

# Retrospective Cohort Study of Ibuprofen Based Pain Regimen to Reduce Postoperative Opioid Use in Adult Tonsillectomy

Antoinette Esce<sup>1</sup> and Duncan Meiklejohn<sup>1</sup>

<sup>1</sup>University of New Mexico Health Sciences Center

April 16, 2024

## Abstract

**Objectives:** Quantify the effect of a non-opioid pain regimen on postoperative opioid prescriptions filled by the patient after adult tonsillectomy. **Design:** Retrospective cohort study including a time frame before and after a practice change from an opioid/acetaminophen-based postoperative pain regimen to a regimen based on ibuprofen and acetaminophen. Half of study subjects received a prescription for postoperative opioid medications. Half were prescribed ibuprofen following surgery and only provided with opioid analgesia as a rescue medication, where ibuprofen was medically contraindicated, or at patient request following counseling regarding risks of opioids. The New Mexico Prescription Monitoring System was used to verify filled opioid prescriptions. Descriptive statistics and logistic regression were used for data analysis. **Settings:** Tertiary care academic medical center. **Participants:** All elective adult tonsillectomies performed consecutively by a single surgeon. **Main Outcome Measures:** Percent of patients filling an opioid prescription. **Results:** Ninety-nine patients were included in analysis. 53 received an opioid-based postoperative regimen and 46 received an ibuprofen/acetaminophen-based regimen. There was no difference in the bleeding rate between the two groups. Significantly fewer patients in the ibuprofen group filled postoperative opioid prescriptions when compared to the group that did not receive ibuprofen (40% vs. 96.2%,  $p < 0.0001$ ,  $OR = 0.02$ ). **Conclusion:** Ibuprofen is a safe and effective analgesic following adult tonsillectomy and significantly reduces the proportion of patients who fill a postoperative opioid prescription.

## Abstract

**Objectives:** Quantify the effect of a non-opioid pain regimen on postoperative opioid prescriptions filled by the patient after adult tonsillectomy.

**Design :** Retrospective cohort study including a time frame before and after a practice change from an opioid/acetaminophen-based postoperative pain regimen to a regimen based on ibuprofen and acetaminophen. Half of study subjects received a prescription for postoperative opioid medications. Half were prescribed ibuprofen following surgery and only provided with opioid analgesia as a rescue medication, where ibuprofen was medically contraindicated, or at patient request following counseling regarding risks of opioids. The BLINDED FOR REVIEW Prescription Monitoring System was used to verify filled opioid prescriptions. Descriptive statistics and logistic regression were used for data analysis.

**Settings :** Tertiary care academic medical center.

**Participants:** All elective adult tonsillectomies performed consecutively by a single surgeon.

**Main Outcome Measures :** Percent of patients filling an opioid prescription.

**Results:** Ninety-nine patients were included in analysis. 53 received an opioid-based postoperative regimen and 46 received an ibuprofen/acetaminophen-based regimen. There was no difference in the bleeding

rate between the two groups. Significantly fewer patients in the ibuprofen group filled postoperative opioid prescriptions when compared to the group that did not receive ibuprofen (40% vs. 96.2%,  $p < 0.0001$ , OR=0.02).

**Conclusion:** Ibuprofen is a safe and effective analgesic following adult tonsillectomy and significantly reduces the proportion of patients who fill a postoperative opioid prescription.

**Keywords:** evidence based medicine, outcomes, tonsillectomy, Health services research, pharmacology

### Key points:

1. The opioid epidemic is an ongoing public health problem and prescription drug use continues to contribute.
2. Opioid prescriptions for post-operative analgesia varies widely.
3. Ibuprofen is safe and effective for adults following tonsillectomy.
4. An ibuprofen prescription significantly reduces the proportion of patients filling a post-operative opioid prescription following tonsillectomy.
5. The same post-operative ibuprofen prescription also reduced the amount of opioid prescribed.

### Introduction

The Centers for Disease Control (CDC) has classified the current crisis of opioid abuse, misuse, and redirection as an epidemic.(1) Mortality in the United States (US) from prescription drug overdose totaled 14,975 deaths in 2018, and actual fiscal costs have been estimated at close to \$50 billion in the US alone.(2,3) According to the 2019 National Survey on Drug Use and Health, 9.7 million people aged 12 or older reported misusing prescription pain relievers in 2019. Over half of misusers obtained their medication from a friend or relative, and 37.5% obtained them from a health care provider, either through a prescription or by stealing.(4)

Postoperative pain prescriptions have been identified as an inciting factor for opioid misuse, with longer durations of prescription increasing the risk.(5–7) Multiple studies have demonstrated that postoperative opioid prescriptions are variable even across similar procedures, that overprescribing is common, and that the risk of diversion is present.(8–13) Guidelines for safe prescribing in the setting of chronic pain and long-term prescriptions are available through the CDC, however there is a paucity of research on effective and specific postoperative management with opioid-sparing regimens.(14)

Many common otolaryngologic surgeries are excellent candidates for opioid-sparing regimens, as they are frequently outpatient and associated with minimal or limited postoperative pain. The recent clinical practice guideline from the American Academy of Otolaryngology - Head and Neck Surgery (AAO-HNS) on “Opioid Prescribing after Common Otolaryngology Operations,” strongly recommended that “clinicians should advocate for nonopioid medications as first-line management of pain after otolaryngologic surgery.”(15) Despite this, multiple misconceptions among otolaryngologists regarding the relative risks of opioids and NSAIDs were reported in a recent systematic review.(16) In this same study, Cramer et al found multimodal postoperative analgesia with acetaminophen and a non-steroidal anti-inflammatory drug (NSAID) to be safer and more effective than an opioid-based regimen. These findings support other data showing NSAIDs to be at least equianalgesic to opioid-based regimens and capable of reducing the need for narcotic rescue medications.(17–19) Though there is a theoretical concern for increased postoperative bleeding with NSAID use based on their cyclooxygenase (COX) inhibitory activity, data do not support an increased risk of bleeding with non-aspirin NSAIDs in adults.(20–22) Additionally, the use of selective COX-2 inhibitors may reduce even this theoretical risk.

Evaluating the impact of first line nonopioid postoperative analgesia on the consumption of opioids was highlighted as a research need in the AAO-HNS clinical practice guideline.(15) Adult tonsillectomy is an ideal procedure for this type of evaluation, as it is commonly known to result in significant postoperative pain, and practicing otolaryngologists report the largest prescriptions of opioids for tonsillectomy when compared

to other adult otolaryngologic surgical procedures.(8,17) No published literature to date has quantified the benefit of an NSAID-based regimen on postoperative opioid requirement for adult tonsillectomy.

## Objectives

The purpose of our study was to quantify the effect of an NSAID-based, non-opioid pain regimen on postoperative opioid prescriptions filled by the patient.

## Methods

### Ethical Considerations

This study was approved by the Institutional Review Board at the BLINDED FOR REVIEW. The data that support the findings of this study are available from the corresponding author upon reasonable request. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement was used to guide reporting in this observational study.

### Settings

A tertiary care academic medical center in BLINDED FOR REVIEW United States.

### Participants

All elective adult tonsillectomies performed by a single surgeon between June 2, 2017 and September 20, 2019.

### Main Outcome Measures

The primary outcome was consumption of opioids, as indicated by a patient filling any opioid prescription postoperatively, based on the review of the BLINDED FOR REVIEW Prescription Monitoring Program (PMP) online database. A secondary outcome was the initial dispensed quantity of filled opioid prescriptions.

### Design

All elective adult tonsillectomies performed by a single surgeon (BLINDED FOR REVIEW) at a single institution between June 2, 2017 and September 20, 2019 were reviewed. During this time, the surgeon instituted a change in postoperative pain management for quality improvement purposes. Prior to the change, patients were prescribed an opioid analgesic and maximum safe dose of acetaminophen postoperatively and counseled against using ibuprofen (Group 1). After the change, patients were prescribed maximum safe doses of acetaminophen and ibuprofen and counseled by the surgeon about the risks of opioid analgesics (Group 2). For patients in Group 2, opioids were only prescribed as postoperative rescue medications, if NSAID was contraindicated due to an allergy or medical condition, or if specifically requested by the patient preoperatively after receiving counseling on opioid risks and the benefits of an NSAID-based regimen. No patient in either group was denied a prescription for opioid medications if they specifically requested them preoperatively, or if they felt their pain was not adequately controlled postoperatively. All tonsillectomies were performed using a “cold” technique without electrocautery or Coblation. Exclusion criteria included pediatric patients less than 18 years of age at the time of surgery, patients undergoing tonsillectomy for malignancy, and patients undergoing additional procedures such as uvulopalatopharyngoplasty or adenoidectomy.

The primary intervention in this study was the postoperative prescriptions for ibuprofen and acetaminophen. The secondary intervention was counseling regarding the risks of opioid analgesics and the benefits of a non-opioid pain regimen. Additional information collected via chart review included patient demographic information, comorbidities as defined by the patient’s American Society of Anesthesiologists (ASA) Physical Status Score, procedure information, pathology results, relevant patient history related to substance abuse, opioid misuse, chronic pain, or anxiety/depression, any medical contraindications to ibuprofen or acetaminophen, any reported adverse effects from pain medications, and any complications related to the surgical procedure.

Information regarding filled perioperative opioid prescriptions as well as dose and duration was extracted from the PMP website. A waiver was provided by the BLINDED FOR REVIEW Board of Pharmacy to permit use of de-identified information from the PMP website for the purposes of this research study. The website was searched for the patient's identifying information including any known previous names or aliases, and any prescription of any controlled substance tracked by the PMP was recorded for a time period ranging from one month prior to the surgical date to three months after the surgical date. The PMP database was searched for patient records for all states and non-state medical systems participating in the online database (33 of 50 US states, as well as the US Military Health System and Puerto Rico).

Simple student t-tests of two proportions for binary data or nonparametric Mann-Whitney U tests for continuous data were used to compare the primary outcomes and other relevant characteristics between Groups 1 and 2. A subgroup analysis was performed on Group 2 to compare relevant patient factors between those who received ibuprofen and filled an opioid prescription and those who received ibuprofen and did not fill an opioid prescription, though the study was not properly powered to detect a difference in this subgroup. A nonparametric Mann-Whitney U test was used to compare the average initial prescribed opioid dose between groups, as these were not normally distributed. Finally, a multiple logistic regression was designed to evaluate the independent effect of an ibuprofen prescription and counseling on opioid prescription filling while controlling for age, race, and a history of opioid use, substance abuse, chronic pain, or anxiety/depression.

## Results

Ninety-nine patients were identified and included in the analysis. Group 1 contained 53 patients who received a routine postoperative opioid prescription and counseling against ibuprofen use. Group 2 contained 46 patients who received an ibuprofen prescription and counseling regarding the risks of opioid medications. Population level data on various characteristics for each of these groups can be found in Table 1. There was no statistically significant difference in age, ASA score, opioid use, chronic pain, or anxiety/depression between the two groups. Pathology from all cases was consistent with either inflammatory tonsillitis and/or benign tonsillar hypertrophy.

Outcomes are reported in Table 2. Fifty-one of the 53 patients (96.2%) in Group 1 filled a postoperative opioid prescription. Only 18 of the 46 patients (40.0%) in Group 2 filled a postoperative opioid prescription, which was significantly fewer than Group 1 ( $p < 0.001$ ). Sixteen of these 18 patients (88.9%) filled an opioid prescription on postoperative day zero or one. Six of these patients had requested opioids during their preoperative visit.

When averaged to a standard cohort of 50 patients, an ibuprofen prescription and preoperative counseling resulted in a 66.5% reduction in the amount of opioid prescribed for tonsillectomy. The average first quantity of opioid dispensed in morphine equivalents for the patients in Group 1 was  $215\text{mg} \pm 113\text{mg}$ , which is the equivalent of approximately 143mg of oxycodone. The average first quantity of opioid dispensed in morphine equivalents for the patients in Group 2 was  $167\text{mg} \pm 122.5\text{mg}$ , which is the equivalent of approximately 111mg of oxycodone, and significantly less than Group 1 ( $p = 0.04$ ). Based on the data in this study, 50 patients undergoing tonsillectomy without ibuprofen would collectively use 10,300mg in morphine equivalents. This translates to 6,867mg of oxycodone or 1,373 5mg tablets. On the other hand, 50 patients undergoing tonsillectomy with an ibuprofen prescription would collectively use 3,450mg in morphine equivalents. This translates to 2,300mg of oxycodone or 460 5mg tablets.

A subgroup analysis of Group 2 did not find any difference in age, race, or relevant patient factors between those who received ibuprofen and filled an opioid prescription and those who received ibuprofen and did not fill an opioid prescription. There was no statistically significant difference in bleeding rates between Groups 1 and 2 (5.3% vs 2.2%,  $p = 0.42$ ), though this study was not powered to detect any such difference.

A multiple logistic regression controlling for age, race, and a history of opioid use, substance abuse, chronic pain, or anxiety/depression was designed to assess the ability of an ibuprofen prescription to independently predict the likelihood of a filled postoperative opioid prescription. The only statistically significant independent predictor was an ibuprofen prescription, which significantly reduced the odds of a patient filling a

postoperative opioid prescription (OR = 0.02, 95% CI 0.003, 0.09,  $p < 0.001$ ).

## Discussion

The opioid crisis continues to undermine public health in the US, with prescription narcotics accounting for a large proportion of abuse and misuse. Current published research strongly suggests that perioperative prescribing of opioids is a significant factor in this crisis. Surgeons have been reported as being the second largest prescribers of opioids in this country,(23) and as such have a unique opportunity to reduce overall opioid misuse. This retrospective cohort study of a single provider's practice change confirms the benefit of preoperative counseling and a structured, non-opioid based postoperative pain regimen in reducing opioid prescriptions after adult tonsillectomy.

The risks of perioperative opioid prescriptions are well documented. Based on a 2018 AAO-HNS survey, 37 tablets or one week's worth of opioid medication were prescribed on average following adult tonsillectomy, with substantial variability.(8) This amount correlates with the 15% theoretical risk of long-term opioid use with a one week initial prescription reported by the CDC, with the risk accelerating around 3 days and increasing steadily the longer the initial prescription.(7) In addition to the risk of dependence and abuse for the patient, there is also increased community harm from overprescribing of opioids. Many postoperative opioid prescriptions are not used or are overprescribed, creating potential for diversion and abuse.(9–13)

The recent clinical practice guideline from the AAO-HNS released in April 2021 discusses the role of opioid analgesics in postoperative otolaryngologic surgical care and makes several recommendations, including a strong recommendation for the use of nonopioid analgesia whenever possible following surgery. This guideline also emphasized the importance of reducing the number of extra opioids available after surgery.(15) Our study is the first to quantify the effect of a simple practice change in reducing the number of filled opioid prescriptions, thus limiting both patient exposure to opioids as well as the number of extra opioids available in the community for misuse or diversion.

A major strength of this study is a clear intervention with two comparable cohort groups. Though it was not randomized or prospective, provider, procedural technique and hospital factors were consistent, and there was no opportunity for selection bias as the groups were instead split temporally. Though an NSAID-based pain regimen was the main intervention in this study, it is important to note that the prescription was not provided in a vacuum. Changing the default postoperative pain prescription from opioids to ibuprofen required a change in preoperative counseling, which highlighted the risks of opioids and the safety and effectiveness of ibuprofen. This intervention alone may have reduced opioid use postoperatively and likely increased the efficacy of the ibuprofen prescription in preventing opioid use postoperatively.

One weakness of this study was the limitation of our primary outcome variable. While the PMP reports filled opioid prescriptions, it does not track the quantity of medication used by the patient or leftover dispensed medication. Additionally, our study did not assess postoperative pain control or medication side effects, as we were unable to quantify or detail a true side effect rate for analgesic medications based solely on chart review.

Interestingly, for those patients who received an opioid prescription, the initial amount prescribed was significantly lower in Group 2, though variability remained high. It is possible that the practice change or other external factors (such as increased awareness of the opioid crisis) affected the prescribing patterns of providers on the surgical team, leading to reduced initial quantity prescribed. This type of effect correlates with recent research showing reduced postoperative opioid prescribing from external forces such as regulatory changes, implementation of prescription monitoring programs, or implementation of targeted counseling.(24,25)

## Conclusion

Providing a prescription for ibuprofen following adult tonsillectomy along with counseling about the risks of opioid medications significantly decreases the number of filled opioid prescriptions and the initial dose of opioid prescriptions. Further research is necessary to determine otolaryngology specific risk factors for prolonged opioid use following common procedures.

## References

1. Understanding the Epidemic | Drug Overdose | CDC Injury Center [Internet]. 2021 [cited 2021 Apr 12]. Available from: <https://www.cdc.gov/drugoverdose/epidemic/index.html>
2. Wilson N. Drug and Opioid-Involved Overdose Deaths — United States, 2017–2018. MMWR Morb Mortal Wkly Rep [Internet]. 2020 [cited 2021 Apr 12];69. Available from: <https://www.cdc.gov/mmwr/volumes/69/wr/mm6911a4.htm>
3. Oderda GM, Lake J, Rüdell K, Roland CL, Masters ET. Economic Burden of Prescription Opioid Misuse and Abuse: A Systematic Review. *J Pain Palliat Care Pharmacother*. 2015 Oct 2;29(4):388–400.
4. Lipari RN. Key Substance Use and Mental Health Indicators in the United States: Results from the 2019 National Survey on Drug Use and Health. 2019;114.
5. Brat GA, Agniel D, Beam A, Yorkgitis B, Bicket M, Homer M, et al. Postsurgical prescriptions for opioid naive patients and association with overdose and misuse: retrospective cohort study. *BMJ*. 2018 Jan 17;360:j5790.
6. Brummett CM, Waljee JF, Goesling J, Moser S, Lin P, Englesbe MJ, et al. New Persistent Opioid Use After Minor and Major Surgical Procedures in US Adults. *JAMA Surg*. 2017 Jun 21;152(6):e170504.
7. Shah A. Characteristics of Initial Prescription Episodes and Likelihood of Long-Term Opioid Use — United States, 2006–2015. MMWR Morb Mortal Wkly Rep [Internet]. 2017 [cited 2019 Sep 19];66. Available from: <https://www.facebook.com/CDCMMWR>
8. Schwartz MA, Naples JG, Kuo C-L, Falcone TE. Opioid Prescribing Patterns among Otolaryngologists. *Otolaryngol Neck Surg*. 2018 May;158(5):854–9.
9. Rodgers J, Cunningham K, Fitzgerald K, Finnerty E. Opioid consumption following outpatient upper extremity surgery. *J Hand Surg*. 2012 Apr;37(4):645–50.
10. Patel S, Sturm A, Bobian M, Svider PF, Zuliani G, Kridel R. Opioid Use by Patients After Rhinoplasty. *JAMA Facial Plast Surg*. 2018 Jan 1;20(1):24–30.
11. Hill MV, McMahon ML, Stucke RS, Barth RJ. Wide Variation and Excessive Dosage of Opioid Prescriptions for Common General Surgical Procedures. *Ann Surg*. 2017;265(4):709–14.
12. Bartels K, Mayes LM, Dingmann C, Bullard KJ, Hopfer CJ, Binswanger IA. Opioid Use and Storage Patterns by Patients after Hospital Discharge following Surgery. *PloS One*. 2016;11(1):e0147972.
13. Bicket MC, Long JJ, Pronovost PJ, Alexander GC, Wu CL. Prescription Opioid Analgesics Commonly Unused After Surgery: A Systematic Review. *JAMA Surg*. 2017 Nov 1;152(11):1066–71.
14. Chou R, Gordon DB, de Leon-Casasola OA, Rosenberg JM, Bickler S, Brennan T, et al. Management of Postoperative Pain: A Clinical Practice Guideline From the American Pain Society, the American Society of Regional Anesthesia and Pain Medicine, and the American Society of Anesthesiologists' Committee on Regional Anesthesia, Executive Committee, and Administrative Council. *J Pain*. 2016 Feb 1;17(2):131–57.
15. Anne S, Mims J “Whit,” Tunkel DE, Rosenfeld RM, Boisoneau DS, Brenner MJ, et al. Clinical Practice Guideline: Opioid Prescribing for Analgesia After Common Otolaryngology Operations. *Otolaryngol Neck Surg*. 2021 Apr 1;164(2\_suppl):S1–42.
16. Cramer JD, Barnett ML, Anne S, Bateman BT, Rosenfeld RM, Tunkel DE, et al. Nonopioid, Multimodal Analgesia as First-line Therapy After Otolaryngology Operations: Primer on Nonsteroidal Anti-inflammatory Drugs (NSAIDs). *Otolaryngol Neck Surg*. 2021 Apr 1;164(4):712–9.
17. Tolska HK, Hamunen K, Takala A, Kontinen VK. Systematic review of analgesics and dexamethasone for post-tonsillectomy pain in adults. *Br J Anaesth*. 2019 Aug 1;123(2):e397–411.

18. Salonen A, Kokki H, Nuutinen J. Recovery After Tonsillectomy in Adults: A Three-Week Follow-up Study. *The Laryngoscope*. 2002 Jan 1;112(1):94–8.

19. Moiniche S, Romsing J, Dahl JB, Tramer MR. Nonsteroidal Antiinflammatory Drugs and the Risk of Operative Site Bleeding After Tonsillectomy: A Quantitative Systematic Review. *Anesth Analg*. 2003 Jan;96(1):68.

20. Krishna S, Hughes LF, Lin SY. Postoperative hemorrhage with nonsteroidal anti-inflammatory drug use after tonsillectomy: a meta-analysis. *Arch Otolaryngol Head Neck Surg*. 2003 Oct;129(10):1086–9.

21. Stokes W, Swanson RT, Schubart J, Carr MM. Postoperative Bleeding Associated with Ibuprofen Use after Tonsillectomy: A Meta-analysis. *Otolaryngol Neck Surg*. 2019 Nov 1;161(5):734–41.

22. Rigglin L, Ramakrishna J, Sommer DD, Koren G. A 2013 updated systematic review & meta-analysis of 36 randomized controlled trials; no apparent effects of non steroidal anti-inflammatory agents on the risk of bleeding after tonsillectomy. *Clin Otolaryngol*. 2013 Apr 1;38(2):115–29.

23. Cramer JD, Wisler B, Gouveia CJ. Opioid Stewardship in Otolaryngology: State of the Art Review. *Otolaryngol–Head Neck Surg Off J Am Acad Otolaryngol-Head Neck Surg*. 2018 May;158(5):817–27.

24. Rubin S, Wulu JA, Edwards HA, Dolan RW, Brams DM, Yarlagadda BB. The Impact of MassPAT on Opioid Prescribing Patterns for Otolaryngology Surgeries. *Otolaryngol Neck Surg*. 2021 Apr 1;164(4):781–7.

25. Banik GL, Kraimer KL, Shindo ML. Opioid Prescribing in Patients Undergoing Neck Dissections With Short Hospitalizations. *Otolaryngol Neck Surg*. 2021 Apr 1;164(4):792–8.

**Table 1.** Descriptive population statistics

	Total (N=99)	Group 1 Opioid Rx + No Ibu (N=53)	Group 2 Ibu Rx + No Opioid (N=46)	p-value
<b>Sex</b>				
Female (%)	68 (68%)	35 (66%)	33 (72%)	NS
<b>Age (years)</b>				
Mean (SD)	29.4 (±10.8)	30.2 (±11.1)	28.6 (±10.4)	NS
<b>Race/Ethnicity</b>	57 (58%) 6 (6%)	32 (60%) 5 (9%)	25 (54%) 1 (2%)	NS NS NS
Hispanic (%)	24 (24%)	11 (21%)	13 (28%)	
Native (%) White (%)				
<b>Average ASA Score</b>				
Mean (SD)	1.9 (±0.6)	1.9 (±0.6)	1.8 (±0.7)	NS
<b>Relevant Patient Factors</b>	2 (2%) 17 (17%)	2 (4%) 11 (21%)	0 (0%) 6 (13%) 17 (32%)	NS NS NS
History of opioid use				
History of chronic pain				
History of anxiety/depression				

Descriptive characteristics for each study group. SD is standard deviation. There were no statistically significant differences between the two groups in terms of demographics or risk factors for opioid use.

	Group 1 Opioid Rx + No Ibu (N=53)	Group 2 Ibu Rx + No Opioid (N=46)	[2]p-value
--	-----------------------------------	-----------------------------------	------------

<b>Filled an opioid Rx</b>			
Count (%)	51 (96.2%)	18 (40.0%)	<0.001
<b>Average initial opioid dose (mg)</b>			
Mean (SD)	215 ( $\pm 113$ )	167 ( $\pm 122.5$ )	0.04

**Table 2.** Primary and secondary outcomes

Summary statistics for the primary and secondary outcomes. SD is standard deviation. Fewer opioid prescriptions for less narcotic per prescription were filled by the group who received an ibuprofen prescription.

**Hosted file**

Table1.docx available at <https://authorea.com/users/736559/articles/712140-retrospective-cohort-study-of-ibuprofen-based-pain-regimen-to-reduce-postoperative-opioid-use-in-adult-tonsillectomy>

**Hosted file**

Table2.docx available at <https://authorea.com/users/736559/articles/712140-retrospective-cohort-study-of-ibuprofen-based-pain-regimen-to-reduce-postoperative-opioid-use-in-adult-tonsillectomy>