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REVIEW

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Enhanced recovery after surgery, current, and future considerations in head and neck cancer

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Abstract

Objectives: Review of the current and relevant literature to develop a list of evidence-based recommendations that can be implemented in head and neck surgical practices. To provide rationale for the multiple aspects of comprehensive care for head and neck surgical patients. To improve postsurgical outcomes for head and neck surgical patients.

Methods: Extensive review of the medical literature was performed and relevant studies in both the head and neck surgery and other surgical specialties were considered for inclusion.

Results: A total of 18 aspects of perioperative care were included in this review. The literature search included 276 publications considered to be the most relevant and up to date evidence. Each topic is concluded with recommendation grade and quality of evidence for the recommendation.

Conclusion: Since it's conception, enhanced recovery after surgery (ERAS) protocols have continued to push for comprehensive and evidence based postsurgical care to improve patient outcomes. Head and neck oncology is one of the newest fields to develop a protocol. Due to the complexity of this patient population and their postsurgical needs, a multidisciplinary approach is needed to facilitate recovery while minimizing complications. Current and future advances in head and neck cancer research will serve to strengthen and add new principles to a comprehensive ERAS protocol.

Level of Evidence: 2a.

KEYWORDS

enhanced recovery after surgery, head and neck oncology, free tissue transfer, outcomes, evidence-based medicine

1 | INTRODUCTION

Enhanced recovery after surgery (ERAS) protocols were conceived in the 1990s to standardize care through evidence-based practice.[1] These protocols improve outcomes and decrease healthcare costs.[2–4] Since the original protocols were developed for colorectal surgery,[5] ERAS protocols have become standard practice in a majority of surgical and surgical adjacent fields.[6–11] Over the past two decades, a growing body of evidence indicates the implementation of ERAS protocols improve patient outcomes including fewer complications, reduced length of hospital stay (LOS), earlier return to normal activities, and reduced opioid use.[12–16] In 2017, the first head and neck protocol was published, providing the framework for a multimodal pathway specific for patients undergoing head and neck cancer (HNC) surgery.[17]

HNC and its treatment pose unique challenges to patients due to the innate anatomy and its role in function and appearance. A multidisciplinary approach is required to adequately address the significant changes to the speech, swallowing, breathing, feeding, and appearance of the patient as well as the physical and psychological toll of treatment.[18–21] The complexity of care required for these patients lends the potential for vast improvements in perioperative management. In recent years, there has been an increase in publications showing improved outcomes in HNC patients after introducing ERAS protocols.[17,22–25]

This review is a comprehensive summary of the current and evolving areas of multidisciplinary optimization at all phases of care for the HNC patient, from diagnosis to discharge.

1.1 | Literature search

Relevant "head and neck cancer" publications were searched through the PubMed database and included articles were published through September 2022. Included search terms were "enhanced recovery after surgery," "head and neck surgery," "total laryngectomy (TL)," "free-flap reconstruction," "oral cavity cancer," and variations of these and other terms. Primary searches for high-level evidence in head and neck surgery were vetted for inclusion. When lacking in the HNC literature, high-level evidence of non-head and neck surgery was included if deemed to be applicable across fields.

1.2 | Quality of data

Centre for evidence-based medicine criteria were used to analyze the quality of evidence presented in the literature.[26] Levels of evidence characterized by "high" included systematic reviews, meta-analyses, or large randomized controlled trials. Moderate level was assigned to smaller randomized controlled trials and prospective cohort studies. "Low" was assigned to retrospective data. The GRADE (Grading of Recommendations, Assessment, Development, and Evaluation) system was used to assign strength to the recommendations.[27] Strength was classified as strong, weak, or conditional. Strong was assigned to recommendations with high quality evidence, or with low quality evidence with a high benefit-to-risk ratio. Weak was assigned to recommendations with low quality evidence, or uncertain benefit. Conditional was assigned to recommendations with low quality evidence and a perceived benefit.

2 | RESULTS

A total of 18 aspects of perioperative care were included in this review. The literature search included 276 publications considered to be the most relevant and up to date evidence. Each topic is concluded with recommendation grade and quality of evidence for the recommendation.

2.1 | Preadmission education

HNC involves intricate anatomy and treatment often has functional consequences. Patient education on disease processes and treatment expectations has been recognized as an important part of informed consent. Preoperative education has been shown to reduce anxiety and improve patient satisfaction and involvement in decision-making.[28,29] Traditionally, patient education is provided exclusively during the clinic visit. However, studies have shown that retention and comprehension after these visits can be as low as 20%.[30,31] Providers have addressed this through pamphlets and written materials, which are easy to produce and replicate. The HNC population has a disproportionately low literacy rate, with some studies quoting 30% of patients being unable to read above an eighth grade level.[32,33] This unique consideration begs a better solution. With widespread access to technology, multimedia education has become a popular option in the education of complex disease and treatment processes.[34] Studies have shown that access to multimedia education improves patient satisfaction,[35–37] recall of risks,[38] and reduces rates of anxiety and depression.[39,40] D'Souza et al. found that multimodal patient education significantly decreased rates of clinical anxiety and depression after diagnosis for late stage HNC patients for up to 6 and 3 months, respectively.[40] The same group found that multimedia education for the caregivers of HNC patients may carry the same benefits.[41] While there are clear psychological benefits to improving patient education, until recently, there were no publications in the HNC literature showing improved surgical outcomes from education intervention. Schmid et al. recently found shorter LOS, reduced complications, and decreased cost after implementation of a preoperative multi-professional assessment and information day (MUPAID).[42] At this time, it is unknown which aspect of the MUPAID resulted in these improvements. Further studies are needed to corroborate a benefit with postoperative recovery and preoperative education.

2.2 | Recommendations

• Educational resources should be accessible and tailored to the patients technologic, literacy, and informational needs.	High	Strong
• Patient education should be individualized for the specific disease process and surgery.	High	Strong
• Multimedia resources are a useful adjunct in the informed consent process.	Moderate	Strong

2.3 | Preadmission speech and language pathology assessment

HNC patients often have functional changes in speech, breathing, and swallowing from the disease process and its subsequent treatment. Pretreatment speech and language pathology (SLP) evaluation of speech, voice, and swallow has been employed for decades in the HNC population.[43] Pretreatment swallowing exercises have been shown to improve swallowing outcomes for HNC patients undergoing primary chemoradiation; however, this is not studied in the context of surgery.[44,45] For patients undergoing surgery, pretreatment counseling concerning the expected functional and physiologic changes is paramount to the patient's understanding and expectations. In a retrospective review by Shenson et al., pretreatment SLP counseling reduced LOS post TL by an average of 3 days without affecting 30-day readmissions or emergency department visits.[46] This study reflects findings in the orthopedic and surgical oncology literature that pretreatment counseling reduces LOS and overall cost.[47,48] A small randomized trial by Longobardi et al. showed that pre-laryngectomy counseling by SLP increased patient satisfaction scores, decreased psychological distress, and facilitated greater use and acceptance of tracheoesophageal speech.[49] SLP counseling was included in the MUPAID protocol and may have played a contributory role in the improved outcomes.[42]

2.4 | Recommendation

• SLP evaluation and counseling should be provided to all patients with a new diagnosis of HNC.	High	Strong
• Preoperative SLP counseling improves patient satisfaction and decreases psychological distress.	Low	Conditional
• Preoperative SLP evaluation and swallowing exercises improve swallowing outcomes in patients undergoing primary chemoradiation.	High	Strong

2.5 | Preadmission tobacco and alcohol cessation counseling and treatment

While tobacco smoking rates continue to decline worldwide, HNC patients continue to carry this risk factor at a higher rate than the general population. Perioperative tobacco use has been associated with higher rates of intra and postoperative cardiac, pulmonary, neurologic, and infectious complications.[50–55] Wound healing is also impacted by perioperative tobacco use increasing the rates of wound dehiscence, infection, and need for reoperation.[56–60] For HNC patients, persistent smoking is associated with higher rates of recurrence, second primaries, decreased response to radiation therapy (RT), and decreased overall survival (OS).[61–65] While all data points to earlier cessation leading to better outcomes for surgical patients, cessation of at least 4 weeks prior to surgery has been found to decrease surgical site infections (SSIs).[66,67] Effective smoking cessation strategies and techniques continue to pose a large problem for HNC providers and patients.[68] A randomized control trial by Park et al. showed a 13% increase in tobacco abstinence in cancer patients who received sustained counseling and an approved cessation medication compared to those with short term counseling and medication advice.[69] A combination of nicotine replacement therapy with counseling has been shown to increase cessation rates among HNC patients.[70] Due to high rates of concomitant alcohol use disorder, and depression among HNC patients who smoke, the data suggests tobacco cessation rates improve when other comorbidities are treated in conjunction.[71,72] Guidelines in tobacco cessation for patients include a multifaceted approach of counseling, nicotine replacement, and pharmacologic intervention.[66,73] Perioperative alcohol use has been shown to increase rates of postoperative infections, delirium, withdrawal, wound dehiscence, bleeding, cardiopulmonary complications, and neurological complications.[74] Abstinence from tobacco and alcohol for 6–8 weeks prior to surgery has been shown to decrease incidence of postoperative morbidity by up to 50%.[74,75]

2.6 | Recommendations

• Tobacco use, alcohol use, and depression should be screened for and addressed concurrently.	High	Strong
• Tobacco cessation should be emphasized in all patients diagnosed with HNC at least 6 weeks before surgery to reduce postoperative mortality and complications.	High	Strong
• Tobacco cessation should be approached through a combination of counseling, nicotine replacement, and pharmacologic intervention.	High	Strong
• Treatment of alcohol use disorder and depression increase tobacco cessation rates.	High	Strong

2.7 | Preadmission nutrition optimization

Up to 50% of HNC patients are considered malnourished.[76,77] HNC patients are at increased risk of pretreatment malnutrition due to the inherent location of tumors involving the upper aerodigestive tract as well as increased risk factors of alcohol use and smoking.[76,78] Malnutrition at the time of surgery is associated with increased wound complications, bleeding and transfusions, pulmonary complications, delirium, refeeding syndrome, LOS, and mortality.[79–85] Nutritional status should be evaluated via a validated nutritional assessment tool from the time of diagnosis in patients with HNC. Nutritional risk index has been validated in HNC patients and considers serum albumin levels and weight loss.[76,86] Early identification of malnourished patients and those at high risk to become malnourished should prompt a timely intervention including involvement of a trained dietician.[87] According to the European Society for Clinical Nutrition and Metabolism guideline, preoperative nutritional support should be initiated in any patient found to have >10% weight loss in the previous 6 months, BMI <18.5, malnutrition found on a validated screening tool, albumin <30 g/l, or inability to consume >50% of their recommended intake for more than 7 days. The guideline recommends that nutritional support should be maintained for 7–14 days, even if surgery must be delayed to reduce postoperative complications precipitated by malnutrition.[88] Enteral feeding should be considered in carefully selected patients who are unable to meet adequate oral intake requirements.[89] Immunonutrition supplements such as arginine, glutamine, ribonucleotides, and omega-3 fatty acids have been considered a potential area for improvement with promising results in surgical patients.[90–92] In the HNC population, preoperative immunonutrition has been shown to decrease postoperative fistula rates by up to 50% and LOS by up to 1 week.[93–95] Preoperative fasting is no longer recommended for all patients, the updated guidelines allow for clear liquids up to 2 h prior to induction.[96] Preoperative carbohydrate loading with 800 ml the night before surgery and 400 ml 2 h before surgery has been shown to decrease LOS and does not increase the risk of aspiration.[97–100] Preoperative carbohydrate loading has been shown to decrease insulin resistance, complications, and pain in the postoperative state.[101–103]

2.8 | Recommendations

Early and frequent nutritional assessment should be performed on all patients with a diagnosis of HNC.	High	Strong
Nutritional support and dietician referral should be offered to any patients who meet criteria or are at risk for under or malnutrition.	High	Strong
Nutrition optimization and support should be prioritized for 2 weeks prior to surgery.	High	Strong
Immunonutrition supplementation is safe and may improve outcomes.	High	Conditional
Carbohydrate loading up to 2 h before surgery improves postoperative outcomes.	High	Strong

2.9 | Preadmission sarcopenia management

Up to 70% of HNC patients are sarcopenic.[104] Sarcopenia is defined clinically as decreased skeletal muscle mass with either low strength and/or low performance.[105] Radiologically, it is defined as low skeletal muscle mass at the level of C3 on CT.[106,107] Sarcopenia has previously been associated with worse OS in patients with solid tumors.[108] Preoperative sarcopenia in HNC patients has been associated with severe complications resulting in increased LOS and mortality.[109] Sarcopenia is associated with earlier postoperative complications such as fistula development, venous thromboembolism (VTE), blood transfusions, LOS, delirium, discharge to post-acute care facilities, and readmission.[110–116] Sarcopenia is associated with worse OS and disease-free survival in HNC.[117–121] Evaluation of sarcopenia should be done during the first clinic visit with a validated screening tool such as hand grip strength or chair rise test.[105,122,123] Early detection and intervention on sarcopenia may improve patient outcomes.[124] In patients undergoing major abdominal surgery, prehabilitation in the form of structured exercise is associated with decreased LOS and postoperative complication rates.[125–128] Following the recommendation of the Society of Sarcopenia, Cachexia, and Wasting Disorders, sarcopenic patients should be instructed to undergo progressive resistance training two to three times a week to increase muscle mass and function. This can be self-directed or under the instruction of a physical therapist.[129–131]

2.10 | Recommendations

Preoperative sarcopenia assessment using validated skeletal muscle mass at the level of C3 in conjunction with either hand grip test or chair stand test should be performed for all patients with a diagnosis of HNC.	Moderate	Conditional
Progressive resistance training is safe and effective in increasing muscle mass and function of patients with sarcopenia.	High	Strong
Increased muscle mass and function can improve surgical outcomes.	High	Strong
Addition of a HNC physical therapist to the multidisciplinary team may increase compliance with exercise routine.	Moderate	Strong

2.11 | Preadmission depression management

There is a wide range of reported major depressive disorder (MDD) rates among patients diagnosed with HNC, with studies quoting between 6 and 52%.[132,133] The increased instance of emotional distress is most commonly due to the associated functional impairment of speaking, breathing, and swallowing along with facial

disfigurement.[134,135] Of the medically ill population, HNC patients have among the highest rates of suicide.[136–140] MDD is typically diagnosed within the first few months following diagnosis of HNC.[133] MDD adversely affects multiple aspects of a patient's recovery including OS, LOS, compliance with treatment, self-care abilities, as well as quality of life (QoL).[20,133,141–143] Due to the well-known adverse effects of depression in HNC patients, the landmark PROTECT trial out of the University of Nebraska was the first to show efficacy of prophylactic escitalopram in the prevention of MDD in HNC patients by up to 50%.[144] Since then, a secondary analysis has been published which established criteria for baseline characteristics of patients that would benefit from prophylactic treatment.[145] They found that patients with baseline depressive symptoms, determined by a score of 4 or greater on the Quick Inventory of Depressive Symptomatology-Self Report (QIDS-SR), or those who were to undergo primary RT would have the highest reduction in MDD development. Interestingly, not only did the incidence of MDD during treatment decrease in this population but patients reported sustained benefit after cessation of the drug for up to 3 months. Due to the high benefit and low risk profile of escitalopram, the authors proposed lowering the QIDS-SR prophylaxis threshold to 2 in order to benefit the maximum number of patients. These data show the importance and value of depression screening for the HNC population.

2.12 | Recommendations

All patients should be screened for depression from time of diagnosis and at each additional clinical visit.	High	Strong
Patients should be started on prophylactic escitalopram if they meet baseline criteria of QIDS-SR score of 2, or if they are treated with primary RT.	Moderate	Strong

2.13 | Preoperative multimodal analgesia

Pain associated with HNC surgery can be nociceptive, neuropathic, psychogenic, idiopathic, or a combination of the above. The value of treating pain through multiple pathways has been recognized since the early 1990s and has become a keystone in complex pain management. Multimodal analgesia (MMA) incorporates a variety of non-opioid based pain treatments and allows for flexibility in practice based on the individual patients' comorbidities, allergies, disease process, and other medications. Preoperative MMA administration has been shown to effectively reduce the need for postoperative pain scores, opioid use, as well as hospital stays in the HNC literature and other surgical fields.[146–151] Common elements of preoperative MMA include acetaminophen, nonsteroidal anti-inflammatory drugs, muscle relaxants, local anesthetics, and GABA analogues.[152] In a study by Vu et al., a single preoperative dose of ≥1 celecoxib, gabapentin, and/or tramadol has been associated with decreased opioid use both in the operating room and in PACU as well as shorter PACU stay in patients undergoing HNC surgery.[23] Chiu et al. demonstrated that a single dose of preoperative gabapentin in patients undergoing tongue resection and anterolateral free flap decreased postoperative pain scores, opioid use, sedation, and antiemetic use.[153] Many preoperative MMA protocols include 1–3 days of preoperative analgesia administration with the last dose up to 2 h prior to surgery. Opioid sparing preoperative analgesia is effective for patients who are opioid naive; however, for patients already taking opioids, these medications should be continued and a referral to a designated pain management specialist should be considered.

2.14 | Recommendations

Preoperative opioid-sparing pain management should be incorporated into the surgical plan for patients undergoing surgery.	High	Strong
Scheduled singular or combinations of acetaminophen, celecoxib, gabapentin, ibuprofen, and tramadol should be considered for inclusion in the perioperative pain regimen for HNC patients.	Moderate	Strong
Modifications for doses and medications should be individualized based on the patient's past medical history, allergies, age, and other medications.	High	Strong

2.15 | Intraoperative euvolemia and vasopressor use

Fluid overload is a known risk factor for complications of head and neck reconstructive surgery.[154] Anesthesiologists have previously been tasked with maintaining hemodynamic stability without the adjunct of vasopressors due to the perceived compromise of pedicled and free flap survival.[154–157] There is a growing body of evidence from more recent studies showing that vasopressors, when necessary, do not compromise free flap survival.[158] Fluid administration is used to maximize stroke volume and treat hypovolemia.[159] Goal directed therapy (GDT) is used to maximize oxygen delivery and hemodynamic parameters while maintaining euvolemia.[160] GDT reduces mortality, rates of respiratory failure, prolonged intubation, pneumonia, wound infections, sepsis, and kidney injury.[161] Intraoperative crystalloid administration of 130 ml/kg/24 h or greater than 7 L is an independent factor of major postoperative medical complications.[60,162] Farwell et al. showed increased surgical complications associated with higher intraoperative fluid volumes.[163] A cutoff of 5500 ml was found to be predictive of increased complications, both medical and surgical.[164] Dooley et al. showed that the negative outcomes associated with excess fluid administration should be expanded to fluid given in PACU as this fluid was found to be an independent variable in increasing LOS.[165]

2.16 | Recommendations

Judicious administration of intraoperative fluids should be employed for patients undergoing HNC surgery and reconstruction throughout the entire perioperative period.	High	Strong
Intraoperative vasopressors, when necessary, are safe in free flap reconstruction surgery.	Low	Conditional

2.17 | Intraoperative normothermia

Intraoperative hypothermia, defined as a core body temperature <36°C, is a common adverse event during general anesthesia as the body is unable to regulate its own temperature.[166] Methods to increase core body temperature in the perioperative period include warmed intravenous fluids, decreased cutaneous exposure, warming blankets and mattresses, and warmed humidified oxygen administration.[166] Despite these technologies, Moola et al. showed that incidence of inadvertent hypothermia is up to 90% greater than hyperthermia.[167] Intraoperative hypothermia has been associated with several surgical and postsurgical complications including coagulopathies, blood loss, need for blood transfusion, increased LOS, SSI, and increased mortality.[168–173] Previous studies have shown that hypothermia during free flap reconstruction reduces flap survival which is thought to be due to vasoconstriction.[174] In the head and neck literature, intraoperative hypothermia has been linked to delayed time to extubation, increased neck seromas, and wound dehiscence.[175] Sumer et al. found that hypothermia <35° in patients, regardless of length of hypothermic event, had a fivefold increase in both infectious and overall complications.[176] Minimum core body temperature of <36° has been shown to increase flap loss, arterial thrombosis, and hospital LOS in free flap surgery.[177]

2.18 | Recommendations

Temperature monitoring is necessary to ensure normothermia is maintained intraoperatively.	High	Strong
In the perioperative period, minimum core body temperature of the patient should be between 36 and 36.5.	Moderate	Strong
Multiple well established warming methods can reduce inadvertent intraoperative hypothermia.	High	Strong

2.19 | Postoperative extubation

Extubation following free flap placement for reconstruction following HNC resection has often been delayed to prevent damage to microvascular anastomosis during emergence. However, a recent paradigm shift has advocated for immediate postoperative extubation due to demonstrable increase in complications associated with delayed extubation.[178–180] Use of rapid awakening procedures to bring patients to a lucid state prior to departure from the operating room significantly reduces complications, including pneumonia, and ICU LOS upon multivariate analysis.[180] Bertelsen et al. found no increase in free flap or other complications associated with immediate extubation.[181] In those with extensive alcohol consumption prior to surgery, extubation in the operating room decreases need for treatment for alcohol withdrawal.[179] Early extubation additionally increases patient comfort and significantly decreases use of anxiolytics and restraint use during hospital stay.[178] In cases where airway security cannot be guaranteed, such as extensive oral cavity resections with bulky free flap reconstruction, recent literature advocates for a delayed extubation trial on POD1 rather than the classic teaching of preemptive tracheostomy.[182–189] Preemptive tracheostomy placement has been shown to be an independent risk factor for postoperative complications in patients with extensive oral cavity resections including increased rates of dysphagia, pneumonias, and LOS when compared to delayed extubation.[182,190] Between the preemptive and delayed tracheostomy groups in oral cavity resections, there remained a decrease in pneumonia rates in the delayed group.[191]

2.20 | Recommendations

Immediate postoperative extubation decreases complications and ICU stay while increasing patient wellbeing.	Moderate	Conditional
Alternatively to preemptive tracheotomy in patients with potentially unsafe airways, a delayed extubation (POD1) should be considered.	Low	Conditional
Conversion to tracheostomy should be considered for patients who fail immediate or delayed extubation on a case-by-case basis.	Moderate	Strong

2.21 | Postoperative transfusion

Perioperative transfusion in HNC patients has decreased substantially since implementation of restrictive transfusion protocols. Prior to 2000, up to 73% of HNC patients received perioperative transfusions for large resections and there were associated high complication rates and decreased survival.[192] The current incidence of perioperative transfusion is around 6%.[193] Current transfusion protocols advise blood administration in asymptomatic patients with a hemoglobin <7 in otherwise healthy patients and <8 in patients with cardiovascular disease.[194,195] Perioperative transfusion has been considered to increase postoperative morbidity and mortality in HNC patients.[196] Studies have shown a more than two fold increase (71 vs. 31%) in recurrence of HNC, thought to be

due to the immunomodulation and tumor-promoting effects of blood transfusion.[193,197–200] Decreased OS, increased wound infections, flap failures, and hospital readmission rates were all found to be associated with perioperative blood transfusions.[198,201–203] A recent study published by Runge et al. concluded that current transfusion practices do not increase oncologic risk or decrease OS over a 5 year period; however, this study included only a limited number of patients.[204]

2.22 | Recommendations

Blood product administration should be given when indicated according to current guidelines of hemoglobin <7 in asymptomatic patients, hemoglobin <8 in asymptomatic cardiovascular patients, or when >30% blood volume lost intraoperatively.	High	Strong
Hemostasis should be emphasized throughout surgery to prevent unnecessary blood loss requiring transfusion.	Moderate	Strong

2.23 | Postoperative VTE prophylaxis and anticoagulation

Cancer as well as postoperative state are both individual risk factors for VTE.[205] Consideration of mechanical and pharmacologic prophylaxis for patients undergoing major head and neck surgery is warranted to reduce risk of VTE. Sequential compression devices (SCDs) decrease the risk of VTE development by 50%; however, ensuring compliance with these can prove difficult.[206,207] It has been shown that postoperative low molecular weight heparin reduces VTE incidence in HNC patients by up to 50%; however, this is also associated with a nearly threefold increase in bleeding complications.[208] VTE prophylaxis should therefore be individualized based on the patients risk using the validated Caprini score to determine management.[209,210] For patients on chronic anticoagulation or antiplatelet therapy, safely restarting has also been a point of interest. It is generally recommended to restart warfarin 12–24 h after surgery without bridging via low-molecular-weight heparin following HNC surgery. New oral anticoagulants including rivaroxaban, apixaban, and dabigatran should be resumed 2–3 days postoperatively. Oral antiplatelet drugs can be restarted 24 h after surgery.[211,212]

2.24 | Recommendations

All hospitalized HNC surgical patients should have SCDs.	High	Strong
Caprini score should be used to determine if chemoprophylaxis is warranted. With score greater than 7 chemoprophylaxis should be strongly considered.	High	Strong

2.25 | Postoperative nausea and vomiting prophylaxis

Postoperative nausea and vomiting (PONV) remains a prevalent complication after anesthesia and its incidence is associated with distress and anxiety for surgical patients.[213,214] The development of PONV is highly associated with surgical length and postoperative pain, two factors commonly experienced by HNC patients.[17,215–217] A multimodal approach to the prevention of PONV should be employed in all patients undergoing HNC surgery. Further complications of PONV include delayed mobilization, wound dehiscence, dehydration, and aspiration.[218–222] While controlling postoperative pain is paramount to prevention of PONV, postoperative opioids have been found to increase PONV in patients.[215,223] This risk can be mitigated by opioid sparing postoperative analgesia which has shown to be both safe and effective. Taniguchi et al. found that scheduled postoperative IV acetaminophen reduces incidence of PONV in gynecologic patients.[224] Gastric decompression prior to extubation has been shown to reduce PONV in otolaryngologic surgeries, though this is commonly reserved to procedures that are likely to introduce blood into the stomach.[220,225,226] Data show that 5-hydroxytryptamine-3 receptor agonists combined with corticosteroids are efficacious for prophylaxis of PONV.[227–229] The evidence supports that breakthrough PONV should be treated with rescue drugs chosen from a different therapeutic class than the prophylactic drugs.[230,231]

2.26 | Recommendations

All patients undergoing HNC surgery should have PONV prophylaxis scheduled.	Low	Weak
Rescue PONV drugs should be in a different class than prophylaxis drugs.	High	Strong
Gastric decompression should be applied to all patients undergoing surgeries with risk of blood introduction into the stomach.	Moderate	Strong
Opioid sparing pain management should be employed in the prophylaxis of PONV.	High	Strong

2.27 | Postoperative nutrition

Postoperative nutrition plans should be made by a registered dietician who has experience with HNC patients.[232] Early enteral feeding within the first 24 h after surgery has been shown to have many benefits in critically ill or high-risk patients and is advocated for by multiple clinical guidelines.[233–236] In HNC patients with a BMI <20, increase in calories has shown to decrease mortality, highlighting the importance of early feeding with emphasis of expedited advance to goal.[237] Early feeding reduces septic complications

as well as major medical complications.[238–240] Kerwala et al. found that early oral feeding on POD1 after free flap is not associated with increased dehiscence or fistula formation, however is associated with a decrease in LOS by more than 7 days.[241] Stramiello et al. found that early oral feeding (on or before POD5) in properly selected patients did not increase the risk of salivary fistula after free flap, and may expedite swallowing function recovery.[242] The ERAS program described by Coyle et al. advocates for tube feeds within 12 h after surgery.[187]

2.28 | Recommendations

Enteral feeding should be commenced within the first 24 h after surgery.	High	Conditional
All patients with preoperative under or malnutrition should be monitored for signs of refeeding syndrome.	Moderate	Conditional
Postoperative nutrition plans should be made by a dietician who has experience with HNC patients.	High	Strong

2.29 | Postoperative pain management

Postoperative pain management focuses on the continuation of preoperative pain management with MMA (scheduled celecoxib, gabapentin, and acetaminophen or tramadol).[22,23,25,243] MMA has previously been shown to reduce postoperative opioid prescriptions in outpatient thyroid, parathyroid, and parotid surgeries by up to 50%.[244,245] Hinther et al. showed that MMA significantly reduced postoperative opioid consumption by approximately 25% and decreased time to mobilization by 1 day among HNC surgery and free flap reconstruction patients.[246] Postoperatively, the patient's baseline pain regimen should be restarted immediately to maintain baseline pain repression. Importantly, administration of MMA preoperatively and perioperatively with control of depression leads to decreased perception of pain and the mean morphine equivalent dose administered in the first 72 h postoperatively.[247,248] Kiong et al. found adherence to ERAS protocols also decreases mean hospital stay and overall complications.[243]

Although opioid use should be minimized, the severe pain associated with surgery may require opioids for breakthrough pain.[17,249] When selecting opioids, the use of longer acting opioids, such as tramadol, methadone and low dose morphine should be utilized to reduce habit forming potentials. It should be kept in mind that certain groups are more likely to suffer from opioid abuse. Preoperative opioid usage, age younger than 65 years, patient-controlled analgesia use, and ICU admission all predict a higher risk of increased opioid requirements.

2.30 | Recommendations

Postoperative pain management should rely on scheduled opioid sparing analgesics including acetaminophen, gabapentin, nonsteroidal anti-inflammatory drugs, and glucocorticoids.	High	Strong
Opioids should be used sparingly on an as needed basis for pain uncontrolled by scheduled medicines.	High	Strong
Long-acting opioids are preferred over short acting opioids for postsurgical pain management.	Moderate	Conditional

2.31 | Postoperative early mobilization and involvement of physical therapy

One of the cornerstones of ERAS is early postoperative ambulation.[17,25] Yeung et al. found that patients mobilized after postoperative day 4 were four times more likely to develop pneumonia.[250] Yang et al. found that early mobilization (out of bed by POD3) was associated with reduced time to removal of nasogastric tubes, urethral catheters, and tracheostomies as well as longer sleep duration and improved patient comfort.[251] Twomey et al. showed that early mobilization within 24 h decreased overall complications, major complications, and LOS whereas mobilization after 48 h increased major complications and LOS.[252] Early mobilization has been shown to decrease the incidence of delirium.[253] Currently, the ERAS guidelines for HNC surgery with free flap reconstruction recommend mobilization within the first 24 h after surgery.[22] Physical therapy should be initiated as soon as possible to begin early and intensive mobilization during the hospital stay.[254] Steegmann et al. showed that an individualized autonomous exercise plan in addition to traditional physical therapy decreased fatigue, digestive problems, and LOS in postoperative HNC patients. These data were more pronounced with earlier initiation of mobilization.[254] Beyond the hospital stay, long-term exercise regime beyond postoperative hospitalization should also be encouraged for HNC patients.[255] A recent pilot study advocated for at-home exercise program for HNC patients and showed that it had positive effects on physical function and QoL.[256]

2.32 | Recommendations

Patients should mobilize within 24 h of undergoing major HNC surgery.	Moderate	Strong
All patients should work with physical therapy throughout their hospitalization.	Moderate	Strong
Patients should receive individualized autonomous exercise plans to complete while hospitalized, as well as after discharge.	Low	Strong

2.33 | Postoperative delirium

Postoperative delirium is a common and serious complication after extensive HNC surgery.[257–260] It is associated with an increased cognitive impairment, readmission, functional disability, mental health disorders pneumonia, LOS, and death.[261–264] In a meta-analysis by Zhu et al., authors found that postoperative delirium in the HNC population ranged from 11.50 to 36.11%.[266] Risk factors for the development of delirium in HNC patients include old age, male sex, duration of surgery, history of hypertension, increased blood loss or need for transfusions, alcohol misuse, flap reconstruction, and neck dissection.[258,265,267] Multicomponent interventions have been proposed to reduce the incidence of postoperative delirium.[268,269] They are generally divided into non-pharmacological intervention and pharmacologic intervention.[270,271] Non-pharmacological interventions include early ambulation, providing appropriate lighting, addressing dehydration and nutritional needs, carrying out medication review, and promoting good sleep hygiene.[272] Pharmacological agents that can be used are antipsychotics, cholinesterase inhibitors, melatonin, and alpha-2-agonists.[273]

2.34 | Recommendations

Delirium risk factors should be screened preoperatively.	Low	Strong
Delirium prevention though pharmacologic and non-pharmacological interventions should be employed for all patients undergoing major HNC surgery.	High	Strong

2.35 | Postoperative discharge planning

HNC patients require multifaceted discharge coordination following surgery. Due to their complex and intensive discharge needs, HNC patients are at increased risk for discharge delay. Lang et al. demonstrated that patients without social support or those with inadequate or no insurance experienced higher rates of delay, leading to increased LOS.[274] Concerted efforts are needed to identify barriers to discharge prior surgery to prevent unnecessary medical costs and nosocomial risks from prolonged LOS. Involvement of social work and case management should be employed in the phase of transitional care to organize medical supplies, arrange placement after discharge or aid in home health set up, suggest financial or emotional support services. Follow up appointments should be made for patients prior to discharge in all indicated specialties including surgery, medical oncology, radiation oncology, SLP, physical therapy, and all other indicated fields.

2.36 | Recommendations

Aside from post hospital placement, discharge planning should include patient and family education, organization of at home medical supplies, financial and emotional support resources, and scheduling of follow up appointments.	Moderate	Conditional
Due to their complex and intensive postsurgical needs, discharge planning for major HNC surgery patients should begin on or before the day of surgery.	Moderate	Strong
Barriers to discharge should be assessed prior to surgery.	Moderate	Strong

3 | CONCLUSION

Institution of an ERAS protocol for patients undergoing head and neck surgeries requires comprehensive collaboration from multidisciplinary teams. ERAS reduces complications, shortens LOS and therefore can reduce healthcare costs while providing better perioperative care in patients undergoing HNC surgeries. Implementing ERAS principles in head and neck surgery is still a growing process. While increasing data for HNC is being produced in the literature, many of the ERAS recommendations remain generalized from those utilized in other surgical fields. ERAS is a dynamic set of recommendations designed to evolve as new data emerge. Current and future advances in HNC research will serve to strengthen and add new principles to a comprehensive ERAS protocol.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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