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Unveiling Prescribing Patterns: A Systematic Review of Chronic Opioid Prescriptions After Head and Neck Cancer Surgeries

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Abstract

Objective. This study aims to review opioid prescribing changes for pain management in head and neck cancer (HNC) surgery patients, given the recent focus on Enhanced Recovery After Surgery protocols.

Data Sources. MEDLINE, Embase, and CENTRAL, covering 1998 to 2023.

Review Methods. We selected studies that evaluated opioid prescribing patterns post-major HNC surgery in various settings, including tertiary care hospitals and community hospitals. Primary outcomes considered were prevalence and patterns of opioid use post-surgery, as well as related outcomes such as chronic use and side effects.

Results. Of 1278 abstracts, 24 studies involving 17,027 patients from the United States, China, and Canada met inclusion criteria. Quality was assessed using the MINORS scale, with an average score of 9.9 for non-comparative studies and 20.0 for comparative studies. Persistent opioid use post-surgery, defined as ongoing prescriptions 90 days after treatment, was noted in 15.4% to 64% of patients. Two studies reported adverse events, with up to 16% of patients experiencing side effects. Risk factors for chronic use included preoperative opioid use, tobacco use, higher cancer stage, adjuvant treatment, and demographic factors. Correlations were found between larger opioid prescriptions and shorter survival in advanced cancers. There was notable variability in patient-reported pain control.

Conclusion. Persistent opioid use post-HNC surgery is common, with variable efficacy and risk of adverse effects. Tailoring pain management to individual risk factors and focusing on multimodal analgesia could reduce the risks of continued opioid use. Future prospective studies are required to identify optimal pain management strategies.

Keywords

chronic opioid use, Enhanced Recovery After Surgery (ERAS) protocols, head and neck cancer (HNC) surgery, multimodal analgesia (MMA), opioid prescribing trends, opioid use, pain management

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Opioid use is a mainstay of postoperative pain management for head and neck cancer (HNC) surgery. However, their use requires careful consideration due to the potential for dependency and adverse effects, especially in the context of the ongoing opioid crisis. Enhanced Recovery After Surgery (ERAS) protocols, which specifically advocate for multimodal analgesia (MMA) techniques aimed at minimizing opioid consumption, have been increasingly adopted in managing HNC patients undergoing surgery to address these concerns. These protocols are designed to reduce the physiological stress of surgery, promote faster postoperative recovery, and minimize the risk of prolonged opioid use. Prior systematic reviews have assessed opioid use and ERAS protocols, but variation in ERAS protocol implementation points to a need for further investigation of post-surgical opioid use among

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HNC patients. Dort et al outlined best practices for perioperative care in HNC surgery, emphasizing the benefits of MMA and opioid-sparing techniques as part of coordinated perioperative care to enhance recovery while minimizing complications and opioid dependency.[1] Reviews by Kattar et al, Chorath et al, and Kiong et al have demonstrated that ERAS implementation is associated with reduced opioid consumption, shorter hospital stays, and fewer postoperative complications.[2-4] These results highlight the effectiveness of structured clinical pathways in optimizing recovery outcomes. While ERAS protocols have shown benefits in other surgical specialties through reduced hospital stays, lower complication rates, and improved long-term outcomes, their influence on opioid prescribing patterns in HNC surgeries remains underexplored.[5-12] To address this gap, we aim to conduct a systematic review of the existing literature to gain deeper insights into opioid prescribing trends, persistent opioid usage (defined as continued use beyond 90 days post-treatment), and the role of ERAS protocols following HNC surgery.

Methods

Data Sources and Search Strategy

This study was pre-registered on PROSPERO (International Prospective Register of Systematic Reviews) with the registration number CRD42024503353, and adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.[13] MEDLINE (Ovid), Embase (Ovid), and Cochrane Central Register of Controlled Trials (CENTRAL) were queried from inception to December 2023. We applied an English language filter to our search, limiting results to studies published in English. To focus on primary research, we excluded narrative reviews unless primary data were reported. The search terms were developed in consultation with a medical librarian (M.R.) and included both controlled vocabulary (eg, MeSH terms) and free-text terms related to head and neck neoplasms and opioid analgesics. All searches in this study were developed and executed by a medical librarian (M.R.). The full search strategy is provided in Supplemental File S1, available online. The results from all databases were aggregated and de-duplicated using the Covidence tool (https://www.covidence.org) for further screening.

Study Selection

Our query included systematic reviews, clinical trials, randomized controlled trials, cohort studies, and case-control studies. Studies were included if they evaluated pain management strategies, with or without ERAS protocols, in adults (≥18 years) undergoing major head and neck surgery, with or without adjuvant treatment. "Major head and neck cancer surgery" was defined as procedures that required general anesthesia and/or significant reconstruction, including free-flap techniques.

Primary outcomes included prevalence and patterns of opioid use in patients following HNC surgery and outcomes related to chronic opioid use, such as dependency or opioid-related side effects. We also evaluated persistent opioid use, which is defined as continued opioid prescriptions 90 days post-treatment.

The search results were initially screened for duplicates and the identified studies were then screened by titles and abstracts of the articles, followed by full-text review by 2 independent reviewers (B.S. and S.K.) using Covidence systematic review software (Covidence, Veritas Health Innovation). Disagreements between reviewers were resolved by consensus or by a third reviewer (J.L.F.). **Figure 1** outlines this process. The relevant data were extracted from the finalized studies using a predefined structured form (B.S. and S.K.), which were reviewed by the senior author. The extracted data were then checked by 1 reviewer (J.L.F.).

Assessment of Risk of Systematic Bias

The methodological quality of the included studies was rated according to the Methodological Index for Non-Randomized Studies (MINORs) criteria for assessing the methodological quality of studies with or without a control group.[14] Based on each of the 12 items, 4 of which are reserved for comparative studies, studies were rated on the following scale: 0 for "not reported," 1 for "reported but inadequate," or 2 for "reported and adequate." Total quality was then valued as "poor," "fair," or "good" (Supplemental File S2, available online).

Results

From a total of 1278 abstracts, 24 studies were ultimately identified and considered suitable based on the review protocol, with all being retrospective in nature.[15-38] The

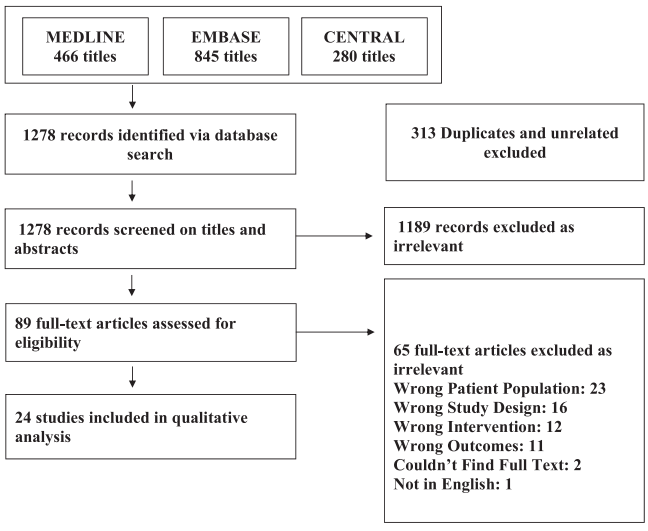

Figure 1. PRISMA flow diagram. This diagram shows the study selection process. A total of 1278 records were identified from MEDLINE, EMBASE, and CENTRAL.

mean age of study subjects varied from 47 to 74.8 years.[27,33] Cohort size ranged from 37 to 7484 patients, and studies took place in the United States, China, and Canada.[30,36] Five of 24 studies (20.8%) used control groups as part of their comparative studies.[17,19,21,22,28] Supplemental Table S1, available online, outlines each of the studies.

The quality of the studies, assessed using the MINORS scale, yielded an average score of 9.9/16 for non-comparative studies and 20.0/24 for comparative studies. Persistent opioid use following surgery was observed in 15.4% to 64% of patients.[20,29] Adverse events were reported in 2 studies, with up to 16% of patients experiencing side effects.[21,30] Identified risk factors for chronic opioid use included preoperative opioid use, psychosocial factors including psychiatric disorders and tobacco use, advanced cancer stage, adjuvant treatment, younger age, and longer hospital stays.[15,16,18,20,22,25,33-36,38] Patient-reported outcomes varied significantly across studies, with assessments including pain intensity, pain interference with daily activities, quality of life, and patient satisfaction with pain management.[16,17,21,31] Studies that employed ERAS protocols generally reported improved patient-reported outcomes, such as lower pain scores and higher patient satisfaction with pain management strategies.[17,21,22,38]

Types of Opioids and Prescription Practices

Studies that specified the type of opioids used are outlined in **Table 1**. Cata et al examined various opioids, such as hydrocodone (46%), tramadol (11%), oxycodone (5%), codeine (3%), fentanyl (3%), hydromorphone (3%), methadone (4%), and morphine (3%), noting a median in-hospital opioid medication exposure of 35.99 mg.[16] Persistent opioid use was observed in 31% of patients at 6 months and 15% at 12 months. Clark et al compared opioid usage between ERAS and non-ERAS groups, finding that ERAS protocols, which included traditional opioid-sparing medications such as gabapentin, methadone, and liposomal bupivacaine, significantly reduced total opioid consumption to 134.0 MME compared to 361.9 MME in the non-ERAS group.[17] Hinther et al reported a decrease in opioid consumption from 43.3 to 29.7 mg in the postoperative period following the introduction of MMA protocols.[19] Jandali et al highlighted that 21.7% of ERAS patients were discharged with narcotics compared to 90.3% in the control group, with significantly fewer narcotic refills required by ERAS patients.[21] Kiong et al reported reduced opioid requirements (138.8 ± 181.5 MME in the ERAS group vs 207.9 ± 205.5 MME in the control group) after major head and neck surgery with free-flap reconstruction.[22] Li et al compared opioid usage across different institutions, revealing a significantly lower frequency of postoperative opioid orders at the Chinese University of Hong Kong compared to Oregon Health and Science University.[26]

March et al demonstrated a reduction in opioid prescriptions from 225 MME to 0 MME at discharge following lateral neck dissection for malignant thyroid disease with a multimodal intervention.[28] Orgill et al described varied opioid use, such as morphine sulfate, hydrocodone, and oxycodone, for patients undergoing total laryngectomy and laryngopharyngectomy, with suboptimal pain control reported in 35% of patients.[30] Rettig et al found that 26% of patients required opioid refills within 30 days post-surgery, with higher surgical defect volume and pain scores increasing the odds of refills.[32] These studies collectively provide insights into opioid prescribing practices, the types of opioids commonly used, and strategies to minimize opioid use and manage pain effectively in HNC surgery patients.

Table 1. Classification of Commonly Used Opioids in Head and Neck Cancer Studies Based on Their Origin and Synthesis

Opioid	Classification	Studies
Hydrocodone	Semisynthetic opioid	13,26-28
Oxycodone		13,26-28
Morphine	Natural opiate	13,14,27
Methadone	Synthetic opioid	13,14
Tramadol		13,23
Hydromorphone	Semisynthetic opioid	13,14
Codeine	Natural opiate	13,27
Oxymorphone	Semisynthetic opioid	13
Fentanyl	Synthetic opioid	13
Meperidine		27

Rates of Chronic Opioid Use and Predictive Factors

Rates of chronic opioid use, defined as persistent use 90 days post-surgery, varied significantly. At 3 months, the highest rate of persistent opioid use was observed in Hinther et al with 64%, followed by Bollig et al at 43%, while McDermott et al reported a much lower rate of 15.4%.[15,20,29] By the 6-month mark, the rates began to decrease, with Bollig et al showing 33.2%, Cata et al reporting 31%, and Wang et al at 12.53%. McDermott et al had the lowest rate at 7.0%.[29] At 12 months, Hinther et al still reported a relatively high rate of 55%, while other studies showed significantly lower rates, such as Craker et al at 33.8% and Starr et al at 17.2%.[18,20,36] Cata et al had the lowest rate at this timepoint, with just 15%. Craker et al and Starr et al maintained similar rates of 33.8% and 17.2%, respectively, while Schumacher et al reported the lowest rate at 7.2%.

Chronic opioid use following HNC surgeries is influenced by several key factors including preoperative opioid use, undergoing chemoradiation, tobacco use, psychiatric disorders, and advanced cancer stages.[33,35] Studies noted that most of these patients continued opioid use due to clearly documented pain syndromes. Patients who underwent multimodality treatments, such as surgery with adjuvant therapy or radiation, were also more likely to continue using opioids long-term. Conversely, younger

age, higher opioid doses, and longer hospital stays were linked to a greater likelihood of prolonged opioid use.

Several studies provide detailed insights into these factors; for example, Bollig et al conducted a retrospective cohort study involving 388 patients, finding that opioid use at 3 months post-treatment was significantly associated with primary or adjuvant chemoradiation, pretreatment opioid use, and younger age.[15] Similarly, Starr et al studied 7484 patients treated for laryngeal cancer and observed that 17.2% of patients had chronic opioid use over 1 year, with early opioid use, tobacco use, higher median MME during treatment, and radiation alone identified as significant predictors, while surgery with chemoradiation was protective.[36] Cata et al reported that preoperative opioid use and adjuvant therapy were key predictors.[16] Craker et al found that continued opioid use at 360 days was significantly associated with pre-existing opioid use and maximum MMEs.[18]

Hinther et al identified chronic opioid use predictors as preoperative opioid use, prior tobacco use, advanced T-stage, and adjuvant treatment as predictors.[20] Kiong et al compared opioid use in an ERAS group versus a control group, finding preoperative opioid use, younger age, race, use of patient-controlled analgesia, and ICU admission were key risk factors for high opioid use.[22] Lee et al observed that 21.8% of patients undergoing curative resection for oral squamous cell carcinoma had persistent opioid use 365 days postoperatively, with predictors including pretreatment opioid use, N stage, and tumor recurrence.[25] Saraswathula et al used SEER-Medicare data to study older patients undergoing primary surgical resection for HNC, identifying preoperative opioid use, black race, postoperative radiotherapy, higher Charlson Comorbidity Index, and psychiatric diagnoses as significant risk factors.[33,34] Schumacher et al found that 7.2% of patients receiving radiotherapy for HNC had persistent opioid use 1 year after treatment, with factors such as high maximum opioid dose and early initiation of opioids contributing to long-term use.[35] Wang et al reported that 12.53% of patients undergoing HNC surgeries had a long-term opioid use at 6 months, associated with adjuvant chemoradiation and longer hospital stays.[38]

Components of ERAS Protocols and Comparison With Non-ERAS Protocols

ERAS protocols incorporate preoperative, intraoperative, and postoperative measures aimed at reducing opioid use and improving patient recovery. Preoperative components of ERAS protocols commonly include patient education, nutritional optimization, and the use of preoperative MMA. Hinther et al demonstrated that the inclusion of preoperative MMA led to a 31% reduction in opioid use compared to standard care.[19] Intraoperatively, ERAS protocols often employ minimally invasive surgical techniques and opioid-sparing anesthesia. Postoperative elements of ERAS protocols focus on early mobilization, MMA (such as NSAIDs, acetaminophen, and gabapentinoids), and standardized discharge planning.

A total of 10 studies in this study directly compared the outcomes of ERAS protocols with traditional, non-ERAS approaches, particularly concerning chronic opioid use. Chronic opioid use was generally defined as continued opioid consumption 90 days postoperatively, though specific definitions varied across studies. The results consistently showed that ERAS protocols significantly lowered the rates of chronic opioid use. Jandali et al observed that only 21.7% of patients managed under ERAS protocols were discharged with opioids, compared to 90.3% in the non-ERAS group.[21] Furthermore, only 6.5% of ERAS patients required a narcotic refill within 30 days postoperatively, versus 36.6% in the control group, highlighting the effectiveness of ERAS in reducing both initial and ongoing opioid needs.

Kiong et al found that ERAS protocols not only decreased mean opioid use within the first 72 hours postoperatively (138.8 MME vs 207.9 MME in the non-ERAS group) but also reduced the number of planned ICU admissions (28.3% vs 36.5%) and shortened hospital stays (7.4 days vs 9.1 days).[22] These findings underscore that ERAS protocols confer multiple benefits beyond opioid reduction, such as enhancing overall recovery and reducing health care resource utilization. Similarly, March et al documented a dramatic decrease in opioid prescriptions at discharge in ERAS patients compared to non-ERAS patients, further supporting the role of multimodal interventions in minimizing opioid use.[28]

Overall, the studies reviewed provide evidence that ERAS protocols may reduce opioid consumption, improve pain management, and enhance recovery outcomes for patients undergoing HNC surgeries. While the variability in definitions and outcome measures across studies limits the feasibility of a formal meta-analysis, the consistent findings support the implementation of ERAS protocols as a standard approach to minimize opioid dependence and improve surgical outcomes. Further research is warranted to refine ERAS components and tailor them to specific patient populations to optimize recovery and minimize opioid use.

Adverse Events and Complications

Two studies describe complications but focus on surgical-related adverse outcomes rather than opioid-related events. For example, Jandali et al reported postoperative complications such as hematomas, occurring in 6.5% of ERAS patients and 5.3% of control patients, along with emergency department visits within 30 days (17.4% in the ERAS group and 20.4% in the control group).[21] Similarly, Orgill et al observed a 16% complication rate, which included 5 fistulas and 1 hematoma.[30] The overall findings suggest that while ERAS protocols may reduce the incidence of opioid-related complications, the variability in study designs and patient populations makes direct comparisons challenging.

Discussion

The management of postoperative pain in HNC surgery patients remains a significant challenge, especially given the imperative to reduce opioid use amid the ongoing opioid crisis. This study reinforces findings from prior systematic reviews, highlighting that MMA within ERAS protocols offers immediate clinical benefits, such as reduced opioid consumption and improved recovery outcomes. However, the evidence remains inconsistent and insufficient to provide definitive guidance on the long-term impact of these protocols on opioid prescribing patterns, chronic opioid use, and oncologic outcomes. While ERAS pathways have shown promise in various surgical specialties, their specific application to HNC surgeries is not yet fully understood due to conflicting findings and studies with limited power.

This systematic review aimed to address these gaps by examining the literature on opioid use after HNC surgery, with a focus on prescribing trends within ERAS frameworks. Our synthesis of available evidence identifies opportunities to refine ERAS protocols and pain management strategies to minimize the risk of chronic opioid dependency. These findings align with those of Zayed et al, who demonstrated that preoperative opioid use, psychiatric comorbidities, and substance use disorders significantly increase the likelihood of chronic opioid use after treatment.[39] These risk factors must be considered when tailoring individualized pain management plans. Furthermore, consistent with prior meta-analyses, we found that younger age, larger surgical defect volumes, and adjuvant therapies such as chemoradiation are associated with persistent opioid use.

Although ERAS protocols provide clear clinical benefits, their influence on oncologic outcomes remains uncertain. For instance, Kiong et al suggest that the impact of ERAS pathways on survival and the timely return to intended oncologic therapy is not well established.[40] Similarly, Mastrolonardo et al identified potential associations between high perioperative opioid use and decreased survival in specific HNC populations.[41,42] These findings underscore the need for more robust, long-term studies to fully elucidate the relationship between MMA, ERAS protocols, and oncologic outcomes.

A general trend of declining opioid use over time can be observed in several studies, but there is significant variability in the rates, with some studies showing persistently high opioid use. This suggests that while time may play a role in reducing opioid use, other factors such as patient characteristics, surgical complexity, and pain management protocols also significantly influence long-term opioid dependence. The findings suggest that ERAS protocols are associated with reduced rates of chronic opioid use and improved patient-reported outcomes compared to traditional opioid-centric methods. However, the quality and heterogeneity of the studies included in this study preclude a definitive comparative or meta-analysis.

This study highlights several important insights regarding opioid use and prescribing practices in HNC surgery patients. A diverse range of opioids, including hydrocodone, tramadol, oxycodone, fentanyl, methadone, and morphine, are commonly used, with choice of opioids varying based on surgical procedures, patient characteristics, and institutional protocols.[16,17,30] ERAS protocols, which emphasize multimodal pain management using non-opioid analgesics and careful opioid titration, have been shown to significantly reduce opioid consumption and improve pain management outcomes. Patients in ERAS programs often require fewer opioids postoperatively, experience shorter hospital stays, and have lower rates of narcotic refills compared to those in standard care settings.[17,21,22] Implementing MMA strategies, as summarized in **Table 2**, can contribute to reduced opioid use and improve pain outcomes in HNC surgery patients.

The variability in opioid prescription sizes indicates the lack of a standardized dosing protocol and highlights the necessity for individualized pain management plans. Follow-up periods ranged from immediate postoperative days to 12 months, with frequent assessments at 3, 6, and 12 months. This extended follow-up provides valuable insights into the long-term opioid use patterns and the potential for chronic opioid dependence among HNC surgery patients. Persistent opioid use was prevalent, with rates as high as 43% at 3 months and 33.8% at 1 year post-surgery.[15,18] This significant level of persistent use calls for enhanced

Table 2. Potential Perioperative Multimodal Analgesia Regimens

Analgesia Component	Dosage/Timing	Comments
Preoperative counseling	Preoperative education on pain management expectations	Reduces anxiety and supports opioid reduction.[18]
Preoperative gabapentinoids (pregabalin/gabapentin)	Pregabalin 75 to 150 mg preoperatively	Reduces neuropathic pain and opioid consumption.[18]
Intraoperative nerve blocks	Intraoperative	Reduces post-surgical pain.[29]
Postoperative acetaminophen	1000 mg every 6 h	Reduces opioid requirements.[16]
Postoperative opioids (eg, oxycodone)	Limit to 3 to 5 days postoperatively	Reserved for breakthrough pain; minimizes long-term use.[28]

postoperative monitoring and the development of strategies to mitigate long-term opioid dependence.

Preoperative opioid use is consistently identified as a strong predictor of chronic opioid use postoperatively, with patients already using opioids before surgery more likely to continue using them long-term. This finding underscores the importance of careful preoperative assessment and the implementation of interventions to minimize opioid dependency.[18,33,35] Additionally, there is considerable variability in opioid prescribing practices across institutions and geographic locations, suggesting different pain management approaches and regulatory environments. For example, opioid prescriptions are lower at the Chinese University of Hong Kong compared to Oregon Health and Science University, reflecting different attitudes toward opioids and institutional protocols.[26]

The implementation of MMA protocols, which use a combination of pain management strategies including non-opioid medications, has been effective in reducing opioid consumption and improving pain control, supporting the benefits of opioid-sparing strategies.[19,28] Other factors associated with increased opioid consumption and persistent use include younger age, higher pain scores, larger surgical defect volumes, use of patient-controlled analgesia, and certain adjuvant therapies like chemoradiation.[18,32,35] By identifying these risk factors, physicians can tailor pain management strategies to reduce opioid dependency. Overall, these findings support the adoption of standardized, multimodal pain management approaches and opioid-sparing strategies to optimize pain control, minimize risks associated with opioid use, and improve postoperative outcomes in HNC surgery patients.

Our review also indicates that ERAS protocols may lead to decreased chronic opioid use in HNC surgery patients and that institutions could implement them as part of HNC post-surgical care. While included comparative studies were of generally high quality, there were notable limitations such as lack of blinding and randomization. Prioritizing research that focuses on conducting high-quality, comparative studies will solidify the evidence base. This could eventually support a comprehensive meta-analysis to provide definitive guidance on best practices in postoperative pain management.

ERAS protocols have demonstrated effectiveness in other specialties, including orthognathic surgery, where intraoperative and postoperative MMA with non-opioid medications decreased postoperative opioid consumption and the incidence of postoperative nausea and vomiting.[40] These findings could inform similar strategies in head and neck surgery, although further research is needed to validate these approaches in this patient population. Clinical practice guidelines from the American Academy of Otolaryngology-Head and Neck Surgery emphasize the importance of minimizing opioid overtreatment and adverse effects when possible.[42]

Opioids remain a cornerstone in the management of acute postoperative pain and, when used appropriately, are effective and necessary for many patients undergoing major surgeries[43] Opioids are not inherently detrimental when judiciously prescribed and monitored and should be viewed as one component of a comprehensive pain management toolkit. Non-opioid medications, including NSAIDs, acetaminophen, gabapentinoids, and corticosteroids, have been demonstrated to provide equivalent or even superior pain control compared to opioids, as measured by patient-reported pain scores.[44,45] Integrative medicine strategies, such as acupuncture and mindfulness-based stress reduction, have shown promise in managing postoperative pain and reducing opioid requirements.[46,47] Partial mu-opioid agonists like buprenorphine have been effective in both acute and chronic pain management, offering analgesia with a lower risk of dependence and respiratory depression compared to full agonists.[48,49] For patients requiring chronic opioid therapy, it is crucial to implement strategies aimed at mitigating adverse opioid-related events. This includes comprehensive patient education on opioid use, adherence monitoring, and utilizing tools like prescription drug monitoring programs.[50,51] Research into best practices for managing long-term opioid use in HNC patients is necessary to develop guidelines that minimize risks while ensuring adequate pain control.

While opioid prescriptions have decreased over the past decade, opioid-related deaths have continued to rise, with 80,816 fatalities linked to opioid overdoses in 2021. Surgeons were responsible for 37% of opioid prescriptions between 2007 and 2012, and alarmingly, 70% to 90% of opioids prescribed after surgery went unused, increasing the chances of misuse and diversion.[52] Approximately 1 in 14 patients who receive opioids after minor outpatient surgery continue using them after 1 year.[53] Patients covered under both Medicare/Medicaid coverage are at higher risk for new persistent opioid use, emphasizing the role of social factors in opioid-related health outcomes.[54] The risk of adverse events adds further complexity to the opioid crisis; respiratory depression affects up to one-fifth of surgery patients, while nausea and vomiting occur in up to three-quarters of cases. These complications contribute to prolonged length of stay and increased costs for patients.[55] Broadly, financial toxicity impacts over 25% of cancer patients, leading to delayed care and non-compliance with treatment.[56] These findings highlight the societal and health burdens associated with opioid use and underscore the need for further research in this area.

Limitations

The included studies exhibit significant heterogeneity in terms of study design, patient populations, surgical techniques, components of ERAS protocols, opioid prescribing practices, and follow-up durations. This variability, combined with differences in how opioid use and outcomes are defined and reported across studies,

complicates direct comparisons and the synthesis of findings across studies. The retrospective nature of included studies introduces potential biases, such as recall and selection bias. Additionally, studies that relied on self-reported data may be subject to reporting bias. Despite 85% of cancer patients undergoing treatment in community settings, most studies identified were conducted in tertiary academic centers or specialized cancer hospitals. This concentration of studies limits the generalizability of findings in a broader range of health care settings.[57] Additionally, the majority of studies were based in the United States, with fewer studies from other regions, potentially limiting the global applicability of the results.

Conclusions

Persistent opioid use following head and neck surgery is a significant concern that requires a balanced approach to pain management. Opioids, while effective and often necessary, should be integrated into a multimodal pain management plan that includes non-opioid medications and therapies. Embracing such an approach can optimize pain control, minimize risks associated with opioid use, and improve outcomes. Future research should focus on prospective studies to identify optimal pain management strategies that are both effective and individualized. Standardized reporting guidelines, more rigorous study designs, and the inclusion of diverse patient populations will be essential for generating robust and generalizable evidence. Future prospective work should aim to elucidate the most effective components of ERAS protocols, determine whether modifications to these protocols could benefit specific patient populations, and ultimately support the development of evidence-based guidelines for optimal pain management in HNC surgery.

Author Contributions

Sabin Karki, manuscript writing, abstract and journal screening, keyword development; **Brooke Stephanian**, manuscript writing, abstract and journal screening, keyword development; **Mirian Ramirez**, database search, keyword development; **Michael G. Moore**, editing manuscript draft; **David A. Campbell**, editing manuscript draft; **Diane W. Chen**, editing manuscript draft; **Michael W. Sim**, editing manuscript draft; **Jessica A. Yesensky**, editing manuscript draft; **Avinash Mantravadi**, editing manuscript draft; **Janice L. Farlow**, design, conception, manuscript writing, table and figure design.

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Supplemental Material

Additional supporting information is available in the online version of the article.

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