </ol> </li> </ul>	
<ul style="list-style-type: none"> <li>• <b>Postoperatively outpatient</b> <ol style="list-style-type: none"> <li>1. Round the clock, scheduled acetaminophen may be all that a patient requires.</li> <li>2. NSAIDs should be combined with acetaminophen on postoperative day 2 or 3.</li> <li>3. If prescribing opioids for outpatient use, limit prescription to 5-10 doses of oral opioid.</li> <li>4. Initiate bowel regimen ASAP if using opioids.</li> <li>5. Avoid other CNS depressants if using opioids.</li> </ol> </li> </ul>	

much to be explored in optimizing the patient experience and preventing unnecessary narcotic use and subsequent abuse, especially in outpatient thyroid and parathyroid surgery patients. Specifically, two areas have much room for improvement in quality. First, no consensus exists for the use of locoregional anesthesia for thyroid or parathyroid surgery in terms of its effectiveness, or lack thereof, timing, and agents to use [23-31]. This area should further be explored to validate and standardize this procedure improving efficiency and effectiveness. Additionally, there is a paucity of evidence surrounding outpatient post-surgical analgesia, particularly as it pertains to the use of opioids. There is evidence that some thyroid and parathyroid surgery patients use opioids for prolonged periods postoperatively at similar rates to major procedures [4] and that that prescribing practices vary widely among surgeons performing thyroid and parathyroid surgery [45]. In light of the current opioid epidemic in the United States, it is incumbent upon physicians to thoughtfully and responsibly use opioids as part of postoperative pain management plans in order to avoid

physical dependence, transition to illegal use, and diversion. For this reason, surgeons who perform thyroid and parathyroid surgery need evidence based guidelines on what agents, in which doses and for what duration, are likely to be adequate for their patients in order to improve safety, effectiveness, and efficiency of care.

## Conclusion

Thyroid and parathyroid surgery are commonly performed as outpatient procedures. Preoperative evaluation and education are critical components of developing the pain management plan for these patients. Multimodal analgesia, the use of two or more drugs working through different mechanisms of actions, should be employed in every perioperative time period. When used, opioids should be used at the lowest possible doses, for the shortest period of time. Specifically, we recommend a preoperative bilateral superficial cervical block, preoperative intravenous or oral acetaminophen in lieu of NSAIDs which may increase bleeding risk, judicious use of intraoperative narcotics and anti-emetics, and

beginning NSAID therapy at postoperative day 2 or 3. Outpatient opioid prescriptions should be limited in size, enough for 2 to 4 days, if given at all. Future opportunities for study include standardizing locoregional anesthesia employed during endocrine neck surgery and optimizing outpatient analgesia while decreasing the risk for opioid diversion and chronic use.

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