OXFORD

JNCI: Journal of the National Cancer Institute, 2025, **117(11),** 2202–2218

https://doi.org/10.1093/jnci/djaf128

Advance Access Publication Date: June 14, 2025

Article

Multidisciplinary evidence-based consensus statements on salvage surgery for recurrent head and neck cancer (International Centre for Recurrent Head and Neck Cancer)

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Abstract

Background: Recurrent head and neck squamous cell carcinomas are an understudied subgroup, lacking high-quality evidence and thus gold standard management recommendations, resulting in major variations in practice. The aim of this project was to deliver a national multidisciplinary expert consensus on patients with recurrent head and neck squamous cell carcinoma managed by curative salvage surgery.

Received: October 2, 2024. **Revised:** April 9, 2025. **Accepted:** May 14, 2025

Methods: The Appraisal of Guidelines for Research and Evaluation II (AGREEII) protocol guided the Delphi process. Best practice statements were developed after literature review on the perioperative management and surgical salvage of major recurrent head and neck squamous cell carcinoma subsites. Members of the International Centre for Recurrent Head and Neck Cancer network and other UK-based professional stakeholder organizations were invited into an online Delphi study. Participants voted on statements over 3 rounds, with items modified in response to vote thresholds and comments.

Results: A total of 28 experts participated, including 11 otolaryngologists, 7 oncologists, 9 oral and maxillofacial surgeons, and 1 speech and language therapist. Consensus was achieved on 73 statements, with 29 (39.7%) achieving unanimous (threshold = 100%) and 25 (34.2%) very strongly supported (threshold > 90%) agreement.

Conclusions: Salvage surgeries for recurrent head and neck squamous cell carcinoma are challenging cases that require intensive multidisciplinary input to achieve cure while balancing impact on function and quality of life. In this article, we provide a large series of statements based on UK-wide expert consensus that will guide clinicians through the complex intra- and perioperative management of patients undergoing surgical salvage.

Introduction

Despite advances in surgical and oncological treatments over the last 3 decades, patients with a history of head and neck squamous cell carcinoma are at a substantially elevated risk of recurrent and residual disease. When combined with a rising incidence of head and neck squamous cell carcinomas internationally,[1] this has produced a large patient cohort requiring further investigations and treatment after primary management. The reported rates of recurrent head and neck squamous cell carcinoma are conflicting, with studies such as the recent ARTDECO trial of intensity-modulated radiotherapy finding a 2-year locoregional control rate of 74.7% in laryngeal and hypopharyngeal cancers,[2] while a 2021 update of the Meta-analysis of chemotherapy in head and neck cancer (MACH-NC) reported a pooled locoregional failure rate as high as 42%.[3]

Radiotherapy can induce several posttreatment changes to the head and neck mucosa including scarring, diminished blood supply, and radioresistance. As a result, the Royal College of Radiologists cautions against reirradiation of recurrent cancers with a short latency of 6-12 months, in addition to recommending avoidance of elective cervical nodes and aiming for a narrow clinical tumor volume of less than 50 cm.[3,4] Salvage surgery is commonly the only curative option for many patients; however, compared with primary resections, salvage procedures are associated with a higher risk of postoperative complications and treatment failure.[5] Unfortunately, because of a lack of effective alternative treatments, difficulties in standardizing surgical techniques, and a low number of patients eligible for recruitment, there are few high-quality prospective trials in salvage surgery on which to base treatment recommendations. Moreover, there is a shortage of clinical practice guidelines specific to recurrent head and neck squamous cell carcinoma, and those that do exist are hampered by their methodological quality.[6] Accordingly, there is little evidence to support multidisciplinary team decision making, and resultantly, many recurrent head and neck squamous cell carcinoma patients are deemed ineligible for salvage surgery at diagnosis, with one series showing only 47.4% of recurrences undergo salvage surgery, with considerable variations noted across subsites.[7]

Members of our institution, in partnership with ENT UK, recently conducted a UK-wide Delphi study, producing best practice statements on the management of unknown primary head and neck squamous cell carcinoma, which ultimately influenced recommendations in the sixth edition of the UK head and neck cancer guidelines.[8] This project clearly demonstrated the efficacy of national multidisciplinary consensus studies in producing best practice statements for uncommon tumors with complex management pathways and a weak evidence base. Consequently, the aim of this project was to use a modified Delphi methodology to produce comprehensive best practice statements on curative salvage surgery for recurrent head and neck squamous cell carcinoma, to guide head and neck multidisciplinary team decision making in patients being considered for salvage surgical intervention. Specifically, the statements concern preoperative optimization; surgical intervention of recurrent laryngeal, hypopharyngeal, oropharyngeal, and oral cavity tumors; and postoperative management and follow-up.

Methods

Project oversight

The Delphi methodology was adapted from a previous consensus study, the details of which are published elsewhere.[9] Project oversight was provided by the scientific committee of the International Centre for Recurrent Head and Neck Cancer (IReC), consisting of a panel of clinicians and researchers with an interest in recurrent head and neck squamous cell carcinoma. IReC is a network of 9 high-volume centers, led by the Royal Marsden Hospital, London, to accelerate research and improve outcomes for patients with recurrent head and neck squamous cell carcinoma and set international standards in the curative treatment, palliation, and supportive care of this disease. The Appraisal of Guidelines for Research and Evaluation II (AGREEII) protocol was used to prepare this process (Table S1),[10] with the methodology shared in advance with Delphi participants.

Literature search

Topic themes on management of recurrent head and neck squamous cell carcinoma were identified by reviewing existing international guidelines and consensus recommendations.[8,11-14] Following this, multiple English language literature searches were performed using a systematic review and meta-analysis filter of articles published between 2003 and 2023. Literature searches were performed on PubMed on April 1, 2023, and updated on October 31, 2023. Search criteria are provided in Methods S1; in summary, phrases relating to head and neck subsites and surgeries including "laryngectomy," "neck dissection," and "transoral robotic surgery" were combined with terms such as "recurrence," "recurrent," and "salvage." In addition, 2 bespoke systematic reviews were commissioned,[15,16] and additional targeted searches of randomized trials and case series were undertaken where no systematic review evidence existed.

Statement generation

Draft statements were produced according to the National Institute for Health and Care Excellence (NICE) guidance for recommendation language.[17] This recommends directive language (eg, "offer") be used for treatments that should be performed, and

less commanding phrasing (eg, "consider") be advised for recommendations where there is less clarity on the risks and benefits. Statements were authored by an otolaryngology research fellow and resident surgeon (AW), a senior head and neck cancer surgeon (VP), with input from a specialist head and neck speech and language therapist and dietician (GB, NH). The statements identified points in the patient pathway that necessitate decision making to proceed to the next step in management.

Where available, statements were mapped to existing literature, and the quality of the evidence was graded by the research fellow using the Strength of Recommendation Taxonomy (SORT).[18] SORT is a grading scale that evaluates the quality and consistency of evidence and rates research on a simple 3-point scale of A (consistent and good quality patient-orientated evidence), B (inconsistent and limited-quality patient-orientated evidence), and C (based on consensus, usual practice, opinion, disease-oriented evidence, or case series).

Participant selection

After steering committee review, statements were distributed to nominated representatives from units across the United Kingdom. Each center was asked to nominate a consultant otolaryngologist, oncologist, and oral and maxillofacial surgeon. In addition, representatives from UK-based professional stakeholder organizations including ENT UK, the British Association of Head and Neck Oncologists (BAHNO), and the British Association of Oral and Maxillofacial Surgeons were invited to participate.

Delphi process

Representatives were sent a weblink to a 3-stage, online modified Delphi process hosted on Survey Monkey (San Mateo, CA, USA). Statements were answered with agree, disagree, and unsure options. Each statement was accompanied by a free text box to facilitate comments and feedback. Results were single blinded, with only 2 authors (AW, VP) able to review voting and comments between rounds. Participants were provided with summary documents of the best practice guidelines and research articles used to generate statements before voting (Tables S2 and S3). Each round was conducted over 2 weeks, with reminder emails sent on days 5 and 10.

The Delphi was split into 2 phases. The first, covering preoperative management and salvage surgery of the larynx and hypopharynx, was conducted between November 6, 2023, and December 19, 2023, with the second, concerning salvage oral and oropharyngeal surgery and postoperative management and follow-up, occurring between February 12, 2024, and April 5, 2024.

Voting thresholds

Thresholds were modified from the Royal College of Radiology consensus statements[4] (Table S4). "Unsure" or unanswered statements were discarded, and thresholds were calculated from agree and disagree responses. Statements achieving "unanimous" (100%), "very strongly supported" (90%-99%), and "strongly supported" (80%-89%) thresholds were removed from future voting rounds. After round 1, statements were modified in line with participant comments. Most modifications involved toning down the statement to allow more latitude in management choice. The original and modified questions were presented in follow-up rounds. If both statements reached the same threshold, but one attained a higher percentage level of agreement, then it was accepted. Additionally, if the "offer" and "consider" statements reached the same percentage of agreement, then the former was accepted. Finally, the agreed upon statements were graded with the Flesch reading ease score and reviewed by IReC's Patient and Public Involvement team, and where possible, minor adjustments were made to recommendation language to enhance readability. The Delphi leads (AW, VP) retained the concluding remarks on statements between voting and on the final arrangement of the consensus document.

Results

Delphi process

Phase 1 involved 19 experts (11 otolaryngologists, 7 oncologists, 1 speech and language therapist) including representatives from ENT UK ($n = 2$) and BAHNO ($n = 1$). Phase 2 added 9 otolaryngologist, oncologist, and oral and maxillofacial surgeon experts, including BAHNO ($n = 4$) and British Association of Oral and Maxillofacial Surgeons ($n = 1$) representatives. Figure 1 summarizes both Delphi phases. Phase 1 consisted of 31 statements (9 preoperative management and 22 laryngeal and hypopharyngeal salvage surgery), while phase 2 contained 42 statements (24 oral and oropharyngeal salvage surgery and 18 postoperative management). Response rates were 19 of 19 (100%), 17 of 19 (89.5%), and 16 of 19 (84.2%) in phase 1, and 23 of 28 (82.1%), 23 of 28 (82.1%), and 24 of 28 (85.7%) in phase 2. After final arrangement of statements, the mean Flesch reading ease level was 8.9 (range = 0-52.87).

Delphi results

All 73 statements achieved consensus, with agreement thresholds reached as follows: 29 (39.7%) unanimous, 25 (34.2%) very strongly supported, 17 (23.3%) strongly supported, and 2 (2.7%) majority agreement (Figure 2). Reported rates of agreement describe when a statement first met a predetermined agreement threshold and do not report the number of rounds or revisions a particular item underwent. A full summary of statements, voting thresholds across rounds, SORT criteria, supporting evidence, and participant comments is provided in Tables 1-4 and Tables S5-S8.

Preoperative management and evaluation

Full statements, voting thresholds, references,[15,19-23] and comments on preoperative management are summarized in Table 1 and Table S5. The Delphi cohort agreed unanimously ($n = 19$ of 19, 100%; SORT: C) that all aspects of prehabilitation, surgical management, and rehabilitation should be undertaken in a multidisciplinary team environment. Preoperative imaging with contrast-enhanced computed tomography (CT) and/or magnetic resonance imaging reported by a specialist head and neck radiologist ($n = 17$ of 17, 100%; SORT: A) and assessment with whole-body 18-F-fluorodeoxyglucose–positron emission tomography/computed tomography (FDG-PETCT) ($n = 15$ of 15, 100%; SORT: A) also reached unanimous agreement. The cohort had very strong agreement ($n = 18$ of 19, 94.7%; SORT: C) that patients should receive a full discussion of all appropriate salvage techniques and be offered a choice of treatment where multiple options exist.

There was very strong agreement ($n = 18$ of 19, 94.7%; SORT: C) that specialist speech and language therapist examination and counseling should be offered to all presalvage patients. Strong agreement was achieved for offering instrumental assessment with videofluoroscopy and/or flexible endoscopic evaluation of swallowing ($n = 12$ of 14, 85.7%; SORT: C). Screening with validated nutrition tools, with referral to specialist dieticians where a risk of malnourishment and malnutrition is identified (as defined by NICE Clinical Guideline No. 32[24]), had very strong consensus ($n = 15$ of 16, 93.8%; SORT: C). The Delphi cohort had

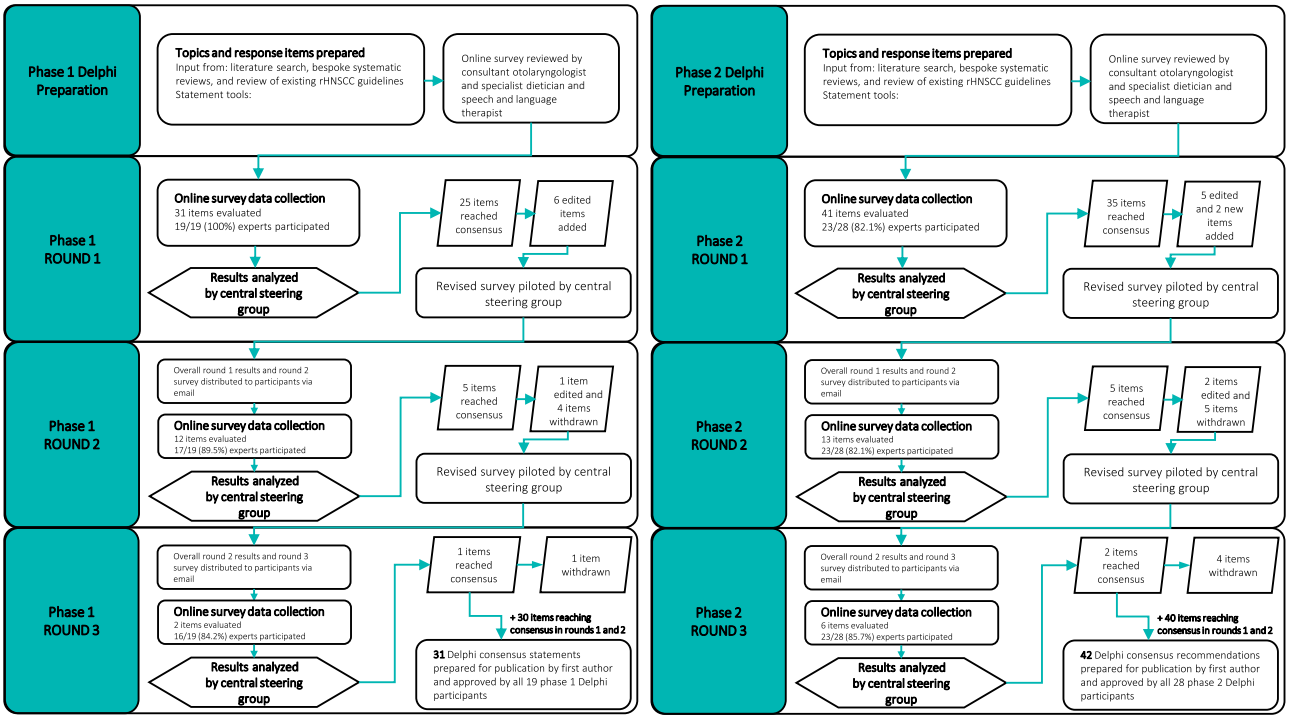

Figure 1. Summarizes the Delphi process in phase 1 (*left*) preoperative management and salvage laryngeal and hypopharyngeal surgery, and phase 2 (*right*) salvage oral cavity and oropharyngeal surgery and postoperative management and follow-up. Abbreviation: rHNSCC = recurrent head and neck squamous cell carcinoma.

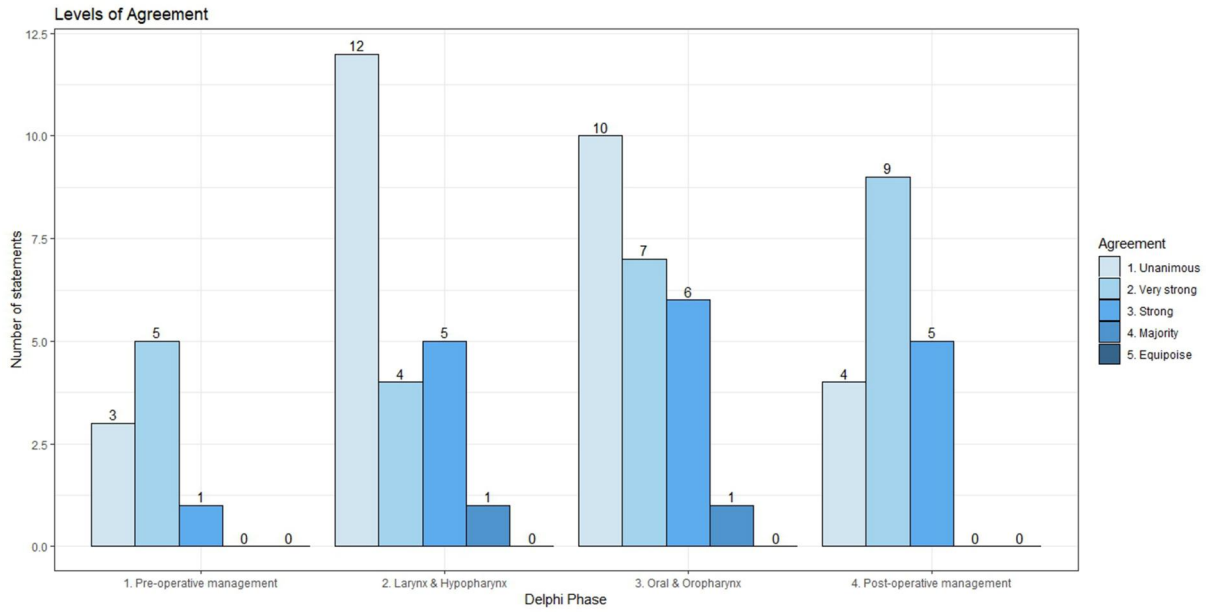

Figure 2. Chart summarizing the number of statements with unanimous, very strong, strong, majority, and equipoise agreement across the 4 major themes (preoperative management, laryngeal and hypopharyngeal salvage surgery, oral cavity and oropharynx salvage surgery, and postoperative management).

very strong agreement on the use of supplemental feeding with prophylactic gastrostomy in those with poor swallowing prognosis, prolonged (>4 weeks) swallow rehabilitation, undernutrition (defined as <30 kcal/kg per day), or nasogastric tube feeding and those at risk of malnutrition ($n = 17$ of 18, 94.4%; SORT: B). Use of nasogastric feeding in patients with short term (<4 weeks) swallow impairment or undernutrition was again very strongly supported ($n = 15$ of 16, 93.8%; SORT: C).

Salvage surgery for recurrent laryngeal and hypopharyngeal squamous cell carcinoma

Statements, voting thresholds, sources,[15,16,25-58] and comments relating to salvage surgery for laryngeal and hypopharyngeal recurrent head and neck squamous cell carcinoma are available in Table 2 and Table S6. There was unanimous agreement ($n = 19$ of 19, 100%; SORT: C) that all patients should undergo rigid

Table 1. Consensus statements on the preoperative management of patients undergoing salvage procedures for recurrent head and neck squamous cell carcinoma

Number	Statement	Round 1 (%)	Round 2 (%)	Round 3 (%)	Level of agreement	Strength of Recommendation Taxonomy	References
Preoperative management and evaluation							
1	Plan all aspects of multimodal prehabilitation, preoperative assessment, surgical care, reconstruction, and rehabilitation with a multidisciplinary team that has experience in managing recurrent head and neck cancers.	100.0	—	—	Unanimous	C	Expert consensus or existing best practice guidelines
2	Offer contrast-enhanced computed tomography and/or magnetic resonance imaging reported by a specialist head and neck radiologist in all patients with suspected recurrent cancer who are being considered for salvage surgery with curative intent.	100.0	—	—	Unanimous	A	Zhu (2023)[19]
3	Offer whole-body 18-fludeoxyglucose–positron emission tomography/computed tomography scans in patients with suspected recurrent head and neck cancer who are being considered for salvage surgery with curative intent.	100.0	—	—	Unanimous	A	Gao (2014),[20] Gupta (2011),[88] Isles (2008),[22] Zhu (2023)[19]
4	Offer patients a full preoperative discussion of all appropriate surgical techniques including the likely postoperative functional outcomes and rehabilitation and identify any patient preferences if a choice of surgical procedure exists.	94.7	—	—	Very strong agreement	C	Expert consensus or existing best practice guidelines
5	Offer patients a full preoperative multidisciplinary evaluation of communication, voice, and swallowing using clinician- and patient-reported outcome measures and pretreatment counseling by a speech and language therapist.	94.7	—	—	Very strong agreement	C	Expert consensus or existing best practice guidelines
6	Offer patients a preoperative instrumental evaluation of swallowing using videofluoroscopy and/or flexible endoscopic evaluation of swallowing	85.7	—	—	Strong agreement	C	Expert consensus or existing best practice guidelines
7	Offer nutritional screening using a validated tool, with urgent referral to a specialist dietitian for assessment and treatment in any patient identified to have or be at risk of malnourishment[a] or malnutrition.[b]	93.8	—	—	Very strong agreement	C	Expert consensus or existing best practice guidelines
8	Offer specialist dietician review and prophylactic nutritional support via an endoscopic or radiologically guided gastrostomy in patients undergoing salvage surgical procedures with · poor prognosis for swallowing recovery or prolonged (>4 wks) swallow rehabilitation; · at risk of prolonged (>4 wks) undernutrition (<30 kcal/kg per d); · at risk of prolonged (>4 wks) nasogastric tube feeding; · at risk of malnutrition.[b]	94.4	—	—	Very strong agreement	B	Wang (2014),[23] Williamson (2023)[15]
9	Offer prophylactic nutritional support via a nasogastric tube to patients at risk of short term (<4 wks) impaired swallowing or undernutrition (<30 kcal/kg per d).	93.8	—	—	Very strong agreement	C	Expert consensus or existing best practice guidelines

[a] Patient at risk of malnourishment defined as per National Institute for Health and Care Excellence (NICE) Clinical Guideline No. 32: body mass index <18.5 kg/m^2, unintentional weight loss of >10% within the last 3-6 months, a body mass index of <20 kg/m^2, and unintentional weight loss of >5% within the last 3 to 6 months. "—" denotes a round where the statement was not voted on because of previous acceptance or introduction in later rounds.
[b] Patient at risk of malnutrition defined as per NICE Clinical Guideline No. 32: eaten little or nothing for more than 5 days and/or are likely to eat little or nothing for 5 days or longer, a poor absorptive capacity and/or high nutrient losses, and/or increased nutritional needs from causes such as catabolism.

endoscopic evaluation under general anesthetic to determine quality of transoral access and tumor resectability.

Organ preservation salvage surgeries

On organ-preserving salvage surgeries, there was unanimous consensus that all patients should be counseled on the risk of completion laryngectomy ($n = 19$ of 19, 100%; SORT: B). Unanimous agreement was attained for the following procedures: transoral laser microsurgery for T1-T2 glottic recurrence with limited anterior commissure involvement ($n = 17$ of 17, 100%; SORT: B) and transoral laser microsurgery and transoral robotic surgery in T1-T2 recurrent supraglottic ($n = 18$ of 18, 100%; SORT: B) and hypopharyngeal ($n = 14$ of 14, 100%; SORT: B) cancers with sufficient transoral access. Experts unanimously agreed that partial laryngectomy can be offered in both T1-T2 and T3-T4 recurrent laryngeal disease where adequate respiratory and laryngeal function exists (both $n = 12$ of 12, 100%; SORT: B).

Salvage total laryngectomy and laryngopharyngectomy

There was unanimous agreement that salvage total laryngectomy and laryngopharyngectomy may be used in patients with an adequate Eastern Cooperative Oncology Group performance status and T1-T2 laryngeal ($n = 17$ of 17, 100%; SORT: B) and

Table 2. Consensus statements on the surgical management of patients undergoing salvage procedures for recurrent head and neck squamous cell carcinoma of the larynx and hypopharynx[a]

Number	Statement	Round 1 (%)	Round 2 (%)	Round 3 (%)	Level of agreement	Strength of Recommendation Taxonomy	References
10	Offer direct examination under anesthetic to assess tumor extent, accessibility, cord mobility, and resectability in patients being considered for curative salvage surgery of recurrent laryngeal and hypopharyngeal cancers.	100.0	—	—	Unanimous	C	Expert consensus or existing best practice guidelines
Organ preservation salvage surgeries							
11	Inform patients undergoing transoral and partial salvage laryngeal and hypopharyngeal procedures of the risk of requiring completion salvage laryngectomy or laryngopharyngectomy for recurrence or dysfunction.	100.0	—	—	Unanimous	B	De Virgilio (2018),[25] Leone (2016),[26] Paleri (2011),[27] Ramakrishnan (2013),[28] Russo (2023),[29] Williamson (2023)[15]
12	Offer transoral laser microsurgery in select T1-T2 recurrent glottic cancer with normal cord mobility and laryngeal function, limited anterior commissure involvement, and appropriate transoral access.	100.0	—	—	Unanimous	B	Ramakrishnan (2013),[28] Russo (2023),[29] Zhong (2015)[30]
13	Offer transoral laser microsurgery or transoral robotic surgery in select T1-T2 recurrent supraglottic cancer with normal vocal fold mobility and laryngeal function and adequate transoral access.	100.0	—	—	Unanimous	B	Lechien (2020),[31] Ramakrishnan (2013),[28] Russo (2023)[29]
14	Offer open partial laryngectomy in cases of T1-T2 and smaller T3-T4 recurrent laryngeal cancers with good preoperative respiratory function and no laryngopharyngeal dysfunction.	100.0	—	—	Unanimous	B	De Virgilio (2018),[25] Leone (2016),[26] Paleri (2011),[27] Saraniti (2022)[32]
Salvage total laryngectomy and laryngopharyngectomy							
15	Offer open partial laryngectomy in T1-T2 and small T3-T4 recurrent laryngeal cancers with good preoperative respiratory function and no laryngopharyngeal dysfunction.	100.0	—	—	Unanimous	B	Bulbul (2022)[33]
16	Offer salvage total laryngectomy in patients with adequate ECOG performance status scores and T3-T4 recurrent laryngeal tumors.	100.0	—	—	Unanimous	B	Bulbul (2022)[33]
17	Offer endoscopic resection techniques including transoral laser microsurgery and transoral robotic surgery in select T1-T2 recurrent hypopharyngeal cancer with adequate transoral access and no laryngopharyngeal dysfunction.	100.0	—	—	Unanimous	B	Lai (2022),[34] Lane (2020)[35]
18	Offer salvage laryngopharyngectomy in patients with adequate ECOG performance status scores and T1-T2 recurrent hypopharyngeal cancers where there is an increased risk of laryngopharyngeal dysfunction or involved surgical margins.	100.0	—	—	Unanimous	B	Bulbul (2022)[33]
19	Offer salvage laryngopharyngectomy in patients with adequate ECOG performance status scores and T3-T4 recurrent hypopharyngeal tumors.	100.0	—	—	Unanimous	B	Bulbul (2022)[33]
Neck dissection for recurrent laryngeal and hypopharyngeal squamous cell carcinoma							
20	Consider clinical and radiological observation of the cervical lymph nodes instead of planned neck dissection in T1-T2 recurrent laryngeal and hypopharyngeal tumors with clinically and radiographically N0 disease.	76.9	88.9	—	Strong agreement	B	Davies-Husband (2020),[36] Finegersh (2020),[37] Gross (2020),[38] Lin C (2019),[39] Lin D (2019)[40]
21	Consider at least ipsilateral selective (levels IIa, III, IV) or superselective (IIa, III) neck dissection T3-T4; well lateralized, recurrent laryngeal and hypopharyngeal tumors with a history of radiotherapy treatment to the neck; and clinically and radiologically N0 cervical lymph nodes.	—	75.0	72.7	Majority	B	Davies-Husband (2020),[36] Finegersh (2020),[37] Gross (2020),[38] Lin C (2019),[39] Lin D (2019)[40]
22	Consider bilateral selective (levels IIa, III, IV) or superselective (IIa, III) neck dissection in midline T3-T4 recurrent laryngeal and hypopharyngeal tumors with a history of radiotherapy treatment to the neck and clinically and radiologically N0 cervical lymph nodes.	82.4	—	—	Strong agreement	B	Davies-Husband (2020),[36] Finegersh (2020),[37] Gross (2020),[38] Lin C (2019),[39] Lin D (2019)[40]

(continued)

Table 2. (continued)

Number	Statement	Round 1 (%)	Round 2 (%)	Round 3 (%)	Level of agreement	Strength of Recommendation Taxonomy	References
23	Offer selective (levels II-IV) or superselective (II-III) neck dissection in all recurrent laryngeal and hypopharyngeal cancers with clinically and radiologically node-positive cervical lymph nodes.	82.4	—	—	Strong agreement	B	Bovenkamp (2017),[41] Bovenkamp (2018),[42] Robbins (2005),[43] Van der Putten (2009)[44]
Surgical margins in recurrent laryngeal and hypopharyngeal squamous cell carcinoma							
24	Surgeons should aim for a >1-mm margin when performing salvage transoral surgery for early glottic recurrent cancer.	92.9	—	—	Very strong agreement	C	Expert consensus or existing best practice guidelines
25	Surgeons should aim for a >5-mm margin when performing salvage open partial laryngectomy, total laryngectomy, and laryngopharyngectomy.	81.3	—	—	Strong agreement	C	Expert consensus or existing best practice guidelines
Adjunct procedures in salvage laryngectomy and laryngopharyngectomy							
26	Consider ipsilateral hemithyroidectomy and sparing the contralateral thyroid lobe in salvage total laryngectomy and laryngopharyngectomy when there is no radiological or macroscopic evidence of direct invasion of the thyroid, thyroid cartilage lamina, or subglottis.	—	90.9	—	Very strong agreement	B	Kumar (2013),[45] Xie (2022)[46]
27	Offer reinforcement with vascularized tissue from outside the radiation field, including pedicled or free flaps, in all patients undergoing salvage total laryngectomy and laryngopharyngectomy to promote wound healing and reduce postoperative fistulae and pharyngeal stricture.	85.7	—	—	Strong agreement	B	Cabrera (2020),[47] De Virgilio (2022),[25] Guimaraes (2016),[51] Hasan (2016),[49] Paleri (2014),[50] Sayles (2013),[58] Williamson (2023)[16]
28	Offer reconstruction with vascularized tissue from outside the radiation field in all patients undergoing salvage laryngopharyngectomy with circumferential defects or where only a narrow section of pharyngeal mucosa remains.	100.0	—	—	Unanimous	B	Guimaraes (2016),[51] De Virgilio (2022),[48] Paleri (2014),[50] Williamson (2023)[16]
29	Consider using salivary bypass tubes in salvage total laryngectomy or laryngopharyngectomy cases at high risk of postoperative fistula or pharyngeal stricture, for example in those requiring circumferential reconstruction.	—	91.7	—	Very strong agreement	B	Costantino (2022),[52] Kamhieh (2018),[53] Marijic (2021)[54]
30	Consider avoiding primary tracheoesophageal puncture in salvage laryngectomy and laryngopharyngectomy patients to reduce the risk of pharyngocutaneous fistula.	—	90.9	—	Very strong agreement	B	Barauna Neto (2017),[55] Chakravarty (2018),[56] (2018)[57]
31	In patients without existing speech valve rehabilitation, consider secondary tracheoesophageal puncture after salvage laryngectomy and laryngopharyngectomy in those deemed suitable after multidisciplinary surgical and speech and language therapist review.	—	100.0	—	Unanimous	B	Barauna Neto (2017),[55] Chakravarty (2018),[56] (2018)[57]

[a] "—" denotes a round where the statement was not voted on because of previous acceptance or introduction in later rounds. Abbreviation: ECOG = Eastern Cooperative Oncology Group.

hypopharyngeal ($n = 18$ of 18, 100%; SORT: B) cancers where there is a high risk of involved surgical margins or laryngeal dysfunction. Experts also had unanimous agreement on treatment of T3-T4 recurrent head and neck squamous cell carcinoma of the larynx ($n = 18$ of 18, 100%; SORT: B) and hypopharynx ($n = 17$ of 17, 100%; SORT: B) with total laryngectomy and laryngopharyngectomy. When considering margins, strong agreement ($n = 13$ of 16, 81.3%; SORT: C) was achieved on at least a 5-mm cutoff in open laryngeal and hypopharyngeal procedures.

Neck dissection for recurrent laryngeal and hypopharyngeal squamous cell carcinoma

When considering management of cervical nodes during salvage laryngectomy and laryngopharyngectomy, there was strong agreement ($n = 8$ of 9, 88.9%; SORT: B) that observation of the cervical lymph nodes in lieu of planned neck dissection may be appropriate in T1-T2 laryngeal and hypopharyngeal node-negative disease. However, for T3-T4 recurrence with N0 nodes, there was majority agreement ($n = 8$ of 11, 72.7%; SORT: B) that at least ipsilateral selective (IIa, III, IV) or superselective neck dissection (IIa, III) would be appropriate in well lateralized disease, while bilateral dissection should be performed in midline cancers ($n = 14$ of 17, 82.4%; SORT: B). For node-positive disease, there was strong agreement ($n = 14$ of 17, 82.4%; SORT: B) that patients should undergo either selective (IIa, IIb, III, IV) or superselective (IIa, IIb, III) neck dissection.

Surgical margins in recurrent laryngeal and hypopharyngeal cancers

On margin status in transoral procedures, there was very strong agreement ($n = 13$ of 14, 92.9%; both $n = 12$ of 12, 100%; SORT: C)

on more than 1-mm threshold for early glottic disease. In open laryngeal and hypopharyngeal procedures, strong agreement ($n = 13$ of 16, 81.3%; SORT: C) was achieved on more than a 5-mm margin cutoff.

Adjunct procedures in salvage laryngectomy and laryngopharyngectomy

For adjunct procedures performed during salvage laryngectomy and laryngopharyngectomy, there was very strong agreement on performing ipsilateral hemithyroidectomy ($n = 10$ of 11, 90.9%; SORT: B), considered use of salivary bypass tubes in those at high risk of postoperative pharyngocutaneous fistula and stricture ($n = 11$ of 12, 91.7%; SORT: B), and avoidance of primary tracheoesophageal puncture ($n = 10$ of 11, 90.9%; SORT: B). There was unanimous agreement on use of secondary tracheoesophageal puncture procedures ($n = 8$ of 8, 100%; SORT: B). Delphi participants had strong agreement ($n = 12$ of 14, 100%; SORT: B) on use of free and pedicled flaps in patients undergoing salvage laryngectomy and laryngopharyngectomy and unanimous agreement ($n = 13$ of 13, 100%; SORT: B) on their use in laryngopharyngectomy with circumferential defects.

Salvage surgery for recurrent oral cavity and oropharyngeal squamous cell carcinoma

Full statements, thresholds, resources,[21,33,37,41-43,59-76] and participant feedback on salvage oral cavity and oropharyngeal surgery are summarized in Table 3 and Table S7. Preoperatively, there was a strong consensus in recurrent oropharyngeal tumors for rigid endoscopic assessment under anesthetic to assess tumor extent and resectability ($n = 20$ of 21, 95.2%; SORT: C).

Transoral resections for recurrent oral cavity and oropharyngeal squamous cell carcinoma

Unanimous agreement was seen in statements supporting transoral resection of T1-T2 oral ($n = 21$ of 21, 100%; SORT: B) and oropharyngeal recurrence ($n = 22$ of 22, 100%; SORT: A), whereas agreement was strong on the use of transoral robotic surgery and transoral laser microsurgery in select T3-T4 oropharyngeal recurrent head and neck squamous cell carcinoma ($n = 13$ of 15, 86.7%; SORT: A). There was unanimous agreement that salvage transoral robotic surgery should only be offered by units that have first developed experience of robotic resections in primary cancers ($n = 22$ of 22, 100%; SORT: C). To mitigate bleeding after salvage transoral robotic surgery, there was very strong agreement ($n = 13$ of 14, 92.9%; SORT: B) on prophylactic arterial ligation and strong agreement ($n = 16$ of 18, 88.9%; SORT: B) on using vascularized tissue flaps to cover exposed vessels.

Open resections for recurrent oral cavity and oropharyngeal squamous cell carcinoma

It was agreed unanimously ($n = 23$ of 23, 100%; SORT: C) that salvage open oral and oropharyngeal resections should be treated by teams experienced with managing recurrent cancers and flap reconstruction. Unanimous agreement ($n = 18$ of 18, 100%; SORT: B) was documented for open resections in patients with T1-T2 recurrent oral and oropharyngeal cancers with poor transoral access, while very strong agreement ($n = 16$ of 17, 94.1%; SORT: B) was reached for open procedures in T3-T4 disease. Agreement was unanimous ($n = 23$ of 23, 100%; SORT: B) for use of salvage glossolaryngectomy in locally advanced, low oropharyngeal cancers and on performing prophylactic tracheostomy in procedures where postoperative airway obstruction was anticipated ($n = 23$ of 23, 100%; SORT: C).

Neck dissection for recurrent oral cavity and oropharyngeal squamous cell carcinoma

In recurrent oropharynx cancer with cN0 disease, there was strong agreement ($n = 18$ of 21, 85.7%; SORT: B) for selective (IIa, IIb, III, IV) or superselective (IIa, IIb, III) neck dissection for well-lateralized tumors and bilateral clearance for midline disease ($n = 18$ of 21, 85.7%; SORT: B). Very strong agreement was accomplished in node-positive recurrent oropharyngeal cancers for selective (IIa, IIb, III, IV) neck dissection, again incorporating unilateral lymph node removal in well-lateralized disease ($n = 22$ of 23, 95.7%; SORT: B) and bilateral for midline tumors ($n = 22$ of 23, 95.7%; SORT: B).

In the oral cavity, it was decided unanimously ($n = 18$ of 18, 100%; SORT: B) that T2-T4 N0 disease may be managed by ipsilateral level I, IIa, and III dissection, while strong consensus ($n = 14$ of 17, 82.4%; SORT: B) supported neck dissection in T1 N0 cancers. In node-positive disease, unanimous agreement was obtained for dissection of levels I, IIa, and III (and level IV in oral tongue disease), once again demarcated as ipsilateral in well-lateralized ($n = 21$ of 21, 100%; SORT: C) and bilateral in midline disease ($n = 21$ of 21, 100%; SORT: C).

Surgical margins in recurrent oral cavity and oropharyngeal squamous cell carcinoma

Margin status was difficult to define in the oropharynx, with more than a 5-mm margin achieving strong agreement ($n = 20$ of 23, 87%; SORT: C) in salvage cases for T3-T4 disease. A statement asserting clinicians may consider salvage surgery for recurrent T1-T2 cancers even if less than 5-mm margins are anticipated achieved very strong consensus ($n = 18$ of 19, 94.7%; SORT: B) in the tonsil, but majority agreement ($n = 13$ of 18, 72.2%; SORT: B) in the tongue base. More than a 5-mm margin was met with very strong approval ($n = 18$ of 20, 90%; SORT: B) in oral cavity resections of any stage.

Postoperative management, rehabilitation, and follow-up

Full statements, consensus thresholds, references,[20,22,77-94] and comments for postoperative rehabilitation and follow-up are provided in Table 4 and Table S8.

Immediate postoperative management

Postprocedure, use of 24-48 hours of antibiotics was strongly supported after clean contaminated salvage surgery ($n = 16$ or 18, 88.9%; SORT: B) and flap reconstruction ($n = 16$ of 18, 88.9%; SORT: B). Commencement of enteral feeding within 24 hours received very strong consensus ($n = 18$ of 19, 94.7%; SORT: C), while regular specialist dietetic assessment was met with unanimous agreement ($n = 20$ of 20, 100%; SORT: C). Consideration of early oral feeding (<5 days after salvage) had strong agreement for oral and oropharyngeal resections ($n = 17$ of 20, 85%; SORT: B), whereas a statement advising against early oral feeding after salvage laryngectomy had very strong support ($n = 15$ of 16, 93.8%; SORT: A).

Participants unanimously agreed ($n = 21$ of 21, 100%; SORT: C) to ongoing postoperative evaluation by specialist speech and language therapists, while postoperative instrumental assessment including videofluoroscopy and flexible endoscopic evaluation of swallowing had very strong agreement ($n = 20$ of 21, 95.7%; SORT: C). There was unanimous agreement ($n = 17$ of 17, 100%; SORT: B) on use of water-soluble contrast swallow assessment prior to commencing feeding after salvage laryngectomy.

Table 3. Consensus statements on the surgical management of patients undergoing salvage procedures for recurrent head and neck squamous cell carcinoma of the oral cavity and oropharynx[a]

Number	Statement	Round 1 (%)	Round 2 (%)	Round 3 (%)	Level of agreement	Strength of Recommendation Taxonomy	References
32	Offer direct examination under anesthetic to assess for tumor anatomy, accessibility, and trismus in all patients being considered for salvage surgery of recurrent oropharyngeal tumors.	95.2	—	—	Very strong agreement	C	Expert consensus or existing best practice guidelines
Transoral resections for recurrent oral cavity and oropharyngeal squamous cell carcinoma							
33	Offer minimally invasive resection techniques such as transoral robotic and transoral laser salvage surgery in T1-T2 recurrent oropharyngeal cancer with favorable tumor anatomy and adequate transoral access.	100.0	—	—	Unanimous	A	Hardman (2020),[59] Hardman (2022),[60] Jayaram (2016),[61] Kao (2017),[62] Turner (2023)[63]
34	Offer transoral resection techniques in recurrent T1-T2 oral cavity cancer with favorable tumor anatomy and transoral access.	100.0	—	—	Unanimous	B	Chen (2021),[64] Nandy (2022),[65] Weckx (2019)[66]
35	Offer minimally invasive techniques such as transoral robotic and transoral laser salvage surgery in select T3-T4 recurrent oropharyngeal cancer with favorable tumor anatomy and transoral access.	86.7	—	—	Strong agreement	A	Hardman (2020),[59] Hardman (2022),[60] Jayaram (2016),[61] Kao (2017),[62] Turner (2023)[63]
36	Salvage transoral robotic surgery should be offered by units who have first developed extensive experience of transoral robotic surgery for primary head and neck cancers.	100.0	—	—	Unanimous	C	Expert consensus or existing best practice guidelines
37	Offer prophylactic transcervical arterial ligation to mitigate the risk of postoperative hemorrhage in salvage transoral robotic surgery of the oropharynx.	92.9	—	—	Very strong agreement	B	Bollig (2020)[67]
38	Offer use of vascularized pedicled or free tissue to cover exposed vessels to mitigate the risk of postoperative hemorrhage in salvage transoral robotic surgery of the oropharynx.	88.9	—	—	Strong agreement	B	Turner (2023)[63]
Open resections for recurrent oral cavity and oropharyngeal squamous cell carcinoma							
39	Patients being evaluated for open salvage oral and oropharyngeal resections should be treated by a surgical team with experience of managing recurrent head and neck cancers and reconstruction with vascularized tissue flaps.	100.0	—	—	Unanimous	C	Expert consensus or existing best practice guidelines
40	Offer open salvage resections via transmandibular or mandible-sparing transcervical approaches in patients with adequate ECOG performance status scores with T1-T2 recurrent oral and oropharyngeal cancers where there is inadequate access for transoral procedures.	100.0	—	—	Unanimous	B	Bulbul (2022),[33] Jayaram (2016),[61] Kao (2017),[62] Pang (2018)[68]
41	Offer open salvage resections via transmandibular or mandible-sparing transcervical approaches in patients with adequate ECOG performance status scores and T3-T4 recurrent oral and oropharyngeal cancers.	94.1	—	—	Very strong agreement	B	Bulbul (2022),[33] Jayaram (2016),[61] Kao (2017),[62] Pang (2018)[68]
42	After preoperative counseling and speech and swallow assessment, offer salvage total glossolaryngectomy in highly selected patients with adequate ECOG performance status scores and low T3-T4 oropharyngeal tumors with or without gross laryngeal involvement.		100.0	—	Unanimous	B	Kamhieh (2018),[69] Mazerolle (2022),[70] Sinclair (2011)[71]
43	Offer perioperative tracheostomy in patients undergoing salvage oral cavity and oropharyngeal surgery who are at high risk of postoperative airway edema or obstruction.	100.0	—	—	Unanimous	C	Expert consensus or existing best practice guidelines
Neck dissection for recurrent oral cavity and oropharyngeal squamous cell carcinoma							
44	Offer at least ipsilateral selective (levels IIa, III, and IV) or superselective (IIa, III) neck dissection with clinically and radiologically N0 cervical lymph nodes in well lateralized recurrent oropharyngeal cancers of any stage.	85.7	—	—	Strong agreement	B	Bovenkamp (2017),[41] Bovenkamp (2018),[42] Finegersh (2020),[37] Gupta (2022),[21] Malik (2023),[72] Robbins (2005)[43]
45	Offer at least bilateral selective (levels IIa, III, and IV) or superselective (IIa, III) neck dissection with clinically and radiologically N0 lymph nodes in	85.0	—	—	Strong agreement	B	Bovenkamp (2017),[41] Bovenkamp (2018),[42] Finegersh

(continued)

Table 3. (continued)

Number	Statement	Round 1 (%)	Round 2 (%)	Round 3 (%)	Level of agreement	Strength of Recommendation Taxonomy	References
	midline recurrent oropharyngeal cancers of any stage.						(2020),[37] Gupta (2022),[21] Malik (2023),[72] Robbins (2005)[43]
46	Offer at least ipsilateral selective (levels IIa, IIb, III, and IV) neck dissection with clinically and radiologically positive cervical lymph nodes in well lateralized recurrent oropharyngeal cancers of any stage.	95.7	—	—	Very strong agreement	B	Malik (2023)[72]
47	Offer at least bilateral selective (levels IIa, IIb, III, and IV) neck dissection with clinically and radiologically positive cervical lymph nodes in midline recurrent oropharyngeal cancers of any stage.	95.7	—	—	Very strong agreement	B	Malik (2023)[72]
48	Offer at least ipsilateral selective (levels I, IIa, and III to all subsites and include IV in oral tongue) neck dissection in clinically and radiologically N0 recurrent T1 oral cavity cancer, particularly in those with no previous history of neck dissection.	82.4	—	—	Strong agreement	B	Finegersh (2020),[37] Gupta (2022),[21] Hutchison (2019)[73]
49	Offer at least ipsilateral selective (levels I, IIa, and III to all subsites and include IV in oral tongue) neck dissection in clinically and radiologically N0 recurrent T2-T4 oral cavity cancer, particularly in those with no previous history of neck dissection.	100.0	—	—	Unanimous	B	Finegersh (2020),[37] Gupta (2022),[21] Hutchison (2019)[73]
50	Offer at least ipsilateral selective (levels I, IIa, IIb, and III to all subsites and include IV in oral tongue) neck dissection with clinically and radiologically positive cervical nodes in well lateralized recurrent oral cavity cancer of any stage, particularly in those with no history of neck dissection.	100.0	—	—	Unanimous	C	Expert consensus or existing best practice guidelines
51	Offer at least bilateral selective (levels I, IIa, IIb, and III to all subsites and IV in oral tongue) neck dissection with clinically and radiologically positive cervical lymph nodes in midline recurrent oral cavity cancer of any stage, particularly in those with no history of neck dissection.	100.0	—	—	Unanimous	C	Expert consensus or existing best practice guidelines
Surgical margins in recurrent oral cavity and oropharyngeal squamous cell carcinoma							
52	Multidisciplinary teams should consider salvage transoral surgery for recurrent T1-T2 tonsil cancers deemed resectable after clinical and radiological assessment, even if <5-mm pathological margins are anticipated.	—	94.7	—	Very strong agreement	B	Hardman (2022),[60] Williamson (2023)[74]
53	Multidisciplinary teams should consider salvage transoral surgery for recurrent T1-T2 tongue-base cancers deemed resectable after clinical and radiological assessment, even if <5-mm pathological margins are anticipated.	—	—	72.2	Majority agreement	B	Hardman (2022),[60] Williamson (2023)[74]
54	Multidisciplinary teams should aim for a >5-mm margin when performing open salvage surgery for T3-T4 recurrent oropharyngeal cancer.	87.0	—	—	Strong agreement	C	Expert consensus or existing best practice guidelines
55	Multidisciplinary teams should aim for a >5-mm margin when performing salvage transoral and open surgery for recurrent oral cavity cancer of any stage.	90.0	—	—	Very strong agreement	B	Bungum (2020),[75] Young (2023)[76]

[a] "—" denotes a round where the statement was not voted on because of previous acceptance or introduction in later rounds. Abbreviations: ECOG = Eastern Cooperative Oncology Group; IV = intravenously.

Long-term follow-up after salvage head and neck surgery

On follow-up, there was very strong agreement on maintaining existing 5-year follow-up schedules ($n = 20$ of 22, 90.9%; SORT: C), with 1-2 monthly reviews for the first 2 years and broadening time frames thereafter ($n = 17$ of 18, 94.4%; SORT: C). At each follow-up, there was very strong agreement ($n = 18$ of 20, 90%; SORT: B) on performing a full head and neck examination, including assessment with flexible nasolaryngoscopy and narrow band imaging where available.

Imaging recommendations in recurrent head and neck cancer

Performing baseline cross-sectional imaging to facilitate comparison with future scans at 3-4 months postsalvage had very strong consensus ($n = 19$ of 20, 95%; SORT: C), and reporting of all postoperative imaging by a specialist head and neck radiologist had a unanimous response ($n = 22$ of 22, 100%; SORT: C). Very strong agreement ($n = 19$ of 21, 90.5%; SORT: C) was achieved in consideration of annual cross-sectional imaging surveillance to facilitate detection of early recurrent and oligometastatic disease.

Table 4. Consensus statements on the postoperative management and follow-up of patients who have undergone salvage procedures for recurrent head and neck squamous cell carcinoma[a]

Number	Statement	Round 1 (%)	Round 2 (%)	Round 3 (%)	Level of agreement	Strength of Recommendation Taxonomy	References
Immediate postoperative management							
56	Offer 24-48 hours of postoperative broad-spectrum intravenous antibiotics following all clean contaminated salvage surgical procedures.	88.9	—	—	Strong agreement	B	Vander Poorten (2020)[77]
57	Offer 24-48 hours of postoperative broad-spectrum intravenous antibiotics following all salvage procedures requiring vascularized tissue transfer for reconstruction or reinforcement.	88.9	—	—	Strong agreement	B	Haidar (2018)[78]
58	Begin enteral feeding within 24 hours following salvage surgery where patients will be nil by mouth for greater than 72 hours or have undernutrition preoperatively.	94.7	—	—	Very strong agreement	C	Expert consensus or existing best practice guidelines
59	Offer regular specialist dietetic intervention to assist postsalvage patients in meeting their nutritional needs. Teams should aim for 80% (but not exceeding 110%) of estimated requirements via enteral and/or oral routes within 7 days, which should continue until patients are meeting their nutritional goals.	100.0	—	—	Unanimous	C	Expert consensus or existing best practice guidelines
60	Consider early oral feeding (within 5 days postoperatively) in selected patients undergoing salvage oral and oropharyngeal resections with defects reconstructed by vascularized tissue transfer following assessment of swallowing by a speech and language therapist.	—	85.0	—	Strong agreement	B	Brady (2022),[79] Kerawala (2021),[80] Stramiello (2021)[81]
61	Early oral feeding is not recommended in patients undergoing salvage laryngectomy and laryngopharyngectomy procedures with and without free flap reconstruction.	93.8	—	—	Very strong agreement	A	Milinis (2021),[82] Singh (2020)[83]
62	Offer ongoing postoperative speech and language therapist evaluation including provision of speech, voice, and swallowing rehabilitation.	100.0	—	—	Unanimous	C	Expert consensus or existing best practice guidelines
63	Offer instrumental evaluation of swallowing using videofluoroscopy and/or flexible endoscopic evaluation of swallowing to guide swallowing rehabilitation in patients with pre- and postsalvage swallowing difficulties.	95.2	—	—	Very strong agreement	C	Expert consensus or existing best practice guidelines
64	Offer using water soluble contrast swallow in salvage laryngectomy and laryngopharyngectomy patients to assess for fistulae before commencing oral feeding.	100.0	—	—	Unanimous	B	Leroy (2023),[84] Narayan (2020)[85]
Long-term follow-up after salvage head and neck surgery							
65	Offer postsalvage patients follow-up for a minimum of 5 years, or longer if deemed to have an elevated risk of further recurrence.	90.9	—	—	Very strong agreement	C	Expert consensus or existing best practice guidelines
66	Offer postsalvage patients follow-up every 1-2 months for the first 2 years and every 3-6 months in years 3-5, or more frequently if deemed to have an elevated risk of further recurrence.	94.4	—	—	Very strong agreement	C	Expert consensus or existing best practice guidelines
67	Offer all postsalvage patients regular head and neck examination including visualization of the upper aerodigestive tract with flexible or rigid nasolaryngoscopy augmented by narrow band imaging (where available) to assess for further recurrence.	90.0	—	—	Very strong agreement	B	Cosway (2016)[86]
Imaging recommendations in recurrent head and neck cancer							
68	Offer baseline MRI and/or contrast-enhanced CT scanning 3-6 months following salvage surgery in patients deemed to be at high risk of further recurrence, to facilitate comparison with future imaging studies.	95.0	—	—	Very strong agreement	C	Expert consensus or existing best practice guidelines
69	Consider annual MRI and/or contrast-enhanced CT surveillance imaging following salvage surgery in high-risk patients to facilitate early detection and implementation of systemic therapy for low-volume recurrent or metastatic cancer.	—	—	90.5	Very strong agreement	C	Expert consensus or existing best practice guidelines

(continued)

Table 4. (continued)

Number	Statement	Round 1 (%)	Round 2 (%)	Round 3 (%)	Level of agreement	Strength of Recommendation Taxonomy	References
70	Cross-sectional imaging including MRI and/or contrast-enhanced CT imaging should be reported by a specialist head and neck radiologist in all patients with suspected further head and neck cancer recurrence.	100.0	—	—	Unanimous	C	Expert consensus or existing best practice guidelines
71	Offer 18-FDG-PETCT rather than planned salvage neck dissection at 3-4 months after radical (chemo)radiotherapy treatment for all primary mucosal squamous head and neck cancers.	—	95.7	—	Very strong agreement	A	Cheung (2016),[87] Gao (2014),[20] Gupta (2011),[21] Isles (2008),[22] Javidnia (2010),[89] Mehanna (2016),[90] Sheikhbahaei (2015)[91]
72	Offer cross-sectional MRI or CT imaging prior to salvage neck dissection for all primary mucosal squamous head and neck cancers when unequivocal FDG-avidity is demonstrated in cervical lymph nodes 3-4 months after radical (chemo)radiotherapy treatment.	—	85.7	—	Strong agreement	C	Expert consensus or existing best practice guidelines
73	Offer interval 3- to 4-month 18-FDG-PETCT in cases of equivocal cervical lymph node FDG-avidity, followed by cross-sectional CT or MRI imaging and salvage neck dissection in cases of persistent FDG-avidity.	84.2	—	—	Strong agreement	A	Mehanna (2016),[90] Liu (2019),[92] Rulach (2019),[93] Wong (2019)[94]

[a] "—" denotes a round where the statement was not voted on because of previous acceptance or introduction in later rounds. Abbreviations: CT = computed tomography; MRI = magnetic resonance imaging; FDG-PETCT = F-fluorodeoxyglucose–positron emission tomography/computed tomography.

After primary chemoradiotherapy, there was very strong agreement ($n = 22$ of 23, 95.7%; SORT: A) on offering 18-FDG-PETCT instead of planned neck dissection at 3-4 months. There was strong agreement on offering CT and/or magnetic resonance imaging with a view to conducting salvage neck dissection when unequivocal FDG avidity is identified at 3-4 months ($n = 18$ of 21, 85.7%; SORT: C) and performing an interval 3-4-month 18-FDG-PETCT in cases of equivocal FDG uptake ($n = 16$ of 19, 84.2%; SORT: A).

Discussion

This article summarizes the results of a modified Delphi study that produced best practice statements on salvage surgery for recurrent head and neck squamous cell carcinoma, modified from IReC and ENT United Kingdom's previous experience on generating consensus on the management of unknown primary head and neck squamous cell carcinoma.[9] The outcome is one of most expansive groups of recommendations on salvage recurrent head and neck squamous cell carcinoma surgery to date, providing a strong foundation of practice for operations where little high-quality literature exists. Participants reached agreement on 73 items covering numerous themes, with a high rate of unanimous ($n = 29$ of 73, 39.7%) and very strongly supported statements ($n = 25$ of 73, 34.2%). A further advantage is the quality of the Delphi cohort, consisting of 28 expert ENT, otolaryngologist, oncologist, and oral and maxillofacial surgeons, oncology, and speech and language therapist consultants from high-volume centers. This reflects the structure of many cancer multidisciplinary teams and provides a broad range of opinions relevant to the varying patient populations around the United Kingdom.

The Delphi demonstrated broad support for salvage surgery across a host of recurrent tumor subsites and staging. This is strengthened by a recent meta-analysis comparing surgical and nonsurgical salvage treatments, which demonstrated 5-year overall survival of 26%-67% and 0%-32%, respectively, strongly favoring surgical intervention.[33] The challenging postoperative course following salvage laryngectomy should not be underestimated, however, as complications occur in approximately 67.5% of patients,[49] with pharyngocutaneous fistula identified as particularly common (19%-37%) and troublesome to manage.[49] By comparison, survival is more varied after salvage oropharyngeal surgeries, with a review of 776 resections finding a 2-year overall survival of 52%, falling to 30% at 5 years.[62] As with the larynx, outcomes are superior to nonsurgical management, with a review of studies comparing operative and nonoperative interventions finding statistically significantly improved 5-year overall survival in those receiving surgery (26% vs 16%, $P = .001$).[61]

Transoral procedures including transoral robotic surgery and transoral laser microsurgery were well supported by the Delphi experts across several cancer subsites and staging. There is growing evidence that transoral procedures can achieve encouraging survival in difficult-to-access recurrent tumors with fewer complications than open resections. For example, a systematic review of salvage transoral robotic surgery found 2-year overall survival and disease-free survival of 73.8% and 74.8%.[59] Results are slightly less reassuring in salvage transoral laser microsurgery, with a review by Russo et al.[29] of recurrent laryngeal cancer noting local control rates of 74.2% and 39.1% at 1 and 5 years, respectively, with a laryngeal preservation rate of 73.5%. Nonetheless, this consensus process strongly favors transoral and open salvage procedures as an effective curative treatment for many recurrent head and neck squamous cell carcinomas, and future iterations of this Delphi may benefit from a focus on novel strategies such as adjuvant immunotherapy to enhance survival following these surgeries.

There was clear harmony on the importance of multidisciplinary input in the perioperative management and rehabilitation of salvage surgery patients, which has previously demonstrated survival benefits on meta-analysis.[95] In particular,

multidisciplinary teams can expedite early intervention for malnutrition and swallow dysfunction by speech and language therapists and dieticians, which can have a considerable impact on postoperative quality of life and function. Salvage patients, who often carry extensive treatment histories and fibrosed tissues, are at a higher risk of swallowing impairment and malnutrition than primary disease, with pooled long-term feeding tube dependency after salvage procedures being 18%, increasing to 41% after open oral and oropharyngeal resections.[15] Unfortunately, the literature review found a paucity of research in speech and swallow rehabilitation after salvage surgery, and many Delphi comments mentioned a lack of availability of speech and language therapists and instrumental swallow assessments across departments. Despite robust consensus over the importance of these interventions, the applicability of these statements may be highly dependent on local resource provision.

Numerous controversies arose during the Delphi, in particular surgical margins in recurrent oropharyngeal tumors, which may be because of inconsistent definitions in the literature. The Royal College of Pathologists recommends a 5-mm margin in the oropharynx,[96] however this is not replicated in the wider literature, where definitions vary from 1 to 5 mm.[74] The RECUT study recently found that margins more than 1 mm were associated with a 2-year local control rate of 80.9% compared with 54.2% in those of no more than 1 mm,[60] suggesting salvage transoral robotic surgery may be safely attempted even when margins less than 5 mm are anticipated. However, another study of salvage transoral robotic surgery by GETTEC, who defined involved margins as no more than 2 mm, found R1 resections were associated with an increased mortality risk on univariate analysis,[60] leaving margins in this cohort as a major area of debate.

Numerous minor disagreements also arose concerning procedures adjunct to salvage laryngectomy, including salivary bypass tubes and timing of tracheoesophageal puncture, necessitating alterations to use less instructive language. Systematic reviews report improved rates of pharyngocutaneous fistula in laryngectomy procedures with salivary bypass tubes (15.8%-22.2% vs 35.3%-38.3%).[52,54] Nevertheless, participants preferred more judicious use of salivary bypass tubes, commenting salivary bypass tubes are poorly tolerated and troublesome to manage and only advocated for their use in select procedures including circumferential resection and reconstruction. Concerning tracheoesophageal puncture, systematic reviews of primary and salvage laryngectomy have shown an elevated risk of pharyngocutaneous fistula in primary compared with secondary puncture.[55,56] In salvage laryngectomy, a small cohort study of 30 patients found a statistically significant difference in postoperative pharyngocutaneous fistula in the primary tracheoesophageal puncture group (0% vs 50%, $P < .05$).[97] Certain Delphi comments reported successful local experience with primary tracheoesophageal puncture in postradiotherapy cases, which may indicate an area of future prospective research.

Finally, although human papillomavirus (HPV) status has a considerable impact on primary oropharyngeal cancers, this was not incorporated into our statements for oropharyngeal salvage. Recent evidence suggests superior survival in HPV-positive compared with HPV-negative recurrent head and neck squamous cell carcinoma, however the former is associated with more frequent distant metastasis, precluding many patients from salvage surgery.[98] Furthermore, this survival disparity does not translate to the salvage cohort, and there is little evidence to recommend differing surgical approaches between these 2 groups. For instance, RECUT found no difference in overall survival ($P = .36$), disease-free ($P = .45$), and disease-specific survival ($P = .24$), or local control ($P = .43$) between HPV-positive and HPV-negative recurrent head and neck squamous cell carcinoma undergoing transoral robotic surgery.[60] This was replicated in an oropharyngeal cancer series by GETTEC, where there was no difference in overall survival ($P = .3$) or relapse-free survival ($P = .4$) following first recurrence according to p16 status.[99]

This project aimed to provide extensive recommendations on salvage surgery for recurrent head and neck squamous cell carcinoma, however, the statements cannot consider every clinical permutation in this complex patient cohort. As such, management plans need to account for the difficulties and ambiguity surrounding the various patient, tumor, and health-care factors that influence the suitability of surgery as a curative treatment. This complexity therefore demands shared multidisciplinary decision making and judicious implementation of these recommendations, and clinicians must understand that certain recommendations may have to be altered or disregarded in certain cases.

Moreover, recurrent head and neck squamous cell carcinoma treatment is an evolving space; for example, recent phase II trials suggest adjuvant or neoadjuvant immunotherapy may have a large impact on disease-free survival,[100] while adjuvant reirradiation with proton therapy has been well tolerated in small cohorts.[101] Although these treatments show promise, they have not undergone randomized phase III trials and are not commonplace oncological practice. In the future, this consensus methodology may have to be reapplied to incorporate these adjuvant therapies should they show widespread efficacy and become standard of care.

This Delphi carries some limitations. Although the consensus statements cover a widespread array of practice, they are not exhaustive, and as a result there may be patient subsets and treatment nuances that may not have been considered. Additionally, by trying to not burden the cohort with a high number of items, the Delphi was limited by its division over 2 phases, in particular by the later addition of otolaryngologist, oncologist, and oral and maxillofacial surgeon participants and low representation from allied health professionals, who may have provided valuable insight into reconstruction and perioperative statements, respectively.

A limitation common to many Delphi studies is their generalizability and applicability to real-world practice, which are subject to funding and staffing constraints. By inviting specialists from various UK regions where practice is relatively homogeneous for primary head and neck squamous cell carcinoma, we aimed to embody a wider spectrum of UK practice that considered each unit's unique challenges and resources. For the same reasons, this renders international consensus more difficult and less applicable, as differences in disease etiology, epidemiology, and historical health-care systems and practices between countries are often too great to create single unified recommendations. Nevertheless, it is our aim that the lessons learned from this national process will be used to deliver future international consensus.

Although this study can be criticized for a lack of input from key multidisciplinary stakeholders involved in diagnostics (radiologists, histopathologists) and supportive care (dietetics), the selected professionals are the key decision makers in delivering salvage surgical service. Ultimately, the level of consensus attained is a reflection of the participating cohort's attitudes, experience, clinical background, and interpretation of available

evidence, and we believe this study has accrued a sufficiently wide spectrum of professionals to do this robustly.

In conclusion, this Delphi has produced one of the largest collections of best practice statements on salvage surgery for recurrent head and neck squamous cell carcinoma, consisting of 73 statements voted on by 28 multidisciplinary experts. Participants represented 4 national organizations and 14 hospitals and thus encompasses a wide selection of UK practice. In the future, there is a need to assess if these consensus statements are reflected in real-world management. To this end, IReC is currently undertaking RESCUE (NCT05808920), which prospectively studies survival, quality of life, and variations in standards of salvage surgical care, thus providing essential information on the relevancy and applicability of these statements.

Acknowledgments

We would like to thank the team and network collaborators at the International Centre for Recurrent Head and Neck Cancer (IReC) for their ongoing support with this article and our wider program of research, Mr Ahmad Abou-Foul for providing help with Figures 1 and 2 and committee members of ENT UK, the British Association of Head and Neck Oncologists (BAHNO), and the British Association of Oral and Maxillofacial Surgeons who participated in this study. We would also like to thank ENT UK, whose foundation grant helped fund access to Survey Monkey for this project. This article was presented as an oral presentation at the annual IReC scientific day May 16, 2024 (London), and BAHNO annual scientific meeting on May 17, 2024 (London).
The funder had no role in the design of the study; the collection, analysis, or interpretation of the data; or the writing of the manuscript and decision to submit it for publication.

Author contributions

Andrew John Williamson (Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Project administration; Resources; Software; Validation; Visualization; Writing—original draft; Writing—review & editing), Stuart Winter (Methodology; Writing—review & editing), Ricard Simo (Methodology; Writing—review & editing), Clare Schilling (Methodology; Writing—review & editing), Uthaya Selbong (Methodology; Writing—review & editing), Andrew Schache (Methodology; Writing—review & editing), Justin Roe (Methodology; Writing—review & editing), Francesco Riva (Methodology; Writing—review & editing), Paul Pracy (Methodology; Writing—review & editing), Claire Paterson (Methodology; Writing—review & editing), Michael Nugent (Methodology; Writing—review & editing), David Noble (Methodology; Writing—review & editing), Iain Nixon (Methodology; Writing—review & editing), Paul Nankivell (Methodology; Writing—review & editing), Jenny Montgomery (Methodology; Writing—review & editing), James McCaul (Methodology; Writing—review & editing), Ziwei Liu (Methodology; Writing—review & editing), Emma King (Methodology; Writing—review & editing), Cyrus Kerawala (Methodology; Writing—review & editing), Shahid Iqbal (Methodology; Writing—review & editing), Ceri Hughes (Methodology; Writing—review & editing), Anoop Haridass (Methodology; Writing—original draft), David Hamilton (Methodology; Writing—review & editing), Jason Fleming (Methodology; Writing—review & editing), Catriona Douglas (Methodology; Writing—review & editing), Kevin Chiu (Methodology; Writing—review & editing), Brian Bisase (Methodology; Writing—review & editing), Puteri Abdul-Harris (Methodology; Writing—review & editing), Natalie Harris (Methodology; Writing—original draft; Writing—review & editing), Grainne Brady (Methodology; Writing—original draft; Writing—review & editing), Ben O'Leary (Conceptualization; Methodology; Supervision; Writing—review & editing), and Vinidh Paleri (Conceptualization; Formal analysis; Investigation; Methodology; Supervision; Validation; Writing—original draft; Writing—review & editing).

Supplementary material

Supplementary material is available at *JNCI: Journal of the National Cancer Institute* online.

Funding

Funding for this study was provided by a £1000 award from the ENTUK Foundation Research Grant (grant number 000231). The salary of Mr Andrew Williamson (Head and Neck research fellow) is provided through a grant from the Royal Marsden Cancer Charity/International Centre for Recurrent Head and Neck Cancer (IReC).

Conflicts of interest

The authors of this article have consulted the JNCI author guidelines and declare no relevant conflict of interest.

Data Availability

The data that support the findings of this study are available from the corresponding authors (AW, VP) on reasonable request.

References

1. Gormley M, Creaney G, Schache A, et al. Reviewing the epidemiology of head and neck cancer: definitions, trends and risk factors. *Br Dent J*. 2022;233:780-786.
2. Nutting CM, Griffin CL, Sanghera P, et al.; ART DECO Trial Management Group. Dose-escalated intensity-modulated radiotherapy in patients with locally advanced laryngeal and hypopharyngeal cancers: ART DECO, a phase III randomised controlled trial. *Eur J Cancer*. 2021;153:242-256.
3. Lacas B, Carmel A, Landais C, et al.; MACH-NC Collaborative Group. Meta-analysis of chemotherapy in head and neck cancer (MACH-NC): an update on 107 randomized trials and 19,805 patients, on behalf of MACH-NC Group. *Radiother Oncol*. 2021;156:281-293.
4. Royal College of Radiologists. *Head and Neck Cancer RCR Consensus Statements*. Royal College of Radiologists; 2022.
5. Sullivan CB, Ostedgaard KL, Al-Qurayshi Z, et al. Primary laryngectomy versus salvage laryngectomy: a comparison of outcomes in the Chemoradiation Era. *Laryngoscope*. 2020;130:2179-2185.
6. De Ravin E, Lu J, Salmon M, et al. Clinical practice guidelines for the management of recurrent head and neck cancer: a systematic review and quality appraisal. *Eur Arch Otorhinolaryngol*. 2023;280:297-305.
7. Williamson A, Lim AE, Green F, et al. The burden of recurrent head and neck squamous cell carcinoma across the United Kingdom: results from a National Snapshot Study. *Head Neck*. 2025;47:1399-1410.

8. Homer JJ, Winter SC, Abbey EC, et al. Head and Neck Cancer: United Kingdom National Multidisciplinary Guidelines, Sixth Edition. *J Laryngol Otol*. 2024;138:S1-S224.
9. Hardman JC, Harrington K, Roques T, et al. Methodology for the development of National Multidisciplinary Management Recommendations using a multi-stage meta-consensus initiative. *BMC Med Res Methodol*. 2022;22:189.
10. Brouwers MC, Kho ME, Browman GP, et al.; AGREE Next Steps Consortium. AGREE II: Advancing guideline development, reporting and evaluation in health care. *CMAJ*. 2010;182:E839-E842.
11. Machiels J-P, René Leemans C, Golusinski W, et al.; ESTRO Executive Board. Electronic address: Info@estro.org. Squamous cell carcinoma of the oral cavity, larynx, oropharynx and hypopharynx: EHNS–ESMO–ESTRO Clinical Practice Guidelines for diagnosis, treatment and follow-up. *Ann Oncol*. 2020;31:1462-1475.
12. Keam B, Machiels J-P, Kim HR, et al. Pan-Asian adaptation of the EHNS–ESMO–ESTRO Clinical Practice Guidelines for the diagnosis, treatment and follow-up of patients with squamous cell carcinoma of the head and neck. *ESMO Open*. 2021;6:100309.
13. Pfister DG, Spencer S, Adelstein D, et al. Head and Neck Cancers, Version 2.2020, NCCN Clinical Practice Guidelines in Oncology. *J Natl Compr Canc Netw*. 2020;18:873-898.
14. Piazza C, Paderno A, Sjogren EV, et al. Salvage carbon dioxide transoral laser microsurgery for laryngeal cancer after (chemo) radiotherapy: a European Laryngological Society consensus statement. *Eur Arch Otorhinolaryngol*. 2021;278:4373-4381.
15. Williamson A, Jashek-Ahmed F, Hardman J, et al. Functional and quality-of-life outcomes following salvage surgery for recurrent squamous cell carcinoma of the head and neck: a systematic review and meta-analysis. *Eur Arch Otorhinolaryngol*. 2023;280:4597-4618.
16. Williamson A, Shah F, Benaran I, et al. Vascularized tissue to reduce fistula after salvage total laryngectomy: a network meta-analysis. *Laryngoscope*. 2024;134:2991-3002.
17. National Institute for Health and Care Excellence. *Developing NICE Guidelines: The Manual*. NICE; 2020.
18. Ebell MH, Siwek J, Weiss BD, et al. Strength of recommendation taxonomy (SORT): a patient-centered approach to grading evidence in the medical literature. *Am Fam Physician*. 2004;69:548-556.
19. Zhu Y, McLaren O, Hardman J, et al. Systematic review and meta-analysis of the diagnostic effectiveness of positron emission tomography-computed tomography versus magnetic resonance imaging in the post-treatment surveillance of head and neck squamous cell carcinoma. *J Laryngol Otol*. 2023;137:22-30.
20. Gao S, Li S, Yang X, et al. 18FDG PET-CT for distant metastases in patients with recurrent head and neck cancer after definitive treatment. A meta-analysis. *Oral Oncol*. 2014;50:163-167.
21. Gupta T, Maheshwari G, Kannan S, et al. Systematic review and meta-analysis of randomized controlled trials comparing elective neck dissection versus sentinel lymph node biopsy in early-stage clinically node-negative oral and/or oropharyngeal squamous cell carcinoma: evidence-base for practice and implications for research. *Oral Oncol*. 2022;124:105642.
22. Isles MG, McConkey C, Mehanna HM. A systematic review and meta-analysis of the role of positron emission tomography in the follow up of head and neck squamous cell carcinoma following radiotherapy or chemoradiotherapy. *Clin Otolaryngol*. 2008;33:210-222.
23. Wang J, Liu M, Liu C, et al. Percutaneous endoscopic gastrostomy versus nasogastric tube feeding for patients with head and neck cancer: a systematic review. *J Radiat Res*. 2014;55:559-567.
24. National Institute for Health and Care Excellence (NICE). Nutrition support for adults: Oral nutrition support, enteral tube feeding and parenteral nutrition: NICE Clinical Guidelines, No. 32 London. 2017.
25. De Virgilio A, Pellini R, Mercante G, et al. Supracricoid partial laryngectomy for radiorecurrent laryngeal cancer: a systematic review of the literature and meta-analysis. *Eur Arch Otorhinolaryngol*. 2018;275:1671-1680.
26. Leone CA, Capasso P, Topazio D, et al. Supracricoid laryngectomy for recurrent laryngeal cancer after chemoradiotherapy: a systematic review and meta-analysis. *Acta Otorhinolaryngol Ital*. 2016;36:439-449.
27. Paleri V, Thomas L, Basavaiah N, et al. Oncologic outcomes of open conservation laryngectomy for radiorecurrent laryngeal carcinoma. *Cancer*. 2011;117:2668-2676.
28. Ramakrishnan Y, Drinnan M, Kwong FNK, et al. Oncologic outcomes of transoral laser microsurgery for radiorecurrent laryngeal carcinoma: a systematic review and meta-analysis of English-language literature. *Head Neck*. 2014;36:280-285.
29. Russo E, Costantino A, Veneroni MV, et al. Transoral laser microsurgery in recurrent laryngeal cancer: a systematic review and meta-analysis. *Laryngoscope*. 2023;133:1425-1433.
30. Zhong A, Xu X, Fan H, et al. Transoral laser microsurgery for recurrent laryngeal carcinoma after primary treatment: a systematic review and meta-analysis. *J Cancer Res Ther*. 2015;11(suppl 2):C173-C178.
31. Lechien JR, Fakhry N, Saussez S, et al. Surgical, clinical and functional outcomes of transoral robotic surgery for supraglottic laryngeal cancers: a systematic review. *Oral Oncol*. 2020;109:104848.
32. Saraniti C, Verro B, Ciodaro F, et al. Oncological outcomes of Primary vs. Salvage OPHL Type II: a systematic review. *Int J Environ Res Public Health*. 2022;19:1837.
33. Bulbul MG, Genovese TJ, Hagan K, et al. Salvage surgery for recurrent squamous cell carcinoma of the. *Head Neck*. 2022;44:275-285.
34. Lai KWK, Lai R, Lorincz BB, et al. Oncological and functional outcomes of transoral robotic surgery and endoscopic laryngopharyngeal surgery for hypopharyngeal cancer: a systematic review. *Front Surg*. 2021;8:810581.
35. Lane C, Rabbani R, Linton J, et al. Systematic review and meta-analysis of transoral laser microsurgery in hypopharyngeal carcinoma. *Laryngoscope Investig Otolaryngol*. 2020;5:66-73.
36. Davies-Husband CR, Drinnan M, King E. Elective neck dissection for salvage total laryngectomy: a systematic review, meta-analysis and "decision-to-treat" approach. *Clinical Otolaryngology*. 2020;45:558-573.
37. Finegersh A, Moss WJ, Saddawi-Konefka R, et al. Meta-analysis of risk of occult lymph node metastasis in the irradiated, clinically N0 neck. *Head Neck*. 2020;42:2355-2363.
38. Gross JH, Vila PM, Simon L, et al. Elective neck dissection during salvage laryngectomy: a systematic review and meta-analysis. *Laryngoscope*. 2020;130:899-906.
39. Lin C, Puram SV, Bulbul MG, et al. Elective neck dissection for salvage laryngectomy: a systematic review and meta-analysis. *Oral Oncol*. 2019;96:97-104.
40. Lin DJ, Lam A, Warner L, et al. Elective neck dissection in patients with radio-recurrent and radio-residual squamous cell carcinoma of the larynx undergoing salvage total

laryngectomy: systematic review and meta-analysis. *Head Neck*. 2019;41:4026-4035.
41. van den Bovenkamp K, Noordhuis MG, Oosting SF, et al. Clinical outcome of salvage neck dissections in head and neck cancer in relation to initial treatment, extent of surgery and patient factors. *Clin Otolaryngol*. 2017;42:693-700.
42. van den Bovenkamp K, Dorgelo B, Noordhuis MG, et al. Viable tumor in salvage neck dissections in head and neck cancer: relation with initial treatment, change of lymph node size and human papillomavirus. *Oral Oncol*. 2018;77:131-136.
43. Robbins KT, Doweck I, Samant S, et al. Effectiveness of supraselective and selective neck dissection for advanced nodal metastases after chemoradiation. *Arch Otolaryngol Head Neck Surg*. 2005;131:965-969.
44. van der Putten L, van den Broek GB, de Bree R, et al. Effectiveness of salvage selective and modified radical neck dissection for regional pathologic lymphadenopathy after chemoradiation. *Head Neck*. 2009;31:593-603.
45. Kumar R, Drinnan M, Robinson M, et al. Thyroid gland invasion in total laryngectomy and total laryngopharyngectomy: a systematic review and meta-analysis of the English literature. *Clin Otolaryngol*. 2013;38:372-378.
46. Xie J, Wu P, Liu H, et al. Thyroid gland invasion in total laryngectomy: a systematic review and meta-analysis. *Int J Surg*. 2022;99:106262.
47. Cabrera CI, Joseph Jones A, Philleo Parker N, et al. Pectoralis major onlay vs interpositional reconstruction fistulation after salvage total laryngectomy: systematic review and meta-analysis. *Otolaryngol Head Neck Surg*. 2021;164:972-983.
48. De Virgilio A, Costantino A, Festa BM, et al. Surgical prevention of pharyngocutaneous fistula in salvage total laryngectomy: a systematic review and network meta-analysis. *Eur Arch Otorhinolaryngol*. 2022;279:5839-5849.
49. Hasan Z, Dwivedi RC, Gunaratne DA, et al. Systematic review and meta-analysis of the complications of salvage total laryngectomy. *Eur J Surg Oncol*. 2017;43:42-51.
50. Paleri V, Drinnan M, van den Brekel MWM, et al. Vascularized tissue to reduce fistula following salvage total laryngectomy: a systematic review. *Laryngoscope*. 2014;124:1848-1853.
51. Guimarães AV, Aires FT, Dedivitis RA, et al. Efficacy of pectoralis major muscle flap for pharyngocutaneous fistula prevention in salvage total laryngectomy: a systematic review. *Head Neck*. 2016;38(suppl 1):E2317-E2321.
52. Costantino A, Pace GM, Festa BM, et al. Salivary bypass tube in total laryngectomy: systematic review and meta-analysis. *Head Neck*. 2022;44:2608-2620.
53. Kamhieh Y, Fox H, Hallett E, et al. Routine use of salivary bypass tubes in laryngectomy patients: systematic review. *J Laryngol Otol*. 2018;132:380-384.
54. Marijić B, Grasl S, Grasl M, et al. Do salivary bypass tubes reduce the risk of pharyngocutaneous fistula after laryngopharyngectomy—a systematic review and meta-analysis. *Cancers (Basel)*. 2021;13:2827.
55. Barauna Neto JC, Dedivitis RA, Aires FT, et al. Comparison between primary and secondary tracheoesophageal puncture prosthesis: a systematic review. *ORL J Otorhinolaryngol Relat Spec*. 2017;79:222-229.
56. Chakravarty PD, McMurran AEL, Banigo A, et al. Primary versus secondary tracheoesophageal puncture: systematic review and meta-analysis. *J Laryngol Otol*. 2018;132:14-21.
57. Luu K, Chang BA, Valenzuela D, et al. Primary versus secondary tracheoesophageal puncture for voice rehabilitation in laryngectomy patients: a systematic review. *Clin Otolaryngol*. 2018;43:1250-1259.
58. Sayles M, Grant DG. Preventing pharyngo-cutaneous fistula in total laryngectomy: a systematic review and meta-analysis. *Laryngoscope*. 2014;124:1150-1163.
59. Hardman J, Liu Z, Brady G, et al. Transoral robotic surgery for recurrent cancers of the upper aerodigestive tract—systematic review and meta-analysis. *Head Neck*. 2020;42:1089-1104.
60. Hardman JC, Holsinger FC, Brady GC, et al. Transoral Robotic Surgery for Recurrent Tumors of the Upper Aerodigestive Tract (RECUT): an international cohort study. *J Natl Cancer Inst*. 2022;114:1400-1409.
61. Jayaram SC, Muzaffar SJ, Ahmed I, et al. Efficacy, outcomes, and complication rates of different surgical and nonsurgical treatment modalities for recurrent/residual oropharyngeal carcinoma: a systematic review and meta-analysis. *Head Neck*. 2016;38:1855-1861.
62. Kao SS, Ooi EH. Survival outcomes following salvage surgery for oropharyngeal squamous cell carcinoma: systematic review. *J Laryngol Otol*. 2018;132:299-313.
63. Turner MT, Chung J, Noorkbash S, et al. Complications following salvage transoral robotic surgery with and without reconstruction: a systematic review of the literature. *Oral Oncol*. 2023;145:106467.
64. Chen T, Lo T, Huang H, et al. Outcomes of salvage treatment in patients with recurrent oral squamous cell carcinoma. *Head Neck*. 2021;43:3764-3774.
65. Nandy K, Rai S, Bhatt S, et al. Salvage surgery for recurrent carcinoma of the oral cavity: assessment of prognostic factors. *Int J Oral Maxillofac Surg*. 2022;51:602-611.
66. Weckx A, Riekert M, Grandoch A, et al. Time to recurrence and patient survival in recurrent oral squamous cell carcinoma. *Oral Oncol*. 2019;94:8-13.
67. Bollig CA, Gilley DR, Ahmad J, et al. Prophylactic arterial ligation following transoral robotic surgery: a systematic review and meta-analysis. *Head Neck*. 2020;42:739-746.
68. Pang P, Li R-W, Shi J-P, et al. A comparison of mandible preservation method and mandibulotomy approach in oral and oropharyngeal cancer: a meta-analysis. *Oral Oncol*. 2016;63:52-60.
69. Kamhieh Y, Fox H, Healy S, et al.; Collectively this is the work of the South Wales Head & Neck Cancer Group. Total glossolaryngectomy cohort study (N = 25): survival, function and quality of life. *Clin Otolaryngol*. 2018;43:1349-1353.
70. Mazerolle P, Fuchsmann C, Schultz P, et al. Salvage total glossectomy and total glosso-laryngectomy: are they worth it? A GETTEC French multicenter study. *Oral Oncol*. 2022;130:105896.
71. Sinclair CF, Carroll WR, Desmond RA, et al. Functional and survival outcomes in patients undergoing total glossectomy compared with total laryngoglossectomy. *Otolaryngol Head Neck Surg*. 2011;145:755-758.
72. Malik A, Hardman JC, Devabalan Y, et al. Systematic review and meta-analysis of occult contralateral nodal metastases in patients with oropharyngeal squamous carcinoma undergoing elective neck dissection. *Eur J Surg Oncol*. 2023;49:316-322.
73. Hutchison IL, Ridout F, Cheung SMY, et al. Nationwide randomised trial evaluating elective neck dissection for early stage oral cancer (SEND study) with meta-analysis and concurrent real-world cohort. *Br J Cancer*. 2019;121:827-836.
74. Williamson A, Moen CM, Slim MAM, et al. Transoral robotic surgery without adjuvant therapy: a systematic review and meta-analysis of the association between surgical margins and local recurrence. *Oral Oncol*. 2023;147:106610.

75. Bungum A, Jensen JS, Jakobsen KK, et al. Impact of surgical resection margins less than 5 mm in oral cavity squamous cell carcinoma: a systematic review. *Acta Otolaryngol*. 2020;140:869-875.
76. Young K, Bulosan H, Kida CC, et al. Stratification of surgical margin distances by the millimeter on local recurrence in oral cavity cancer: a systematic review and meta-analysis. *Head Neck*. 2023;45:1305-1314.
77. Vander Poorten V, Uyttebroek S, Robbins KT, et al. Perioperative antibiotics in clean-contaminated head and neck surgery: a systematic review and meta-analysis. *Adv Ther*. 2020;37:1360-1380.
78. Haidar YM, Tripathi PB, Tjoa T, et al. Antibiotic prophylaxis in clean-contaminated head and neck cases with microvascular free flap reconstruction: a systematic review and meta-analysis. *Head Neck*. 2018;40:417-427.
79. Brady G, Leigh-Doyle L, Riva F, et al. Early post-operative feeding: an investigation of early functional outcomes for oral cancer patients treated with surgical resection and free flap reconstruction. *Dysphagia*. 2022;37:1008-1013.
80. Kerawala CJ, Riva F, Paleri V. The impact of early oral feeding following head and neck free flap reconstruction on complications and length of stay. *Oral Oncol*. 2021;113:105094.
81. Stramiello J, Nuyen B, Saraswathula A, et al. Timing of postoperative oral feeding after head and neck mucosal free flap reconstruction. *Laryngoscope Investig Otolaryngol*. 2021;6:1031-1036.
82. Milinis K, Gaskell P, Lau A, et al. Early versus late oral feeding following total (pharyngo)laryngectomy: systematic review and meta-analysis. *Head Neck*. 2021;43:1359-1368.
83. Singh R, Karantanis W, Fadhil M, et al. Meta-analysis on the rate of pharyngocutaneous fistula in early oral feeding in laryngectomy patients. *Am J Otolaryngol*. 2021;42:102748.
84. Leroy C, Brunet A, Touska P, et al. Water soluble swallow for leak detection after total laryngectomy post radiotherapy. *Eur Arch Otorhinolaryngol*. 2023;280:4225-4232.
85. Narayan M, Limbachiya S, Balasubramanian D, et al. Efficacy of small-volume gastrografin videofluoroscopic screening for detecting pharyngeal leaks following total laryngectomy. *J Laryngol Otol*. 2020;134:350-353.
86. Cosway B, Drinnan M, Paleri V. Narrow band imaging for the diagnosis of head and neck squamous cell carcinoma: a systematic review. *Head Neck*. 2016;38 Suppl 1:E2358-E2367.
87. Cheung PKF, Chin RY, Eslick GD. Detecting residual/recurrent head neck squamous cell carcinomas using PET or PET/CT. *Otolaryngol-Head Neck Surg*. 2016;154:421-432.
88. Gupta T, Master Z, Kannan S, et al. Diagnostic performance of post-treatment FDG PET or FDG PET/CT imaging in head and neck cancer: a systematic review and meta-analysis. *Eur J Nucl Med Mol Imaging*. 2011;38:2083-2095.
89. Javidnia H, Corsten MJ. Number needed to treat analysis for planned neck dissection after chemoradiotherapy for advanced neck disease. *J Otolaryngol Head Neck Surg*. 2010;39:664-668.
90. Mehanna H, Wong W-L, McConkey CC, et al.; PET-NECK Trial Management Group. PET-CT surveillance versus neck dissection in advanced head and neck cancer. *N Engl J Med*. 2016;374:1444-1454.
91. Sheikhbahaei S, Taghipour M, Ahmad R, et al. Diagnostic accuracy of follow-up FDG PET or PET/CT in patients with head and neck cancer after definitive treatment: a systematic review and meta-analysis. *AJR Am J Roentgenol*. 2015;205:629-639.
92. Liu HY, Milne R, Lock G, et al. Utility of a repeat PET/CT scan in HPV-associated oropharyngeal cancer following incomplete nodal response from (chemo)radiotherapy. *Oral Oncol*. 2019;88:153-159.
93. Rulach R, Zhou S, Hendry F, et al. 12 week PET-CT has low positive predictive value for nodal residual disease in human papillomavirus-positive oropharyngeal cancers. *Oral Oncol*. 2019;97:76-81.
94. Wong ET, Dmytriw AA, Yu E, et al. FDG PET/CT for locoregional surveillance following definitive treatment of. *Head Neck*. 2019;41:551-561.
95. Shang C, Feng L, Gu Y, et al. Impact of multidisciplinary team management on the survival rate of head and neck cancer patients: a cohort study meta-analysis. *Front Oncol*. 2021;11:630906.
96. Hunter K, Helliwell T, Sandison A, et al. Dataset for the histopathological reporting of carcinomas of the oropharynx and nasopharynx. London: The Royal College of Pathologists; 2021. https://www.rcpath.org/static/24d6fa0d-7462-4876-ab5d826e8104ddee/89177e93-75c7-48c7-82595ea4c8a39f9f/G189-Oropharynx-and-nasopharynx-datasetfor-publication.pdf
97. Emerick KS, Tomycz L, Bradford CR, et al. Primary versus secondary tracheoesophageal puncture in salvage total laryngectomy following chemoradiation. *Otolaryngol Head Neck Surg*. 2009;140:386-390.
98. Haring CT, Kana LA, Dermody SM, et al. Patterns of recurrence in head and neck squamous cell carcinoma to inform personalized surveillance protocols. *Cancer*. 2023;129:2817-2827.
99. Culié D, Lisan Q, Leroy C, et al. Oropharyngeal cancer: first relapse description and prognostic factor of salvage treatment according to p16 status, a GETTEC multicentric study. *Eur J Cancer*. 2021;143:168-177.
100. Hanna GJ, O'Neill A, Shin K-Y, et al. Neoadjuvant and adjuvant nivolumab and lirilumab in patients with recurrent, resectable squamous cell carcinoma of the head and neck. *Clin Cancer Res*. 2022;28:468-478.
101. Hsieh K, Hotca AE, Dickstein DR, et al. Adjuvant reirradiation with proton therapy in head and neck squamous cell carcinoma. *Adv Radiat Oncol*. 2024;9:101418.

JNCI: Journal of the National Cancer Institute, 2025, 117, 2202–2218
https://doi.org/10.1093/jnci/djaf128
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