

# Reducing Opioid Exposure Following Common Ambulatory Hand Surgery: A Systematic Review

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## Abstract

**Background:** The opioid epidemic is a health crisis in the United States. Physicians contribute to this problem by overprescribing opioids. Ambulatory hand surgery (AHS) is common in the United States and associated with overprescribing of opioids. Education and guidance regarding the effectiveness of nonopioid compared with opioid interventions for pain management following ambulatory hand procedures are lacking. We assessed the current literature to suggest evidence-based protocols for postoperative analgesia. **Methods:** A systematic review was performed using PubMed, Web of Science, and Cochrane Library. Studies comparing nonopioid with opioid treatments for pain management following AHS were identified. Studies investigating opioid-sparing strategies after AHS were also identified. Evidence was examined to determine efficacy of nonopioid interventions and to provide recommendations for optimal nonopioid protocols and opioid-sparing strategies. **Results:** A total of 510 studies were identified in the search with 18 meeting inclusion criteria. High-level evidence demonstrated efficacy of nonopioid interventions for pain management following AHS (levels I and II evidence). Results provided evidence-based guidelines for recommendations of nonopioid treatment protocols and opioid-sparing strategies (levels I and II evidence). **Conclusions:** Our review demonstrated nonopioid interventions are adequate in multiple aspects of pain management compared with opioid treatments. Recommendations were established for two nonopioid treatment protocols, and for an opioid-sparing intervention (levels I and II evidence). The evidence provided in this review should be strongly considered for pain management guidance following AHS and provides a means to decrease opioid overprescribing in the United States.

**Keywords:** AHS—ambulatory hand surgery, opioid versus nonopioid, postoperative pain management

## Introduction

The opioid epidemic is a national health crisis in the United States. In 2010 it was estimated that 21 089 people died from opioid overdose.<sup>1</sup> In 2021 approximately 75 673 people died from opioid overdose in the United States, representing a 359% increase in a period of 11 years.<sup>1</sup> Opioid use as a pain-relieving agent is a major contributor to the current epidemic. The number of opioids prescribed by medical doctors has quadrupled since 1999, which directly parallels the increase in opioid-related deaths in the United States.<sup>2</sup> Opioids are standard of care in many acute and chronic pain conditions including surgery.<sup>2,3</sup> The use of opioids in hand surgery has been under recent investigation. Up to 17% of patients undergoing upper extremity (UE) surgery report chronic opioid use.<sup>4</sup> This can lead to misuse, persistent use, and overdose due to opioid-tolerant patients requiring higher doses for adequate pain relief.<sup>2,4</sup> Multiple adverse effects of opioids have been reported including

physical dependence, immunosuppression, opioid induced hyperalgesia, respiratory suppression, decreased endocrine function, gastrointestinal dysfunction, depression, and death.<sup>2,5</sup> Due to these effects opioid exposure should be limited when appropriate.

Most hand surgery is performed ambulatory. The most performed hand procedures are carpal tunnel release (CTR), trigger finger release (TFR), tenosynovectomy for de Quervain syndrome, and fasciectomy for Dupuytren contracture.<sup>6</sup> Managing pain for ambulatory patients can be

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challenging because of the lack of postoperative surveillance. The goal of postoperative pain management (POPM) is to decrease patient discomfort and provide enough relief for the patient to perform necessary activities of daily living while recovering.<sup>7</sup> A survey in 2015 of the attitudes and self-reported practices of hand surgeons in the United States regarding prescription opioid use showed 76% of respondents thought prescription opioid abuse is a big or moderate problem, and 89% thought opioids are overprescribed when treating pain.<sup>8</sup> Despite this, opioids continue to be overprescribed following outpatient hand procedures.<sup>9-12</sup> A false belief may be that opioid misuse arises only in larger more complex surgeries. A study of 36 177 patients investigating new onset of persistent opioid use following minor or major surgery demonstrated between 5.9% and 6.5% of patients reported persistent opioid use after surgery between the two groups with no statistical difference between groups.<sup>13</sup> These studies demonstrate physicians are routinely overprescribing opioid medications regardless of procedure severity, creating exposure for opioid misuse and injury.

Recently, studies comparing opioid versus nonopioids (OvNO) for POPM following ambulatory hand surgery (AHS) have emerged. The primary goal of this systematic review is to examine the evidence of OvNO use for POPM management of AHS, and to provide an evidence-based treatment protocol to reduce opioid exposure. A secondary goal of this review was to examine opioid-sparing interventions to provide evidence-based recommendations to decrease postoperative opioid consumption.

## Materials and Methods

A systematic review was conducted per the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines.<sup>14</sup> A MEDLINE search was performed via PubMed, Web of Science, and Cochrane Collection Library between the time of January 2001 through May 2022. The Boolean search phrase (“opioid” OR “pain management” OR “non-opioid” OR “nonopioid”) AND (“carpal tunnel release” OR “trigger finger release” OR “tenosynovectomy” OR “fasciectomy” OR “hand surgery”) was used to identify studies for investigation. Full search strategy is demonstrated by Figure 1.

Inclusion criteria included studies investigating POPM using an OvNO treatment. Studies were included if they investigated an opioid-sparing intervention with results including number of opioids consumed (ie, presurgical education strategies to decrease postoperative opioid consumption). Studies included in this review were limited to hand, wrist, and soft tissue elbow procedures and were excluded if the primary procedures studied involved the shoulder. Studies that stated they were investigating UE procedures were screened to determine what the primary procedures involved were. If they primarily included hand and wrist procedures with a minority of shoulder procedures, they were included.

Studies were excluded if the intervention was a comparison of surgical procedure type (ie, comparison of endoscopic versus open procedures), if the intervention was performed during or related to anesthesia, if the procedures were not ambulatory, if the postoperative pain or opioid consumption related to sparing strategies was not measured within the study, and if the studies were not in English. Full inclusion and exclusion criteria can be found in Table 1. Article screening primarily consisted of title and abstract review, which was performed by two independent reviewers MH and VK. Data from each study were collected by one investigator, MH, which included method of design, intervention variables, sample size, results, conclusions, and level of evidence (LOE). A list of included studies can be found in Table 2.

## Evaluation of Bias

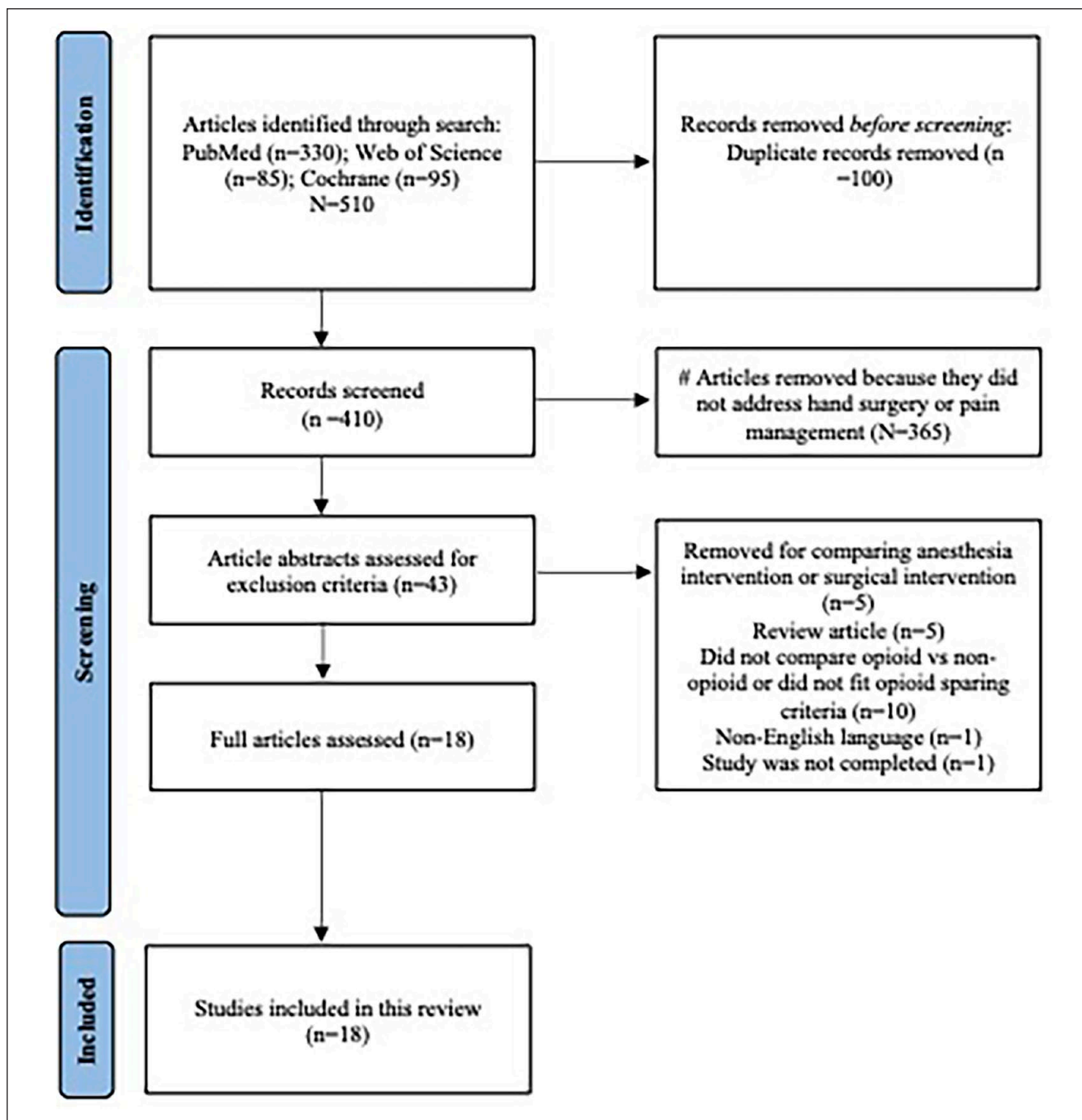
Threat of bias was evaluated for each study included. For randomized controlled trials (RCTs) the Cochrane risk-of-bias tool for RCTs was used.<sup>32</sup> Studies were given an overall rating of “high risk,” “some concern,” and “low risk.” Bias for non-RCTs was assessed with the methodological index for nonrandomized studies.<sup>33</sup> Methodological index for nonrandomized studies assessment is used to assess both comparative and noncomparative studies. Comparative studies have a maximum score of 24, and noncomparative studies have a maximum score of 16. Higher scores equate to less threat of bias.

## Results

A total of 510 studies were found during the initial search. After duplicates removed 410 studies were screened. Titles were screened and then abstracts of qualifying articles were reviewed, subsequently 366 articles were removed for not meeting criteria. After review 18 articles were included (Table 2). Eleven studies investigated OvNO as a treatment strategy for POPM (OvNO studies), and 7 studies investigated methods for reducing overall opioid consumption postoperatively (opioid-sparing studies). Opioid versus nonopioid studies were assessed for the primary research goal: Do nonopioids provide adequate POPM compared with opioids? Opioid-sparing studies were assessed to provide recommendations on interventions that reduce opioid consumption postoperatively. A summary of the primary outcomes and results can be found in Supplemental Tables 1a and 1b for OvNO and opioid-sparing strategies, respectively.

## Patient Demographics

Most surgeries investigated in this review were CTR, with some studies specifying open CTR or endoscopic CTR. The second most included procedure was TFR, followed by de Quervain release and mass excision (mucous or ganglion cyst). No patients under 18 years old were included in any



**Figure 1.** Graphical representation of the literature review adhering to PRISMA guidelines.  
 Note. PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

of the studies in this review. Full patient demographic details can be found in Supplemental Table 2.

**Risk of Bias**

Of the 10 RCTs included in this study, 1 was rated high risk for bias, 1 was rated some concern for bias, and 8 were rated low risk for bias. For the non-RCTs, 7 were comparative

and the mean MINOR score was 17.6 (range 15-21). One study was noncomparative and received a score of 14. Cochrane and MINOR scores can be found in Table 2.

**Nonopioid vs Opioid—Pain Management**

Data strongly support that nonopioid analgesics are adequate for POPM after AHS. Eleven studies in this review

**Table I.** Study Inclusion and Exclusion Criteria.

Inclusion criteria	Exclusion criteria
English language	Non–upper extremity procedures
Human participants	Non–ambulatory hand procedures
Primary clinical studies	Systematic reviews
Ambulatory hand surgery	Case studies
Postoperative pain management intervention	Interventions performed during anesthesia
Results included opioid vs nonopioid data	Studies that used surgical procedure as the only intervention to affect postoperative pain
Postoperative pain as outcome	
Opioid-sparing interventions with opioid consumption outcome	

were evaluated for comparison of OvNO analgesics for POPM. Most studies used the visual analog scale or the numeric pain rating scale to evaluate pain. One study (Miller et al<sup>25</sup>) did not use a traditional measure of pain, instead researchers quantified pain through number of pain medication pills consumed and need for additional pain medication supplementation. Of the 11 studies, 4 showed superior pain relief when nonopioids were used for postoperative pain compared with opioids.<sup>16,19-21</sup> Two separate RCTs, one performed with 105 patients and one performed with 188 patients following similar protocols, demonstrated ibuprofen and acetaminophen independently provided better postoperative pain relief when compared with oxycodone ( $P < .05$ ; LOE II).<sup>20,21</sup> Another RCT with 68 patients comparing a combination treatment of naproxen and acetaminophen to hydrocodone-acetaminophen—reported patients in the nonopioid group had lower pain scores both immediately after surgery (Postoperative Day 0-6) and 2 weeks postoperatively ( $P < .05$ ; LOE II).<sup>19</sup> A prospective study of 219 patients revealed a treatment group that managed pain with only over-the-counter (OTC) medications reported superior pain control at 2 weeks compared with a treatment group that managed pain with opioids ( $P < .0001$ ; LOE II).<sup>16</sup> The remaining 7 articles assessed for nonopioid versus opioid POPM; all reported no significant differences in any aspects of pain scores (LOE I-IV).<sup>15,22,25,26,28,29</sup>

### Nonopioid vs Opioid—Adverse Effects

Robust evidence exists to support higher adverse effects associated with opioids compared with nonopioids. Six studies included in this review investigated adverse side effects as an outcome measurement, each reporting higher rates of adverse effects in opioid groups.<sup>20,21,23,25,28,29</sup> The highest LOE in this review reported increased rates of drowsiness in the opioid group compared with the nonopioid group ( $P = .0009$ ; LOE I).<sup>28</sup> An RCT of 60 participants reported 23% of the opioid group had adverse medication-related symptoms compared with 3% of the nonopioid group ( $P = .05$ ; LOE II).<sup>29</sup> A prospective study of 269

patients reported 39.7% and 13.4% of patients in the opioid and nonopioid groups, respectively, had medication-related side effects ( $P < .001$ ; LOE III).<sup>25</sup> The most common side effects reported were drowsiness, constipation, and nausea. Ilyas et al reported 11% of patients in the opioid group experienced adverse effects, while only 3% of patients in the nonopioid group experienced adverse effects (LOE II).<sup>20</sup> Similarly, Ilyas et al reported 15% of patients in the opioid group had adverse medication-related reactions compared with 3.2% in the nonopioid groups.<sup>21</sup> Nausea, itchiness, and constipation were the highest reported adverse effects (LOE II).<sup>20,21</sup>

### Nonopioid vs Opioid—Patient Satisfaction With Pain Management

Current evidence demonstrates nonopioid POPM provides adequate patient satisfaction compared with opioids. Six studies included in this review investigated patient satisfaction as an outcome.<sup>15,19-21,22,26</sup> Benavent et al reported when grouping patients by number of opioid pills consumed patients who took zero opioids reported significantly higher satisfaction with pain management compared with the groups that consumed 4 and 5 opioid pills ( $P < .05$ ; LOE IV).<sup>15</sup> All other studies showed no significant difference in patient satisfaction of pain management between groups (LOE II-IV).

### Nonopioid vs Opioid—Postoperative Functional Assessment

Nonopioid pain management interventions are associated with improved function following AHS. Grandizio et al demonstrated superior quick Disability of Arm Shoulder and Hand questionnaire (quickDASH) scores 2 weeks postoperatively in patients receiving nonopioid pain management compared with opioids ( $P = .041$ ; LOE II).<sup>19</sup> Results also displayed a trend in improved Boston Carpal Tunnel Questionnaire (BCTQ) scores in the nonopioid group. A prospective study of 505 patients reported superior scores in the brief Michigan Hand Questionnaire (bMHQ) and the

**Table 2.** List of Included Studies.

Author	Journal	LOE	Cochrane or minor score	Year	Title
Benavent et al <sup>15</sup>	JHS	IV	14	2020	Patient satisfaction and opioid use with a postoperative opioid protocol after common hand procedures
Dar et al <sup>16</sup>	PRS	II	20	2021	WALANT hand surgery does not require postoperative opioid pain management
Dwyer et al <sup>17</sup>	JSH	II	16	2018	Prospective evaluation of an opioid reduction protocol in hand surgery
Gaddis et al <sup>18</sup>	AS	II	Low risk	2019	Effect of prescription size on opioid use and patient satisfaction after minor hand surgery
Grandizio et al <sup>19</sup>	JHS	II	Some concern	2021	Opioid versus nonopioid analgesia after carpal tunnel release: a randomized, prospective study
Ilyas et al <sup>20</sup>	JHS	II	Low risk	2018	Pain management after carpal tunnel release surgery: a prospective randomized double-blinded trial comparing acetaminophen, ibuprofen, and oxycodone
Ilyas et al <sup>21</sup>	JHS	II	Low risk	2019	A prospective, randomized, double-blinded trial comparing acetaminophen, ibuprofen, and oxycodone for pain management after hand surgery
Lalonde et al <sup>22</sup>	PRS	II	Low risk	2022	Time to stop routinely prescribing opiates after carpal tunnel release
Lee and Jeong <sup>23</sup>	JHS	III	High risk	2022	A randomized control trial comparing opioid and paracetamol for pain control after carpal tunnel release
Lynch et al <sup>24</sup>	JHAM	IV	21	2020	Written prescription for over-the-counter nonopioid pain medications does not increase the likelihood of use after ambulatory hand and upper extremity surgery
Miller et al <sup>25</sup>	JHS	III	15	2017	Postoperative pain management following carpal tunnel release: a prospective cohort evaluation
Shetty et al <sup>26</sup>	JHS	III	19	2022	Prescription opioids and patient-reported outcomes and satisfaction after carpal tunnel release surgery
Stepan et al <sup>27</sup>	JHS	III	16	2018	Perioperative celecoxib and postoperative opioid use in hand surgery: a prospective cohort study
Stepan et al <sup>27</sup>	PRS	II	Low risk	2021	Standardized perioperative patient education decreases opioid use after hand surgery: a randomized controlled trial
Thibaudeau et al <sup>28</sup>	JHS	I	Low risk	2018	Optimizing postoperative pain control in ambulatory hand surgery—acetaminophen with codeine versus ibuprofen/acetaminophen: a double-blind randomized control trial
Weinheimer et al <sup>29</sup>	JHS	I	Low risk	2019	A prospective, randomized, double-blinded controlled trial comparing ibuprofen and acetaminophen versus hydrocodone and acetaminophen for soft tissue hand procedures
Wong and Goyal <sup>30</sup>	JHS	IV	18	2020	Postoperative pain management of non-“opioid-naive” patients undergoing hand and upper-extremity surgery
Zohar-Bondar et al <sup>31</sup>	JHS	II	Low risk	2022	The effect of standardized perioperative patient education on opioid use after minor soft tissue procedures distal to the wrist

Note. LOE = level of evidence; JHS = Journal of Hand Surgery; AS = Annals of Surgery; PRS = Plastic and Reconstructive Surgery; JHAM = Journal of Hand and Microsurgery.

Global Mental Health Assessment for patients receiving OTC POPM compared with the opioid group (LOE III).<sup>26</sup>

### *Opioid Sparring—Pain Management Education*

Strong data exist on the effect of pain management education protocols on reducing postoperative opioid use for patients undergoing AHS.<sup>17,27,30,31</sup> Two RCTs in this review

reported significant reduction in opioid consumption with the use of preoperative pain management education compared with standard patient education (LOE II).<sup>27,31</sup> There was also evidence supporting better patient satisfaction when using preoperative pain management education.<sup>27</sup> A retrospective review of 530 patients undergoing ambulatory hand and UE procedures reported on the effectiveness of a preoperative opioid education intervention in both opioid

users and opioid naïve patients.<sup>30</sup> Results indicated opioid naïve patients in the intervention group consumed less opioids compared with the group without intervention (8.5 vs 19.6;  $P < .001$ ; LOE IV).<sup>30</sup> However, chronic opioid users showed no difference in the number of opioids consumed between groups. Authors reported, in general, chronic opioid users consumed more opioids compared with opioid naïve patients postoperatively (21.2 vs 14.5;  $P < .001$ ).<sup>30</sup>

### **Opioid Sparing—Number of Opioids Prescribed**

The number of opioid pills prescribed after AHS affects the amount patients consume.<sup>18</sup> Gaddis et al performed an RCT in which patients receiving 10 opioid pills compared with 30 consumed significantly less and noted no difference in patient-reported efficacy of pain or satisfaction with pain management (6.4 vs 11.9;  $P = .001$ ; LOE II).<sup>18</sup>

### **Opioid Sparing—Preoperative Celecoxib Treatment**

Nonsteroidal antiinflammatory drugs (NSAIDs) such as ibuprofen, naproxen, and celecoxib have been used preoperatively to decrease postoperative pain before and after surgery.<sup>34,35</sup> Evidence in this review did not support preoperative NSAIDs as a method to decrease opioid consumption following AHS (LOE III).<sup>34</sup>

### **Opioid Sparing—Nonopioid Prescription**

The use of a nonopioid prescription was suggested as a method to encourage nonopioid use over opioids for POPM.<sup>24</sup> Authors hypothesized having a prescription for nonopioids would entice their use.<sup>24</sup> A retrospective review of 244 patients undergoing hand and UE surgery was performed. Findings indicated patients who received a prescription for nonopioids consumed less opioids compared with those who received only an opioid prescription; however, the data were not considered significant (1.4 vs 1.9;  $P = .06$ ; LOE IV).<sup>24</sup>

## **Discussion**

The opioid epidemic is a major health crisis in the United States and physicians are contributing to the problem. A survey from the Substance Abuse and Mental Health Services Administration reported up to 92% of opioid misusers received opioids through physician prescriptions.<sup>36</sup> Hand surgery is common in the United States and frequently results in prescription of opioids for POPM. In this review authors have presented evidence that nonopioid medications are superior or equivalent in multiple aspects of pain management after AHS (LOE I, II, and IV).<sup>15,16,19-22,25,26,28,29</sup> Following AHS authors recommend physicians do not rely on opioids for first-line pain management. Two level II

studies demonstrated that ibuprofen 600 mg and acetaminophen 500 mg independently provided patients with superior pain control compared with opioids (oxycodone 5 mg).<sup>20,21</sup> A combination of celecoxib 400 mg and acetaminophen 975 mg has also demonstrated better postoperative pain control compared with opioids.<sup>19</sup> Within this review, authors found no evidence that opioids provided a superior pain control when compared with nonopioid treatments. Most nonopioid intervention protocols consisted of acetaminophen (500-975 mg) and/or NSAIDs (375-600 mg) taken as directed.

We recommend a combination treatment of NSAID with acetaminophen for postoperative pain control (LOE I and II).<sup>16,19,22,28,29</sup> The strongest evidence in this review demonstrated a combination protocol of 400 mg ibuprofen and 650 mg acetaminophen taken as needed following medication-specific guidelines provided equal pain relief compared with an opioid intervention (LOE I).<sup>28</sup> A protocol of 400 mg oral celecoxib (or 500 mg naproxen for patients with sulfa allergies) twice daily and 975 mg of acetaminophen every 6 hours provided superior pain relief compared with an opioid treatment protocol.<sup>19</sup> For patients unable to take NSAIDs due to allergy or medical conditions, a protocol of 500 mg acetaminophen every 6 hours can be advised (LOE II).<sup>20,21,23</sup> For patients with acetaminophen allergies, a protocol of 600 mg ibuprofen every 6 hours may be advised (LOE II).<sup>20,21</sup> A full list of recommendations can be found in Table 3.

Adverse effects of opioid medications are well documented. Authors have provided robust evidence of decreased adverse effects when using nonopioid POPM (LOE I and II).<sup>20,21,25,28,29</sup> The most common adverse effects related to opioid use included drowsiness, pruritus, nausea, and constipation. This is consistent with previous evidence regarding side effects of opioid medications. There are known adverse effects of acetaminophen and NSAIDs, but there were minimal incidences reported throughout our study. Adverse effects from medication can interfere with recovery and rehabilitation following surgery. Decreasing these effects will lead to enhanced recovery and optimal patient safety.

Improved functional outcomes after AHS are an important result of the procedure. Two studies in this review demonstrated improved functional outcome measure scores in the quickDASH, bMHQ, and BCTQ, when comparing OvNO interventions (LOE II and III). The quickDASH and the bMHQ are two functional outcome measures that have shown good validity for patients undergoing hand procedures.<sup>37,38</sup> The BCTQ has been shown to have good validity for patients undergoing carpal tunnel surgery.<sup>39</sup>

Hesitation to use nonopioids for POPM may be due to concern of decreased patient satisfaction due to patient-perceived superiority of opioids.<sup>40</sup> Six studies in this review comparing OvNO used patient satisfaction with pain management as a research outcome. Five of which demonstrated

**Table 3.** Author Recommendations.

Factor	LOE	Recommendation
Pain management	I and II	Combination of ibuprofen 375 to 600 mg and acetaminophen 500 to 975 mg directed to be taken as needed for pain following medication-specific guidelines for dose schedule following CTR, TFR, dQR, or SME.
Pain management if unable to take NSAIDs	II	Ten doses of 500 mg acetaminophen every 6 hours as needed are adequate for pain following CTR or TFR
Pain management if unable to take acetaminophen	II	Ten doses of 600 mg ibuprofen every 6 hours as needed are adequate for pain following CTR or TFR
Patient education if opioids are prescribed	II	Preoperative education should be provided to decrease postoperative opioid use. Education focused on nonopioid interventions (icing, elevation, NSAIDs, acetaminophen, rest). Education should be provided on adverse effects and risks associated with opioids. This information should also be provided as a printout and distributed postoperatively.

Note. LOE = level of evidence; CTR = carpal tunnel release; TFR = trigger finger release; dQR = de Quervain release; SME = simple mass excision; NSAIDs = nonsteroidal antiinflammatory drugs.

no significant difference in patient satisfaction, and one reported a significantly higher satisfaction with pain management for the nonopioid group.<sup>15,19-21,22,26</sup> Nonopioids will provide patients with adequate satisfaction of POPM following AHS (LOE II-IV).

Using nonopioid pain management strategies eliminates opioid exposure. Authors of this review wanted to provide additional methods and recommendations for decreasing opioid exposure if they are prescribed. Preoperative pain management education has demonstrated compelling evidence as a method of decreasing opioid consumption following AHS.<sup>17,30,31</sup> Preoperative education strategies discussed were rest, ice, elevation, NSAIDs, and acetaminophen as first-line therapy, and the use of opioids to be reserved as a last resort for pain management.<sup>27,31</sup> Information associated with the adverse effects of opioids was also discussed, and patients were provided with a printout of this information to take home postoperatively. This demonstrated to be effective in reducing opioid consumption after AHS compared with standard patient education.<sup>27,31</sup> An RCT conducted by Zohar-Bondar et al demonstrated 71% of patients that received preoperative education including a postoperative instruction sheet consumed zero opioids for pain management.<sup>31</sup> Another RCT with patients receiving more complex hand surgery including basal joint arthroplasty, tendon repair, nerve repair, ligament repair, radial or ulnar osteotomies, and arthrodesis of the wrist, hand, or fingers demonstrated similar findings.<sup>27</sup> A total of 42% of patients receiving preoperative education and a postoperative printout took zero opioids for pain management.<sup>27</sup>

We recommend patients undergoing AHS receive preoperative education, and a printout be provided postoperatively (LOE II). Education should include importance of rest, procedure for icing, emphasis on elevation of the surgical extremity, and medication administration timing and dose. Information regarding opioids was reserved as a last

resort for pain management if first-line treatments are not effective. The postoperative handout should clearly illustrate this information and be provided to the patient before discharge home (LOE II).

A limitation of this study was the exclusion criteria for many of RCTs and prospective studies included in this review. Most exclusion criteria included current use of opioids for pain management. A portion of the patient population will inevitably be using opioids to manage their pain, especially if it is a chronic condition. Future research efforts must be made to include this patient population in high-quality RCTs.

Opioid exposure has become a major problem in the United States over the past decade and physicians have a role. The medical community must do its part to decrease patient exposure and limit unnecessary opioid prescribing. Randomized controlled trials and prospective cohort studies are considered among the highest LOE. This review consisted mainly of RCTs and prospective cohort studies that demonstrated nonopioids are adequate or even superior to opioids in multiple aspects of pain management following AHS. Evidence was also provided on strategies to decrease opioid consumption postoperatively mainly through preoperative pain management education. Opioids should not be used as first-line pain management for patients recovering from AHS. Preoperative education of pain management focusing on rest, ice, elevation, acetaminophen, and NSAID use should be performed, and provided as a postoperative printout.

### Ethical Approval

This study was approved by our institutional review board.

### Statement of Human and Animal Rights

This article does not contain any studies with human or animal subjects.

## Statement of Informed Consent

No patient data were used in this article; therefore, no informed consent was necessary.

## Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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