National Comprehensive Cancer Network®

NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®)

Head and Neck Cancers

Version 1.2021 — November 9, 2020

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National Comprehensive Cancer Network®

NCCN Guidelines Version 1.2021
Head and Neck Cancers

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Clinical Trials: NCCN believes that the best management for any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

To find clinical trials online at NCCN Member Institutions, click here: nccn.org/clinical_trials/member_institutions.html.

NCCN Categories of Evidence and Consensus: All recommendations are category 2A unless otherwise indicated.

See NCCN Categories of Evidence and Consensus.

NCCN Categories of Preference: All recommendations are considered appropriate.

See NCCN Categories of Preference.

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Updates in Version 1.2021 of the NCCN Guidelines for Head and Neck Cancers from Version 2.2020 include:

LIP-1
- Footnote added: Cutaneous squamous cell carcinoma of the vermilion lip are not included in this guideline. See NCCN Guidelines for Squamous Cell Skin Cancer. (Also on LIP-2, LIP-3, LIP-4)

OR-2
- Footnote modified: *Data are limited on the efficacy of SLN biopsy for oral cavity cancers.* See Sentinel Lymph Node Biopsy in Principles of Surgery (SURG-A, 7 of 8).

ORPH-1
- p16 (HPV)-positive disease: Included T0 in clinical staging. (Also on ORPHPV-2/3/4)

ORPH-4
- Following resection, no adverse features pathway: RT added.

ORPH-A
- Definitive RT
  - High risk, fractionation sub-bullet added: IMRT planning can consist of sequential IMRT (S-IMRT) or simultaneous integrated boost (SIB) techniques. Equivalent doses in 2 Gy (EQD2) can be used to determine appropriate fractionation schemes when using SIB techniques.
  - Low to intermediate risk, sub-bullet modified: 44–50 Gy (2.0 Gy/fraction) *used for S-IMRT or the use of an anterior neck field and* to 54–63 Gy (1.6–1.8 Gy/fraction) *when using SIB techniques*

NASO-1
- Clinical staging: Added T0 (EBV+) to middle pathway. (Also on NASO-2)

NASO-A
- Definitive RT
  - High risk, sub-bullet modified: ~~66 Gy (2.2 Gy/fraction) to~~ 70–70.2 Gy (1.8–2.0 Gy/fraction); daily Monday–Friday in 6–7 weeks

NASO-B
- Systemic Therapy/RT Followed by Adjuvant Chemotherapy
  - Cisplatin + RT followed by carboplatin/5-FU changed from a category 2B to category 2A recommendation.
  - Useful in certain circumstances, added: If cisplatin ineligible or intolerant, carboplatin may be used as an alternative: Carboplatin + RT followed by carboplatin/5-FU
- Recurrent, Unresectable, or Metastatic Disease
  - Useful in certain circumstances, added: Pembrolizumab (for TMB-H tumors)

SUPRA-2
- Under clinical Staging, reference to footnote h added. (Also on SUPRA-5)

ETHM-1
- Workup, second bullet modified: CT with contrast or MRI with contrast of skull base *and neck*

ETHM-2
- Newly diagnosed T3,T4a, primary treatment option added: Systemic therapy (category 2B), followed by local treatment:
  - If CR: Consider systemic therapy/RT or RT (category 2B)
  - If <CR: Resection, followed by consider systemic therapy/RT if adverse features or RT (category 2B)
- Footnote added: Primary systemic therapy options for newly diagnosed T3,T4a ethmoid sinus tumors include etoposide/cisplatin (category 2B), or docetaxel/carboplatin/fluorouracil (category 2B).
- Footnotes modified:
  - Pathologic features: negative margins, favorable histology *(including low grade), not located along the cribriform plate or medial wall of the orbit, no perineural invasion or lymphovascular space invasion.* ~~central tumors, and low-grade tumors.~~ (Also on ETHM-3)
  - Adverse features include positive margins, close margins *(tumors adjacent to the cribriform plate and/or medial wall of the orbit), unfavorable histology (*high grade, *adenoid cystic),* ~~high-grade lesions, and~~ intracranial *and/or intraorbital* extension, *cribriform plate location, medial wall of orbit location, perineural invasion, and lymphovascular space invasion. (*Also on ETHM-3)

ADV-1
- PS 3, following palliative RT or single-agent systemic therapy, arrow added to "Recurrent or persistent disease (See ADV-3)."

ADV-2
- PS 2/PS 3, added to best supportive care: ± *Palliative RT or Palliative surgery* (Also on ADV-4)

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Updates in Version 1.2021 of the NCCN Guidelines for Head and Neck Cancers from Version 2.2020 include:

ADV-3
- Locoregional recurrence without prior RT
  - Resectable disease, treatment: Combination systemic therapy followed by RT or systemic therapy/RT changed from a category 3 to a category 2B recommendation.
- Footnote added: Combination systemic therapy followed by RT or systemic therapy/RT may be considered for cytoreduction or symptom control followed by local therapy as indicated.

OCC-3
- N1, neck dissection: removed "preferred."

OCC-4
- Added footnote p on this page.

SALI-B
- Useful in certain circumstances for HER2+ tumors
  - Trastuzumab changed from a category 2B to a category 2A recommendation.
  - Regimens added:
    - ◊ Ado-trastuzumab emtansine (TDM-1)
    - ◊ Trastuzumab/pertuzumab
    - ◊ Docetaxel/trastuzumab
- Useful in certain circumstances, additional regimens added:
  - Axitinib (category 2B)
  - Sorafenib (category 2B)
  - Pembrolizumab (for TMB-H tumors)
- Footnote added: Refer to ASCO/CAP guidelines for HER2 testing. (Wolff AC, Hammond MEH, Allison KH, et al. Human Epidermal Growth Factor Receptor 2 Testing in Breast Cancer: American Society of Clinical Oncology/College of American Pathologists Clinical Practice Guideline Focused Update. J Clin Oncol. 2018;36(20):2105-2122.)

MM-2
- T3,N0, T4a,N0, T3–T4a,N1:
  - Clinical trial added as primary treatment option.
  - Adjuvant therapy, added: ± systemic therapy (category 2B) (Also on MM-3)
- Footnote added: While adjuvant systemic therapy may be used for mucosal melanoma, the data to support its use are far thinner than for cutaneous melanoma. Options may include nivolumab (category 2B) or cisplatin/temozolomide (category 2B). See Discussion. (Also on MM-3)

MM-3
- T3,N0, primary treatment modified: Resection ~~+ neck dissection~~

SURG-A (1 of 8)
- Evaluation, bullets added:
  - Pre-treatment evaluation should include consultations with medical oncology, radiation oncology, dental oncology, speech-language pathologist, and reconstructive surgeon as appropriate.
  - Tumor staging for untreated patients is essential based on review of the head and neck diagnostic imaging studies and chest imaging as appropriate.
  - In addition to the office-based head and neck examination to include fiberoptic nasopharyngolaryngoscopy, examination under anesthesia to assess the tumor extent and to obtain a biopsy is indicated. In the setting of metastatic carcinoma to the neck an examination under anesthesia to search for the putative primary site is important for diagnosis and treatment planning.
- Integration of Therapy
  - Bullet modified: "For patients undergoing...The surgical procedure should ~~not~~ *rarely* be modified..."
  - Bullet added: Once the multidisciplinary team has established a proposed treatment regimen, the responsible physician and a member of the team should discuss the recommendations in detail with the patient to include the risks, benefits, and potential outcomes. The patient should be offered the opportunity to participate in the final decision (shared decision-making).

SURG-A (2 of 8)
- Heading modified: *Special Considerations: Suspected HPV-Associated* Metastatic Squamous Cell Carcinoma to the Neck~~: Suspected HPV-Associated Oropharyngeal Squamous Cell Carcinoma (OPSCC)~~
  - First bullet modified: Often, the patient's first presenting sign of *oropharyngeal squamous cell carcinoma (*OPSCC)...It is incumbent upon the treating physician or surgeon to diligently search for and ~~identify the likely~~ *pathologically confirm the* primary site, *which is* usually *located* in the base of tongue or tonsil.
  - Fourth bullet modified: EUA and confirmatory...EUA may entail unilateral or bilateral *palatine* tonsillectomy, biopsies or excision of the lingual tonsil(s), or biopsies of any suspicious areas in the base of tongue or glossopharyngeal sulcus as indicated. Lingual tonsillectomy may be considered *if the palatine tonsils are negative for tumor and other biopsies are negative.*

Continued

Updates in Version 1.2021 of the NCCN Guidelines for Head and Neck Cancers from Version 2.2020 include:

SURG-A (2 of 8) continued

- Fifth bullet modified: FNA biopsy of the neck mass, ~~usually~~ *often performed* under US guidance, will *usually* establish the diagnosis of metastatic carcinoma. A definitive cytologic diagnosis of squamous cell carcinoma is highly accurate, and further assessment of immunostaining for p16 can support the diagnosis of HPV-associated OPSCC *in the presence of an oropharyngeal primary tumor...*~~Be~~ *The surgeon should be* prepared to ~~do~~ *perform* a neck dissection at the time of open biopsy if frozen section confirms squamous cell carcinoma.

SURG-A (3 of 8)

- Fourth bullet modified: For oral cavity cancers, as ~~thickness of the lesion~~ *depth of invasion* increases, the risk...
- Sixth bullet modified: Segmental...show evidence of direct tumor involvement of the bone at the time of operation or through preoperative imaging (~~CT/MRI/Panorex~~ *CT or MRI). A panorex may be useful for assessing mandibular height when a marginal or coronal mandibulectomy is a consideration. In the edentulous patient due to mandibular atrophy that occurs over time, a partial mandibulectomy may not be possible.*
- Eighth bullet modified: For tumors of the larynx, the decision to perform either total laryngectomy or conservation laryngeal surgery (eg, transoral resection, hemilaryngectomy, *supracricoid partial laryngectomy,* supraglottic laryngectomy) will be decided by the surgeon and the patient but should adhere to the principles of complete tumor extirpation with curative intent and function preservation. *Partial laryngeal surgery should be avoided if adjuvant radiation therapy is likely following surgery.*
- Last bullet modified: Transoral robotic surgery (TORS) or laser-assisted resections of primary cancers ~~in~~ *of* the ~~oral cavity,~~ larynx and pharynx are increasingly used approaches for cancer resection in selected patients with ~~limited disease and~~ accessible tumors. Oncologic principles are similar to open procedures. Successful application of these techniques requires specialized skills and experience. *Postoperative hemorrhage can be a major and rarely life-threatening complication. It is incumbent upon the TORS surgeon to use appropriate surgical strategies to diminish the risk of postoperative hemorrhage.*

SURG-A (4 of 8)

- Margins
  - Line modified: When there is an initial cut-through with an invasive tumor at the surgical margin, obtaining additional adjacent margins from the patient may also be associated with a higher risk for local relapse *and should be described in the operative report.*
  - First bullet modified: In transoral *endoscopic and robotic approaches for oropharynx cancers,* ~~laser microsurgery,~~ margins of 1.5–2.0 mm may be *acceptable, but the data are based on retrospective studies and caution is indicated.* ~~achieved with the goal of complete tumor resection with maximal normal tissue preservation. With this approach, adequacy of resection may be uncertain and is assessed under high magnification and confirmed intraoperatively by frozen sections.~~ Such margins would be considered "close" and ~~may be~~ *are* inadequate for certain sites such as oral tongue.
  - Second bullet modified: The details of resection margins should be included in the operative dictation. The margins may be assessed on the resected specimen or alternatively from the surgical bed with proper orientation. *Adequacy of the margins may very by site. For a glottic cancer 1- to 2-mm margins are sufficient but inadequate for an invasive carcinoma of the oral tongue.*
  - Fourth bullet modified: A close margin is defined as the distance from the invasive tumor front to the resected margin that is less than *2–*5 mm, *depending on the anatomic site involved.*

SURG-A (6 of 8)

- Second bullet modified: ...For tumors with a depth greater than ~~4~~ *3* mm...
- Last bullet modified: ...For example, a T4a glottic tumor with extension through the cricothyroid membrane and subglottic extension should include ~~a total~~ thyroidectomy...

SURG-A (7 of 8)

- Sentinel lymph node biopsy, first bullet modified: SLN biopsy is an alternative to elective neck dissection for identifying occult cervical metastasis in patients with early (T1 or T2) oral cavity carcinoma in centers where expertise for this procedure is available. *Technical experience and judgment are required for successful execution of lymphatic mapping and SLN...*

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Updates in Version 1.2021 of the NCCN Guidelines for Head and Neck Cancers from Version 2.2020 include:

SURG-A (8 of 8)
- Reference added: Haughey BH, Sinha P. Prognostic factors and survival unique to surgically treated p16+ oropharyngeal cancer. Laryngoscope 2012;122 Suppl 2:S13-S33.

RAD-A
- Section title modified: "*Principles of* Radiation Techniques."

SYST-A (1 of 4)
- Primary systemic therapy + concurrent RT
  - Regimens moved from "other recommended" to "useful in certain circumstances"
    - ◊ 5-FU/hydroxyurea (category 2B)
    - ◊ Cetuximab (category 2B)
    - ◊ Cisplatin/infusional 5-FU (category 2B)
    - ◊ Cisplatin/paclitaxel (category 2B)
- Systemic Therapy/RT Following Induction Therapy, or Combination Chemotherapy for Recurrent/Persistent Disease
  - Weekly cetuximab + concurrent RT, category of preference changed to "useful in certain circumstances"

SYST-A (2 of 4)
- Cetuximab/platinum (cisplatin or carboplatin)/5-FU (category 1), category of preference changed to "other recommended regimen"
- Other recommended regimens
  - Added: Pembrolizumab/platinum (cisplatin or carboplatin)/paclitaxel (category 2B)
  - Added: Pembrolizumab/platinum (cisplatin or carboplatin)/docetaxel (category 2B)
- Useful in certain circumstances, added: Pembrolizumab (for MSI-H tumors)
- Footnote removed: Data suggest an overall survival advantage for patients treated with pembrolizumab/platinum/5-FU when compared to cetuximab/platinum/5-FU for first-line treatment of recurrent/metastatic head and neck squamous cell carcinoma. (Rischin D, Harrington KJ, Greil R, et al. Protocol-specified final analysis of the phase 3 KEYNOTE-048 trial of pembrolizumab (pembro) as first-line therapy for recurrent/metastatic head and neck squamous cell carcinoma (R/M HNSCC). J Clin Oncol 2019:37(15_suppl): Abstract 6000.)

SYST-A (3 of 4) through SYST-A (4 of 4)
- References have been updated.

NUTR-A (2 of 2)
- First bullet, lines removed: However, these patients will need encouragement to monitor their caloric intake and to assess for changes in body weight during treatment. They also may need temporary tube feeding intervention during and/or after treatment.
- Third bullet and sub-bullets added: For those who did not warrant prophylactic PEG or NG tube placement pretreatment, caloric intake, treatment related side effects, and change in body weight should be monitored by a registered dietitian nutritionist (RDN) weekly during treatment. Consider reactive feeding tube placement if two or more of the following criteria apply:
  - Inadequate food intake (60 percent of estimated energy expenditure) anticipated for more than 10 days.5
  - Consider weight loss 5% or greater in 1 month
  - Severe mucositis, odynophagia, dysphagia (grade 3+) or aspiration
  - Condier age >60 years
- References added: Bossola, M. Nutritional Intervention in Head and Neck Cancer Patients Undergoing chemoradiotherapy: A narrative Review. Nutrients. 2015;7:265-276; Talwar, B, et al. Nutritional Management in the Head and Neck Cancer: United Kingdom National Multidisciplinary Guidelines J Laryngol Otol. 2016 May; 130 (supp2);s32-s40; Sachdev, S, et al. Age most significant predictor of requiring enteral feeding in head-and-neck cancer patients. Radiat Oncol 10, 93 (2015).

DENT-A (1 of 3)
- This section has been significantly revised and updated.

MULTIDISCIPLINARY TEAM

The management of patients with head and neck cancers is complex. All patients need access to the full range of support services and specialists with expertise in the management of patients with head and neck cancer for optimal treatment and follow-up. Outcomes are improved when patients with head and neck cancers are treated in high-volume centers.

- Head and neck surgery
- Radiation oncology
- Medical oncology
- Plastic and reconstructive surgery
- Specialized nursing care
- Dentistry/prosthodontics
- Physical medicine and rehabilitation (including therapy for lymphedema of the neck)
- Speech and swallowing therapy
- Clinical social work
- Clinical nutrition
- Pathology (including cytopathology)
- Diagnostic and interventional radiology
- Adjunctive services
  - Neurosurgery
  - Ophthalmology
  - Psychiatry
  - Addiction services
  - Audiology
  - Palliative care

SUPPORT SERVICES

Follow-up should be performed by a physician and other health care professionals with expertise in the management and prevention of treatment sequelae. It should include a comprehensive head and neck exam. The management of head and neck cancer patients may involve the following:

- General medical care
- Pain and symptom management (See NCCN Guidelines for Adult Cancer Pain)
- Nutritional support
  - Enteral feeding
  - Oral nutrition
- Dental care for RT effects
- Xerostomia management
- Smoking and alcohol cessation (See NCCN Guidelines for Smoking Cessation)
- Speech and swallowing therapy
- Audiology
- Tracheotomy care
- Wound management
- Depression assessment and management (See NCCN Guidelines for Distress Management)
- Social work and case management
- Supportive care (See NCCN Guidelines for Palliative Care)

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

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Cancer of the Lip (Mucosa)

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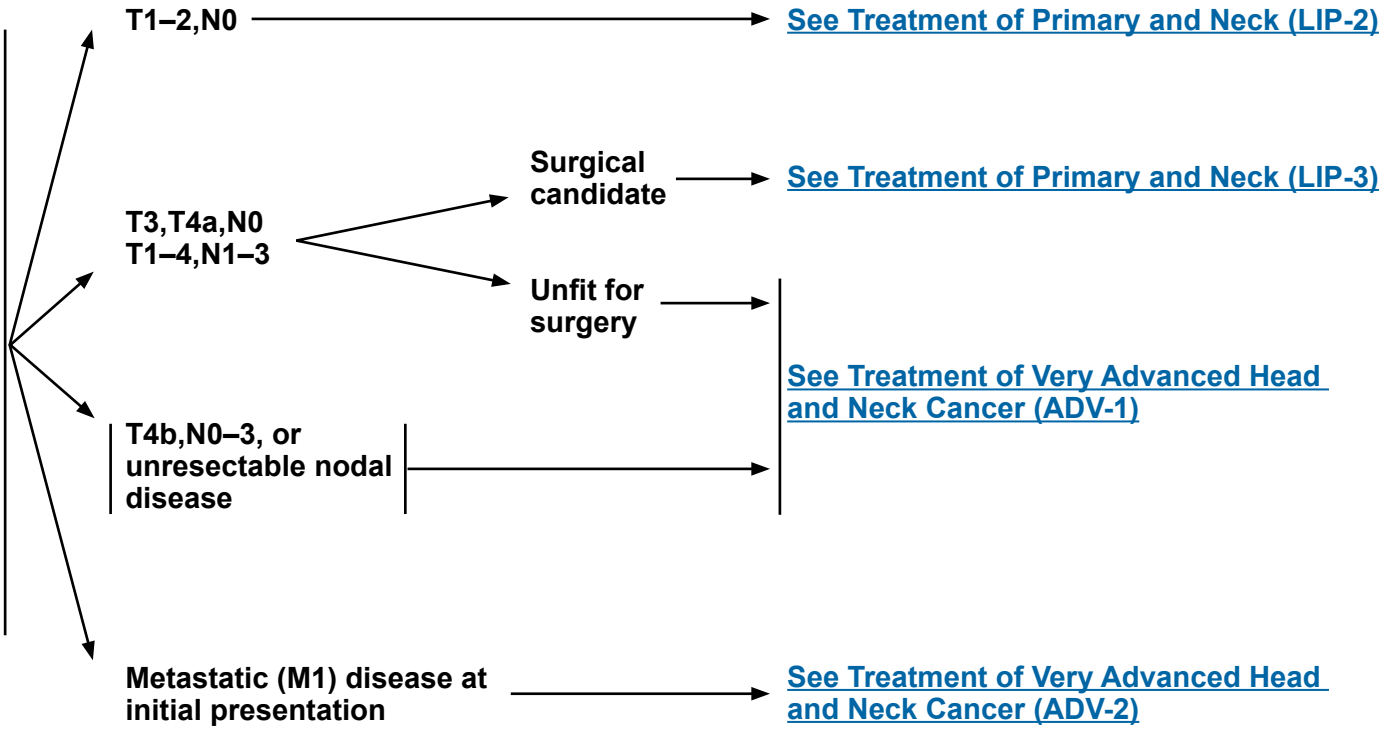
WORKUP

- History and physical (H&P)[a,b] including a complete head and neck exam; mirror and/or fiberoptic examination as clinically indicated
- Biopsy[c]
- As clinically indicated
  - Chest CT (with or without contrast)[c,d]
  - Consider FDG PET/CT[d]
  - Panorex[d]
  - CT and/or MRI with contrast of primary and neck[d]
  - Preanesthesia studies
  - Dental evaluation[e]
  - Nutrition, speech and swallowing evaluation/therapy[f]
  - Smoking cessation counseling[a]
  - Fertility/reproductive counseling[g]

Multidisciplinary consultation as indicated

CLINICAL STAGING[h]



[a] H&P should include documentation and quantification (pack years smoked) of tobacco use history. All current smokers should be advised to quit smoking, and former smokers should be advised to remain abstinent from smoking. For additional cessation support, refer to the Patient/Provider Smoking Cessation Resources in the NCCN Guidelines for Smoking Cessation.

[b] Screen for depression (See NCCN Guidelines for Distress Management).

[c] Image-guided (US or CT) needle biopsy of cystic neck nodes may offer better diagnostic yield than FNA by palpation alone for initial diagnosis in this setting.

[d] See Principles of Imaging (IMG-A).

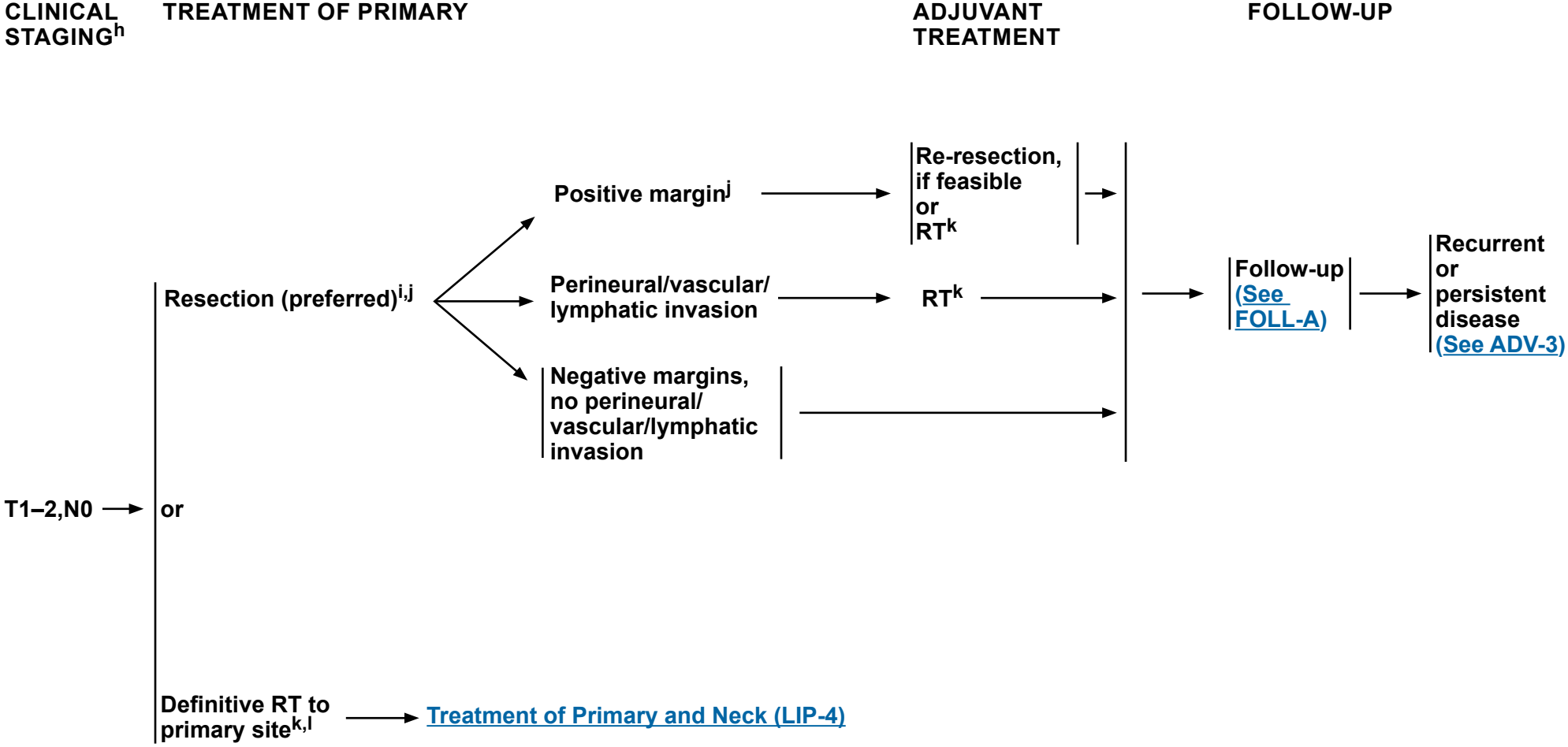
[e] See Principles of Dental Evaluation and Management (DENT-A).

[f] See Principles of Nutrition: Management and Supportive Care (NUTR-A).

[g] See fertility and reproductive endocrine considerations in the NCCN Guidelines for Adolescent and Young Adult (AYA) Oncology.

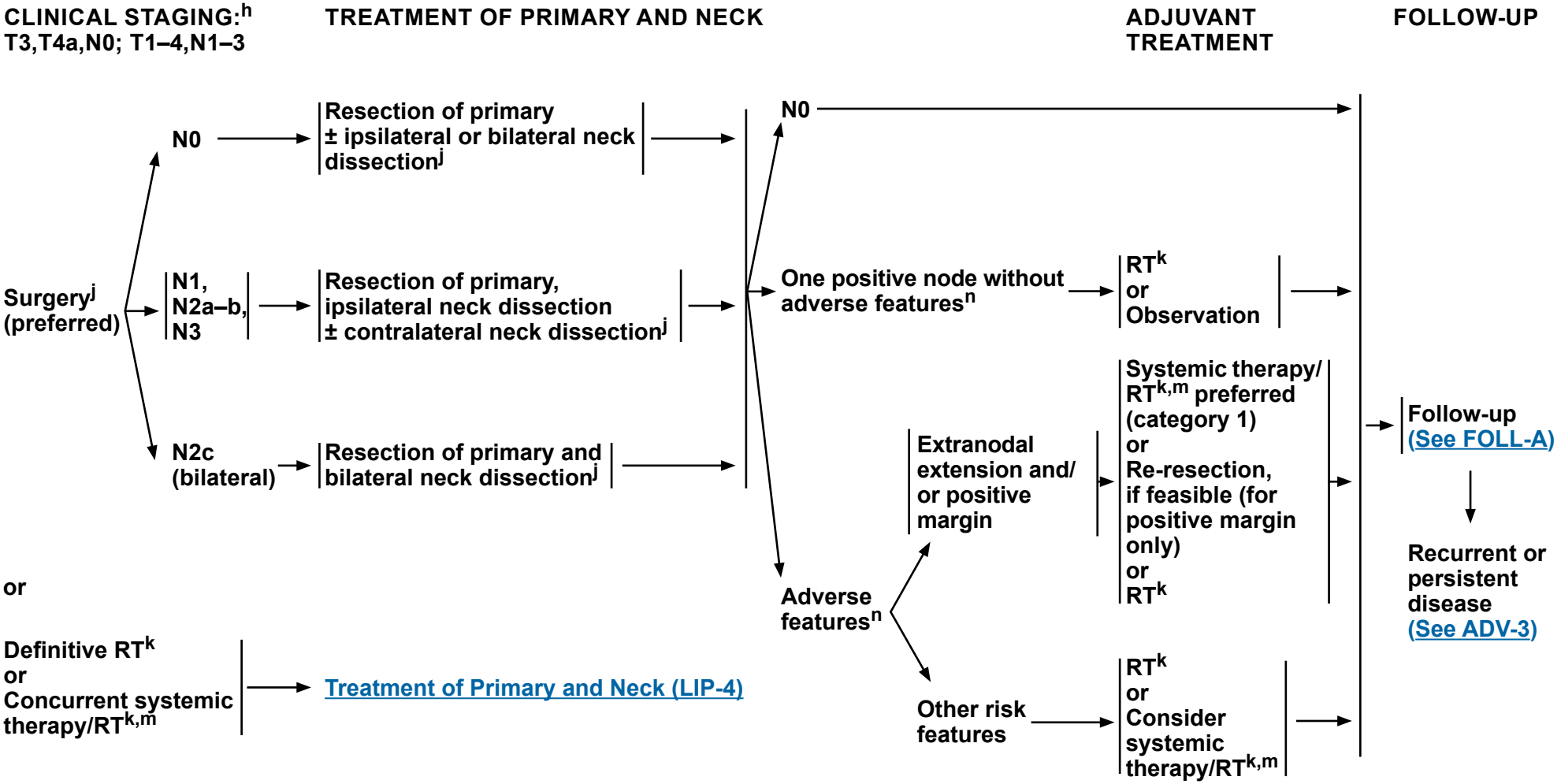
[h] Cutaneous squamous cell carcinoma of the vermilion lip is not included in this guideline. See NCCN Guidelines for Squamous Cell Skin Cancer.

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.



[h] Cutaneous squamous cell carcinoma of the vermilion lip is not included in this guideline. See NCCN Guidelines for Squamous Cell Skin Cancer.
[i] Elective neck dissection is not recommended.
[j] See Principles of Surgery (SURG-A).
[k] See Principles of Radiation Therapy (LIP-A).
[l] No elective treatment to neck is preferred for the T1–2,N0.

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.



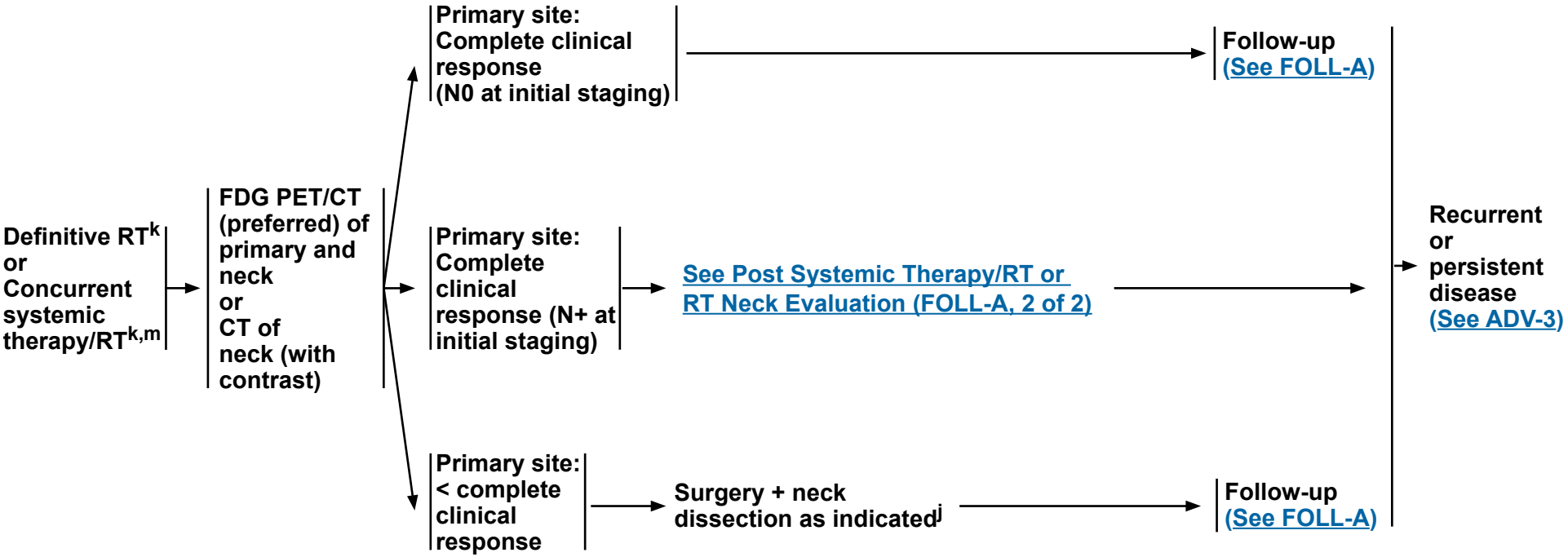
h Cutaneous squamous cell carcinoma of the vermilion lip is not included in this guideline. See NCCN Guidelines for Squamous Cell Skin Cancer.
j See Principles of Surgery (SURG-A).
k See Principles of Radiation Therapy (LIP-A).
m See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
n Adverse features: extranodal extension, pT3 or pT4 primary, positive margins, close margins, multiple positive nodes, or perineural/lymphatic/vascular invasion.

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

CLINICAL STAGING:[h]
T3,T4a,N0; T1–4,N1–3

TREATMENT OF PRIMARY AND NECK

FOLLOW-UP



[h] Cutaneous squamous cell carcinoma of the vermilion lip is not included in this guideline. See NCCN Guidelines for Squamous Cell Skin Cancer.
[j] See Principles of Surgery (SURG-A).
[k] See Principles of Radiation Therapy (LIP-A).
[m] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

PRINCIPLES OF RADIATION THERAPY[1]

DEFINITIVE:

RT Alone

- **Planning target volume (PTV)**
  - **High risk: Primary tumor and involved lymph nodes [this includes possible local subclinical infiltration at the primary site and at the high-risk level lymph node(s)]**
    - ◊ **66 Gy (2.2 Gy/fraction) to 70 Gy (2.0 Gy/fraction); daily Monday–Friday in 6–7 weeks[2]**
  - **Low to intermediate risk: Sites of suspected subclinical spread**
    - ◊ **44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[3]**
- **External beam RT (EBRT) ± brachytherapy[4,5]**
- **Brachytherapy**
  - **Interstitial brachytherapy is considered for selected cases.[4,5]**
    - ◊ **Low dose-rate (LDR) brachytherapy (0.4–0.5 Gy per hour):**
      - **– Consider LDR boost 20–35 Gy if combined with 50 Gy EBRT or 60–70 Gy over several days if using LDR as sole therapy**
    - ◊ **High dose-rate (HDR) brachytherapy:**
      - **– Consider HDR boost 21 Gy at 3 Gy/fraction if combined with 40–50 Gy EBRT or 45–60 Gy at 3–6 Gy/fraction if using HDR as sole therapy.**

Either intensity-modulated RT (IMRT) or 3D conformal RT is recommended.

CONCURRENT SYSTEMIC THERAPY/RT:[6,7]

- **PTV:**
  - **High risk: Typically 70 Gy (2.0 Gy/fraction)**
  - **Low to intermediate risk: 44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[3]**

POSTOPERATIVE:

- **Preferred interval between resection and postoperative RT is ≤6 weeks.**
- **PTV**
  - **High risk: Adverse features such as positive margins (see footnote n on LIP-3)**
    - ◊ **60–66 Gy (2.0 Gy/fraction) daily Monday–Friday in 6–6.5 weeks**
  - **Low to intermediate risk: Sites of suspected subclinical spread**
    - ◊ **44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[3]**
- **For T1–T2 simple lesions, treat with postoperative RT as per non-melanoma skin cancers. See the NCCN Guidelines for Non-Melanoma Skin Cancers.**

[1] See Principles of Radiation Techniques (RAD-A) and Discussion.

[2] For doses >70 Gy, some clinicians feel that the fractionation should be slightly modified (eg, <2.0 Gy/fraction for at least some of the treatment) to minimize toxicity. An additional 2–3 doses can be added depending on clinical circumstances.

[3] Suggest 44–50 Gy in 3D conformal RT and sequentially planned IMRT or 54–63 Gy with IMRT dose painting technique (dependent on dose per fraction).

[4] Brachytherapy should be performed at centers where there is expertise in this modality. (Nag S, Cano ER, Demanes DJ, et al. The American Brachytherapy Society recommendations for high-dose-rate brachytherapy for head-neck carcinomas. Int J Radiat Oncol Biol Phys 2001;50:1190-1198; and Mazeron JJ, Ardiet JM, Hale-Meder C, et al. GEC-ESTRO recommendations for brachytherapy for head and neck squamous cell carcinomas. Radiother Oncol 2009;91:150-156.)

[5] The interval between EBRT and brachytherapy should be as short as possible (1–2 weeks) depending on recovery from acute toxicity. The interval between HDR fractions should be at least 6 hours.

[6] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).

[7] Based on published data, concurrent systemic therapy/RT most commonly uses conventional fractionation at 2.0 Gy per fraction to a typical dose of 70 Gy in 7 weeks with single-agent cisplatin given every 3 weeks at 100 mg/m^2; 2–3 cycles of chemotherapy are used depending on the radiation fractionation scheme (RTOG 0129) (Ang KK, Harris J, Wheeler R, et al. Human papillomavirus and survival of patients with oropharyngeal cancer. N Engl J Med 2010;363:24-35). When carboplatin and 5-FU are used, the recommended regimen is standard fractionation plus 3 cycles of chemotherapy. (Bourhis J, Sire C, Graff P, et al. Concomitant chemoradiotherapy versus acceleration of radiotherapy with or without concomitant chemotherapy in locally advanced head and neck carcinoma (GORTEC 99-02): an open-label phase 3 randomised trial. Lancet Oncol 2012;13:145-153). Other fraction sizes (eg, 1.8 Gy, conventional), multiagent chemotherapy, other dosing schedules of cisplatin, or altered fractionation with chemotherapy are efficacious, and there is no consensus on the optimal approach. In general, the use of concurrent systemic therapy/RT carries a high toxicity burden; altered fractionation or multiagent chemotherapy will likely further increase the toxicity burden. For any systemic therapy/RT approach, close attention should be paid to published reports for the specific chemotherapy agent, dose, and schedule of administration. Systemic therapy/RT should be performed by an experienced team and should include substantial supportive care.

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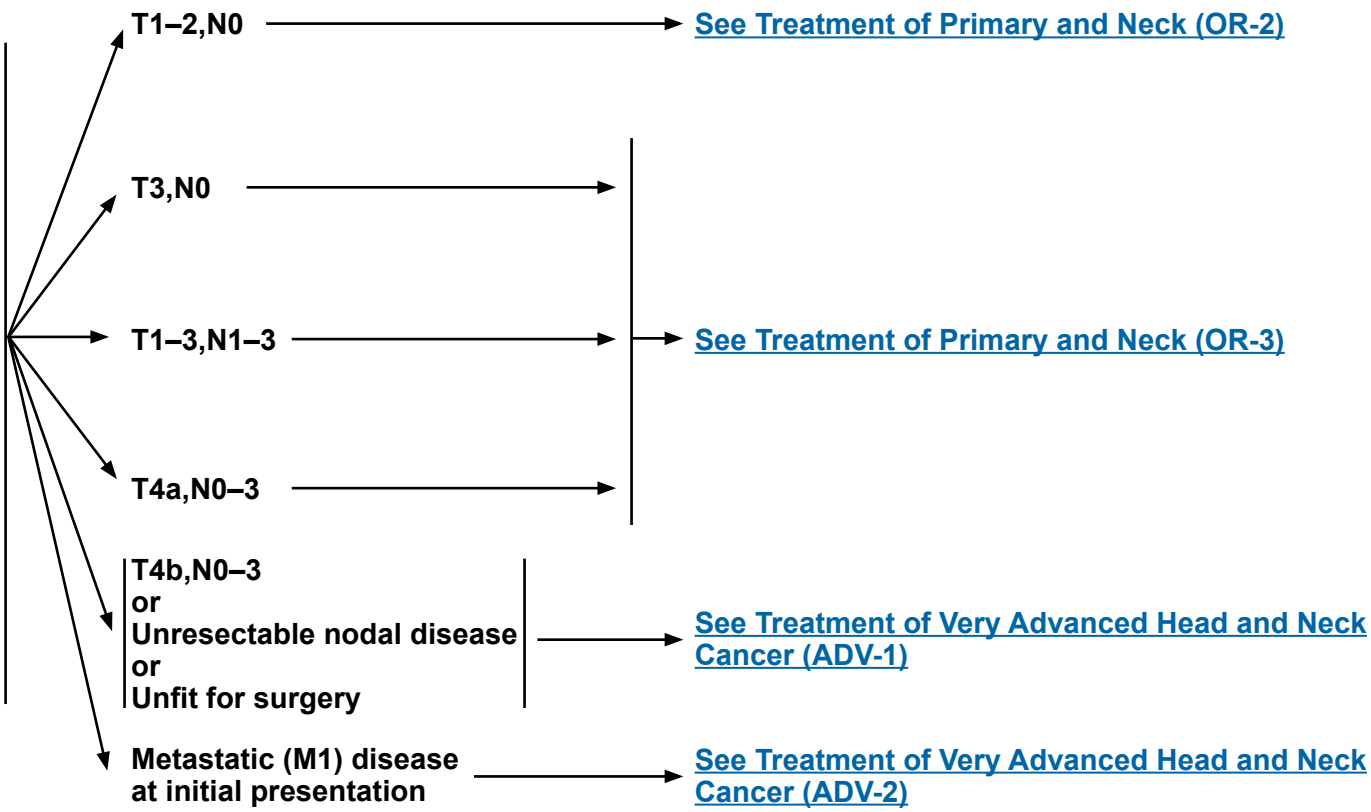
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

Buccal mucosa, floor of mouth, anterior tongue, alveolar ridge, retromolar trigone, hard palate

WORKUP

- H&P[a,b] including a complete head and neck exam; mirror and fiberoptic examination as clinically indicated
- Biopsy[c]
- As clinically indicated:
  - Chest CT (with or without contrast)[d]
  - CT with contrast and/or MRI with contrast of primary and neck
  - Consider FDG PET/CT[d,e]
  - Examination under anesthesia (EUA) with endoscopy
  - Preanesthesia studies
  - Dental/prosthodontic evaluation,[f] including Panorex or dental CT without contrast[d]
  - Nutrition, speech and swallowing evaluation/therapy[g]
  - Smoking cessation counseling[a]
  - Fertility/reproductive counseling[h]
- Multidisciplinary consultation as indicated

CLINICAL STAGING



[a] H&P should include documentation and quantification (pack years smoked) of tobacco use history. All current smokers should be advised to quit smoking, and former smokers should be advised to remain abstinent from smoking. For additional cessation support, refer to the Patient/Provider Smoking Cessation Resources in the NCCN Guidelines for Smoking Cessation.

[b] Screen for depression (See NCCN Guidelines for Distress Management).

[c] Image-guided (US or CT) needle biopsy of cystic neck nodes may offer better diagnostic yield than FNA by palpation alone for initial diagnosis in this setting.

[d] See Principles of Imaging (IMG-A).

[e] See Discussion.

[f] See Principles of Dental Evaluation and Management (DENT-A).

[g] See Principles of Nutrition: Management and Supportive Care (NUTR-A).

[h] See fertility and reproductive endocrine considerations in the NCCN Guidelines for Adolescent and Young Adult (AYA) Oncology.

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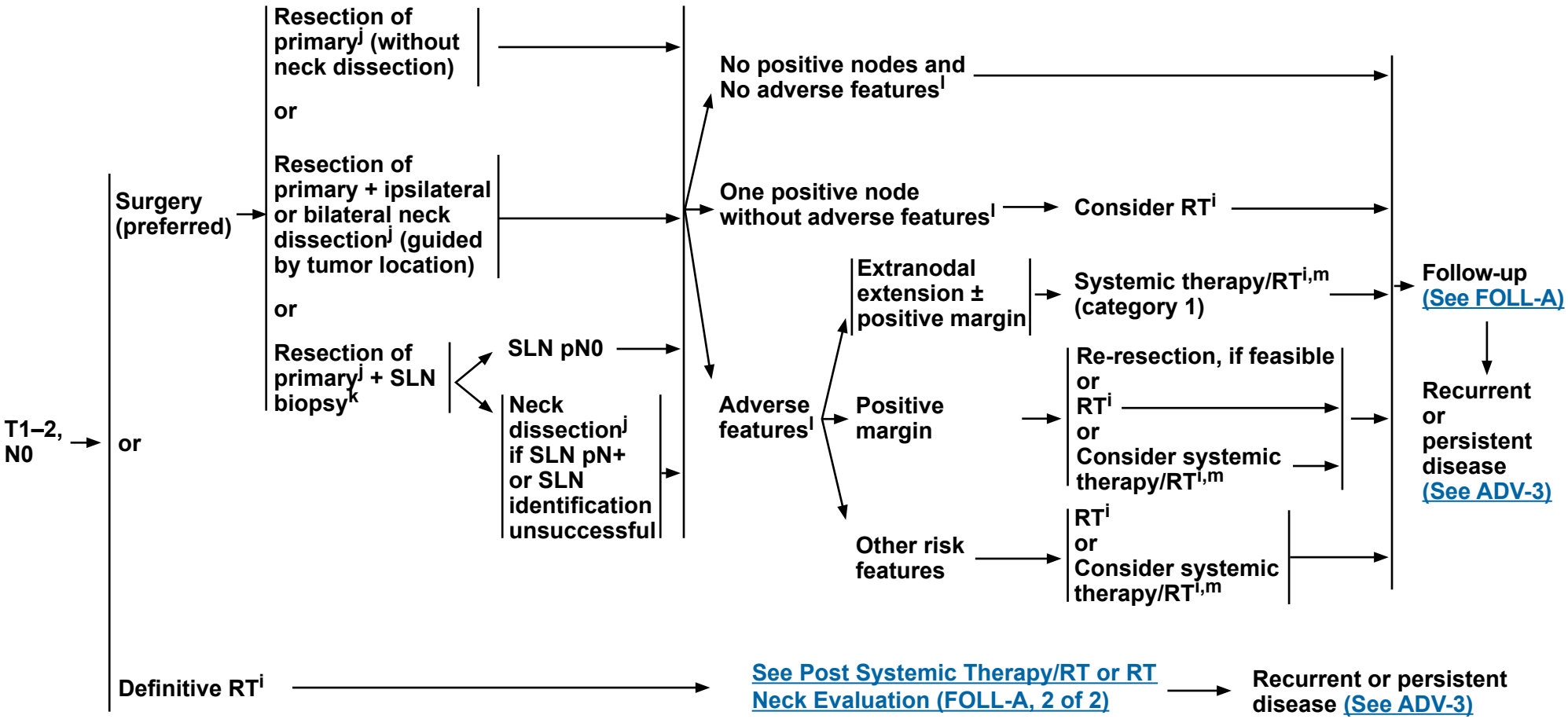
Buccal mucosa, floor of mouth, anterior tongue, alveolar ridge, retromolar trigone, hard palate



[i] Principles of Radiation Therapy (OR-A).
[j] See Principles of Surgery (SURG-A).
[k] Data are limited on the efficacy of SLN biopsy for oral cavity cancers. See Sentinel Lymph Node Biopsy in Principles of Surgery (SURG-A, 7 of 8).

[l] Adverse features: extranodal extension, positive margins, close margins, pT3 or pT4 primary, pN2 or pN3 nodal disease, nodal disease in levels IV or V, perineural invasion, vascular invasion, lymphatic invasion (See Discussion).
[m] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).

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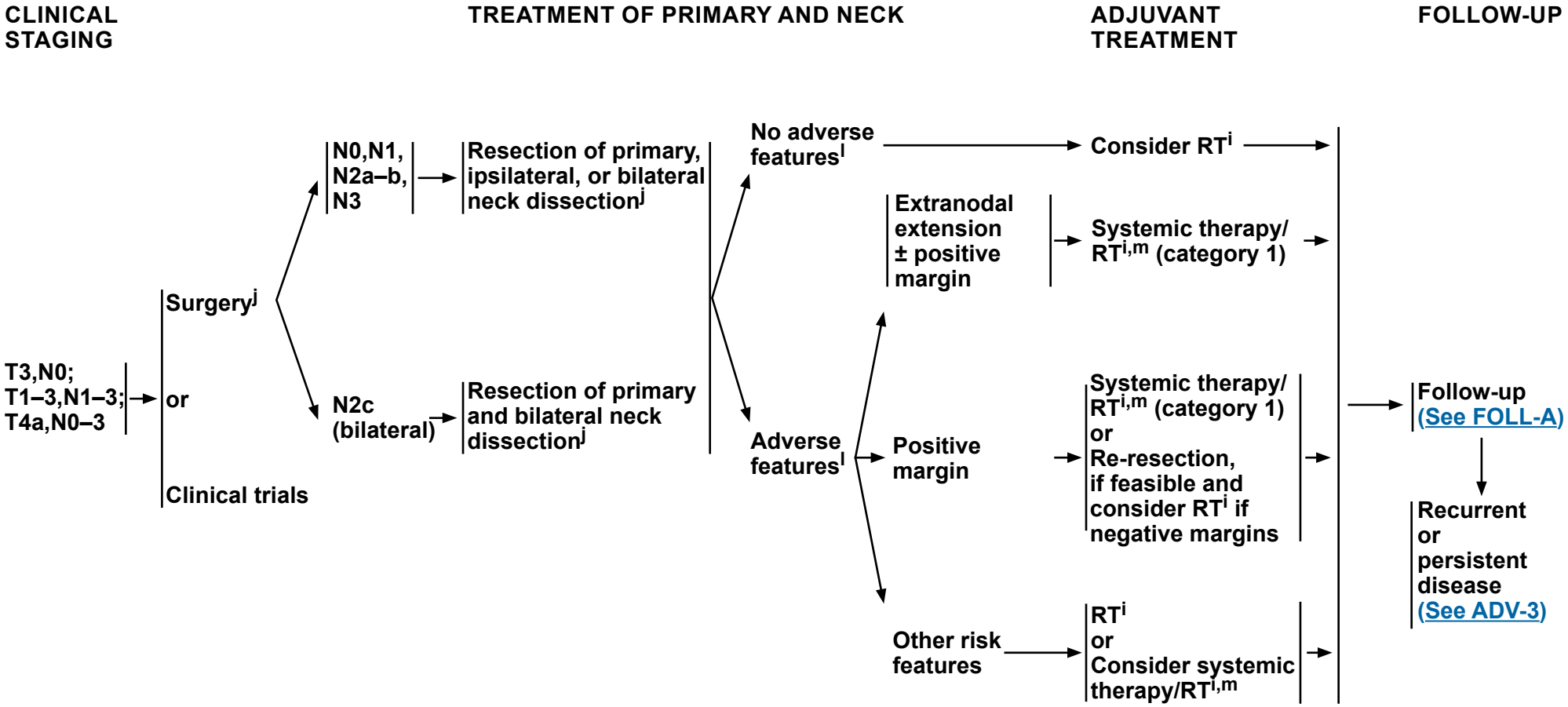
Buccal mucosa, floor of mouth, anterior tongue, alveolar ridge, retromolar trigone, hard palate



[i] See Principles of Radiation Therapy (OR-A).
[j] See Principles of Surgery (SURG-A).
[l] Adverse features: extranodal extension, positive margins, close margins, pT3 or pT4 primary, pN2 or pN3 nodal disease, nodal disease in levels IV or V, perineural invasion, vascular invasion, lymphatic invasion (See Discussion).
[m] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).

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Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

PRINCIPLES OF RADIATION THERAPY[1]

DEFINITIVE:

RT Alone

- **PTV:**
  - **High risk: Primary tumor and involved lymph nodes [this includes possible local subclinical infiltration at the primary site and at the high-risk level lymph node(s)]:**
    - ◊ **Fractionation:**
      - **– 66 Gy (2.2 Gy/fraction) to 70 Gy (2.0 Gy/fraction); daily Monday–Friday in 6–7 weeks[2]**
      - **– Concomitant boost accelerated RT:**
        - **– 72 Gy/6 weeks (1.8 Gy/fraction, large field; 1.5 Gy boost as second daily fraction during last 12 treatment days)**
        - **– 66–70 Gy (2.0 Gy/fraction; 6 fractions/wk accelerated)**
      - **– Hyperfractionation: 81.6 Gy/7 weeks (1.2 Gy/fraction, twice daily)**
  - **Low to intermediate risk: Sites of suspected subclinical spread**
    - ◊ **44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[3]**
- **Brachytherapy**
  - **Interstitial brachytherapy is considered for selected cases.[4,5]**
    - ◊ **LDR brachytherapy (0.4–0.5 Gy per hour):**
      - **– Consider LDR boost 20–35 Gy if combined with 50 Gy EBRT or 60–70 Gy over several days if using LDR as sole therapy.**
    - ◊ **HDR brachytherapy:**
      - **– Consider HDR boost 21 Gy at 3 Gy/fraction if combined with 40–50 Gy EBRT or 45–60 Gy at 3–6 Gy/fraction if using HDR as sole therapy.**

For unresectable disease, see ADV-1.

Either IMRT or 3D conformal RT is recommended.

[1] See Principles of Radiation Techniques (RAD-A) and Discussion.

[2] For doses >70 Gy, some clinicians feel that the fractionation should be slightly modified (eg, <2.0 Gy/fraction for at least some of the treatment) to minimize toxicity. An additional 2–3 doses can be added depending on clinical circumstances.

[3] Suggest 44–50 Gy in 3D conformal RT and sequentially planned IMRT or 54–63 Gy with IMRT dose painting technique (dependent on dose per fraction).

[4] Brachytherapy should be performed at centers where there is expertise in this modality. (Nag S, Cano ER, Demanes DJ, et al. The American Brachytherapy Society recommendations for high-dose-rate brachytherapy for head-neck carcinomas. Int J Radiat Oncol Biol Phys 2001;50:1190-1198; and Mazeron JJ, Ardiet JM, Hale-Meder C, et al. GEC-ESTRO recommendations for brachytherapy for head and neck squamous cell carcinomas. Radiother Oncol 2009;91:150-156.)

[5] The interval between EBRT and brachytherapy should be as short as possible (1–2 weeks) depending on recovery from acute toxicity. The interval between HDR fractions should be at least 6 hours.

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PRINCIPLES OF RADIATION THERAPY[1]

POSTOPERATIVE:

RT or Concurrent Systemic Therapy/RT[6-10]

- **Preferred interval between resection and postoperative RT is ≤6 weeks.**
- **PTV**
  - **High risk: Adverse features such as positive margins (see footnote l on OR-3)**
    - **60–66 Gy (2.0 Gy/fraction); daily Monday–Friday in 6–6.5 weeks**
  - **Low to intermediate risk: Sites of suspected subclinical spread**
    - **44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[3]**

Either IMRT or 3D conformal RT is recommended.

[1]See Principles of Radiation Techniques (RAD-A) and Discussion.
[3]Suggest 44–50 Gy in 3D conformal RT and sequentially planned IMRT or 54–63 Gy with IMRT dose painting technique (dependent on dose per fraction).
[6]See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[7]Bernier J, Domenge C, Ozsahin M, et al. Postoperative irradiation with or without concomitant chemotherapy for locally advanced head and neck cancer. N Engl J Med 2004;350:1945-1952.
[8]Cooper JS, Pajak TF, Forastiere AA, et al. Postoperative concurrent radiotherapy and chemotherapy for high-risk squamous-cell carcinoma of the head and neck. N Engl J Med 2004;350:1937-1944.
[9]Bernier J, Cooper JS, Pajak TF, et al. Defining risk levels in locally advanced head and neck cancers: A comparative analysis of concurrent postoperative radiation plus chemotherapy trials of the EORTC (#22931) and RTOG (#9501). Head Neck 2005;27:843-850.
[10]Cooper JS, Zhang Q, Pajak TF, et al. Long-term follow-up of the RTOG 9501/intergroup phase III trial: postoperative concurrent radiation therapy and chemotherapy in high-risk squamous cell carcinoma of the head and neck. Int J Radiat Oncol Biol Phys 2012;84:1198-1205.

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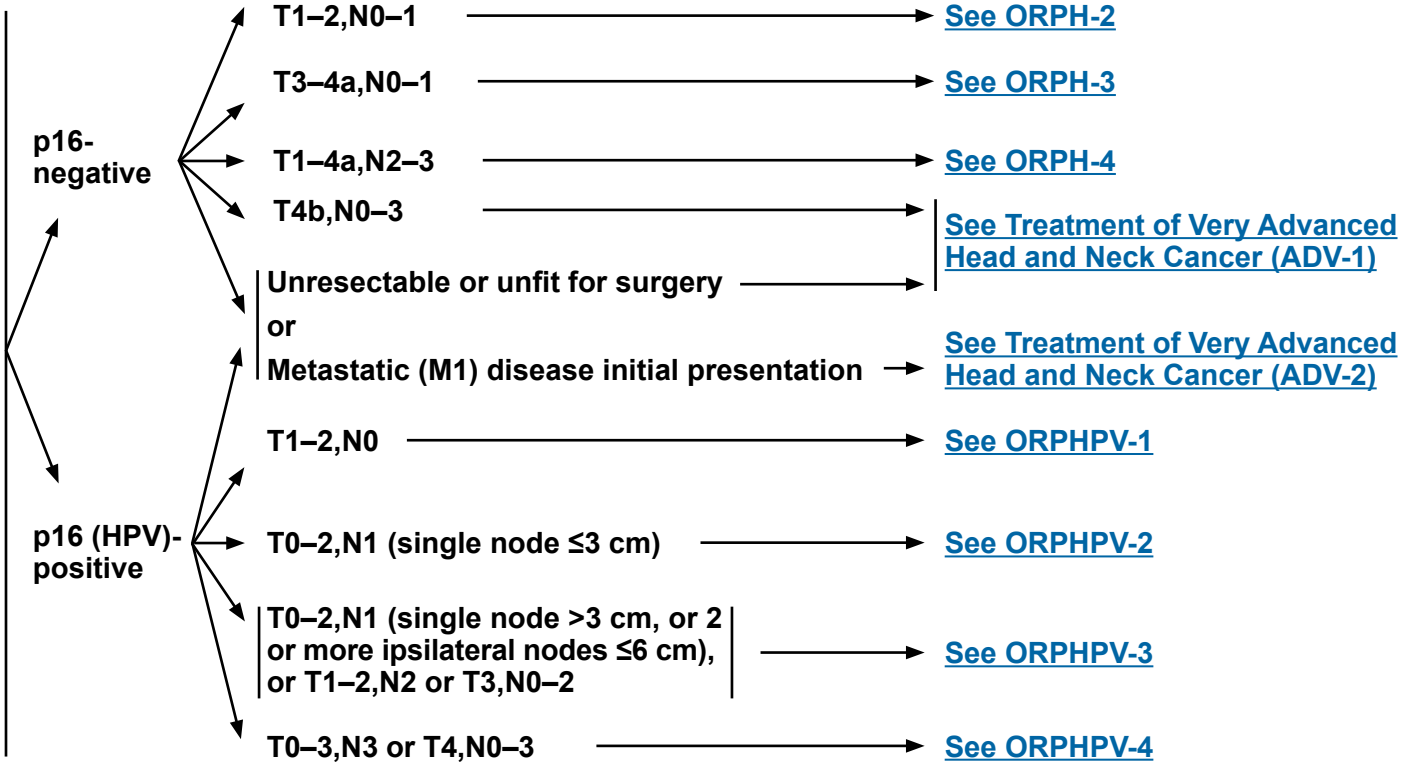
Base of Tongue/Tonsil/Posterior Pharyngeal Wall/Soft Palate

WORKUP

- Tumor human papillomavirus (HPV) testing by p16 immunohistochemistry (IHC) required[a]
- H&P[b,c] including a complete head and neck exam; mirror and fiberoptic examination as clinically indicated
- Biopsy of primary site or fine-needle aspiration (FNA) of the neck[d]
- CT with contrast and/or MRI with contrast of primary and neck[e]
- As clinically indicated:
  - EUA with endoscopy[f]
  - Preanesthesia studies
  - FDG PET/CT[e]
  - Chest CT[e] (with or without contrast)
  - Dental evaluation[g] including Panorex
  - Nutrition, speech and swallowing evaluation/therapy, and audiogram[h]
  - Smoking cessation counseling[b]
  - Fertility/reproductive counseling[i]

Multidisciplinary consultation as clinically indicated



[a] See Principles of p16 Testing and HPV Status (ORPH-B).
[b] H&P should include documentation and quantification (pack years smoked) of tobacco use history. All current smokers should be advised to quit smoking, and former smokers should be advised to remain abstinent from smoking. For additional cessation support, refer to the Patient/Provider Smoking Cessation Resources in the NCCN Guidelines for Smoking Cessation.
[c] Screen for depression (See NCCN Guidelines for Distress Management).
[d] Image-guided (US or CT) needle biopsy of cystic neck nodes may offer better diagnostic yield than FNA by palpation alone for initial diagnosis in this setting.
[e] See Principles of Imaging (IMG-A).
[f] Prior to treatment, EUA with biopsy confirmation of the oropharyngeal primary site is recommended for patients presenting with a p16+ cervical lymph node. See Principles of Surgical Management (SURG-A).
[g] See Principles of Dental Evaluation and Management (DENT-A).
[h] See Principles of Nutrition: Management and Supportive Care (NUTR-A).
[i] See fertility and reproductive endocrine considerations in the NCCN Guidelines for Adolescent and Young Adult (AYA) Oncology.
[j] The clinical staging definitions take into consideration the new AJCC 8th edition staging for oropharynx cancer, while referencing the staging criteria previously used in clinical trials on the management of oropharynx cancer.

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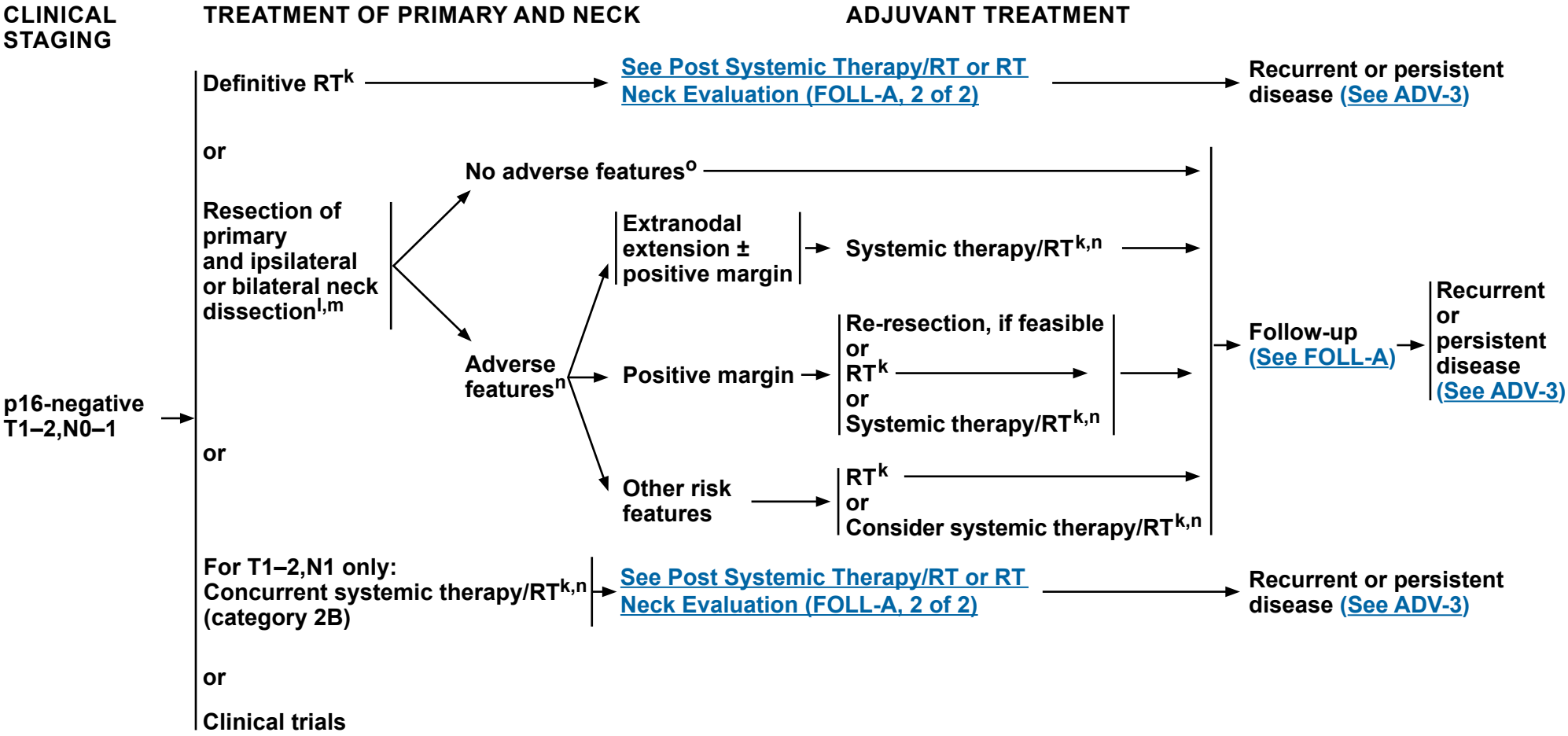
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

Base of Tongue/Tonsil/Posterior Pharyngeal Wall/Soft Palate



[k] See Principles of Radiation Therapy (ORPH-A).
[l] See Principles of Surgery (SURG-A).
[m] Tumors in the base of tongue, posterior pharyngeal wall, and soft palate require consideration of bilateral neck treatment as do tumors of the tonsil invading the tongue base.
[n] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[o] Adverse features: extranodal extension, positive margins, close margins, pT3 or pT4 primary, pN2 or pN3 nodal disease, nodal disease in levels IV or V, perineural invasion, vascular invasion, lymphatic invasion (See Discussion).

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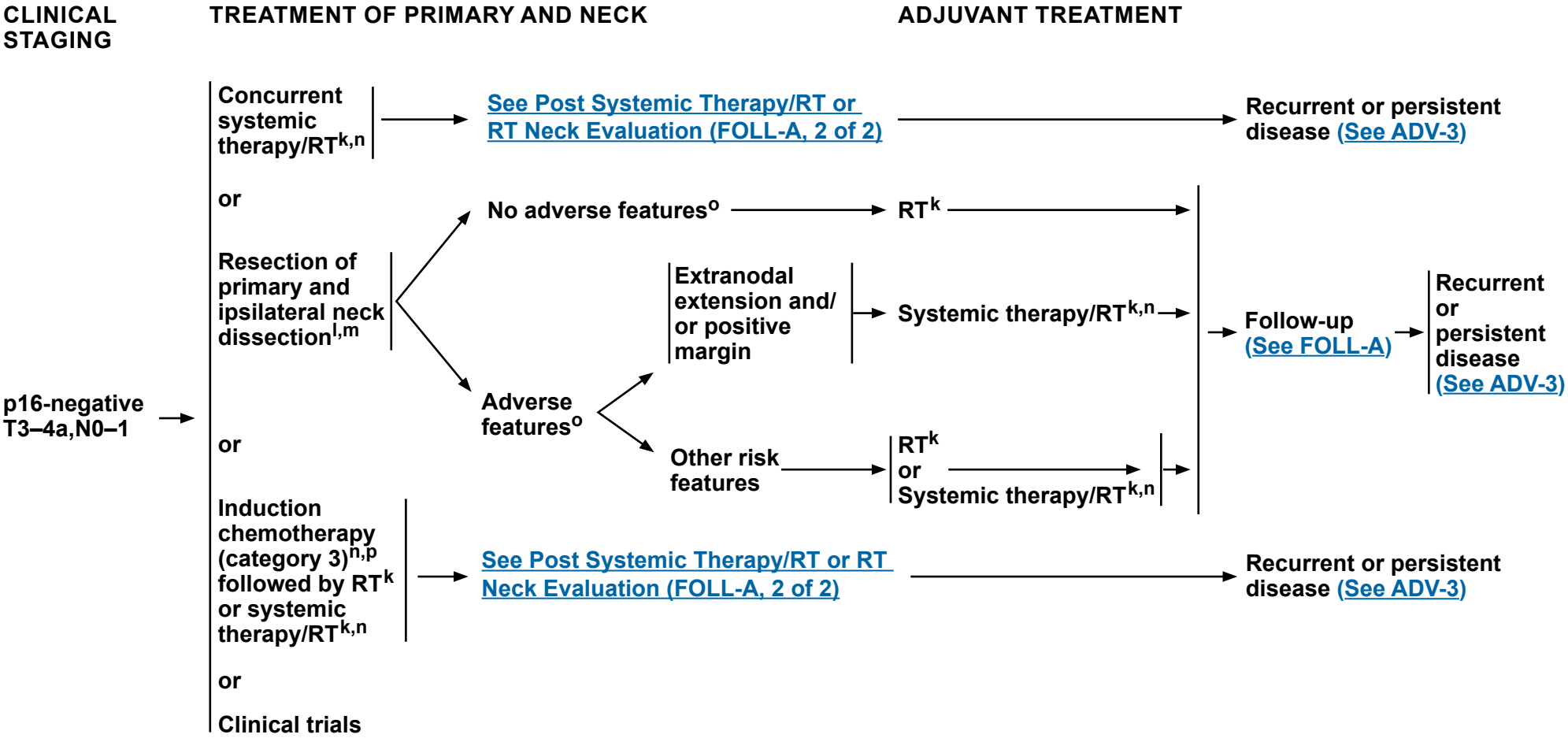
Base of Tongue/Tonsil/Posterior Pharyngeal Wall/Soft Palate



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[p] See Discussion on induction chemotherapy.

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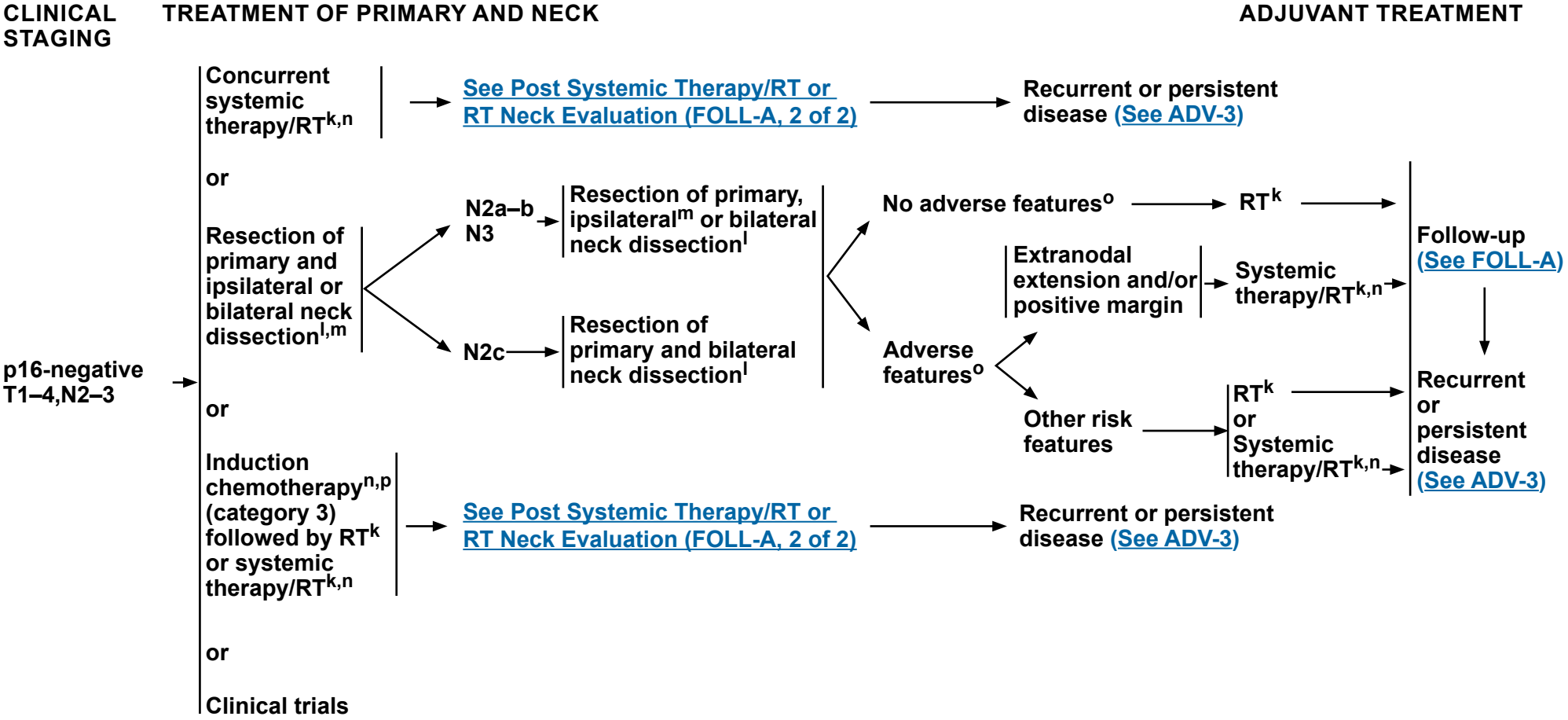
Base of Tongue/Tonsil/Posterior Pharyngeal Wall/Soft Palate



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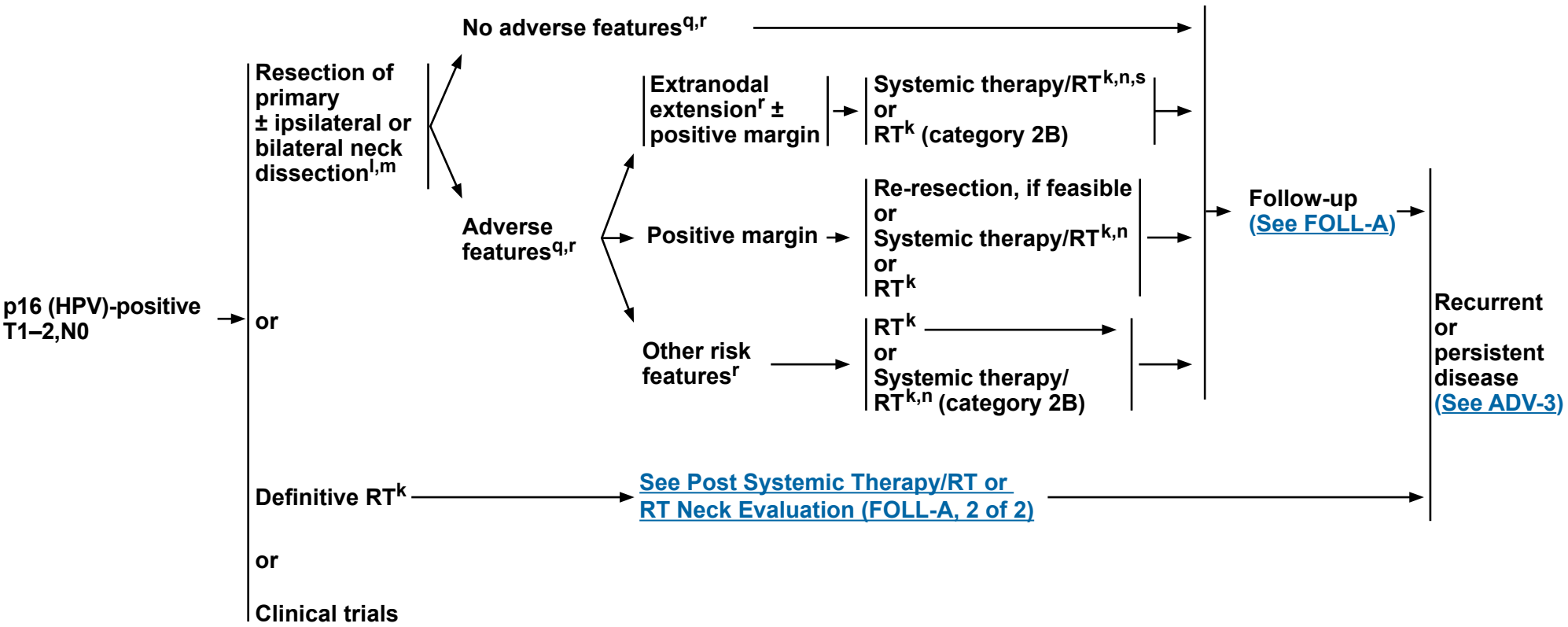
Base of Tongue/Tonsil/Posterior Pharyngeal Wall/Soft Palate



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[q] Pathologic staging criteria differ from clinical staging criteria in HPV-mediated oropharyngeal cancer. For pathologic stage following resection, see AJCC 8th edition for appropriate staging criteria (ST-7).

[r] Adverse features: extranodal extension, positive margins, close margins, pT3 or pT4 primary, one positive node >3 cm or multiple positive nodes, nodal disease in levels IV or V, perineural invasion, vascular invasion, lymphatic invasion (see Discussion). The definition of an adverse feature in the context of HPV+ disease is an area of active research. This includes the presence and extent of extranodal extension, and the number of involved nodes.

[s] The recommendations for patients at high risk with extranodal extension + positive margins are based on randomized studies involving patients for whom the HPV status of their tumors was not specified.

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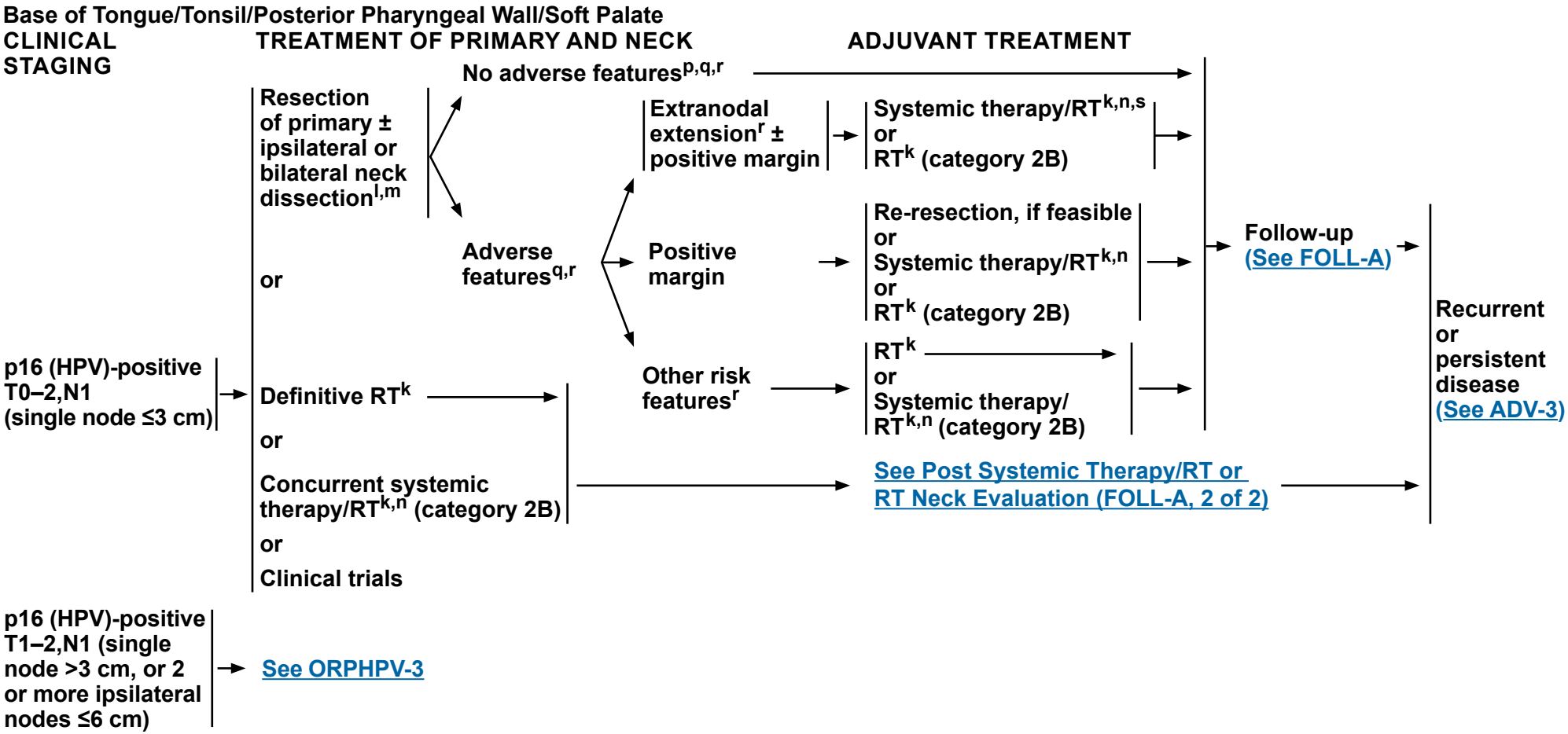

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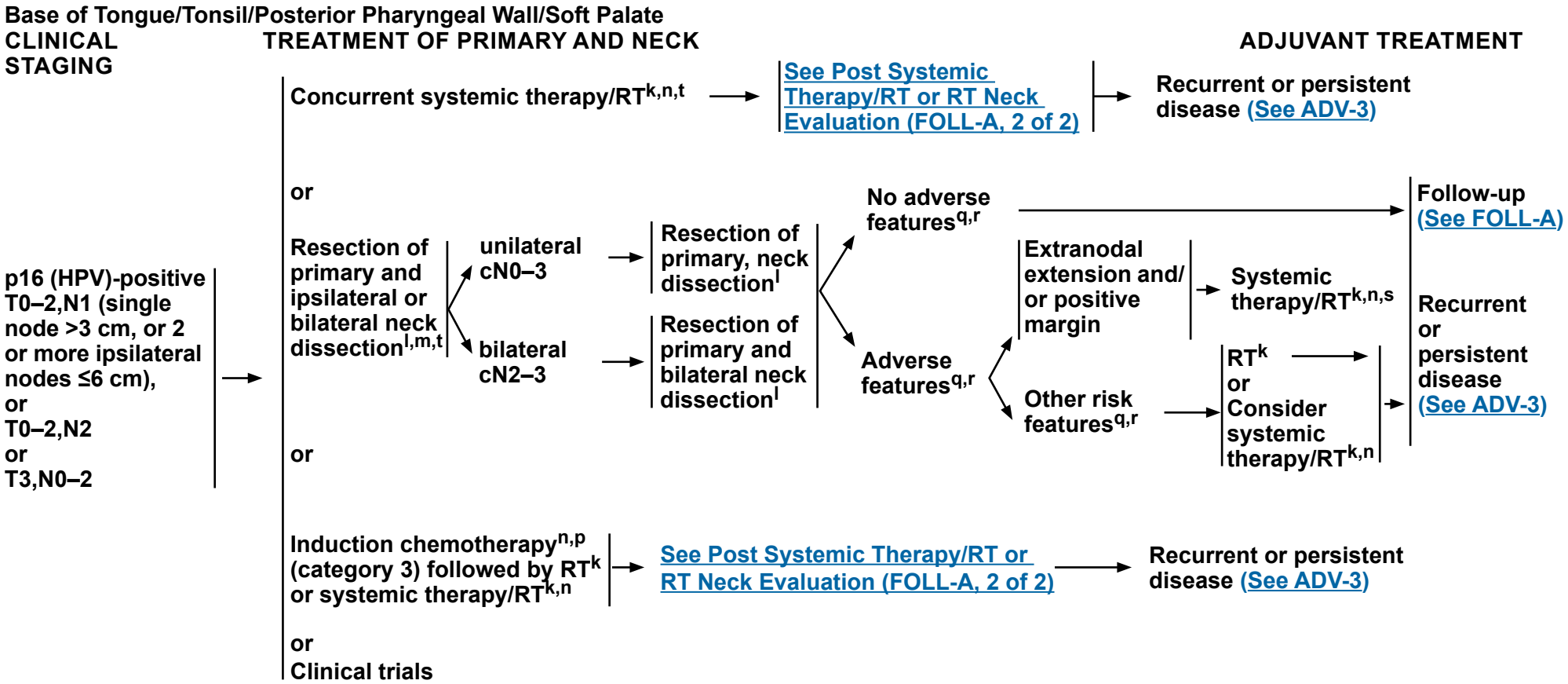

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[s] The recommendations for patients at high risk with extranodal extension + positive margins are based on randomized studies involving patients for whom the HPV status of their tumors was not specified.
[t] For those with clinical evidence of fixed or matted nodes or obvious extranodal extension, resection is not recommended and concurrent systemic therapy/RT is preferred.

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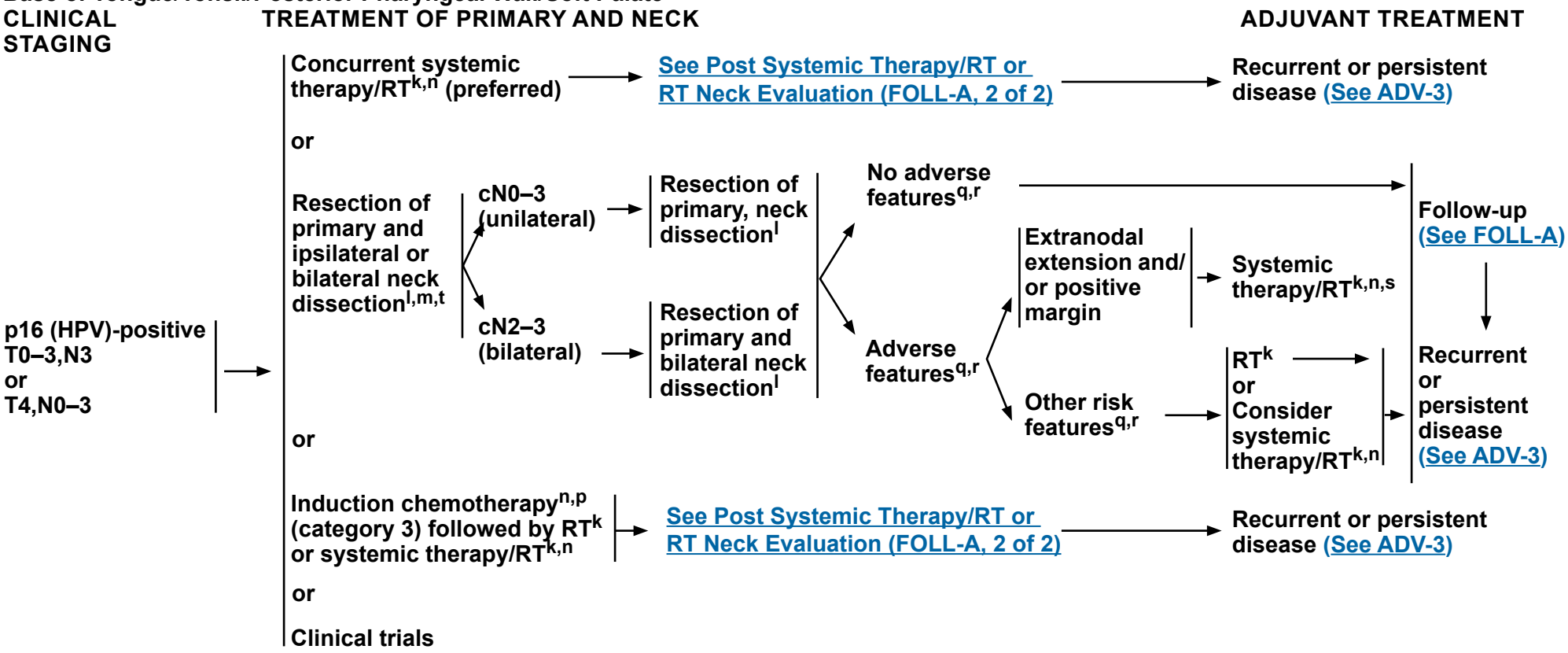
Base of Tongue/Tonsil/Posterior Pharyngeal Wall/Soft Palate



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PRINCIPLES OF RADIATION THERAPY[1]

DEFINITIVE:

RT Alone

- **PTV**
  - **High risk: Primary tumor and involved lymph nodes [this includes possible local subclinical infiltration at the primary site and at the high-risk level lymph node(s)]**
    - ◊ **Fractionation:**
      - **IMRT planning can consist of sequential IMRT (S-IMRT) or simultaneous integrated boost (SIB) techniques. Equivalent doses in 2 Gy (EQD2) can be used to determine appropriate fractionation schemes when using SIB techniques.**
      - **66 Gy (2.2 Gy/fraction) to 70 Gy (2.0 Gy/fraction); daily Monday–Friday in 6–7 weeks[2]**
      - **Concomitant boost accelerated RT:**
        - **72 Gy/6 weeks (1.8 Gy/fraction, large field; 1.5 Gy boost as second daily fraction during last 12 treatment days)**
        - **66–70 Gy (2.0 Gy/fraction; 6 fractions/wk accelerated)**
      - **Hyperfractionation: 81.6 Gy/7 weeks (1.2 Gy/fraction, twice daily)**
      - **69.96 Gy (2.12 Gy/fraction) daily Monday–Friday in 6–7 weeks[3]**
  - **Low to intermediate risk: Sites of suspected subclinical spread**
    - ◊ **44–50 Gy (2.0 Gy/fraction) used for S-IMRT or the use of an anterior neck field and to 54–63 Gy (1.6–1.8 Gy/fraction) when using SIB techniques[4]**
- **Treatment de-intensification is an area of active research, with several published phase II studies demonstrating promising rates of progression-free survival with dose-reduced radiotherapy.**

CONCURRENT SYSTEMIC THERAPY/RT:[5,6]

- **PTV:**
  - **High risk: Typically 70 Gy (2.0 Gy/fraction)**
  - **Low to intermediate risk: 44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[4]**

Either IMRT (preferred) or 3D conformal RT is recommended for cancers of the oropharynx in order to minimize dose to critical structures. Use of proton therapy is an area of active investigation. Proton therapy may be considered when normal tissue constraints cannot be met by photon-based therapy.

[1] See Principles of Radiation Techniques (RAD-A) and Discussion.

[2] For doses >70 Gy, some clinicians feel that the fractionation should be slightly modified (eg, <2.0 Gy/fraction for at least some of the treatment) to minimize toxicity. An additional 2–3 doses can be added depending on clinical circumstances.

[3] Eisbruch A, Harris J, Garden AS, et al. Multi-institutional trial of accelerated hypofractionated intensity-modulated radiation therapy for early-stage oropharyngeal cancer (RTOG 00-22). Int J Radiat Oncol Biol Phys 2010;76:1333-1338.

[4] Suggest 44–50 Gy in 3D conformal RT and sequentially planned IMRT or 54–63 Gy with IMRT dose painting technique (dependent on dose per fraction).

[5] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).

[6] Based on published data, concurrent systemic therapy/RT most commonly uses conventional fractionation at 2.0 Gy per fraction to a typical dose of 70 Gy in 7 weeks with single-agent cisplatin given every 3 weeks at 100 mg/m^2; 2–3 cycles of chemotherapy are used depending on the radiation fractionation scheme (RTOG 0129) (Ang KK, Harris J, Wheeler R, et al. Human papillomavirus and survival of patients with oropharyngeal cancer. N Engl J Med 2010;363:24-35). When carboplatin and 5-FU are used, the recommended regimen is standard fractionation plus 3 cycles of chemotherapy. [Bourhis J, Sire C, Graff P, et al. Concomitant chemoradiotherapy versus acceleration of radiotherapy with or without concomitant chemotherapy in locally advanced head and neck carcinoma (GORTEC 99-02): an open-label phase 3 randomised trial. Lancet Oncol 2012;13:145-153]. Other fraction sizes (eg, 1.8 Gy, conventional), multiagent chemotherapy, other dosing schedules of cisplatin, or altered fractionation with chemotherapy are efficacious, and there is no consensus on the optimal approach. In general, the use of concurrent systemic therapy/RT carries a high toxicity burden; altered fractionation or multiagent chemotherapy will likely further increase the toxicity burden. For any systemic therapy/RT approach, close attention should be paid to published reports for the specific chemotherapy agent, dose, and schedule of administration. Systemic therapy/RT should be performed by an experienced team and should include substantial supportive care. See Discussion.

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

PRINCIPLES OF RADIATION THERAPY[1]

POSTOPERATIVE:

RT or Concurrent Systemic Therapy/RT[7-11]

- **Preferred interval between resection and postoperative RT is ≤6 weeks.**
- **PTV**

High risk: Adverse features such as positive margins[12,13]

- ◊ **60–66 Gy (2.0 Gy/fraction); daily Monday–Friday in 6–6.5 weeks**

Low to intermediate risk: sites of suspected subclinical spread

- ◊ **44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[4]**

Either IMRT (preferred) or 3D conformal RT is recommended for cancers of the oropharynx in order to minimize dose to critical structures. Use of proton therapy is an area of active investigation. Proton therapy may be considered when normal tissue constraints cannot be met by photon-based therapy.

[1] See Principles of Radiation Techniques (RAD-A) and Discussion.

[4] Suggest 44–50 Gy in 3D conformal RT and sequentially planned IMRT or 54–63 Gy with IMRT dose painting technique (dependent on dose per fraction).

[7] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).

[8] Bernier J, Domenge C, Ozsahin M, et al. Postoperative irradiation with or without concomitant chemotherapy for locally advanced head and neck cancer. N Engl J Med 2004;350:1945-1952.

[9] Cooper JS, Pajak TF, Forastiere AA, et al. Postoperative concurrent radiotherapy and chemotherapy for high-risk squamous-cell carcinoma of the head and neck. N Engl J Med 2004;350:1937-1944.

[10] Bernier J, Cooper JS, Pajak TF, et al. Defining risk levels in locally advanced head and neck cancers: A comparative analysis of concurrent postoperative radiation plus chemotherapy trials of the EORTC (#22931) and RTOG (#9501). Head Neck 2005;27:843-850.

[11] Cooper JS, Zhang Q, Pajak TF, et al. Long-term follow-up of the RTOG 9501/intergroup phase III trial: postoperative concurrent radiation therapy and chemotherapy in high-risk squamous cell carcinoma of the head and neck. Int J Radiat Oncol Biol Phys 2012;84:1198-1205.

[12] Adverse features for p16(HPV)-negative disease: extranodal extension, positive margins, close margins, pT3 or pT4 primary, pN2 or pN3 nodal disease, nodal disease in levels IV or V, perineural invasion, vascular invasion, lymphatic invasion (See Discussion).

[13] Adverse features for p16(HPV)-positive disease: extranodal extension, positive margins, close margins, pT3 or pT4 primary, one positive node >3 cm or multiple positive nodes, nodal disease in levels IV or V, perineural invasion, vascular invasion, lymphatic invasion (see Discussion). The definition of an adverse feature in the context of HPV+ disease is an area of active research. This includes the presence and extent of extranodal extension, and the number of involved nodes.

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PRINCIPLES OF P16 TESTING FOR HPV-MEDIATED OROPHARYNGEAL CANCER

- **P16 expression is highly correlated with HPV status and prognosis and is widely available.**
- **A few HPV testing options are available for use in the clinical setting. Expression of p16 as detected by IHC is a widely available surrogate biomarker that has very good agreement with HPV status as determined by the gold standard of HPV E6/E7 mRNA expression.[1-3] Other tests include HPV detection through PCR and in situ hybridization (ISH).[1,3]**
- **Sensitivity of IHC staining for p16 and PCR-based assay is high, although specificity is highest for ISH.[3]**
- **Due to variations in sensitivity and specificity values of testing options, multiple methods may be used in combination for HPV detection, but HPV detection through PCR and ISH may provide additional sensitivity for the former and specificity for the latter in the case of an equivocal p16 or unclear clinical scenario.[3-6]**
- **Sufficient pathologic material for HPV testing can be obtained through FNA.[6,7]**
- **A small proportion of tumors at non-oropharyngeal sites (eg, paranasal sinus, oral cavity, larynx) are HPV-related. However, given the small proportion and lack of consistent evidence in support of prognostic significance, routine HPV testing or p16 testing of non-oropharyngeal cancers is not recommended.**
- **Guidelines for testing are available from the College of American Pathologists.[8]**

[1]Jordan RC, Lingen MW, Perez-Ordonez B, et al. Validation of methods for oropharyngeal cancer HPV status determination in US cooperative group trials. Am J Surg Pathol 2012;36:945-954.
[2]Weinberger PM, Yu Z, Haffty BG, et al. Molecular classification identifies a subset of human papillomavirus–associated oropharyngeal cancers with favorable prognosis. J Clin Oncol 2006;24:736-747.
[3]Cantley RL, Gabrielli E, Montebelli F, et al. Ancillary studies in determining human papillomavirus status of squamous cell carcinoma of the oropharynx: a review. Patholog Res Int 2011;2011:138469.
[4]Singhi AD, Westra WH. Comparison of human papillomavirus in situ hybridization and p16 immunohistochemistry in the detection of human papillomavirus-associated head and neck cancer based on a prospective clinical experience. Cancer 2010;116:2166-2173.
[5]Thavaraj S, Stokes A, Guerra E, et al. Evaluation of human papillomavirus testing for squamous cell carcinoma of the tonsil in clinical practice. J Clin Pathol 2011;64:308-312.
[6]Snow AN, Laudadio J. Human papillomavirus detection in head and neck squamous cell carcinomas. Adv Anat Pathol 2010;17:394-403.
[7]Begum S, Gillison ML, Nicol TL, Westra WH. Detection of human papillomavirus-16 in fine-needle aspirates to determine tumor origin in patients with metastatic squamous cell carcinoma of the head and neck. Clin Cancer Res 2007;13:1186-1191.
[8]Lewis JS, Jr., Beadle B, Bishop JA, et al. Human papillomavirus testing in head and neck carcinomas: Guideline from the College of American Pathologists. Arch Pathol Lab Med 2018;142:559-597.

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Cancer of the Hypopharynx

WORKUP

- H&P[a,b] including a complete head and neck exam; mirror and/or fiberoptic examination as clinically indicated
- Biopsy of primary site or FNA of neck[c]
- CT with contrast and/or MRI with contrast of primary and neck[d]
- EUA with endoscopy
- As clinically indicated:
  - Chest CT (with or without contrast)[d]
  - Consider FDG PET/CT[d]
  - Preanesthesia studies
  - Consider pulmonary function tests for conservation surgery candidates
- Dental/prosthodontic evaluation[e]
  - Nutrition, speech and swallowing evaluation/therapy, and audiogram[f]
  - Smoking cessation counseling[a]
  - Fertility/reproductive counseling[g]

Multidisciplinary consultation as clinically indicated

CLINICAL STAGING

- **Amenable to larynx-preserving [conservation] surgery (most T1,N0, and selected T2,N0)** → See Treatment of Primary and Neck (HYPO-2)
- **Advanced cancer requiring (amenable to) pharyngectomy with total laryngectomy**
  - **T1–3,N0–3** → See Treatment of Primary and Neck (HYPO-3)
  - **T4a,N0–3** → See Treatment of Primary and Neck (HYPO-5)
- **T4b,N0–3 or Unresectable nodal disease or Unfit for surgery** → See Treatment of Very Advanced Head and Neck Cancer (ADV-1)
- **Metastatic (M1) disease at initial presentation** → See Treatment of Very Advanced Head and Neck Cancer (ADV-2)

[a] H&P should include documentation and quantification (pack years smoked) of tobacco use history. All current smokers should be advised to quit smoking, and former smokers should be advised to remain abstinent from smoking. For additional cessation support, refer to the Patient/Provider Smoking Cessation Resources in the NCCN Guidelines for Smoking Cessation.

[b] Screen for depression (See NCCN Guidelines for Distress Management).

[c] Image-guided (US or CT) needle biopsy of cystic neck nodes may offer better diagnostic yield than FNA by palpation alone for initial diagnosis in this setting.

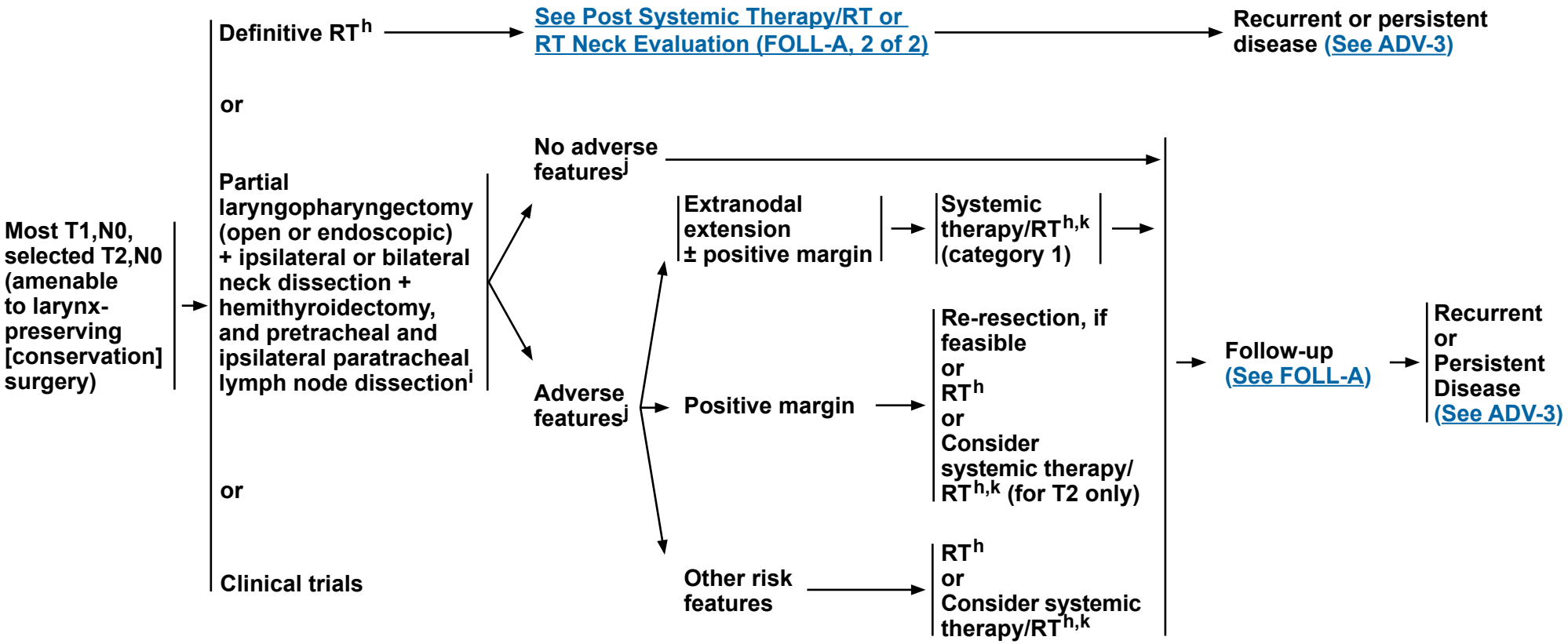
[d] See Principles of Imaging (IMG-A).

[e] See Principles of Dental Evaluation and Management (DENT-A).

[f] See Principles of Nutrition: Management and Supportive Care (NUTR-A).

[g] See fertility and reproductive endocrine considerations in the NCCN Guidelines for Adolescent and Young Adult (AYA) Oncology.

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.



[h] See Principles of Radiation Therapy (HYPO-A).
[i] See Principles of Surgery (SURG-A).
[j] Adverse features: extranodal extension, positive margins, close margins, pT3 or pT4 primary, pN2 or pN3 nodal disease, perineural invasion, vascular invasion, lymphatic invasion (See Discussion).
[k] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).

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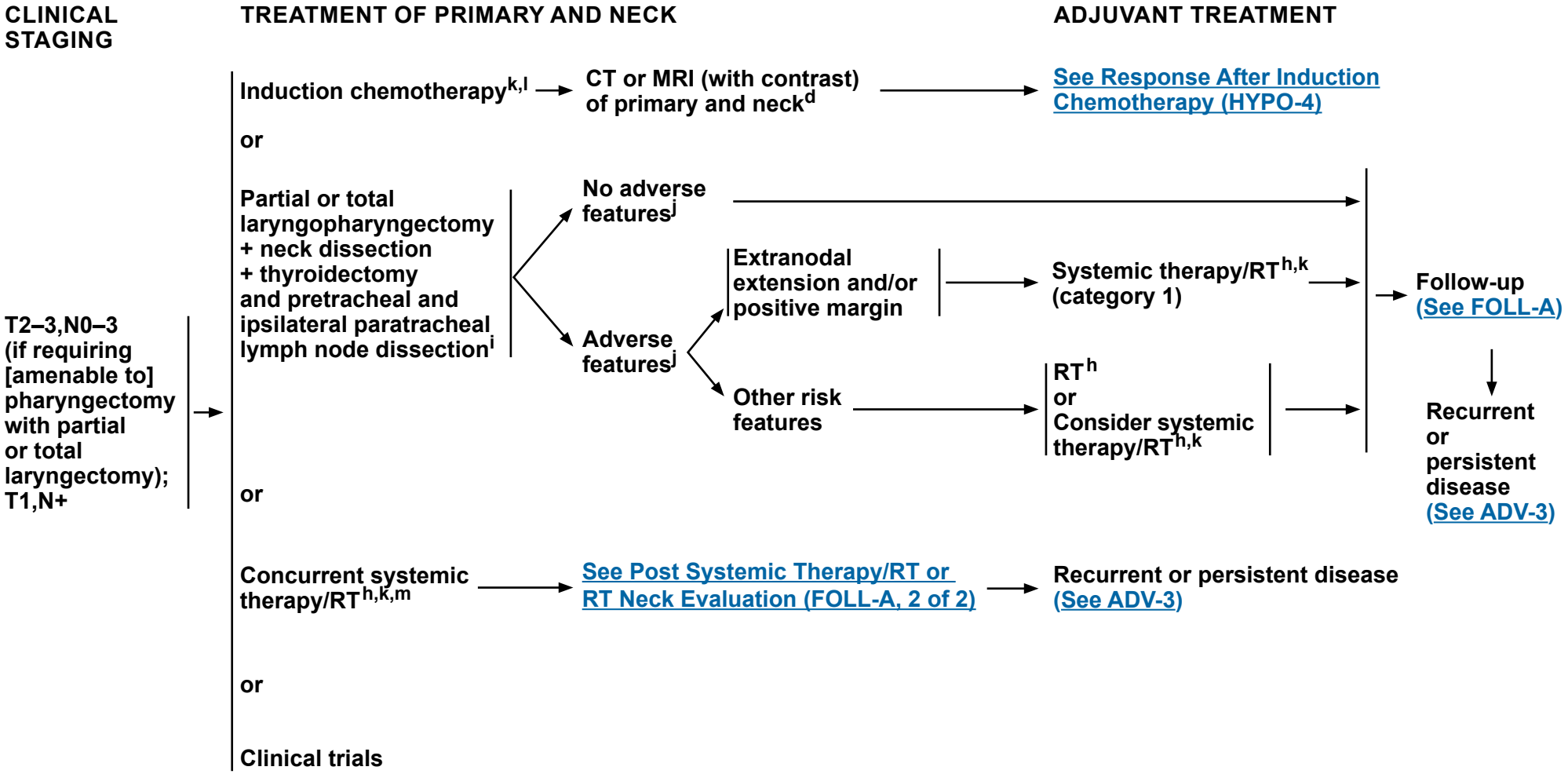

[d] See Principles of Imaging (IMG-A).
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[i] See Principles of Surgery (SURG-A).
[j] Adverse features: extranodal extension, positive margins, close margins, pT3 or pT4 primary, pN2 or pN3 nodal disease, perineural invasion, vascular invasion, lymphatic invasion (See Discussion).
[k] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[l] In randomized clinical trials, assessment of response has been done after 2 or 3 cycles.
[m] When using concurrent systemic therapy/RT, the preferred agent is cisplatin (category 1). See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).

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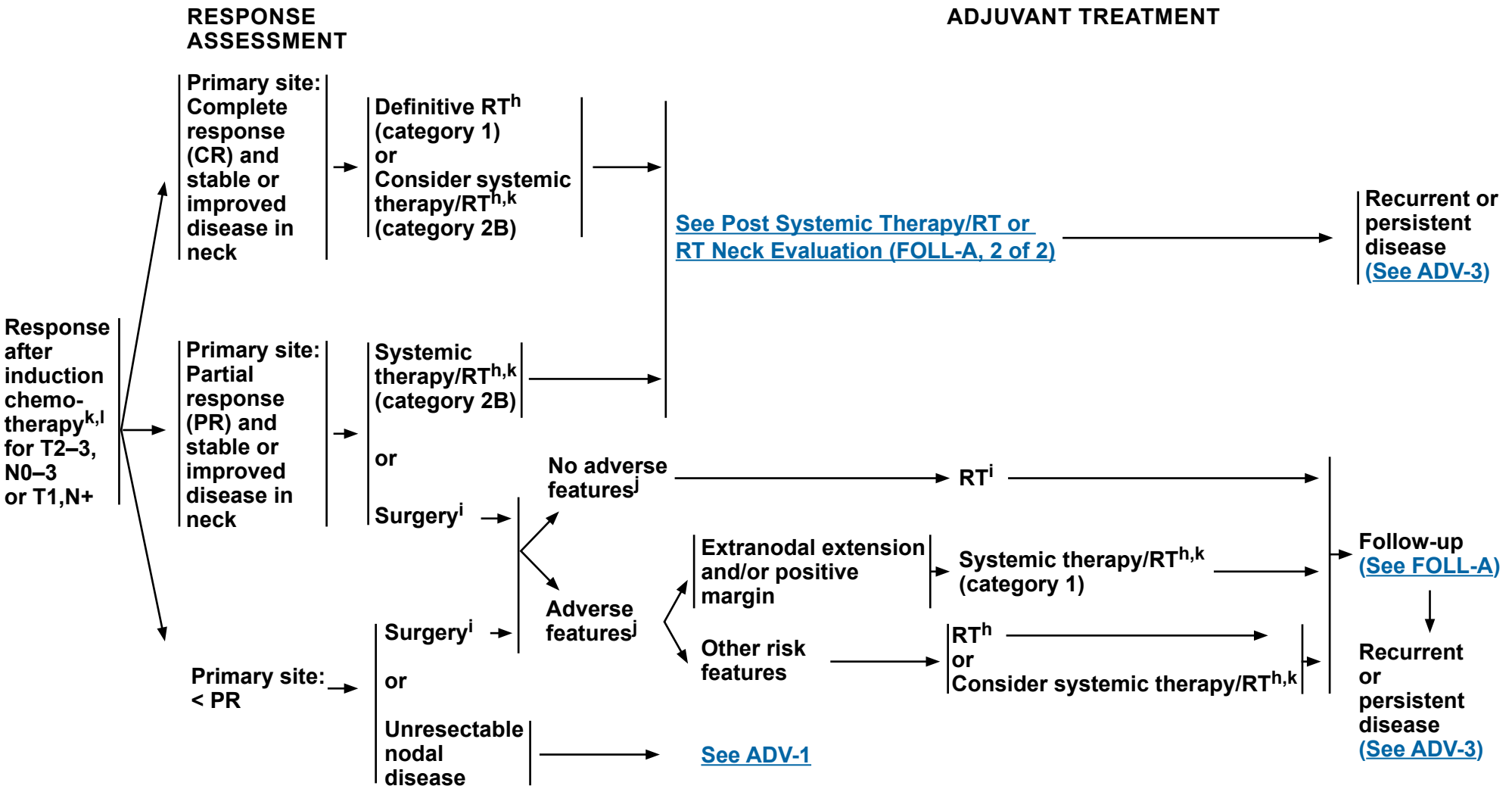

[h] See Principles of Radiation Therapy (HYPO-A).
[i] See Principles of Surgery (SURG-A).
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[k] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[l] In randomized clinical trials, assessment of response has been done after 2 or 3 cycles.

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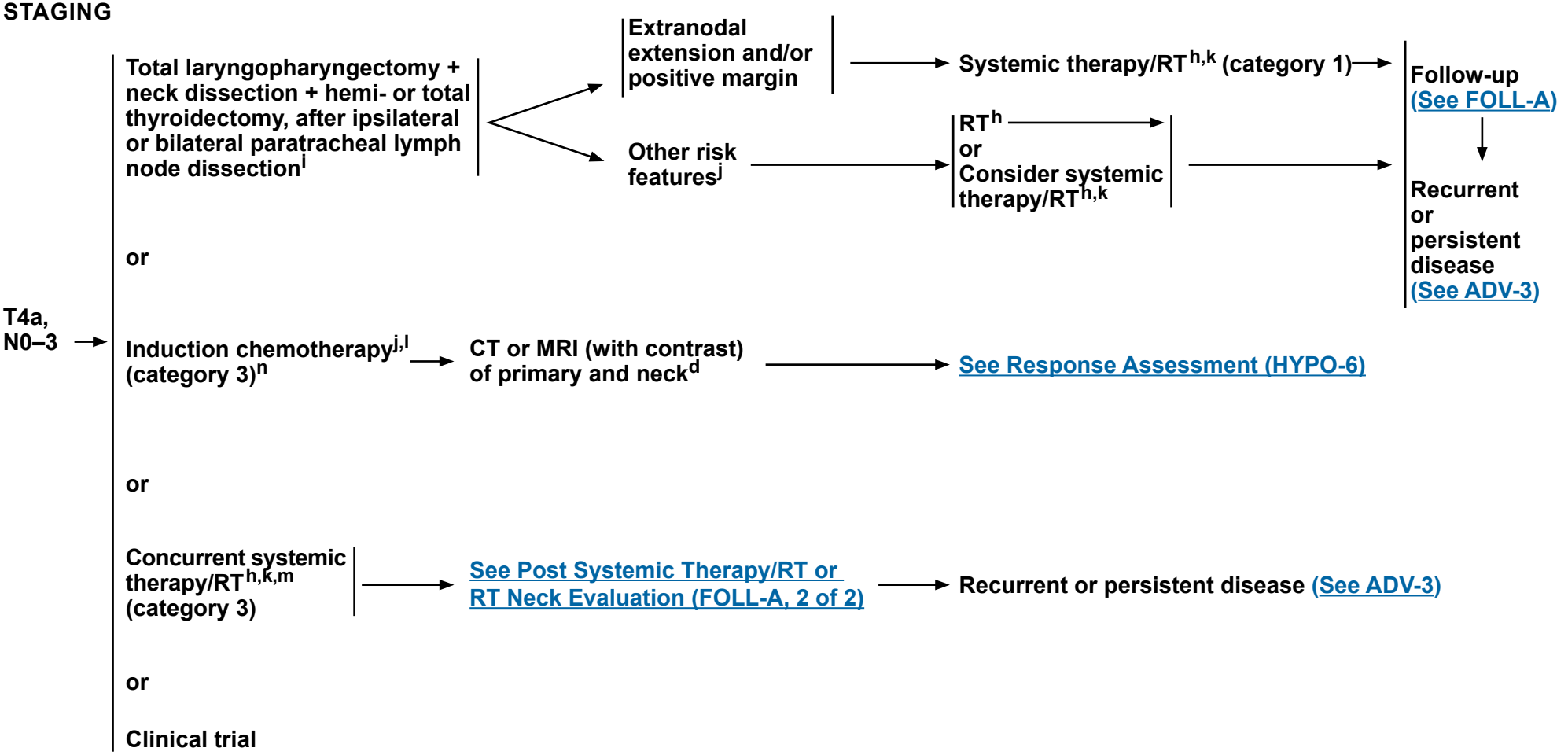

[d] See Principles of Imaging (IMG-A).
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[j] Adverse features: extranodal extension, positive margins, close margins, pT3 or pT4 primary, pN2 or pN3 nodal disease, perineural invasion, vascular invasion, lymphatic invasion (See Discussion).
[k] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[l] In randomized clinical trials, assessment of response has been done after 2 or 3 cycles.
[m] When using concurrent systemic therapy/RT, the preferred agent is cisplatin (category 1). See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[n] See Discussion on induction chemotherapy.

Note: All recommendations are category 2A unless otherwise indicated.
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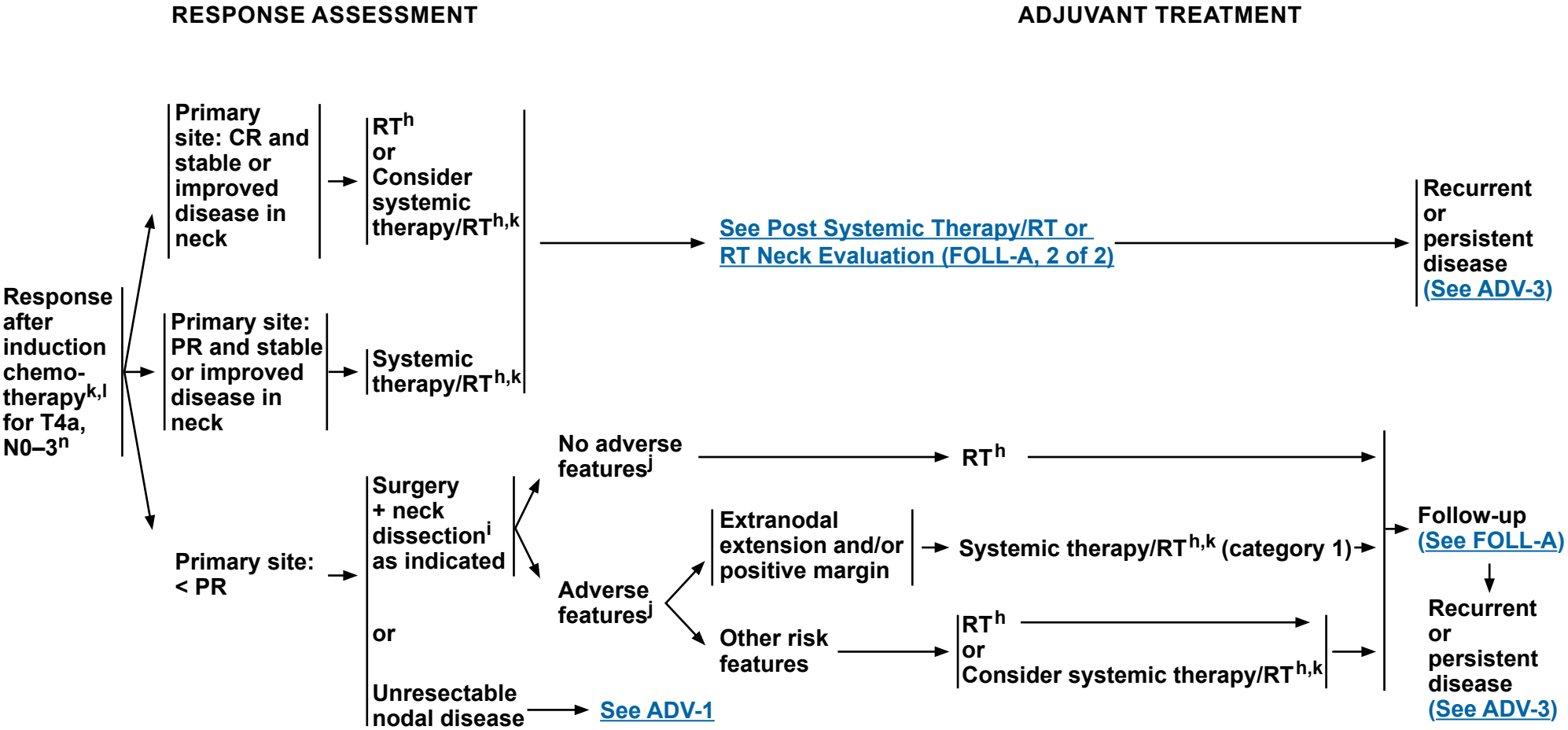

[h] See Principles of Radiation Therapy (HYPO-A).
[i] See Principles of Surgery (SURG-A).
[j] Adverse features: extranodal extension, positive margins, close margins, pT3 or pT4 primary, pN2 or pN3 nodal disease, perineural invasion, vascular invasion, lymphatic invasion (See Discussion).
[k] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[l] In randomized clinical trials, assessment of response has been done after 2 or 3 cycles.
[n] See Discussion on induction chemotherapy.

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Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

PRINCIPLES OF RADIATION THERAPY[1,2]

DEFINITIVE:

RT Alone

- **PTV**
  - **High risk: Primary tumor and involved lymph nodes [this includes possible local subclinical infiltration at the primary site and at the high-risk level lymph node(s)]**
    - ◊ **Fractionation:**
      - **66 Gy (2.2 Gy/fraction) to 70 Gy (2.0 Gy/fraction); daily Monday–Friday in 6–7 weeks[3]**
      - **69.96 Gy (2.12 Gy/fraction) daily Monday–Friday in 6–7 weeks[4]**
      - **Concomitant boost accelerated RT:**
        - **72 Gy/6 weeks (1.8 Gy/fraction, large field; 1.5 Gy boost as second daily fraction during last 12 treatment days)**
        - **66–70 Gy (2.0 Gy/fraction; 6 fractions/wk accelerated)**
      - **Hyperfractionation: 81.6 Gy/7 weeks (1.2 Gy/fraction, twice daily)**
  - **Low to intermediate risk: Sites of suspected subclinical spread**
    - ◊ **44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[5]**

CONCURRENT SYSTEMIC THERAPY/RT:[6,7]

- **PTV**
  - **High risk: typically 70 Gy (2.0 Gy/fraction)**
  - **Low to intermediate risk: 44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[5]**

Either IMRT or 3D conformal RT is recommended.

[1] See Principles of Radiation Techniques (RAD-A) and Discussion.

[2] Particular attention to speech and swallowing is needed during therapy.

[3] For doses >70 Gy, some clinicians feel that the fractionation should be slightly modified (eg, <2.0 Gy/fraction for at least some of the treatment) to minimize toxicity. An additional 2–3 doses can be added depending on clinical circumstances.

[4] Eisbruch A, Harris J, Garden AS, et al. Multi-institutional trial of accelerated hypofractionated intensity-modulated radiation therapy for early-stage oropharyngeal cancer (RTOG 00-22). Int J Radiat Oncol Biol Phys 2010;76:1333-1338.

[5] Suggest 44–50 Gy in 3D conformal RT and sequentially planned IMRT or 54–63 Gy with IMRT dose painting technique (dependent on dose per fraction).

[6] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).

[7] Based on published data, concurrent systemic therapy/RT most commonly uses conventional fractionation at 2.0 Gy per fraction to a typical dose of 70 Gy in 7 weeks with single-agent cisplatin given every 3 weeks at 100 mg/m^2; 2–3 cycles of chemotherapy are used depending on the radiation fractionation scheme (RTOG 0129) (Ang KK, Harris J, Wheeler R, et al. Human papillomavirus and survival of patients with oropharyngeal cancer. N Engl J Med 2010;363:24-35). When carboplatin and 5-FU are used, the recommended regimen is standard fractionation plus 3 cycles of chemotherapy. (Bourhis J, Sire C, Graff P, et al. Concomitant chemoradiotherapy versus acceleration of radiotherapy with or without concomitant chemotherapy in locally advanced head and neck carcinoma (GORTEC 99-02): an open-label phase 3 randomised trial. Lancet Oncol 2012;13:145-153). Other fraction sizes (eg, 1.8 Gy, conventional), multiagent chemotherapy, other dosing schedules of cisplatin, or altered fractionation with chemotherapy are efficacious, and there is no consensus on the optimal approach. In general, the use of concurrent systemic therapy/RT carries a high toxicity burden; altered fractionation or multiagent chemotherapy will likely further increase the toxicity burden. For any systemic therapy/RT approach, close attention should be paid to published reports for the specific chemotherapy agent, dose, and schedule of administration. Systemic therapy/RT should be performed by an experienced team and should include substantial supportive care.

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

PRINCIPLES OF RADIATION THERAPY[1,2]

POSTOPERATIVE:

RT or Concurrent Systemic Therapy/RT[6,8-11]

- **Preferred interval between resection and postoperative RT is ≤6 weeks.**
- **PTV**
  - **High risk: Adverse features such as positive margins (See footnote j on HYPO-3).**
    - ◊ **60–66 Gy (2.0 Gy/fraction; daily Monday–Friday) in 6–6.5 weeks**
  - **Low to intermediate risk: sites of suspected subclinical spread**
    - ◊ **44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[5]**

Either IMRT or 3D conformal RT is recommended.

[1]See Principles of Radiation Techniques (RAD-A) and Discussion.
[2]Particular attention to speech and swallowing is needed during therapy.
[5]Suggest 44–50 Gy in 3D conformal RT and sequentially planned IMRT or 54–63 Gy with IMRT dose painting technique (dependent on dose per fraction).
[6]See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).

[8]Bernier J, Domenge C, Ozsahin M, et al. Postoperative irradiation with or without concomitant chemotherapy for locally advanced head and neck cancer. N Engl J Med 2004;350:1945-1952.
[9]Cooper JS, Pajak TF, Forastiere AA, et al. Postoperative concurrent radiotherapy and chemotherapy for high-risk squamous-cell carcinoma of the head and neck. N Engl J Med 2004;350:1937-1944.
[10]Bernier J, Cooper JS, Pajak TF, et al. Defining risk levels in locally advanced head and neck cancers: A comparative analysis of concurrent postoperative radiation plus chemotherapy trials of the EORTC (#22931) and RTOG (#9501). Head Neck 2005;27:843-850.
[11]Cooper JS, Zhang Q, Pajak TF, et al. Long-term follow-up of the RTOG 9501/intergroup phase III trial: postoperative concurrent radiation therapy and chemotherapy in high-risk squamous cell carcinoma of the head and neck. Int J Radiat Oncol Biol Phys 2012;84:1198-1205.

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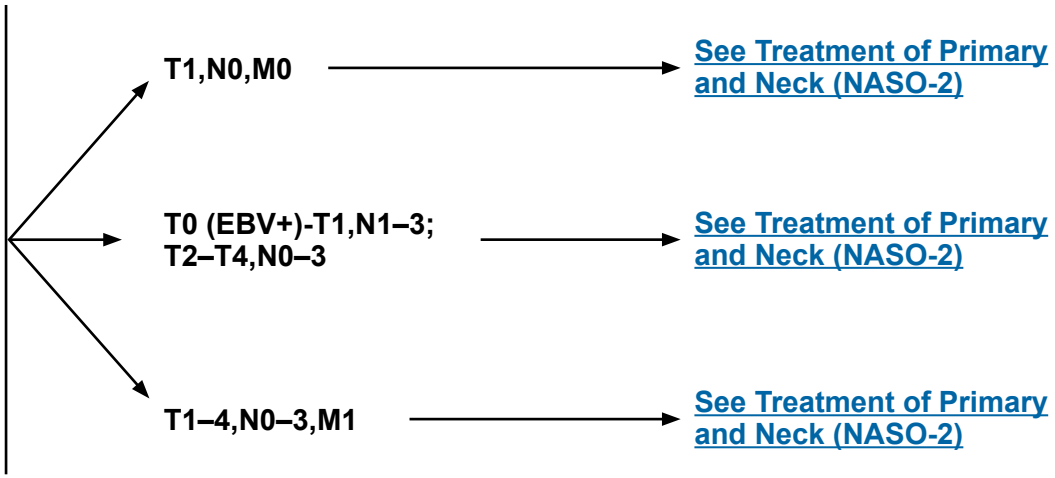
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

WORKUP

- H&P[a,b] including a complete head and neck exam; mirror examination as clinically indicated
- Nasopharyngeal fiberoptic examination
- Biopsy of primary site or FNA of the neck[c]
- MRI with contrast of skull base to clavicle ± CT of skull base/neck with contrast to evaluate skull base erosion
- Imaging for distant metastases with FDG PET/CT and/or chest CT with contrast[d]
- Consider Epstein-Barr virus (EBV)/DNA testing[e]
- As clinically indicated:
  - Dental/prosthodontic evaluation[f]
  - Nutrition, speech and swallowing evaluations/therapy[g]
  - Audiogram
  - Consider ophthalmologic and endocrine evaluation
  - Smoking cessation counseling[a]
  - Fertility/reproductive counseling[h]

Multidisciplinary consultation as clinically indicated

CLINICAL STAGING



[a] H&P should include documentation and quantification (pack years smoked) of tobacco use history. All current smokers should be advised to quit smoking, and former smokers should be advised to remain abstinent from smoking. For additional cessation support, refer to the Patient/Provider Smoking Cessation Resources in the NCCN Guidelines for Smoking Cessation.

[b] Screen for depression (See NCCN Guidelines for Distress Management).

[c] Image-guided (US or CT) needle biopsy of cystic neck nodes may offer better diagnostic yield than FNA by palpation alone for initial diagnosis in this setting.

[d] See Principles of Imaging (IMG-A).

[e] For nonkeratinizing or undifferentiated histology, consider testing for EBV in tumor and blood. Common means for detecting EBV in pathologic specimens include in situ hybridization for EBV-encoded RNA (EBER) or immunohistochemical staining for latent membrane protein (LMP). The EBV DNA load within the serum or plasma may be quantified using polymerase chain reaction (PCR) targeting genomic sequences of the EBV DNA such as BamHI-W, EBNA, or LMP; these tests vary in their sensitivity. The EBV DNA load may reflect prognosis and change in response to therapy.

[f] See Principles of Dental Evaluation and Management (DENT-A).

[g] See Principles of Nutrition: Management and Supportive Care (NUTR-A).

[h] See fertility and reproductive endocrine considerations in the NCCN Guidelines for Adolescent and Young Adult (AYA) Oncology.

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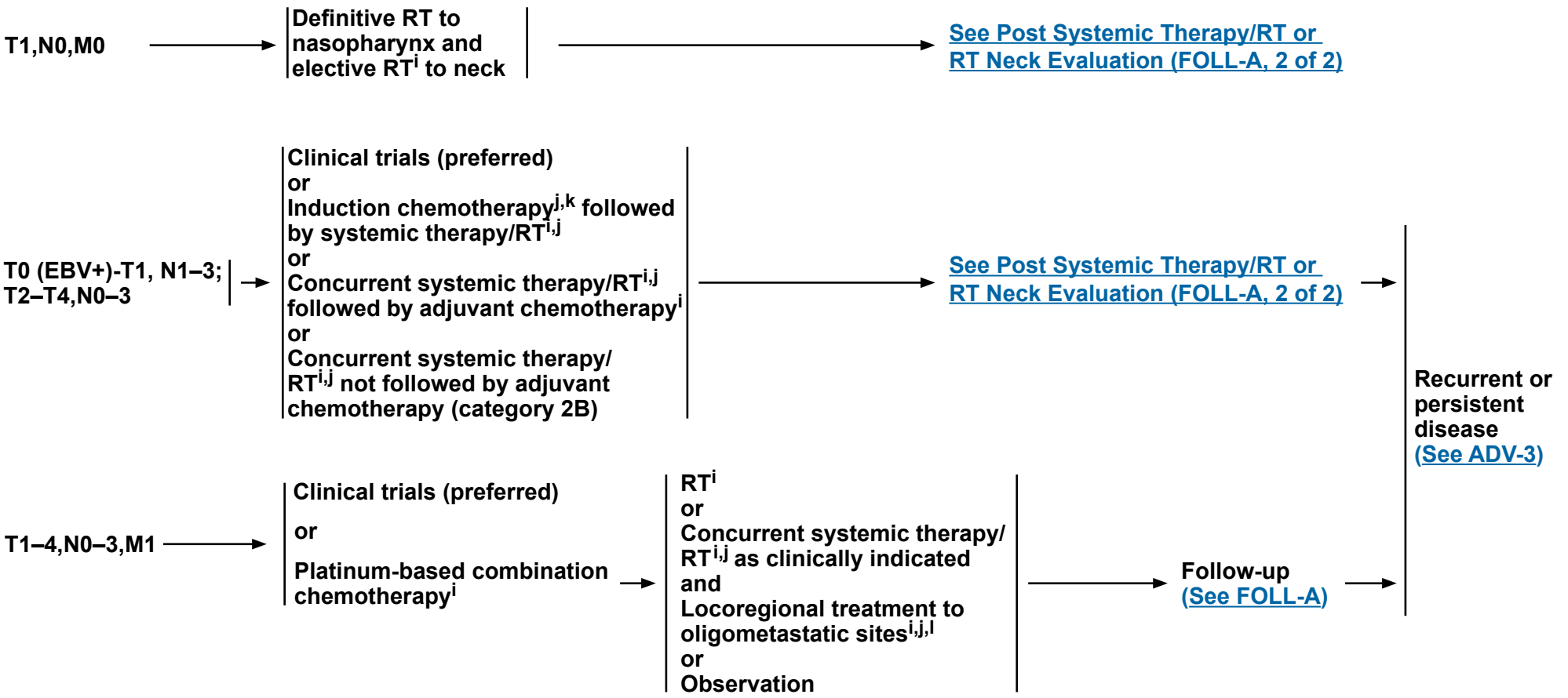

[i] See Principles of Radiation Therapy (NASO-A).
[j] See Systemic Therapy for Nasopharyngeal Cancers (NASO-B).
[k] See Discussion on induction chemotherapy.
[l] Can be used for select patients with distant metastasis in limited site or with small tumor burden, or for patients with symptoms in the primary or any nodal site.

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PRINCIPLES OF RADIATION THERAPY[1]

DEFINITIVE:

RT Alone (for T1,N0 or patients who are not eligible to receive chemotherapy)

- **PTV**
  - **High risk: Primary tumor and involved lymph nodes [this includes possible local subclinical infiltration at the primary site and at the high-risk level lymph node(s)]**
    - ◊ **70–70.2 Gy (1.8–2.0 Gy/fraction); daily Monday–Friday in 6–7 weeks[2,3]**
    - ◊ **69.96 Gy (2.12 Gy/fraction) daily Monday–Friday in 6–7 weeks[4]**
- **Low to intermediate risk: Sites of suspected subclinical spread**
  - **44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[5]**

CONCURRENT SYSTEMIC THERAPY/RT:[6]

(preferred for patients eligible for chemotherapy)

- **PTV**
  - **High risk: typically 70–70.2 Gy (1.8–2.0 Gy/fraction); daily Monday–Friday in 7 weeks[2]**
  - **Low to intermediate risk: 44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[5]**

IMRT is recommended for cancers of the nasopharynx to minimize dose to critical structures. Proton therapy can be considered when normal tissue constraints cannot be met by photon-based therapy.

[1] See Principles of Radiation Techniques (RAD-A) and Discussion.
[2] Care should be taken to avoid critical neural structures; therefore, 1.8 Gy/fraction can be considered.
[3] For doses >70 Gy, some clinicians feel that the fractionation should be slightly modified (eg, <2.0 Gy/fraction for at least some of the treatment) to minimize toxicity. An additional 2–3 doses can be added depending on clinical circumstances.
[4] Lee NY, Zhang Q, Pfister DG, et al. Addition of bevacizumab to standard systemic therapy/RT for locoregionally advanced nasopharyngeal carcinoma (RTOG 0615): a phase 2 multi-institutional trial. Lancet Oncol 2012;13:172-180.
[5] Suggest 44–50 Gy in sequentially planned IMRT or 54–63 Gy with IMRT dose painting technique (dependent on dose per fraction).
[6] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).

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SYSTEMIC THERAPY FOR NASOPHARYNGEAL CANCERS

• The choice of systemic therapy should be individualized based on patient characteristics (eg, PS, goals of therapy).

Induction[a]/Sequential Systemic Therapy

Preferred Regimens

- Gemcitabine/cisplatin (category 1)[1]
- Docetaxel/cisplatin/5-FU (dose-adjusted) (category 1 for EBV-associated disease, category 2A for non–EBV-associated disease)[2-4]

Other Recommended Regimens

- Cisplatin/5-FU[5]
- Cisplatin/epirubicin/paclitaxel
- Docetaxel/cisplatin (category 2B)[6]
- Following induction, agents used with concurrent systemic therapy/RT typically include weekly cisplatin[7] or carboplatin[8]

Systemic Therapy/RT Followed by Adjuvant Chemotherapy

Preferred Regimens

- Cisplatin + RT followed by cisplatin/5-FU[7,9]

Other Recommended Regimens

- Cisplatin + RT followed by carboplatin/5-FU[10]
- Cisplatin + RT without adjuvant chemotherapy (category 2B)[11]

Useful in Certain Circumstances

- If cisplatin ineligible or intolerant, carboplatin may be used as an alternative:
  - Carboplatin + RT followed by carboplatin/5-FU[8,12]

Recurrent, Unresectable, or Metastatic Disease (with no surgery or RT option)

Preferred Regimens

First-Line[b]

- Cisplatin/gemcitabine (category 1)[13,14]

Other Recommended Regimens

First-Line[b]

- Combination Therapy
  - Cisplatin/5-FU[15,16]
  - Cisplatin or carboplatin/docetaxel[17] or paclitaxel[15]
  - Carboplatin/cetuximab[18]
  - Gemcitabine/carboplatin
- Single Agents
  - Cisplatin[19,20]
  - Carboplatin[21]
  - Paclitaxel[22]
  - Docetaxel[23,24]
  - 5-FU[20]
  - Methotrexate[16,25]
  - Gemcitabine[26]
  - Capecitabine[27]

Subsequent-Line

- Immunotherapy
  - Nivolumab if previously treated, recurrent or metastatic non-keratinizing disease (category 2B)[28,29]
  - Pembrolizumab if previously treated, PD-L1–positive, recurrent or metastatic disease (category 2B)[30]

Useful in Certain Circumstances

Subsequent-line

- Pembrolizumab (for TMB-H tumors)[31]

[a]The categories of evidence and consensus for induction therapy vary depending on site. (See disease-specific site in the Head and Neck Table of Contents)
[b] If not previously used, these regimens may be considered in subsequent-lines, as other recommended regimens.

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SYSTEMIC THERAPY FOR NASOPHARYNGEAL CANCERS
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Continued

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WORKUP[a]

- H&P[b,c] including a complete head and neck exam; mirror and/or fiberoptic examination as clinically indicated
- Biopsy of primary site or FNA of the neck[d]
- CT with contrast and thin angled cuts through larynx and/or MRI with contrast of primary and neck[e]
- EUA with endoscopy
- As clinically indicated:
  - Chest CT (with or without contrast)[e,f]
  - Consider FDG PET/CT[e]
  - Preanesthesia studies
  - Pulmonary function evaluation for conservation surgery candidates
  - Consider videostrobe for select patients
  - Dental evaluation[g]
  - Nutrition, speech and swallowing evaluation/therapy[h]
  - Audiogram
  - Smoking cessation counseling[a]
  - Fertility/reproductive counseling[i]

Multidisciplinary consultation as clinically indicated

CLINICAL STAGING → TREATMENT OF PRIMARY AND NECK

CLINICAL STAGING	TREATMENT OF PRIMARY AND NECK
Carcinoma in situ	See Treatment (GLOT-2)
Amenable to larynx-preserving (conservation) surgery (T1–T2,N0 or select T3,N0)[j]	See Treatment (GLOT-2)
T3 requiring (amenable to) total laryngectomy (N0–1)	See Treatment of Primary and Neck (GLOT-3)
T3 requiring (amenable to) total laryngectomy (N2–3)	See Treatment of Primary and Neck (GLOT-4)
T4a disease	See Treatment of Primary and Neck (GLOT-6)
T4b,N0–3 or Unresectable nodal disease or Unfit for surgery	See Treatment of Very Advanced Head and Neck Cancer (ADV-1)
Metastatic (M1) disease at initial presentation	See Treatment of Very Advanced Head and Neck Cancer (ADV-2)

[a] Complete workup may not be indicated for Tis,T1, but history and physical examination and biopsy are required. Direct laryngoscopy under anesthesia is generally recommended for all cases.

[b] H&P should include documentation and quantification (pack years smoked) of tobacco use history. All current smokers should be advised to quit smoking, and former smokers should be advised to remain abstinent from smoking. For additional cessation support, refer to the Patient/Provider Smoking Cessation Resources in the NCCN Guidelines for Smoking Cessation.

[c] Screen for depression (See NCCN Guidelines for Distress Management).

[d] Image-guided (US or CT) needle biopsy of cystic neck nodes may offer better diagnostic yield than FNA by palpation alone for initial diagnosis in this setting.

[e] See Principles of Imaging (IMG-A).

[f] Chest CT is recommended for advanced nodal disease to screen for distant metastases, and for select patients who smoke to screen for lung cancer. See NCCN Guidelines for Lung Cancer Screening.

[g] See Principles of Dental Evaluation and Management (DENT-A).

[h] See Principles of Nutrition: Management and Supportive Care (NUTR-A).

[i] See fertility and reproductive endocrine considerations in the NCCN Guidelines for Adolescent and Young Adult (AYA) Oncology.

[j] Nodal disease in such glottic tumors is rare. See Discussion.

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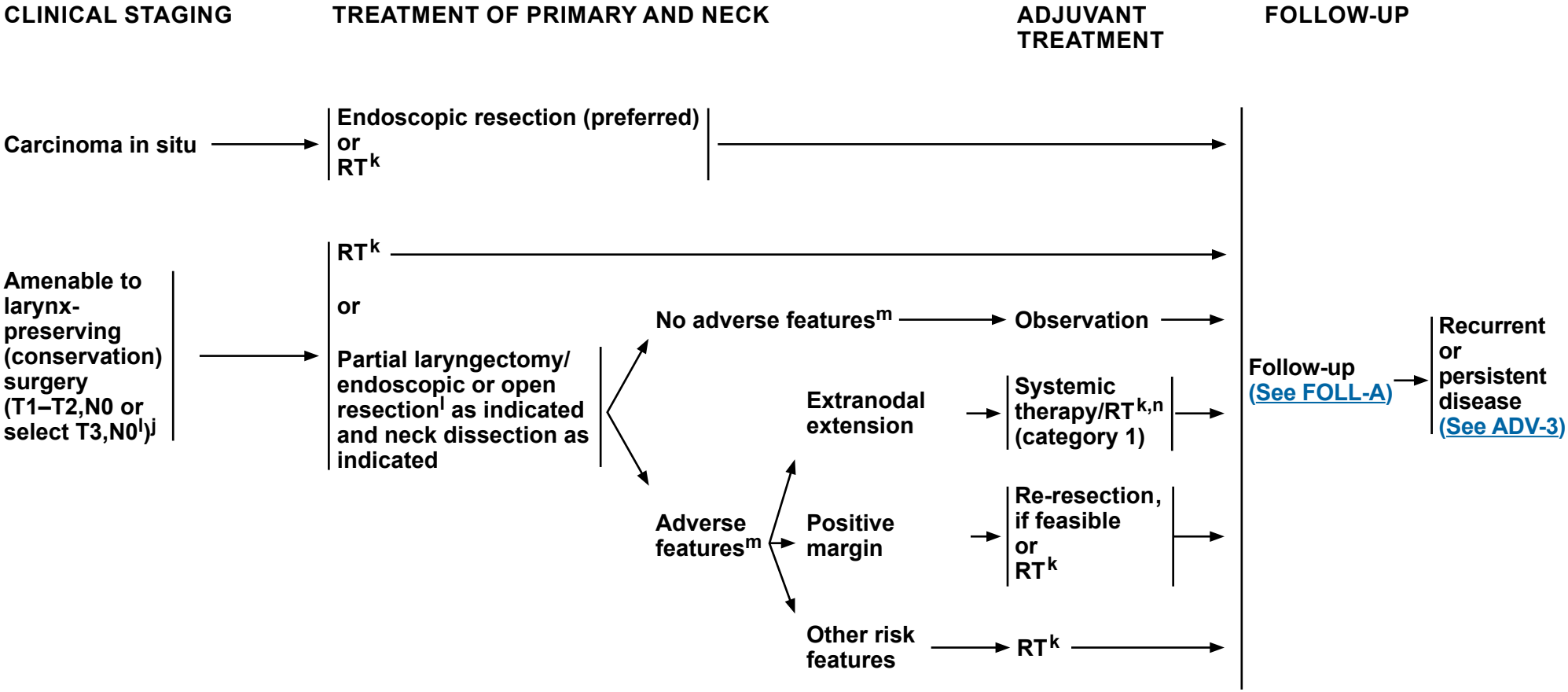

[j]Nodal disease in such glottic tumors is rare. See Discussion.
[k]See Principles of Radiation Therapy (GLOT-A).
[l]See Principles of Surgery (SURG-A).
[m]Adverse features: extranodal extension, positive margins, close margins, pT4 primary, pN2 or pN3 nodal disease, perineural invasion, vascular invasion, lymphatic invasion (See Discussion).
[n]See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).

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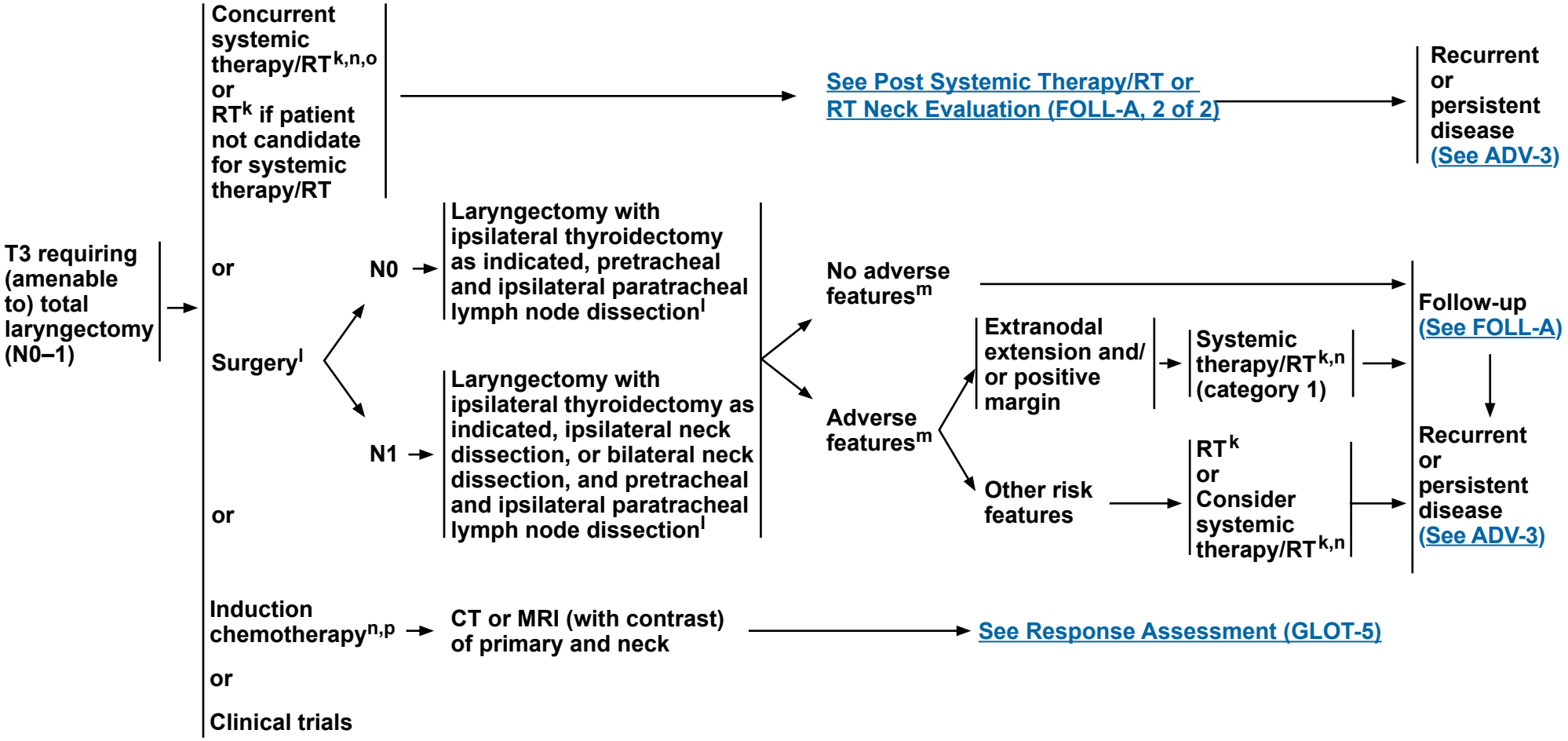

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[l] See Principles of Surgery (SURG-A).
[m] Adverse features: extranodal extension, positive margins, close margins, pT4 primary, pN2 or pN3 nodal disease, perineural invasion, vascular invasion, lymphatic invasion (See Discussion).
[n] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[o] When using concurrent systemic therapy/RT, the preferred agent is cisplatin (category 1). See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[p] See Discussion on induction chemotherapy.

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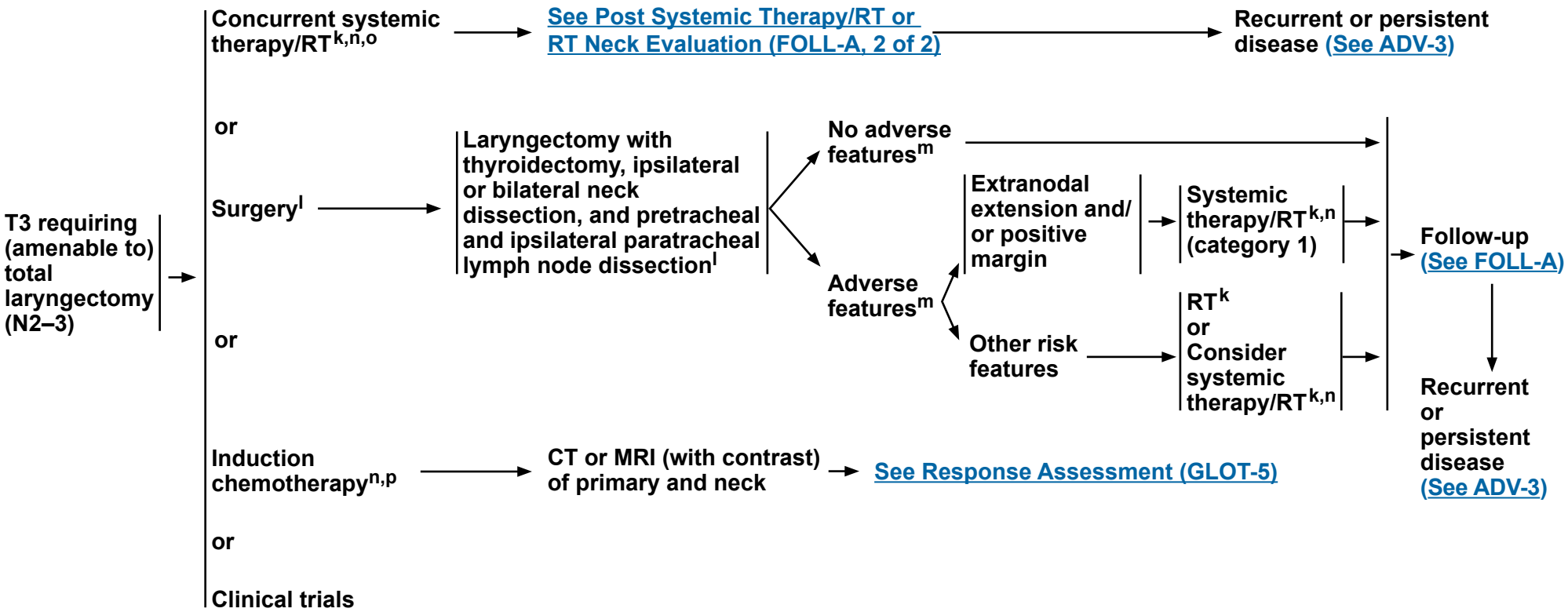

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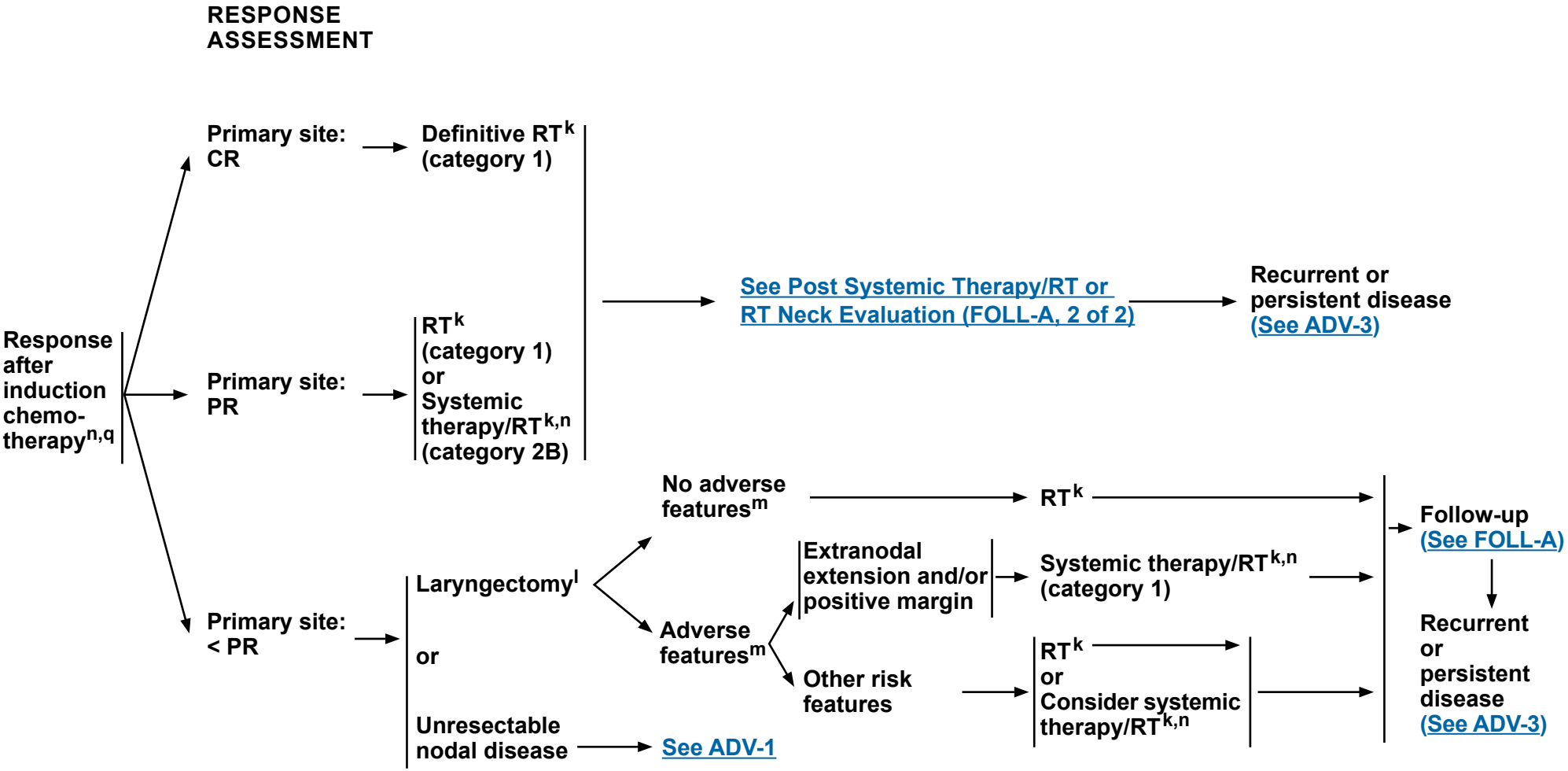

[k] See Principles of Radiation Therapy (GLOT-A).
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[n] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[q] In randomized clinical trials, assessment of response has been done after 2 or 3 cycles.

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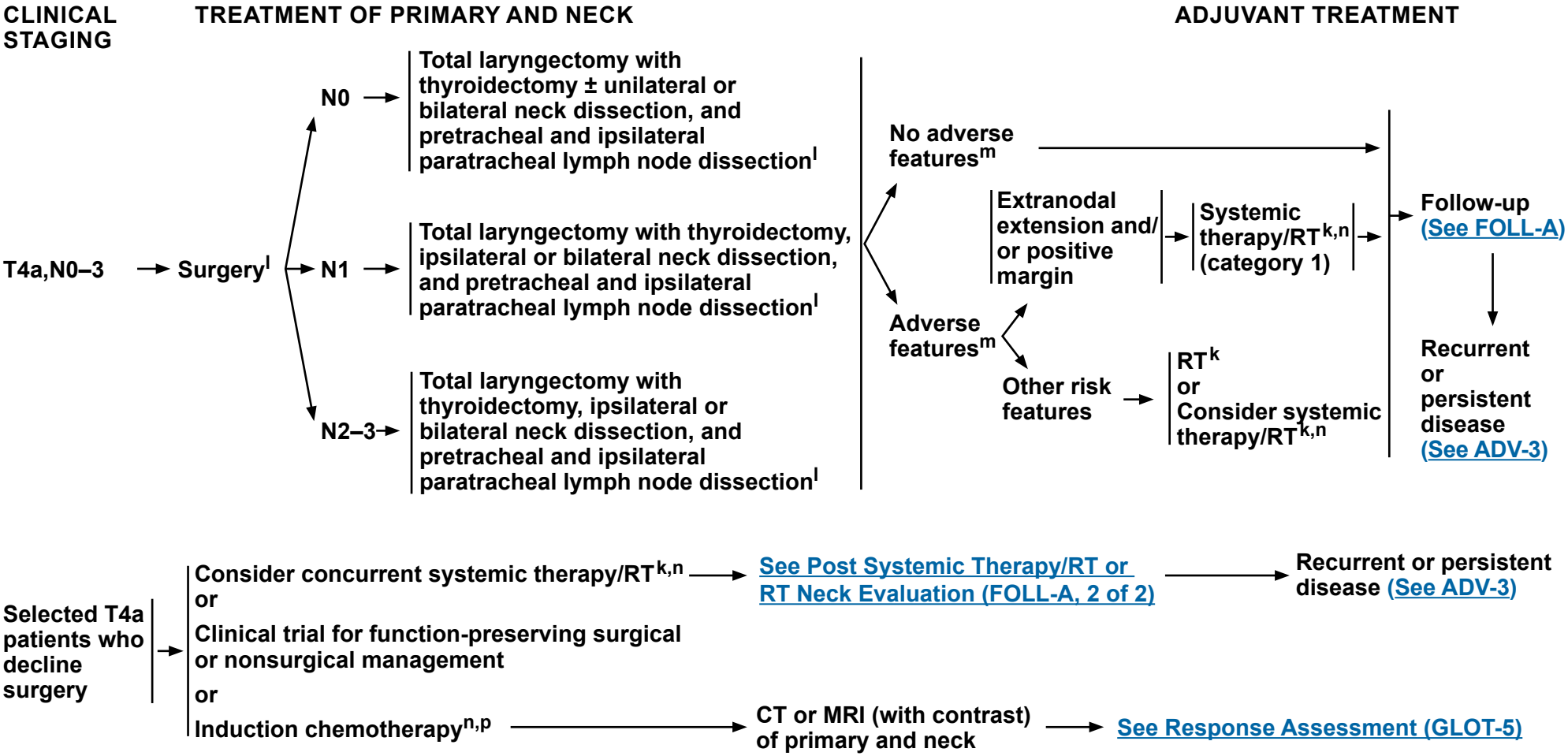

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PRINCIPLES OF RADIATION THERAPY[1]

DEFINITIVE:

RT Alone

- **Tis,N0: 60.75 Gy (2.25 Gy/fraction) to 66 Gy (2.0 Gy/fraction)**
- **T1,N0:**
  - **63 Gy (2.25 Gy/fraction, preferred) to 66 Gy (2.0 Gy/fraction)**
    or
  - **50 Gy (3.12 Gy/fraction) to 52 Gy (3.28 Gy/fraction)[2]**
- **T2,N0: 65.25 (2.25 Gy/fraction) to 70 Gy (2.0 Gy/fraction)**
- **≥T2,N1:**
  - **PTV**
    - ◊ **High risk: Primary tumor and involved lymph nodes [this includes possible local subclinical infiltration at the primary site and at the high-risk level lymph node(s)]**
      - **Fractionation: 66 Gy (2.2 Gy/fraction) to 70 Gy (2.0 Gy/fraction); daily Monday–Friday in 6–7 weeks[3]**
      - **Concomitant boost accelerated RT:**
        - **72 Gy/6 weeks (1.8 Gy/fraction, large field; 1.5 Gy boost as second daily fraction during last 12 treatment days)**
        - **66–70 Gy (2.0 Gy/fraction; 6 fractions/wk accelerated)**
      - **Hyperfractionation: 79.2–81.6 Gy/7 weeks (1.2 Gy/fraction, twice daily)**
    - ◊ **Low to intermediate risk: Sites of suspected subclinical spread**
      - **44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[4]**

Either IMRT or 3D conformal RT is recommended.

CONCURRENT SYSTEMIC THERAPY/RT:[5,6]

- **PTV**
  - **High risk: typically 70 Gy (2.0 Gy/fraction)**
  - **Low to intermediate risk: 44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[4]**

[1] See Principles of Radiation Techniques (RAD-A) and Discussion.

[2] Gowda RV, Henk JM, Mais KL, et al. Three weeks radiotherapy for T1 glottic cancer: the Christie and Royal Marsden Hospital Experience. Radiother Oncol 2003;68:105-111.

[3] For doses >70 Gy, some clinicians feel that the fractionation should be slightly modified (eg, <2.0 Gy/fraction for at least some of the treatment) to minimize toxicity. An additional 2–3 doses can be added depending on clinical circumstances.

[4] Suggest 44–50 Gy in 3D conformal RT and sequentially planned IMRT or 54–63 Gy with IMRT dose painting technique (dependent on dose per fraction).

[5] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).

[6] Based on published data, concurrent systemic therapy/RT most commonly uses conventional fractionation at 2.0 Gy per fraction to a typical dose of 70 Gy in 7 weeks with single-agent cisplatin given every 3 weeks at 100 mg/m^2; 2–3 cycles of chemotherapy are used depending on the radiation fractionation scheme (RTOG 0129) (Ang KK, Harris J, Wheeler R, et al. Human papillomavirus and survival of patients with oropharyngeal cancer. N Engl J Med 2010;363:24-35). When carboplatin and 5-FU are used, then the recommended regimen is standard fractionation plus 3 cycles of chemotherapy. [Bourhis J, Sire C, Graff P, et al. Concomitant chemoradiotherapy versus acceleration of radiotherapy with or without concomitant chemotherapy in locally advanced head and neck carcinoma (GORTEC 99-02): an open-label phase 3 randomised trial. Lancet Oncol 2012;13:145-153]. Other fraction sizes (eg, 1.8 Gy, conventional), multiagent chemotherapy, other dosing schedules of cisplatin, or altered fractionation with chemotherapy are efficacious, and there is no consensus on the optimal approach. In general, the use of concurrent systemic therapy/RT carries a high toxicity burden; altered fractionation or multiagent chemotherapy will likely further increase the toxicity burden. For any systemic therapy/RT approach, close attention should be paid to published reports for the specific chemotherapy agent, dose, and schedule of administration. Systemic therapy/RT should be performed by an experienced team and should include substantial supportive care.

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PRINCIPLES OF RADIATION THERAPY[1]

POSTOPERATIVE:

RT or Concurrent Systemic Therapy/RT[5,7-10]

- **Preferred interval between resection and postoperative RT is ≤6 weeks.**
- **PTV**
  - **High risk: Adverse features such as positive margins (See footnote m on GLOT-3).**
    - **60–66 Gy (2.0 Gy/fraction); daily Monday–Friday in 6–6.5 weeks**
  - **Low to intermediate risk: sites of suspected subclinical spread**
    - **44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[4]**

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[1]See Principles of Radiation Techniques (RAD-A) and Discussion.
[4]Suggest 44–50 Gy in 3D conformal RT and sequentially planned IMRT or 54–63 Gy with IMRT dose painting technique (dependent on dose per fraction).
[5]See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[7]Bernier J, Domenge C, Ozsahin M, et al. Postoperative irradiation with or without concomitant chemotherapy for locally advanced head and neck cancer. N Engl J Med 2004;350:1945-1952.
[8]Cooper JS, Pajak TF, Forastiere AA, et al. Postoperative concurrent radiotherapy and chemotherapy for high-risk squamous-cell carcinoma of the head and neck. N Engl J Med 2004;350:1937-1944.
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[10]Cooper JS, Zhang Q, Pajak TF, et al. Long-term follow-up of the RTOG 9501/intergroup phase III trial: postoperative concurrent radiation therapy and chemotherapy in high-risk squamous cell carcinoma of the head and neck. Int J Radiat Oncol Biol Phys 2012;84:1198-1205.

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  - Consider pulmonary function tests for conservation surgery candidates
  - Consider videostrobe for select patients
  - Dental evaluation[e]
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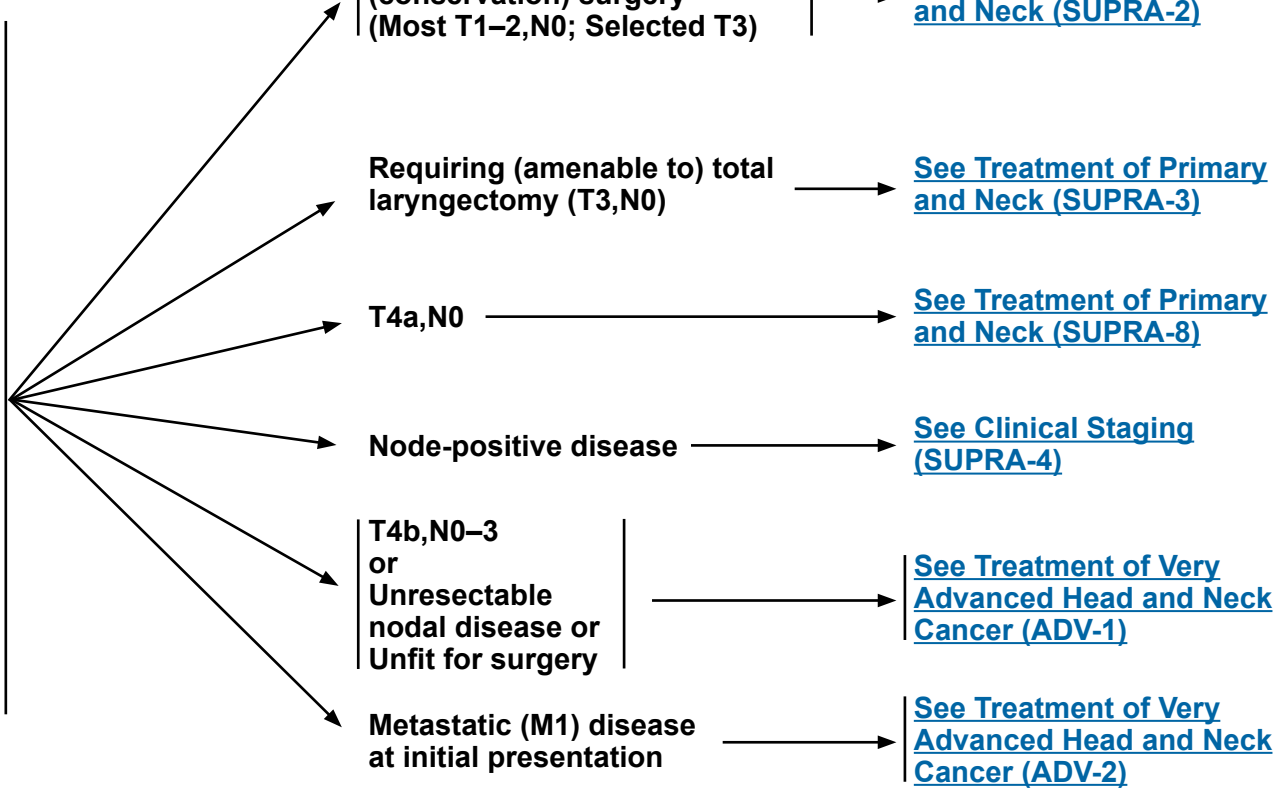
  - Audiogram
  - Smoking cessation counseling[a]
  - Fertility/reproductive counseling[g]

Multidisciplinary consultation as indicated

CLINICAL STAGING



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[d] See Principles of Imaging (IMG-A).

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[f] See Principles of Nutrition: Management and Supportive Care (NUTR-A).

[g] See fertility and reproductive endocrine considerations in the NCCN Guidelines for Adolescent and Young Adult (AYA) Oncology.

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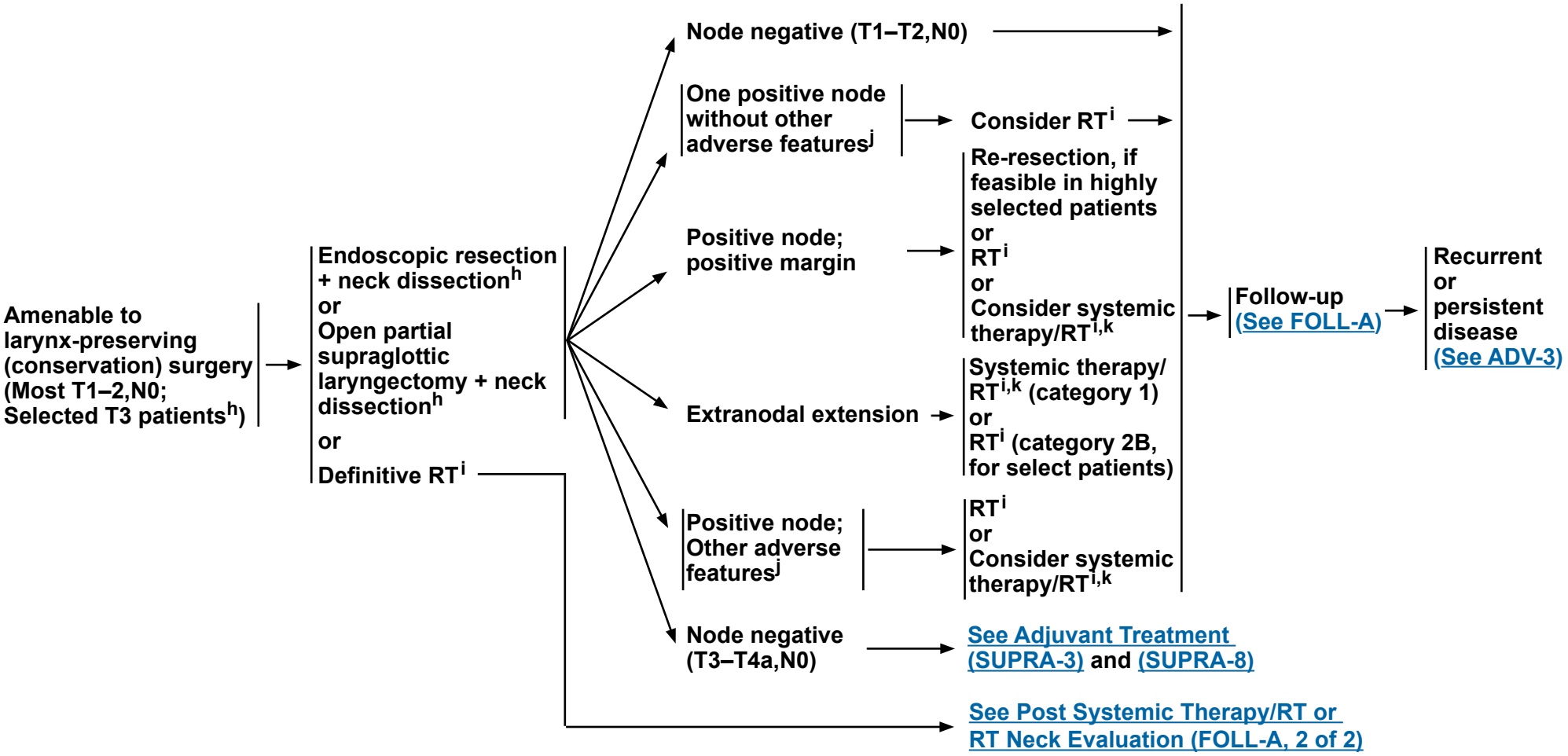

[h] See Principles of Surgery (SURG-A).
[i] See Principles of Radiation Therapy (SUPRA-A).
[j] Adverse features: extranodal extension, positive margins, close margins, pT3 or pT4 primary, pN2 or pN3 nodal disease, perineural invasion, vascular invasion, lymphatic invasion (See Discussion).
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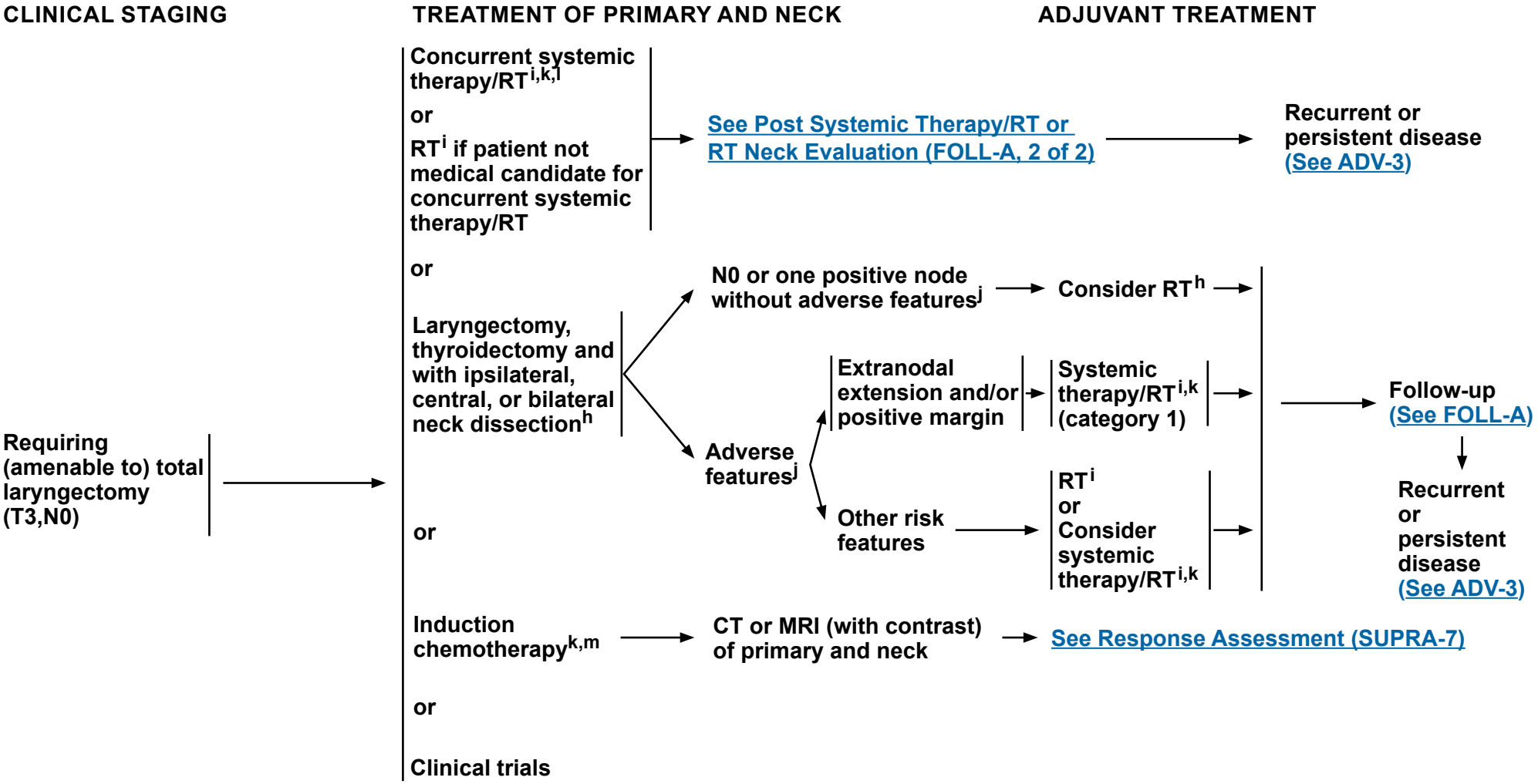

[h] See Principles of Surgery (SURG-A).
[i] See Principles of Radiation Therapy (SUPRA-A).
[j] Adverse features: extranodal extension, positive margins, close margins, pT3 or pT4 primary, pN2 or pN3 nodal disease, perineural invasion, vascular invasion, lymphatic invasion (See Discussion).
[k] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[l] When using concurrent systemic therapy/RT, the preferred agent is cisplatin (category 1). See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[m] See Discussion on induction chemotherapy.

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

CLINICAL STAGING

Node-positive disease

- **Amenable to larynx-preserving (conservation) surgery (T1–2,N+ and selected T3,N1)** → See Treatment of Primary and Neck (SUPRA-5)
- **Requiring (amenable to) total laryngectomy (Most T3,N1–3)** → See Treatment of Primary and Neck (SUPRA-6)
- **T4a,N1–N3** → See Treatment of Primary and Neck (SUPRA-8)
- **T4b,N1–3 or Unresectable nodal disease or Unfit for surgery** → See Treatment of Head and Neck Cancer (ADV-1)

Note: All recommendations are category 2A unless otherwise indicated.
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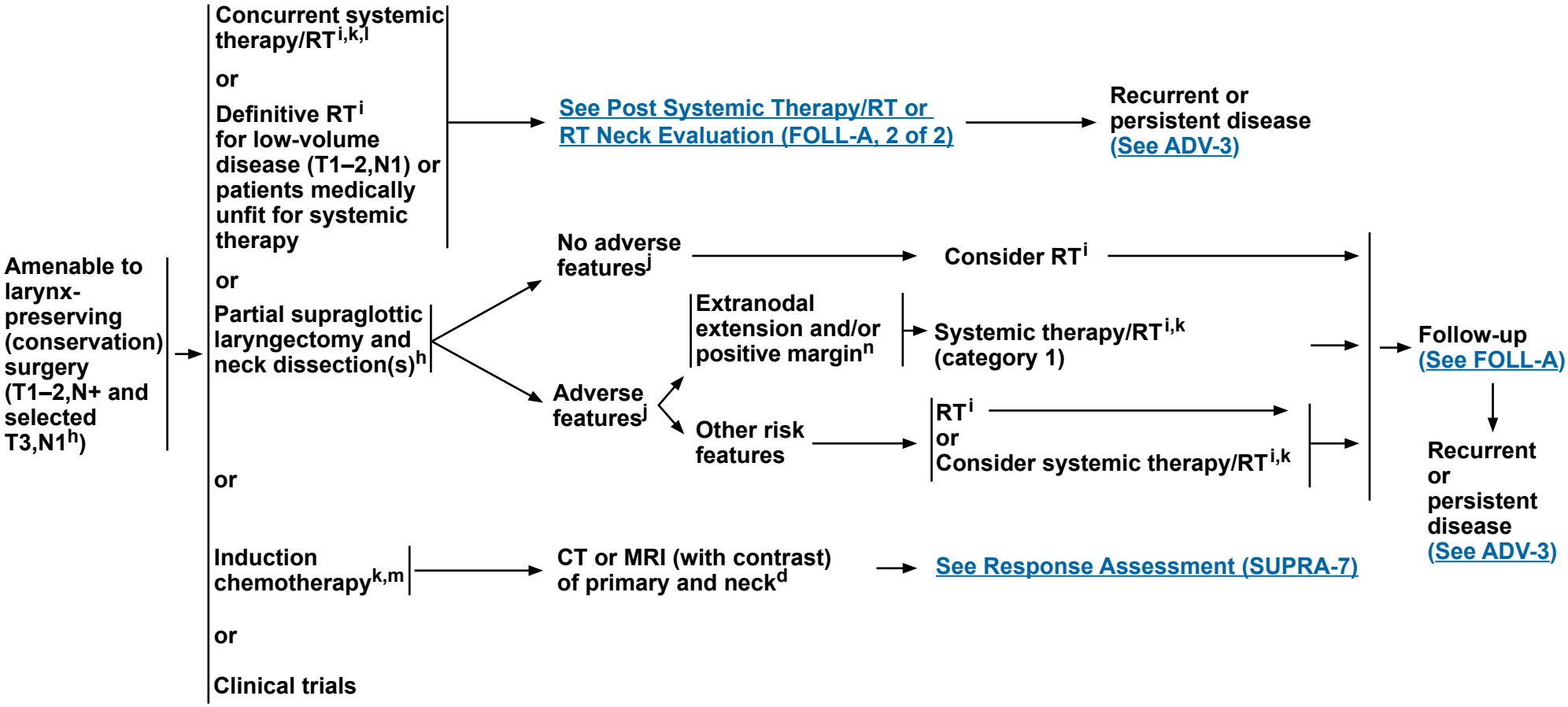

[d] See Principles of Imaging (IMG-A).
[h] See Principles of Surgery (SURG-A).
[i] See Principles of Radiation Therapy (SUPRA-A).
[j] Adverse features: extranodal extension, positive margins, close margins, pT3 or pT4 primary, pN2 or pN3 nodal disease, perineural invasion, vascular invasion, lymphatic invasion (See Discussion).
[k] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[l] When using concurrent systemic therapy/RT, the preferred agent is cisplatin (category 1). See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[m] See Discussion on induction chemotherapy.
[n] In highly select patients, re-resection (if negative margins are feasible and can be achieved without total laryngectomy) where it would potentially change the subsequent indication for chemotherapy.

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

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Cancer of the Supraglottic Larynx

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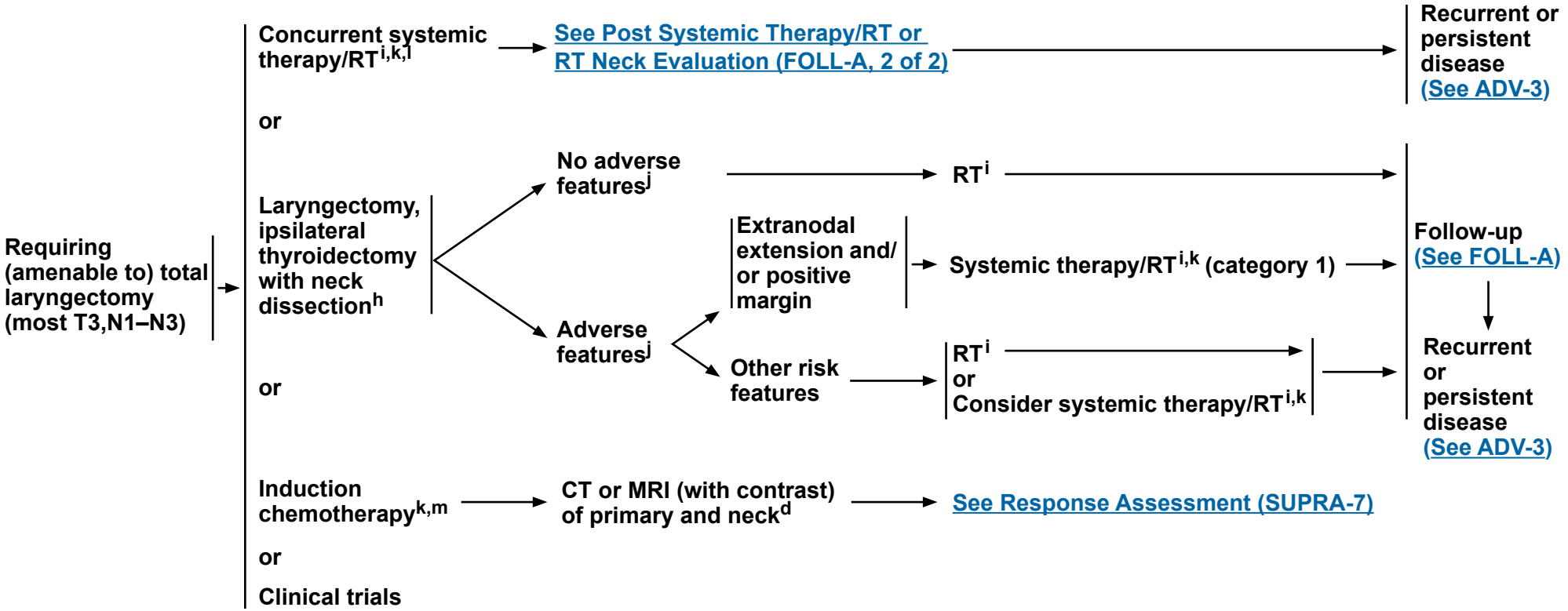
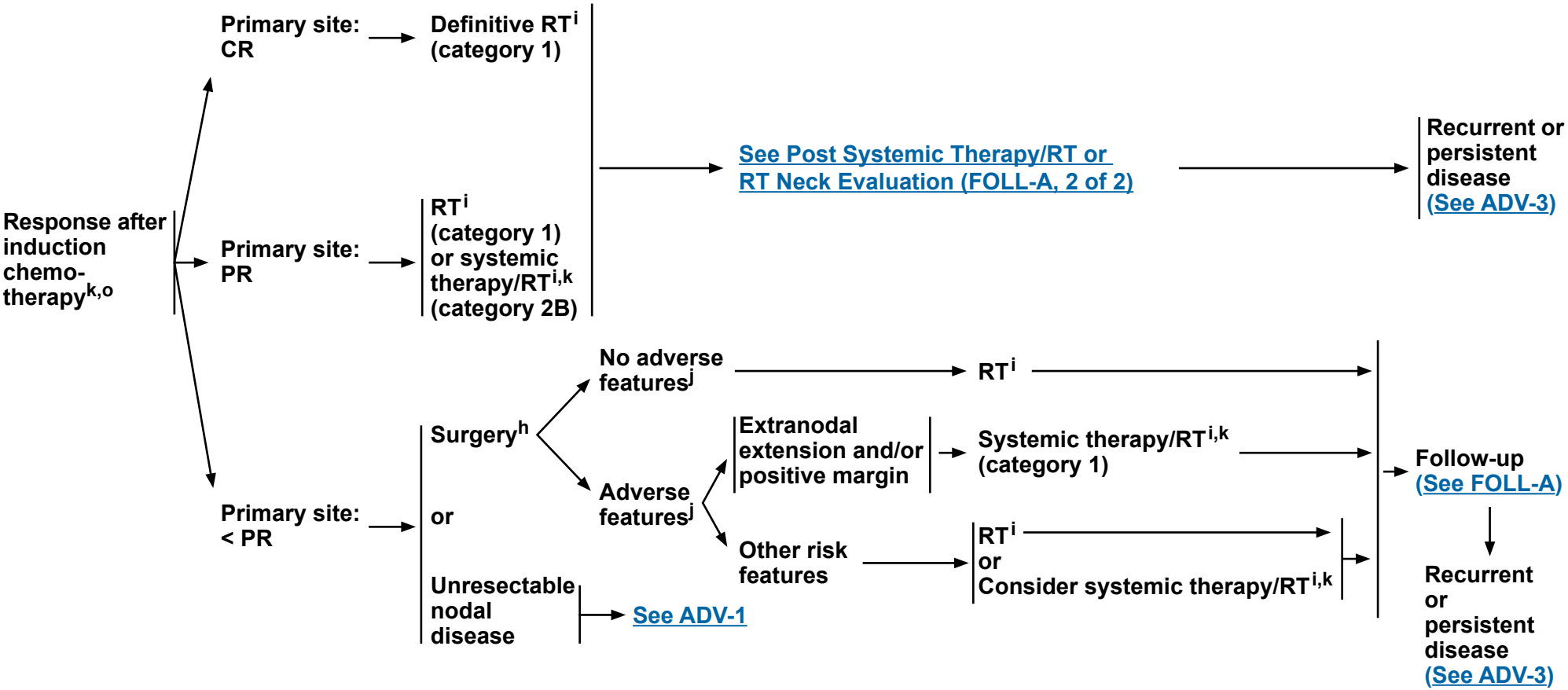
CLINICAL STAGING | **TREATMENT OF PRIMARY AND NECK** | **ADJUVANT TREATMENT**



[d] See Principles of Imaging (IMG-A).
[h] See Principles of Surgery (SURG-A).
[i] See Principles of Radiation Therapy (SUPRA-A).
[j] Adverse features: extranodal extension, positive margins, close margins, pT3 or pT4 primary, pN2 or pN3 nodal disease, perineural invasion, vascular invasion, lymphatic invasion (See Discussion).
[k] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[l] When using concurrent systemic therapy/RT, the preferred agent is cisplatin (category 1). See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[m] See Discussion on induction chemotherapy.

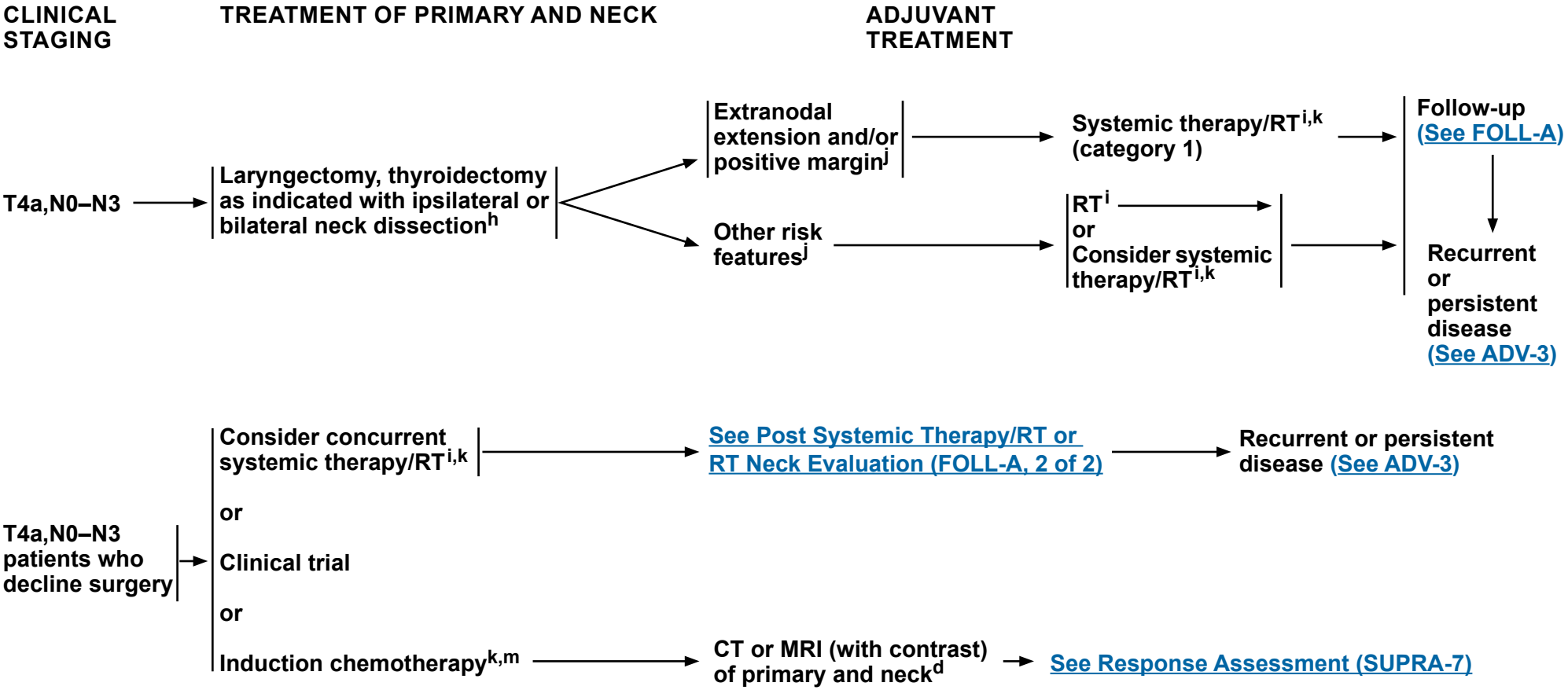
Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

RESPONSE ASSESSMENT



[h] See Principles of Surgery (SURG-A).
[i] See Principles of Radiation Therapy (SUPRA-A).
[j] Adverse features: extranodal extension, positive margins, close margins, pT3 or pT4 primary, pN2 or pN3 nodal disease, perineural invasion, vascular invasion, lymphatic invasion (See Discussion).
[k] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[o] In randomized clinical trials, assessment of response has been done after 2 or 3 cycles.

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.



[d] See Principles of Imaging (IMG-A).
[h] See Principles of Surgery (SURG-A).
[i] See Principles of Radiation Therapy (SUPRA-A).
[j] Adverse features: extranodal extension, positive margins, close margins, pT3 or pT4 primary, pN2 or pN3 nodal disease, perineural invasion, vascular invasion, lymphatic invasion (See Discussion).
[k] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[m] See Discussion on induction chemotherapy.

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

PRINCIPLES OF RADIATION THERAPY[1]

DEFINITIVE:

RT Alone

- **T1–3,N0–1: 66–70 Gy conventional (2.0 Gy/fraction)[2]**
- **PTV**
  - **High risk: Primary tumor and involved lymph nodes [this includes possible local subclinical infiltration at the primary site and at the high-risk level lymph node(s)]**
    - ◊ **Fractionation: 66 Gy (2.2 Gy/fraction) to 70 Gy (2.0 Gy/fraction); daily Monday–Friday in 6–7 weeks[3]**
    - ◊ **Concomitant boost accelerated RT:**
      - **72 Gy/6 weeks (1.8 Gy/fraction, large field; 1.5 Gy boost as second daily fraction during last 12 treatment days)**
      - **66–70 Gy (2.0 Gy/fraction; 6 fractions/wk accelerated)**
    - ◊ **Hyperfractionation: 79.2–81.6 Gy/7 weeks (1.2 Gy/fraction twice daily)**
  - **Low to intermediate risk: Sites of suspected subclinical spread**
    - ◊ **44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[4]**

CONCURRENT SYSTEMIC THERAPY/RT:[5,6]

- **PTV**
  - **High risk: typically 70 Gy (2.0 Gy/fraction)**
  - **Low to intermediate and low risk: 44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[4]**

Either IMRT or 3D conformal RT is recommended. Use of proton therapy is an area of active investigation. Proton therapy may be considered when normal tissue constraints cannot be met by photon-based therapy.

[1] See Principles of Radiation Techniques (RAD-A) and Discussion.
[2] For select T1–2,N0 tumors, accelerated fractionation may be used.
[3] For doses >70 Gy, some clinicians feel that the fractionation should be slightly modified (eg, <2.0 Gy/fraction for at least some of the treatment) to minimize toxicity. An additional 2–3 doses can be added depending on clinical circumstances.
[4] Suggest 44–50 Gy in 3D conformal RT and sequentially planned IMRT or 54–63 Gy with IMRT dose painting technique (dependent on dose per fraction).
[5] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[6] Based on published data, concurrent systemic therapy/RT most commonly uses conventional fractionation at 2.0 Gy per fraction to a typical dose of 70 Gy in 7 weeks with single-agent cisplatin given every 3 weeks at 100 mg/m^2; 2–3 cycles of chemotherapy are used depending on the radiation fractionation scheme (RTOG) (Ang KK, Harris J, Wheeler R, et al. Human papillomavirus and survival of patients with oropharyngeal cancer. N Engl J Med 2010;363:24-35). When carboplatin and 5-FU are used, the recommended regimen is standard fractionation plus 3 cycles of chemotherapy [Bourhis J, Sire C, Graff P, et al. Concomitant chemoradiotherapy versus acceleration of radiotherapy with or without concomitant chemotherapy in locally advanced head and neck carcinoma (GORTEC 99-02): an open-label phase 3 randomised trial. Lancet Oncol 2012;13:145-153]. Other fraction sizes (eg, 1.8 Gy, conventional), multiagent chemotherapy, other dosing schedules of cisplatin, or altered fractionation with chemotherapy are efficacious, and there is no consensus on the optimal approach. In general, the use of concurrent systemic therapy/RT carries a high toxicity burden; altered fractionation or multiagent chemotherapy will likely further increase the toxicity burden. For any systemic therapy/RT approach, close attention should be paid to published reports for the specific chemotherapy agent, dose, and schedule of administration. Systemic therapy/RT should be performed by an experienced team and should include substantial supportive care.

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

PRINCIPLES OF RADIATION THERAPY[1]

POSTOPERATIVE:

RT or Concurrent Systemic Therapy/RT[5,7-10]

- **Preferred interval between resection and postoperative RT is ≤6 weeks.**
- **PTV**
  - **High risk: Adverse features such as positive margins (See footnote j on SUPRA-3).**
    - ◊ **60–66 Gy (2.0 Gy/fraction); daily Monday–Friday in 6–6.5 weeks**
  - **Low to intermediate risk: sites of suspected subclinical spread**
    - ◊ **44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[4]**

Either IMRT or 3D conformal RT is recommended. Use of proton therapy is an area of active investigation. Proton therapy may be considered when normal tissue constraints cannot be met by photon-based therapy.

[1] See Principles of Radiation Techniques (RAD-A) and Discussion.
[4] Suggest 44–50 Gy in 3D conformal RT and sequentially planned IMRT or 54–63 Gy with IMRT dose painting technique (dependent on dose per fraction).
[5] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).

[7] Bernier J, Domenge C, Ozsahin M, et al. Postoperative irradiation with or without concomitant chemotherapy for locally advanced head and neck cancer. N Engl J Med 2004;350:1945-1952.
[8] Cooper JS, Pajak TF, Forastiere AA, et al. Postoperative concurrent radiotherapy and chemotherapy for high-risk squamous-cell carcinoma of the head and neck. N Engl J Med 2004;350:1937-1944.
[9] Bernier J, Cooper JS, Pajak TF, et al. Defining risk levels in locally advanced head and neck cancers: A comparative analysis of concurrent postoperative radiation plus chemotherapy trials of the EORTC (#22931) and RTOG (#9501). Head Neck 2005;27:843-850.
[10] Cooper JS, Zhang Q, Pajak TF, et al. Long-term follow-up of the RTOG 9501/intergroup phase III trial: postoperative concurrent radiation therapy and chemotherapy in high-risk squamous cell carcinoma of the head and neck. Int J Radiat Oncol Biol Phys 2012;84:1198-1205.

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

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NCCN Guidelines Version 1.2021
Ethmoid Sinus Tumors

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WORKUP

- H&P[a,b] including a complete head and neck exam; nasal endoscopy as clinically indicated
- CT with contrast or MRI with contrast of skull base and neck[c]
- As clinically indicated:
  - Chest CT (with or without contrast)[c]
  - Consider FDG PET/CT[c]
  - Dental evaluation[d]
  - Nutrition, speech and swallowing evaluation/therapy[e]
  - Smoking cessation counseling[a]
  - Fertility/reproductive counseling[f]

Multidisciplinary consultation as indicated

→ **Biopsy[g]**

PATHOLOGY

- **Squamous cell carcinoma**
- **Adenocarcinoma**
- **Minor salivary gland tumor[h]**
- **Esthesioneuroblastoma**
- **Undifferentiated carcinoma (sinonasal undifferentiated carcinoma [SNUC], small cell, or sinonasal neuroendocrine carcinoma [SNEC])[i]**

→ **Newly diagnosed T1-T4, M0 disease** → **See Primary Treatment (ETHM-2)**

→ **Diagnosed after incomplete resection (eg, polypectomy)** → **See Primary Treatment (ETHM-3)**

→ **Metastatic (M1) disease at initial presentation** → **See Treatment of Very Advanced Head and Neck Cancer (ADV-2)**

Mucosal melanoma (See NCCN Guidelines for Mucosal Melanoma MM-1)

Sarcoma (See NCCN Guidelines for Soft Tissue Sarcoma)

Lymphoma (See NCCN Guidelines for Non-Hodgkin Lymphomas)

[a] H&P should include documentation and quantification (pack years smoked) of tobacco use history. All current smokers should be advised to quit smoking, and former smokers should be advised to remain abstinent from smoking. For additional cessation support, refer to the Patient/Provider Smoking Cessation Resources in the NCCN Guidelines for Smoking Cessation.

[b] Screen for depression (See NCCN Guidelines for Distress Management).

[c] See Principles of Imaging (IMG-A).

[d] See Principles of Dental Evaluation and Management (DENT-A).

[e] See Principles of Nutrition: Management and Supportive Care (NUTR-A).

[f] See fertility and reproductive endocrine considerations in the NCCN Guidelines for Adolescent and Young Adult (AYA) Oncology.

[g] Image-guided (US or CT) needle biopsy of cystic neck nodes may offer better diagnostic yield than FNA by palpation alone for initial diagnosis in this setting.

[h] Also see the NCCN Guidelines for Salivary Gland Tumors (SALI-1).

[i] For SNUC with neuroendocrine features, small cell, high-grade olfactory esthesioneuroblastoma, or SNEC histologies, systemic therapy should be a part of the overall treatment. Consider a clinical trial and referral to a major medical center that specializes in these diseases. See SYST-A.

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

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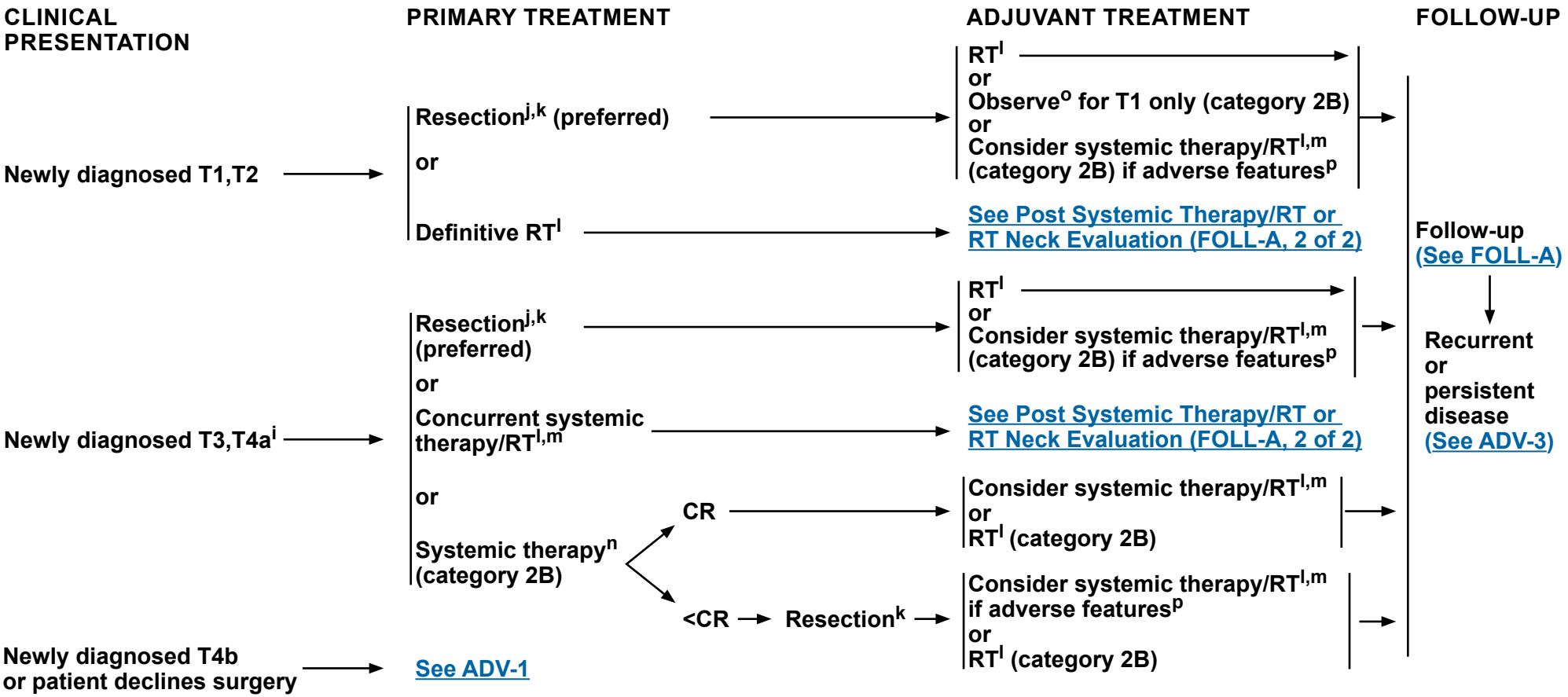


[i] For SNUC with neuroendocrine features, small cell, high-grade olfactory esthesioneuroblastoma, or SNEC histologies, systemic therapy should be a part of the overall treatment. Consider a clinical trial and referral to a major medical center that specializes in these diseases. See SYST-A.

[j] N+ neck disease is uncommon in ethmoid cancers, but, if present, requires neck dissection and appropriate risk-based adjuvant therapy.

[k] See Principles of Surgery (SURG-A).

[l] See Principles of Radiation Therapy (ETHM-A). For minor salivary gland tumors, see SALI-A.

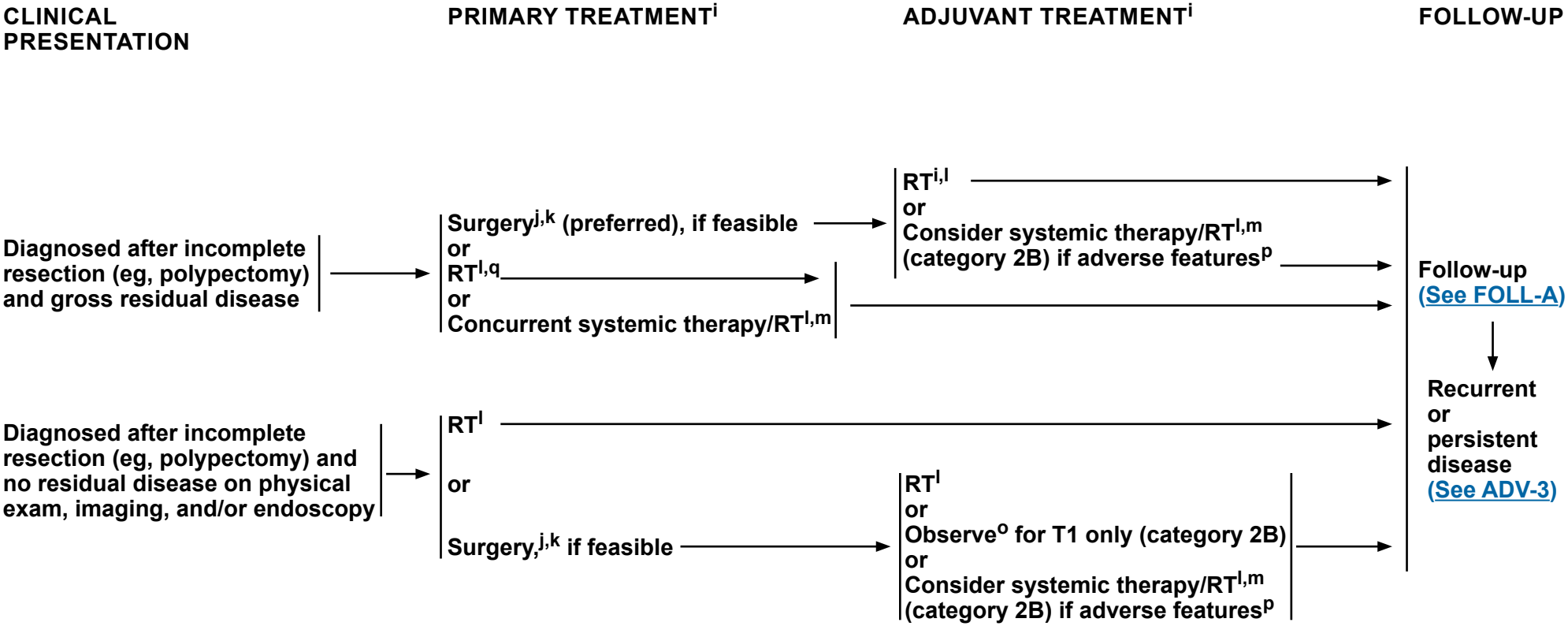
[m] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).

[n] Primary systemic therapy options for newly diagnosed T3,T4a ethmoid sinus tumor include etoposide/cisplatin (category 2B), or docetaxel/cisplatin/fluorouracil (category 2B).

[o] Pathologic features: negative margins, favorable histology (including low grade), not located along the cribriform plate or medial wall of the orbit, no perineural invasion or lymphovascular space invasion.

[p] Adverse features include positive margins, close margins (tumors adjacent to the cribriform plate and/or medial wall of the orbit), unfavorable histology (high grade, adenoid cystic), intracranial and/or intraorbital extension, cribriform plate location, medial wall of orbit location, perineural invasion, and lymphovascular space invasion. (See Discussion).

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.



[i]For SNUC with neuroendocrine features, small cell, high-grade olfactory esthesioneuroblastoma, or SNEC histologies, systemic therapy should be a part of the overall treatment. Consider a clinical trial and referral to a major medical center that specializes in these diseases. See SYST-A.

[j]N+ neck disease is uncommon in ethmoid cancers, but, if present, requires neck dissection and appropriate risk-based adjuvant therapy.

[k]See Principles of Surgery (SURG-A).

[l]See Principles of Radiation Therapy (ETHM-A). For minor salivary gland tumors, see SALI-A.

[m]See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).

[o]Pathologic features: negative margins, favorable histology (including low grade), not located along the cribriform plate or medial wall of the orbit, no perineural invasion or lymphovascular space invasion.

[p]Adverse features include positive margins, close margins (tumors adjacent to the cribriform plate and/or medial wall of the orbit), unfavorable histology (high grade, adenoid cystic), intracranial and/or intraorbital extension, cribriform plate location, medial wall of orbit location, perineural invasion, and lymphovascular space invasion. (See Discussion).

[q]Primary RT is an option for minimal residual squamous cell carcinoma.

Note: All recommendations are category 2A unless otherwise indicated.
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PRINCIPLES OF RADIATION THERAPY[1]

DEFINITIVE:

RT Alone

- **PTV**
  - **High risk: Primary tumor and involved lymph nodes [this includes possible local subclinical infiltration at the primary site and at the high-risk level lymph node(s)]**
    - ◊ **Fractionation:**
      - **66 Gy (2.2 Gy/fraction) to 70–70.2 Gy (1.8–2.0 Gy/fraction); daily Monday–Friday in 6–7 weeks[2,3]**
      - **Concomitant boost accelerated RT:**
        - **72 Gy/6 weeks (2 Gy once daily and then 1.8 Gy/fraction, large field; 1.5 Gy boost as second daily fraction during last 12 treatment days)**
        - **66–70 Gy (2.0 Gy/fraction; 6 fractions/wk accelerated)**
      - **Hyperfractionation: 81.6 Gy/7 weeks (1.2 Gy/fraction, twice daily)**
  - **Low to intermediate risk: Sites of suspected subclinical spread**
    - ◊ **44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[4,5]**

CONCURRENT SYSTEMIC THERAPY/RT:[6]

- **PTV**
  - **High risk: typically 70–70.2 Gy (1.8–2.0 Gy/fraction); daily Monday–Friday in 7 weeks[2]**
  - **Low to intermediate risk: 44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[4,5]**

POSTOPERATIVE:

RT or Concurrent Systemic Therapy/RT[6]

- **Preferred interval between resection and postoperative RT is ≤6 weeks**
- **PTV**
  - **High risk: Adverse features such as positive margins[7]**
    - ◊ **60–66 Gy (1.8–2.0 Gy/fraction); daily Monday–Friday in 6–6.5 weeks[2]**
  - **Low to intermediate risk: sites of suspected subclinical spread**
    - ◊ **44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[4,5]**

Either IMRT or proton therapy is recommended for maxillary sinus or paranasal/ethmoid sinus tumors to minimize dose to critical structures.

[1] See Principles of Radiation Techniques (RAD-A) and Discussion.
[2] In the paranasal sinus area, care should be taken to avoid critical neural structures; therefore, 1.8 Gy/fraction can be considered.
[3] For doses >70 Gy, some clinicians feel that the fractionation should be slightly modified (eg, <2.0 Gy/fraction for at least some of the treatment) to minimize toxicity. An additional 2–3 doses can be added depending on clinical circumstances.
[4] Suggest 44–50 Gy in sequentially planned IMRT or 54–63 Gy with IMRT dose painting technique (dependent on dose per fraction).
[5] Treatment to sites of suspected subclinical spread is not consistently performed at all institutions. (Le QT, Fu KK, Kaplan MJ, et al. Lymph node metastasis in maxillary sinus carcinoma. Int J Radiat Oncol Biol Phys 2000;46:541-549.)
[6] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[7] Adverse features include positive margins, close margins (tumors adjacent to the cribriform plate and/or medial wall of the orbit), unfavorable histology (high grade, adenoid cystic), intracranial and/or intraorbital extension, cribriform plate location, medial wall of orbit location, perineural invasion, and lymphovascular space invasion. (See Discussion).

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

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Maxillary Sinus Tumors

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- H&P[a,b] including a complete head and neck exam; nasal endoscopy as clinically indicated
- Complete head and neck CT with contrast and/or MRI with contrast[c]
- As clinically indicated:
  - Chest CT (with or without contrast)[c]
  - Consider FDG PET/CT[c]
  - Dental/prosthodontic evaluation[d]
  - Nutrition, speech and swallowing evaluation/therapy[e]
  - Smoking cessation counseling[a]
  - Fertility/reproductive counseling[f]

Multidisciplinary consultation as indicated

→ **Biopsy[g]**

PATHOLOGY

- **Squamous cell carcinoma**
- **Adenocarcinoma**
- **Minor salivary gland tumor[h]**
- **Esthesioneuroblastoma**
- **Undifferentiated carcinoma (SNUC, small cell, or SNEC)[i]**

→ **T1–2,N0, All histologies** → See Primary Treatment (MAXI-2)

→ **T3–4a,N0; T1–4a,N+, All histologies** → See Primary Treatment (MAXI-3)

→ **T4b,N0–3** → See Treatment of Very Advanced Head and Neck Cancer (ADV-1)

Mucosal melanoma
(See NCCN Guidelines for Mucosal Melanoma MM-1)

Sarcoma
(See NCCN Guidelines for Soft Tissue Sarcoma)

Lymphoma
(See NCCN Guidelines for Non-Hodgkin Lymphomas)

[a] H&P should include documentation and quantification (pack years smoked) of tobacco use history. All current smokers should be advised to quit smoking, and former smokers should be advised to remain abstinent from smoking. For additional cessation support, refer to the Patient/Provider Smoking Cessation Resources in the NCCN Guidelines for Smoking Cessation.

[b] Screen for depression (See NCCN Guidelines for Distress Management).

[c] See Principles of Imaging (IMG-A).

[d] See Principles of Dental Evaluation and Management (DENT-A).

[e] See Principles of Nutrition: Management and Supportive Care (NUTR-A).

[f] See fertility and reproductive endocrine considerations in the NCCN Guidelines for Adolescent and Young Adult (AYA) Oncology.

[g] Biopsy:
- Preferred route is transnasal.
- Needle biopsy may be acceptable.
- Avoid canine fossa puncture or Caldwell-Luc approach.

[h] Also see the NCCN Guidelines for Salivary Gland Tumors (SALI-1).

[i] For SNUC with neuroendocrine features, small cell, high-grade olfactory esthesioneuroblastoma, or SNEC histologies, systemic therapy should be a part of the overall treatment. Consider a clinical trial and referral to a major medical center that specializes in these diseases. See SYST-A.

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

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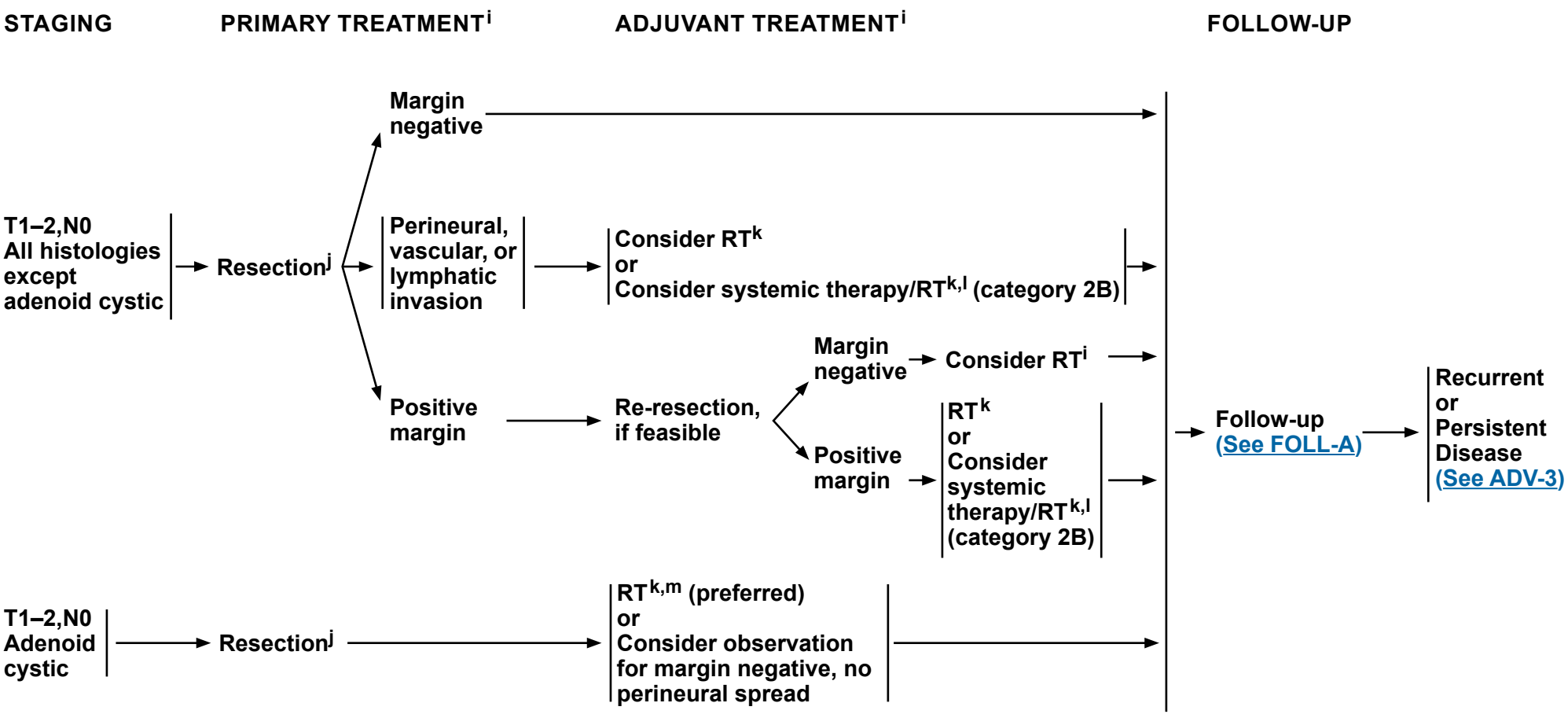

[i]For SNUC with neuroendocrine features, small cell, high-grade olfactory esthesioneuroblastoma, or SNEC histologies, systemic therapy should be a part of the overall treatment. Consider a clinical trial and referral to a major medical center that specializes in these diseases. See SYST-A.
[j]See Principles of Surgery (SURG-A).
[k]See Principles of Radiation Therapy (MAXI-A).
[l]See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[m]For adenoid cystic tumors and minor salivary gland tumors, see SALI-A.

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

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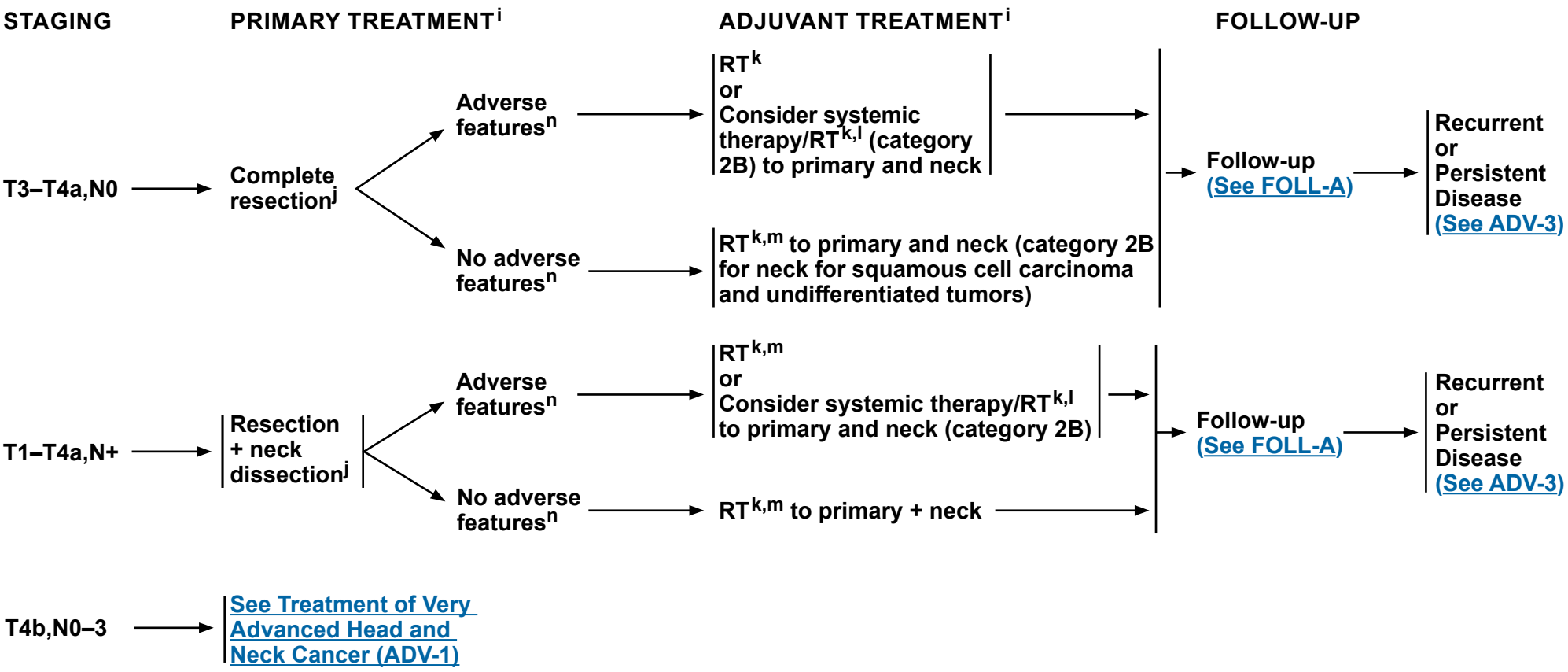

Metastatic disease at initial presentation → See Treatment of Very Advanced Head and Neck Cancer (ADV-2)

[i]For SNUC with neuroendocrine features, small cell, high-grade olfactory esthesioneuroblastoma, or SNEC histologies, systemic therapy should be a part of the overall treatment. Consider a clinical trial and referral to a major medical center that specializes in these diseases. See SYST-A.

[j]See Principles of Surgery (SURG-A).

[k]See Principles of Radiation Therapy (MAXI-A).

[l]See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).

[m]For adenoid cystic tumors and minor salivary gland tumors, see SALI-A.

[n]Adverse features include positive margins, close margins, or extranodal extension (See Discussion).

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

PRINCIPLES OF RADIATION THERAPY[1]

DEFINITIVE:

RT Alone

- PTV
  - High risk: Primary tumor and involved lymph nodes [this includes possible local subclinical infiltration at the primary site and at the high-risk level lymph node(s)]
    - ◊ Fractionation:
      - – 66 Gy (2.2 Gy/fraction) to 70–70.2 Gy (1.8–2.0 Gy/fraction) daily Monday–Friday in 6–7 weeks[2,3]
      - – Concomitant boost accelerated RT:
        - ▪ 72 Gy/6 weeks (2 Gy once daily and then 1.8 Gy/fraction, large field; 1.5 Gy boost as second daily fraction during last 12 treatment days)
        - ▪ 66–70 Gy (2.0 Gy/fraction; 6 fractions/wk accelerated)
      - – Hyperfractionation: 81.6 Gy/7 weeks (1.2 Gy/fraction, twice daily)
  - Low to intermediate risk: Sites of suspected subclinical spread
    - ◊ 44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[4,5]

CONCURRENT SYSTEMIC THERAPY/RT:[6]

- PTV
  - High-risk: typically 70–70.2 Gy (1.8–2.0 Gy/fraction); daily Monday–Friday in 7 weeks[2]
  - Low to intermediate risk: 44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[4,5]

POSTOPERATIVE:

RT or Concurrent Systemic Therapy/RT[6]

- Preferred interval between resection and postoperative RT is ≤6 weeks
- PTV
  - High risk: Adverse features such as positive margins (See footnote n on MAXI-3)
    - ◊ 60–66 Gy (1.8–2.0 Gy/fraction); daily Monday–Friday in 6–6.5 weeks[2]
  - Low to intermediate risk: sites of suspected subclinical spread
    - ◊ 44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[4,5]

Either IMRT or proton therapy is recommended for maxillary sinus or paranasal/ethmoid sinus tumors to minimize dose to critical structures.

[1] See Principles of Radiation Techniques (RAD-A) and Discussion.
[2] In the paranasal sinus area, care should be taken to avoid critical neural structures; therefore, 1.8 Gy/fraction can be considered.
[3] For doses >70 Gy, some clinicians feel that the fractionation should be slightly modified (eg, <2.0 Gy/fraction for at least some of the treatment) to minimize toxicity. An additional 2–3 doses can be added depending on clinical circumstances.
[4] Suggest 44–50 Gy in sequentially planned IMRT or 54–63 Gy with IMRT dose painting technique (dependent on dose per fraction).
[5] Treatment to sites of suspected subclinical spread is not consistently performed at all institutions. (Le QT, Fu KK, Kaplan MJ, et al. Lymph node metastasis in maxillary sinus carcinoma. Int J Radiat Oncol Biol Phys 2000;46:541-549; and Jeremic B, Nguyen-Tan PF, Bamberg M. Elective neck irradiation in locally advanced squamous cell carcinoma of the maxillary sinus: a review. J Cancer Res Clin Oncol 2002;128:235-238.)
[6] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

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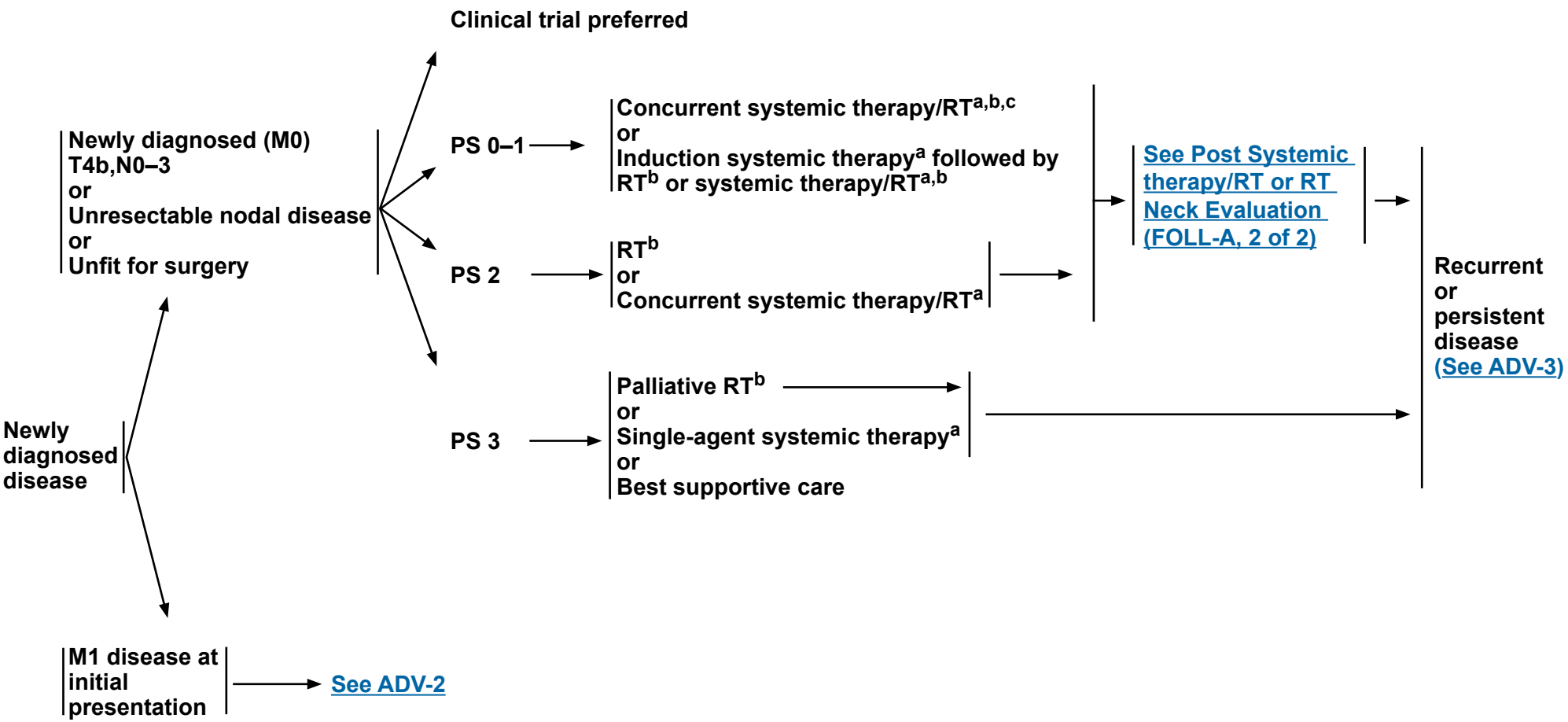
DIAGNOSIS

TREATMENT OF HEAD AND NECK CANCER



PS = Performance Status (Eastern Cooperative Oncology Group [ECOG])

[a] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[b] See Principles of Radiation Therapy (ADV-A).
[c] When using concurrent systemic therapy/RT, the preferred agent is cisplatin (category 1). See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).

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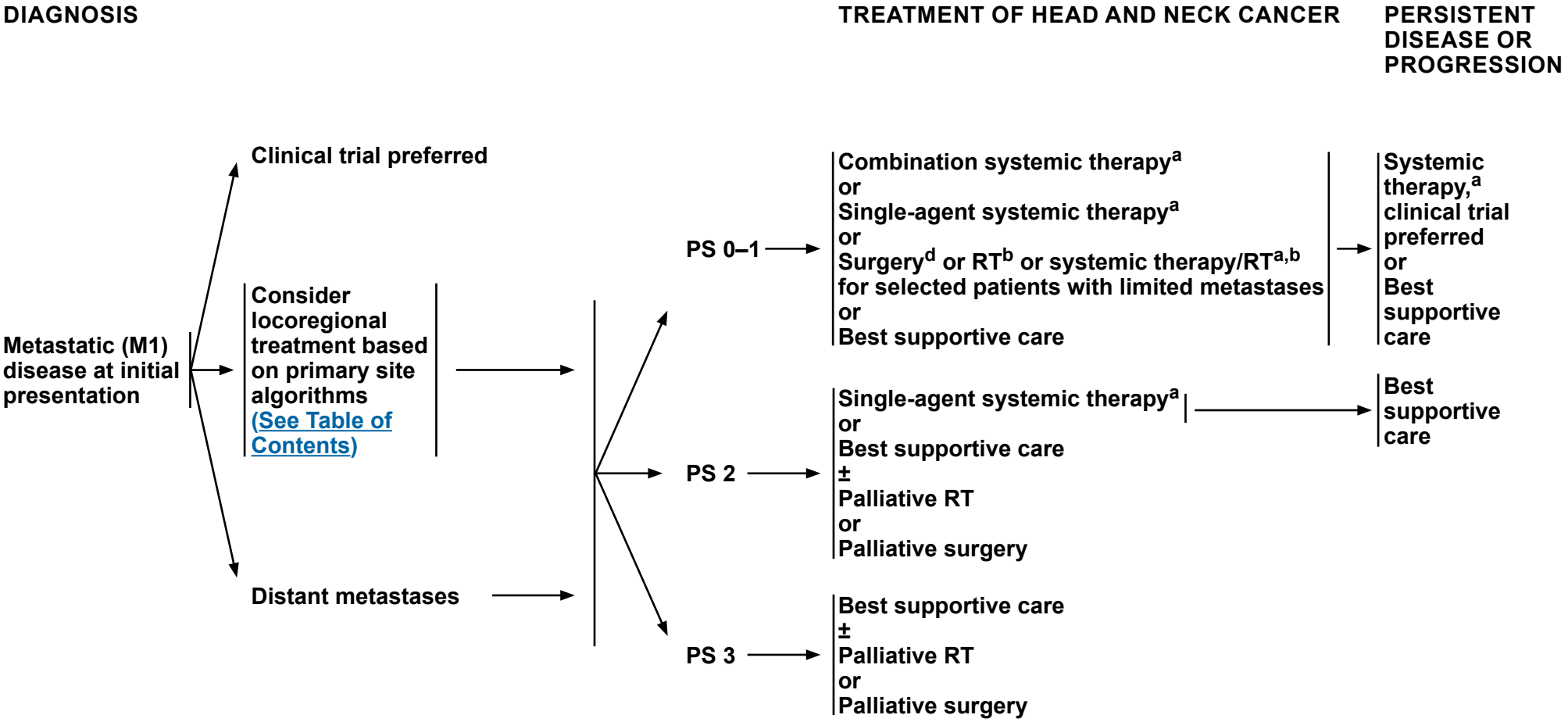

[a] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[b] See Principles of Radiation Therapy (ADV-A).
[d] See Principles of Surgery (SURG-A).

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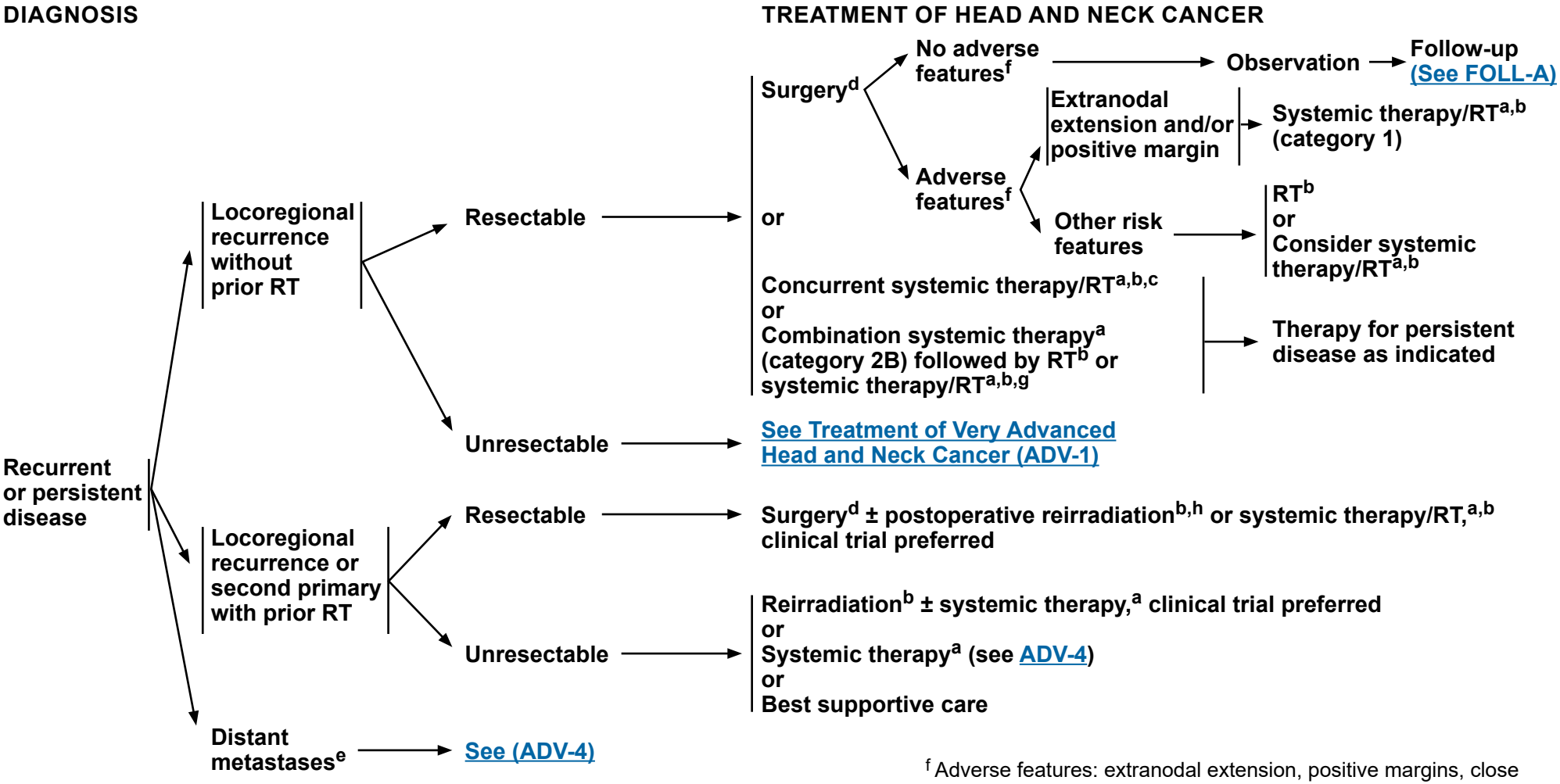

[a] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[b] See Principles of Radiation Therapy (ADV-A).
[c] When using concurrent systemic therapy/RT, the preferred agent is cisplatin (category 1). See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[d] See Principles of Surgery (SURG-A).
[e] Consider palliative RT as clinically indicated (eg, bone metastases). (See RAD-A).
[f] Adverse features: extranodal extension, positive margins, close margins, pT3 or pT4 primary, pN2 or pN3 nodal disease, perineural invasion, vascular invasion, lymphatic invasion (See Discussion).
[g] Combination systemic therapy followed by RT or systemic therapy/RT may be considered for cytoreduction or symptom control followed by local therapy as indicated.
[h] Reirradiation should be limited to a highly select subset of patients (Janot F, et al. J Clin Oncol 2008;26:5518-5523).

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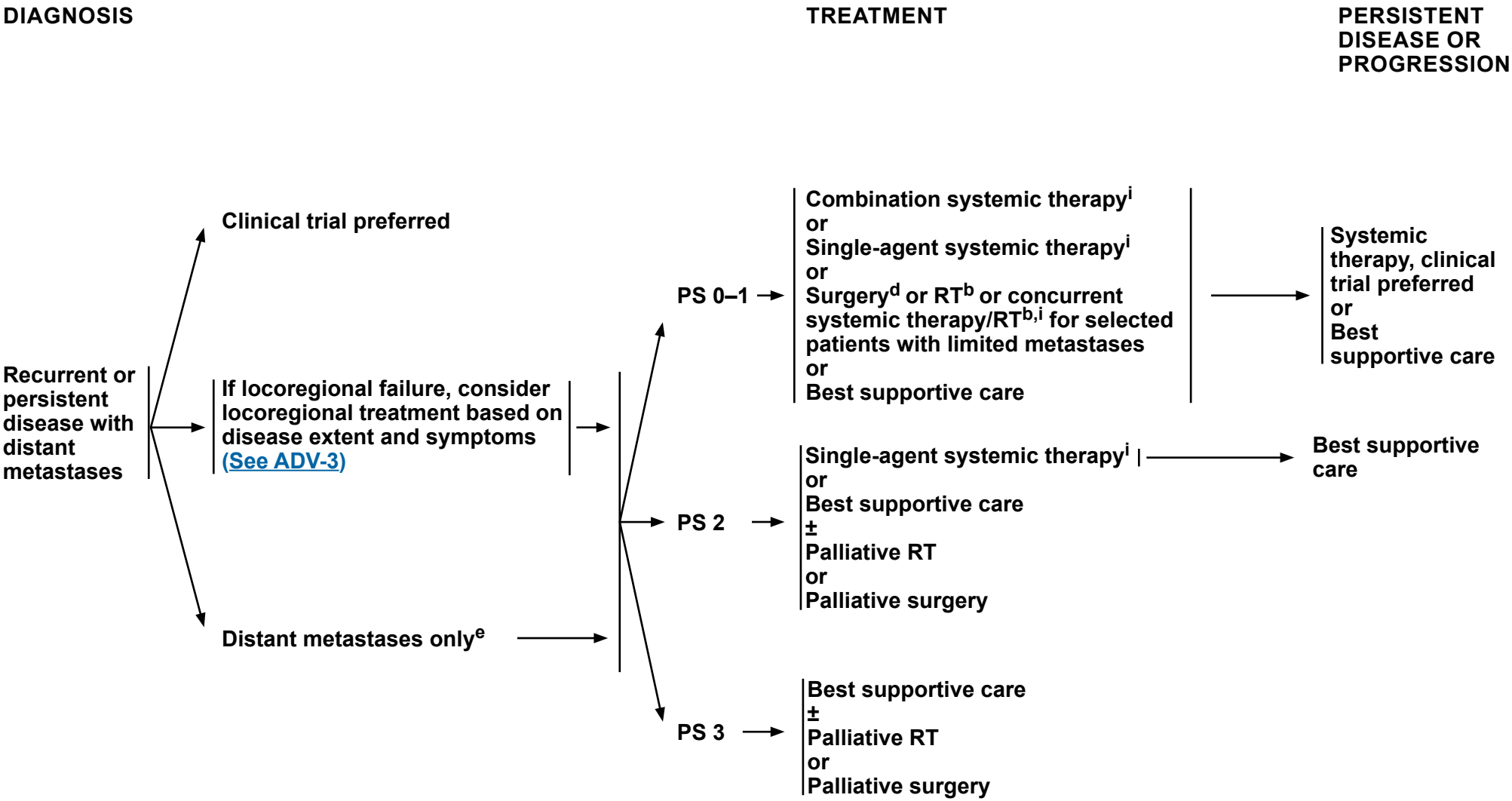

[b] See Principles of Radiation Therapy (ADV-A).
[d] See Principles of Surgery (SURG-A).
[e] Consider palliative RT as clinically indicated (eg, bone metastases). (See RAD-A).
[i] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A) or See Systemic Therapy for Nasopharyngeal Cancers (NASO-B).

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PRINCIPLES OF RADIATION THERAPY[1,2]

CONCURRENT SYSTEMIC THERAPY/RT[3] (PREFERRED FOR PATIENTS ELIGIBLE FOR CHEMOTHERAPY):

- **PTV**
  - **High risk: typically 70 Gy (2.0 Gy/fraction)**
  - **Low to intermediate risk: Sites of suspected subclinical spread**
    - **44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[4]**

SYSTEMIC THERAPY/RT:[3]

Based on published data, concurrent systemic therapy/RT most commonly uses conventional fractionation at 2.0 Gy per fraction to a typical dose of 70 Gy in 7 weeks with single-agent cisplatin given every 3 weeks at 100 mg/m^2; 2–3 cycles of chemotherapy are used depending on the radiation fractionation scheme (RTOG 0129) (Ang KK, Harris J, Wheeler R, et al. Human papillomavirus and survival of patients with oropharyngeal cancer. N Engl J Med 2010;363:24-35). When carboplatin and 5-FU are used, then the recommended regimen is standard fractionation plus 3 cycles of chemotherapy [Bourhis J, Sire C, Graff P, et al. Concomitant chemoradiotherapy versus acceleration of radiotherapy with or without concomitant chemotherapy in locally advanced head and neck carcinoma (GORTEC 99-02): an open-label phase 3 randomised trial. Lancet Oncol 2012;13:145-53]. Other fraction sizes (eg, 1.8 Gy, conventional), multiagent chemotherapy, other dosing schedules of cisplatin, or altered fractionation with chemotherapy are efficacious, and there is no consensus on the optimal approach.[5] Data indicate that accelerated fractionation does not offer improved efficacy over conventional fractionation.[6,7] In general, the use of concurrent systemic therapy/RT carries a high toxicity burden; altered fractionation or multiagent chemotherapy will likely further increase the toxicity burden. For any systemic therapy/RT approach, close attention should be paid to published reports for the specific chemotherapy agent, dose, and schedule of administration. Systemic therapy/RT should be performed by an experienced team and should include substantial supportive care.

[1] See Principles of Radiation Techniques (RAD-A) and Discussion.

[2] In general, the reirradiated population of head and neck cancer patients described in current literature represents a diverse but highly selected group of patients treated in centers where there is a high level of expertise and systems in place for managing acute and long-term toxicities. When the goal of treatment is curative and surgery is not an option, reirradiation strategies can be considered for patients who: develop locoregional failures or second primaries at ≥6 months after the initial radiotherapy; can receive additional doses of radiotherapy of at least 60 Gy; and can tolerate concurrent chemotherapy. Organs at risk for toxicity should be carefully analyzed through review of dose-volume histograms, and consideration for acceptable doses should be made on the basis of time interval since original radiotherapy, anticipated volumes to be included, and patient's life expectancy. For reirradiation dosing, see Principles of Radiation Techniques (RAD-A). Proton therapy can be considered when normal tissue constraints cannot be met by photon-based therapy. (Takiar V, Garden AS, Ma D, et al. Reirradiation of head and neck cancers with intensity modulated radiation therapy: Outcomes and analyses. Int J Radiat Oncol Biol Phys 2016;95:1117-1131.)

[3] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).

[4] Suggest 44–50 Gy in 3D conformal RT and sequentially planned IMRT or 54–63 Gy with IMRT dose painting technique (dependent on dose per fraction).

[5] RTOG 0522: a randomized phase III trial of concurrent accelerated radiation and cisplatin versus concurrent accelerated radiation, cisplatin, and cetuximab [followed by surgery for selected patients] for stage III and IV head and neck carcinomas. Clin Adv Hematol Oncol 2007;5:79-81.

[6] Ang K, Zhang Q, Wheeler RH, et al. A phase III trial (RTOG 0129) of two radiation-cisplatin regimens for head and neck carcinomas (HNC): Impact of radiation and cisplatin intensity on outcome [abstract]. J Clin Oncol 2010;28(suppl 15):Abstract 5507.

[7] Bourhis J, Sire C, Graff P, et al. Concomitant chemoradiotherapy versus acceleration of radiotherapy with or without concomitant chemotherapy in locally advanced head and neck carcinoma (GORTEC 99-02): an open-label phase 3 randomised trial. Lancet Oncol 2012;13:145-153.

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

PRINCIPLES OF RADIATION THERAPY[1,2]

DEFINITIVE:

RT Alone

- **PTV**
  - **High risk: Primary tumor and involved lymph nodes [this includes possible local subclinical infiltration at the primary site and at the high-risk level lymph node(s)]**
    - ◊ **Fractionation:**
      - **70–72 Gy (2.0 Gy/fraction) daily Monday–Friday in 7–7.5 weeks[8]**
      - **Concomitant boost accelerated RT:**
        - **72 Gy/6 weeks (1.8 Gy/fraction, large field; 1.5 Gy boost as second daily fraction during last 12 treatment days)**
        - **66–70 Gy (2.0 Gy/fraction; 6 fractions/wk accelerated)**
      - **Hyperfractionation: 81.6 Gy/7 weeks (1.2 Gy/fraction, twice daily)**
      - **Modified fractionation: total dose >70 Gy and treatment course <7 weeks**
  - **Low to intermediate risk: sites of suspected subclinical spread**
    - ◊ **44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[4]**

Either IMRT or 3D conformal RT is recommended.

POSTOPERATIVE:

RT or Concurrent Systemic Therapy/RT[3,9-11]

- **Preferred interval between resection and postoperative RT is ≤6 weeks.**
- **PTV**
  - **High risk: Adverse features such as positive margins (See footnote f on ADV-3)**
    - ◊ **60–66 Gy (2.0 Gy/fraction); daily Monday–Friday in 6–6.5 weeks**
  - **Low to intermediate risk: sites of suspected subclinical spread**
    - ◊ **44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[4]**

[1] See Principles of Radiation Techniques (RAD-A) and Discussion.

[2] In general, the reirradiated population of head and neck cancer patients described in current literature represents a diverse but highly selected group of patients treated in centers where there is a high level of expertise and systems in place for managing acute and long-term toxicities. When the goal of treatment is curative and surgery is not an option, reirradiation strategies can be considered for patients who: develop locoregional failures or second primaries at ≥6 months after the initial radiotherapy; can receive additional doses of radiotherapy of at least 60 Gy; and can tolerate concurrent chemotherapy. Organs at risk for toxicity should be carefully analyzed through review of dose-volume histograms, and consideration for acceptable doses should be made on the basis of time interval since original radiotherapy, anticipated volumes to be included, and patient's life expectancy. For reirradiation dosing, see Principles of Radiation Techniques (RAD-A). Proton therapy can be considered when normal tissue constraints cannot be met by photon-based therapy. (Takiar V, Garden AS, Ma D, et al. Reirradiation of head and neck cancers with intensity modulated radiation therapy: Outcomes and analyses. Int J Radiat Oncol Biol Phys 2016;95:1117-1131.)

[3] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).

[4] Suggest 44–50 Gy in 3D conformal RT and sequentially planned IMRT or 54–63 Gy with IMRT dose painting technique (dependent on dose per fraction).

[8] For doses >70 Gy, some clinicians feel that the fractionation should be slightly modified (eg, <2.0 Gy/fraction for at least some of the treatment) to minimize toxicity. An additional 2–3 doses can be added depending on clinical circumstances.

[9] Bernier J, Domenge C, Ozsahin M, et al. Postoperative irradiation with or without concomitant chemotherapy for locally advanced head and neck cancer. N Engl J Med 2004;350:1945-1952.

[10] Cooper JS, Pajak TF, Forastiere AA, et al. Postoperative concurrent radiotherapy and chemotherapy for high-risk squamous-cell carcinoma of the head and neck. N Engl J Med 2004;350:1937-1944.

[11] Bernier J, Cooper JS, Pajak TF, et al. Defining risk levels in locally advanced head and neck cancers: A comparative analysis of concurrent postoperative radiation plus chemotherapy trials of the EORTC (#22931) and RTOG (#9501). Head Neck 2005;27:843-850.

Note: All recommendations are category 2A unless otherwise indicated.
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Occult Primary

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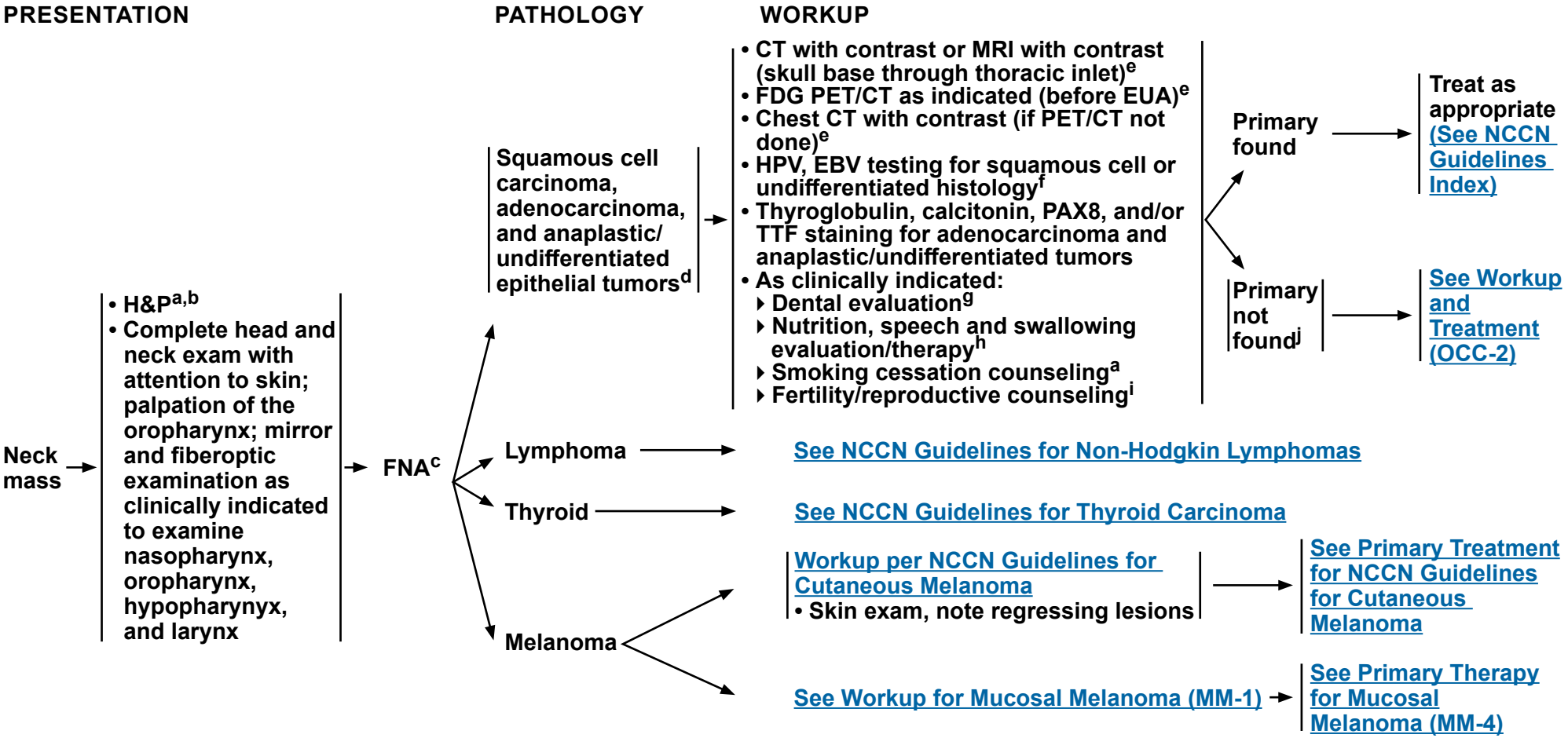

[a] H&P should include documentation and quantification (pack years smoked) of tobacco use history. All current smokers should be advised to quit smoking, and former smokers should be advised to remain abstinent from smoking. For additional cessation support, refer to the Patient/Provider Smoking Cessation Resources in the NCCN Guidelines for Smoking Cessation.

[b] Screen for depression (See NCCN Guidelines for Distress Management).

[c] Repeat FNA, core, or open biopsy may be necessary for uncertain or non-diagnostic histologies. Patient should be prepared for neck dissection at time of open biopsy, if indicated.

[d] Determined with appropriate immunohistochemical stains.

[e] See Principles of Imaging (IMG-A).

[f] Whether HPV or EBV positive status may help to define the radiation fields is being investigated [See Principles of Radiation Therapy (OCC-A) and Discussion].

[g] See Principles of Dental Evaluation and Management (DENT-A).

[h] See Principles of Nutrition: Management and Supportive Care (NUTR-A).

[i] See fertility and reproductive endocrine considerations in the NCCN Guidelines for Adolescent and Young Adult (AYA) Oncology.

[j] Strongly consider referral to a high-volume, multidisciplinary cancer center.

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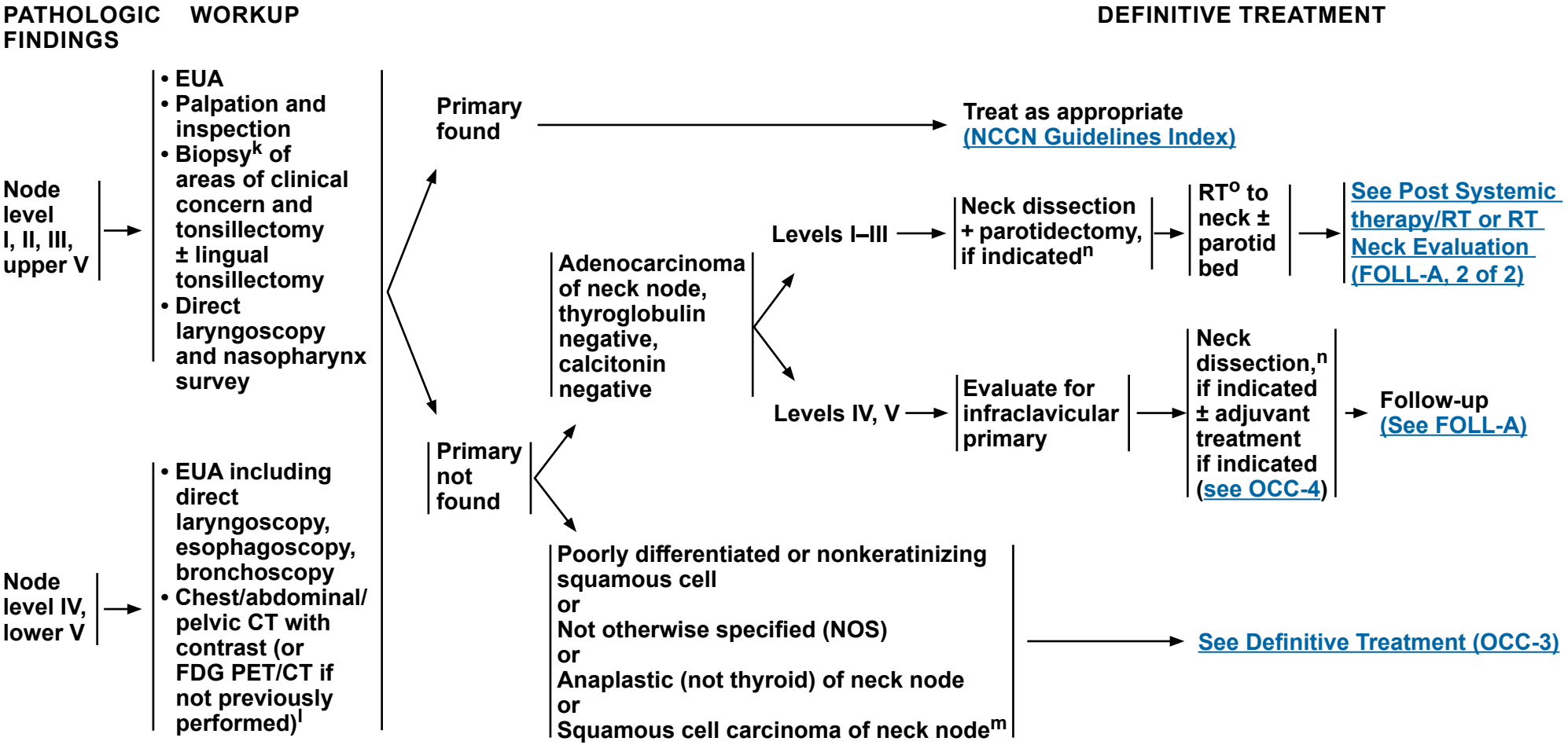

[k] Image-guided (US or CT) needle biopsy of cystic neck nodes may offer better diagnostic yield than FNA by palpation alone for initial diagnosis in this setting.
[l] See Principles of Imaging (IMG-A).
[m] HPV and EBV testing are suggested if not yet done.
[n] See Principles of Surgery (SURG-A).
[o] See Principles of Radiation Therapy (OCC-A).

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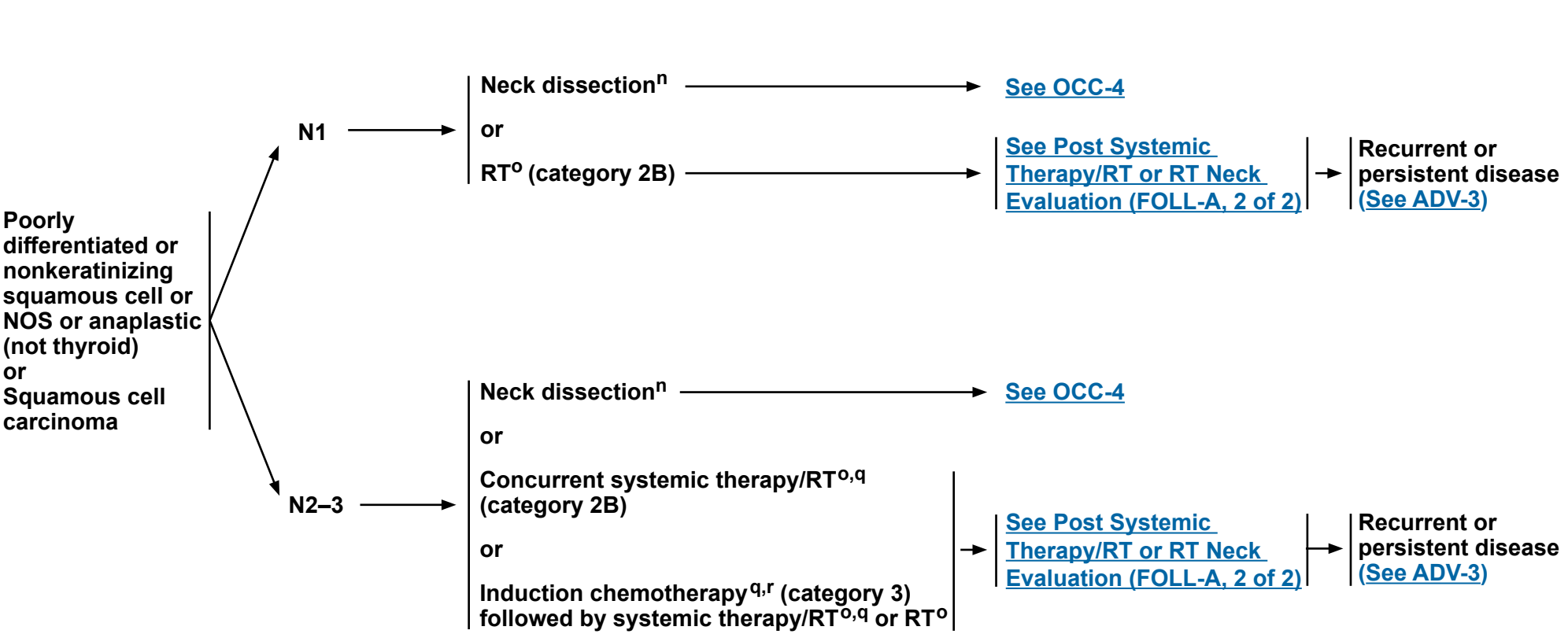

[n] See Principles of Surgery (SURG-A).
[o] See Principles of Radiation Therapy (OCC-A).
[p] Treatment for nasopharyngeal (NASO-2) and p16-positive oropharyngeal cancers (ORPHPV-3 and ORPHPV-4) may guide management of EBV-positive and p16-positive occult primary tumors.
[q] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[r] See Discussion on induction chemotherapy.

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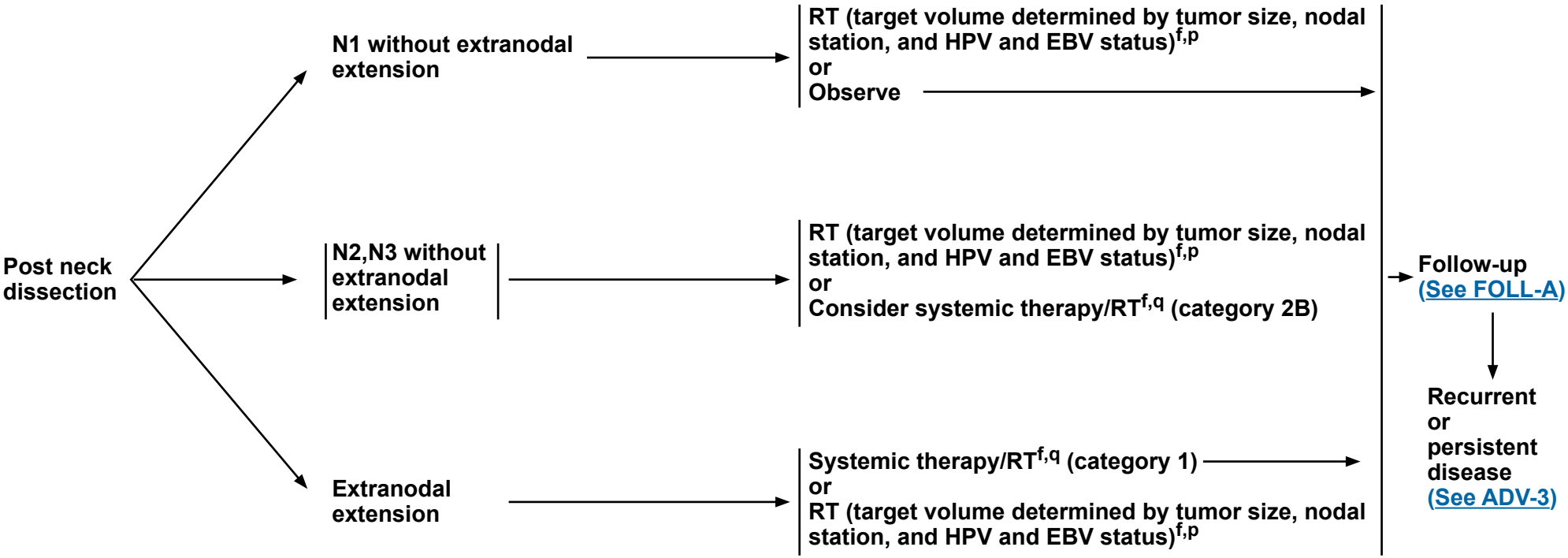
TREATMENT



[f] Whether HPV or EBV positive status may help to define the radiation fields is being investigated [See Principles of Radiation Therapy (OCC-A) and Discussion].
[p] Treatment for nasopharyngeal (NASO-2) and p16-positive oropharyngeal cancers (ORPHPV-3 and ORPHPV-4) may guide management of EBV-positive and p16-positive occult primary tumors.
[q] See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).

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PRINCIPLES OF RADIATION THERAPY[1,2]

DEFINITIVE:

RT Alone

- **PTV**
  - **High risk: Involved lymph nodes [this includes possible local subclinical infiltration at the high-risk level lymph node(s)]**
    - ◊ **Fractionation:**
      - **66 Gy (2.2 Gy/fraction) to 70 Gy (2.0 Gy/fraction); daily Monday–Friday in 6–7 weeks[3]**
      - **Mucosal dosing: 50–66 Gy (2.0 Gy/fraction) to putative mucosal sites, depending on field size. Consider higher dose to 60–66 Gy to particularly suspicious areas**
  - **Low to intermediate risk: Sites of suspected subclinical spread**
    - ◊ **44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[4]**

CONCURRENT SYSTEMIC THERAPY/RT:[5,6]

- **PTV**
  - **High risk: typically 70 Gy (2.0 Gy/fraction)**
  - **Mucosal dosing: 50–60 Gy (2.0 Gy/fraction) to putative mucosal primary sites, depending on field size and use of chemotherapy. Consider higher dose to 60–66 Gy to particularly suspicious areas**
  - **Low to intermediate risk: 44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[4]**

Either IMRT or 3D conformal RT is recommended when targeting the pharyngeal axis to minimize the dose to critical structures. Use of proton therapy is an area of active investigation. Proton therapy may be considered when normal tissue constraints cannot be met by photon-based therapy.

[1]For squamous cell carcinoma, adenocarcinoma, and poorly differentiated carcinoma.
[2]See Principles of Radiation Techniques (RAD-A) and Discussion.
[3]For doses >70 Gy, some clinicians feel that the fractionation should be slightly modified (eg, <2.0 Gy/fraction for at least some of the treatment) to minimize toxicity. An additional 2–3 doses can be added depending on clinical circumstances.
[4]Suggest 44–50 Gy in 3D conformal RT and sequentially planned IMRT or 54–63 Gy with IMRT dose painting technique (dependent on dose per fraction).
[5]See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[6]Based on published data, concurrent systemic therapy/RT most commonly uses conventional fractionation at 2.0 Gy per fraction to a typical dose of 70 Gy in 7 weeks with single-agent cisplatin given every 3 weeks at 100 mg/m^2; 2–3 cycles of chemotherapy are used depending on the radiation fractionation scheme (RTOG 0129) (Ang KK, Harris J, Wheeler R, et al. Human papillomavirus and survival of patients with oropharyngeal cancer. N Engl J Med 2010;363:24-35). When carboplatin and 5-FU are used, the recommended regimen is standard fractionation plus 3 cycles of chemotherapy. (Bourhis J, Sire C, Graff P, et al. Concomitant chemoradiotherapy versus acceleration of radiotherapy with or without concomitant chemotherapy in locally advanced head and neck carcinoma (GORTEC 99-02): an open-label phase 3 randomised trial. Lancet Oncol 2012;13:145-153). Other fraction sizes (eg, 1.8 Gy, conventional), multiagent chemotherapy, other dosing schedules of cisplatin, or altered fractionation with chemotherapy are efficacious, and there is no consensus on the optimal approach. In general, the use of concurrent systemic therapy/RT carries a high toxicity burden; altered fractionation or multiagent chemotherapy will likely further increase the toxicity burden. For any systemic therapy/RT approach, close attention should be paid to published reports for the specific chemotherapy agent, dose, and schedule of administration. Systemic therapy/RT should be performed by an experienced team and should include substantial supportive care.

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PRINCIPLES OF RADIATION THERAPY[1,2]

POSTOPERATIVE:

RT or Concurrent Systemic Therapy/RT[5,7-10]

- **Preferred interval between resection and postoperative RT is ≤6 weeks**
- **PTV**
  - **High risk: Adverse features such as extranodal extension (See OCC-4)**
    - **Mucosal dose: 50–66 Gy (2.0 Gy/fraction) to putative mucosal sites, depending on field size. Consider higher dose to 60–66 Gy to particularly suspicious areas**
  - **Low to intermediate risk: Sites of suspected subclinical spread**
    - **44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[4]**

Either IMRT or 3D conformal RT is recommended when targeting the pharyngeal axis to minimize the dose to critical structures. Use of proton therapy is an area of active investigation. Proton therapy may be considered when normal tissue constraints cannot be met by photon-based therapy.

[1]For squamous cell carcinoma, adenocarcinoma, and poorly differentiated carcinoma.
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[4]Suggest 44–50 Gy in 3D conformal RT and sequentially planned IMRT or 54–63 Gy with IMRT dose painting technique (dependent on dose per fraction).
[5]See Principles of Systemic Therapy for Non-Nasopharyngeal Cancers (SYST-A).
[7]Bernier J, Domenge C, Ozsahin M, et al. Postoperative irradiation with or without concomitant chemotherapy for locally advanced head and neck cancer. N Engl J Med 2004;350:1945-1952.
[8]Cooper JS, Pajak TF, Forastiere AA, et al. Postoperative concurrent radiotherapy and chemotherapy for high-risk squamous-cell carcinoma of the head and neck. N Engl J Med 2004;350:1937-1944.
[9]Bernier J, Cooper JS, Pajak TF, et al. Defining risk levels in locally advanced head and neck cancers: A comparative analysis of concurrent postoperative radiation plus chemotherapy trials of the EORTC (#22931) and RTOG (#9501). Head Neck 2005;27:843-850.
[10]Cooper JS, Zhang Q, Pajak TF, et al. Long-term follow-up of the RTOG 9501/intergroup phase III trial: postoperative concurrent radiation therapy and chemotherapy in high-risk squamous cell carcinoma of the head and neck. Int J Radiat Oncol Biol Phys 2012;84:1198-1205.

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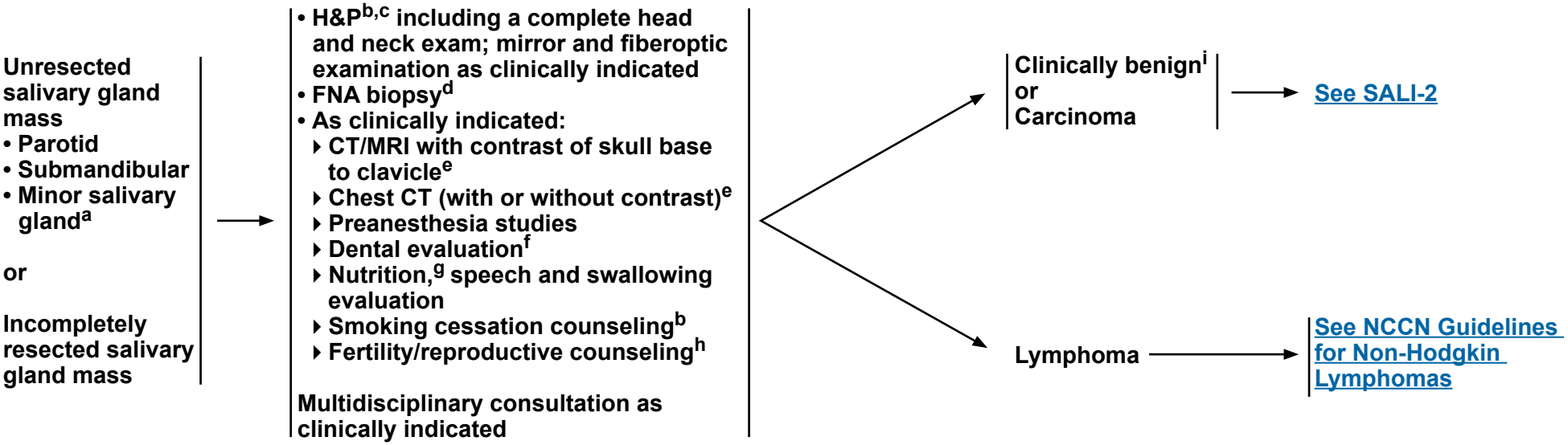
CLINICAL PRESENTATION

WORKUP



[a] Site and stage determine therapeutic approaches.
[b] H&P should include documentation and quantification (pack years smoked) of tobacco use history. All current smokers should be advised to quit smoking, and former smokers should be advised to remain abstinent from smoking. For additional cessation support, refer to the Patient/Provider Smoking Cessation Resources in the NCCN Guidelines for Smoking Cessation.
[c] Screen for depression (See NCCN Guidelines for Distress Management).
[d] Image-guided (US or CT) needle biopsy of cystic neck nodes may offer better diagnostic yield than FNA by palpation alone for initial diagnosis in this setting.
[e] See Principles of Imaging (IMG-A).
[f] See Principles of Dental Evaluation and Management (DENT-A).
[g] See Principles of Nutrition: Management and Supportive Care (NUTR-A).
[h] See fertility and reproductive endocrine considerations in the NCCN Guidelines for Adolescent and Young Adult (AYA) Oncology.
[i] Characteristics of a benign tumor include mobile superficial lobe, slow growth, painless, V and/or VII intact, and no neck nodes.

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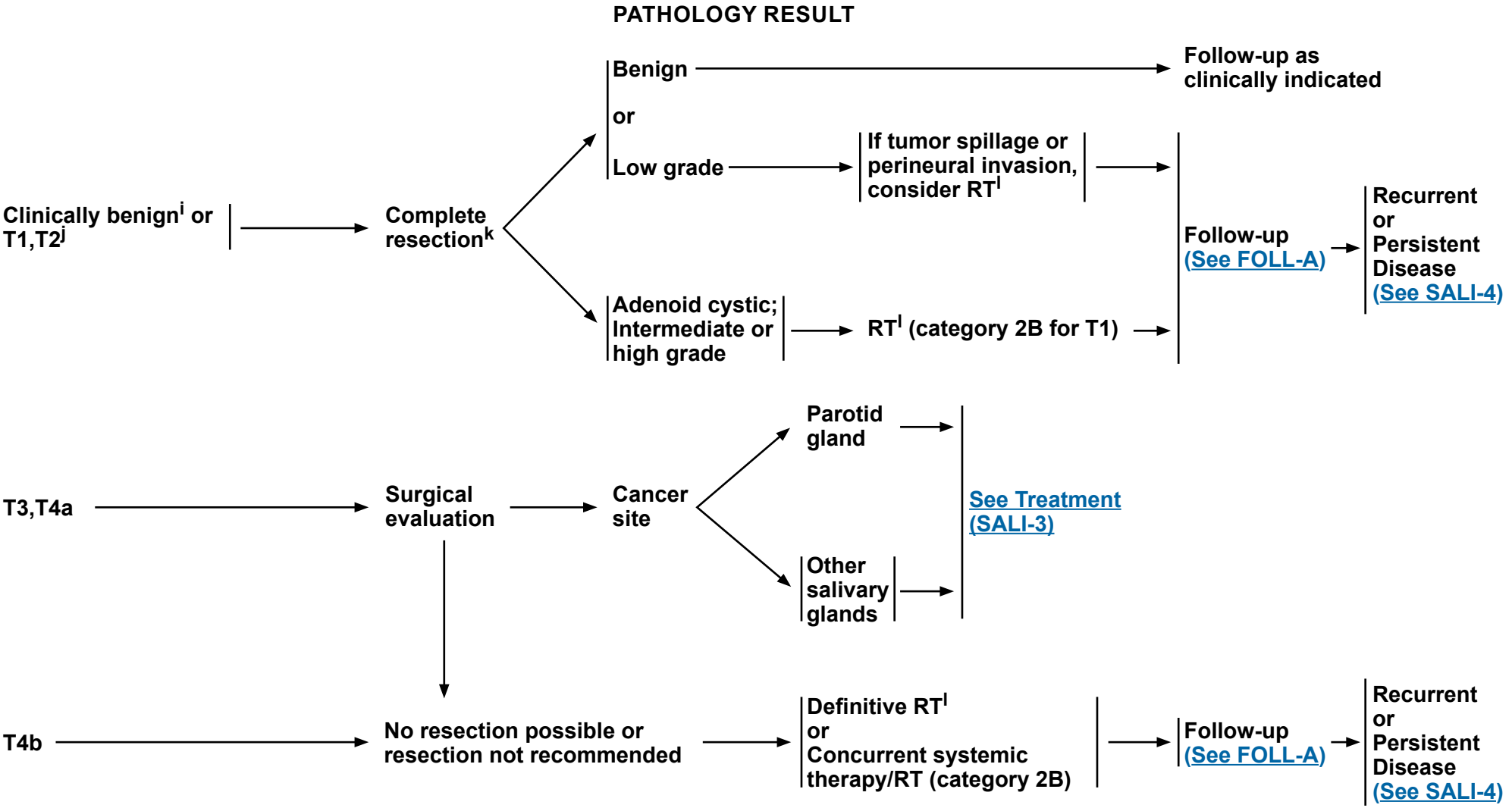
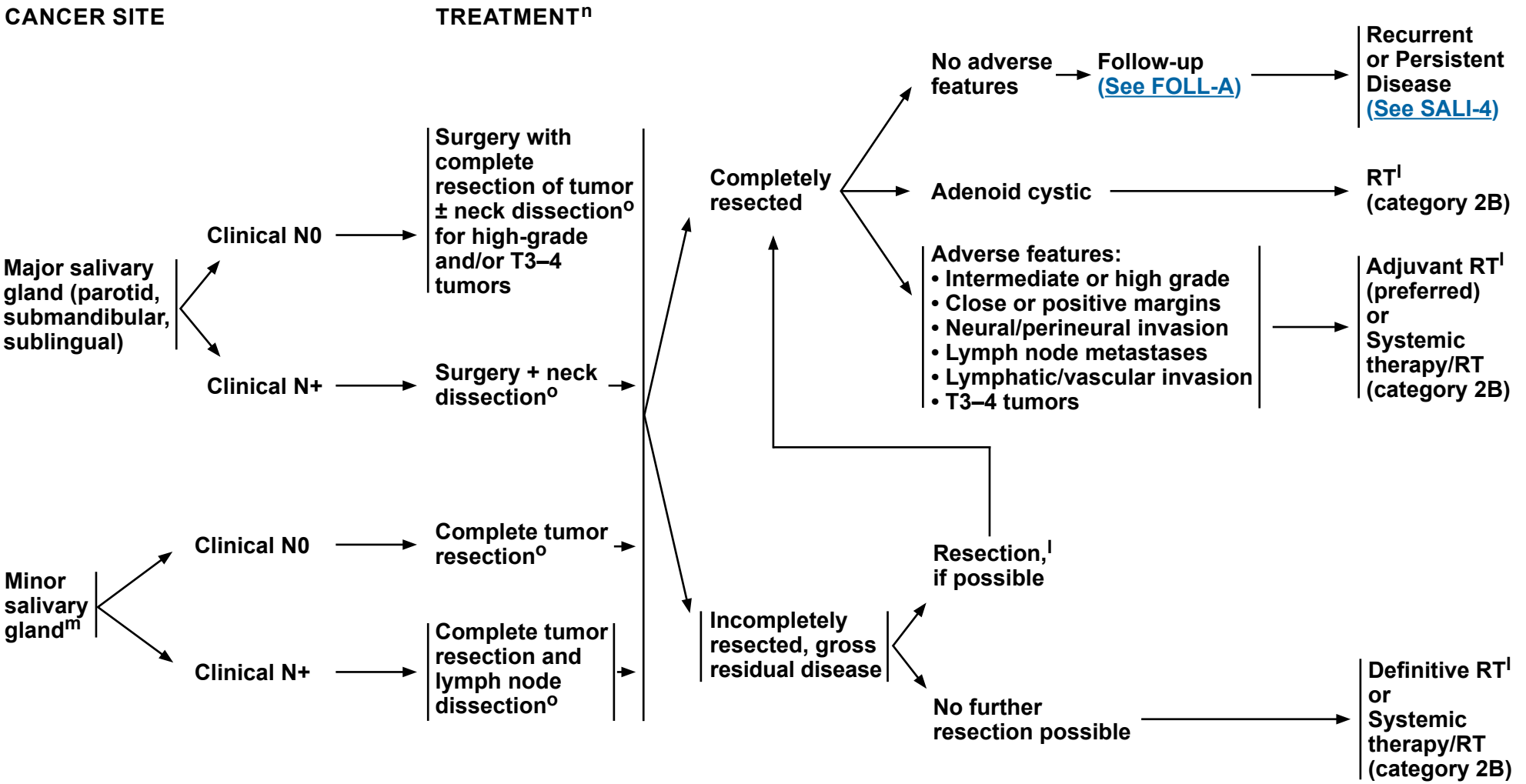


[i]Characteristics of a benign tumor include mobile superficial lobe, slow growth, painless, V and/or VII intact, and no neck nodes.
[j]If incidental N+ disease is present go to SALI-3.
[k]Resection of a clinically benign tumor includes: no enucleation of lateral lobe and intraoperative communication with pathologist if indicated.
[l]See Principles of Radiation Therapy (SALI-A).

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.



[l]See Principles of Radiation Therapy (SALI-A).
[m]For submandibular and sublingual gland tumors, complete gland and tumor resection is recommended.
[n]The facial nerve should be preserved if possible; strongly consider referral to a specialized center with reconstructive expertise.
[o]See Principles of Surgery (SURG-A).

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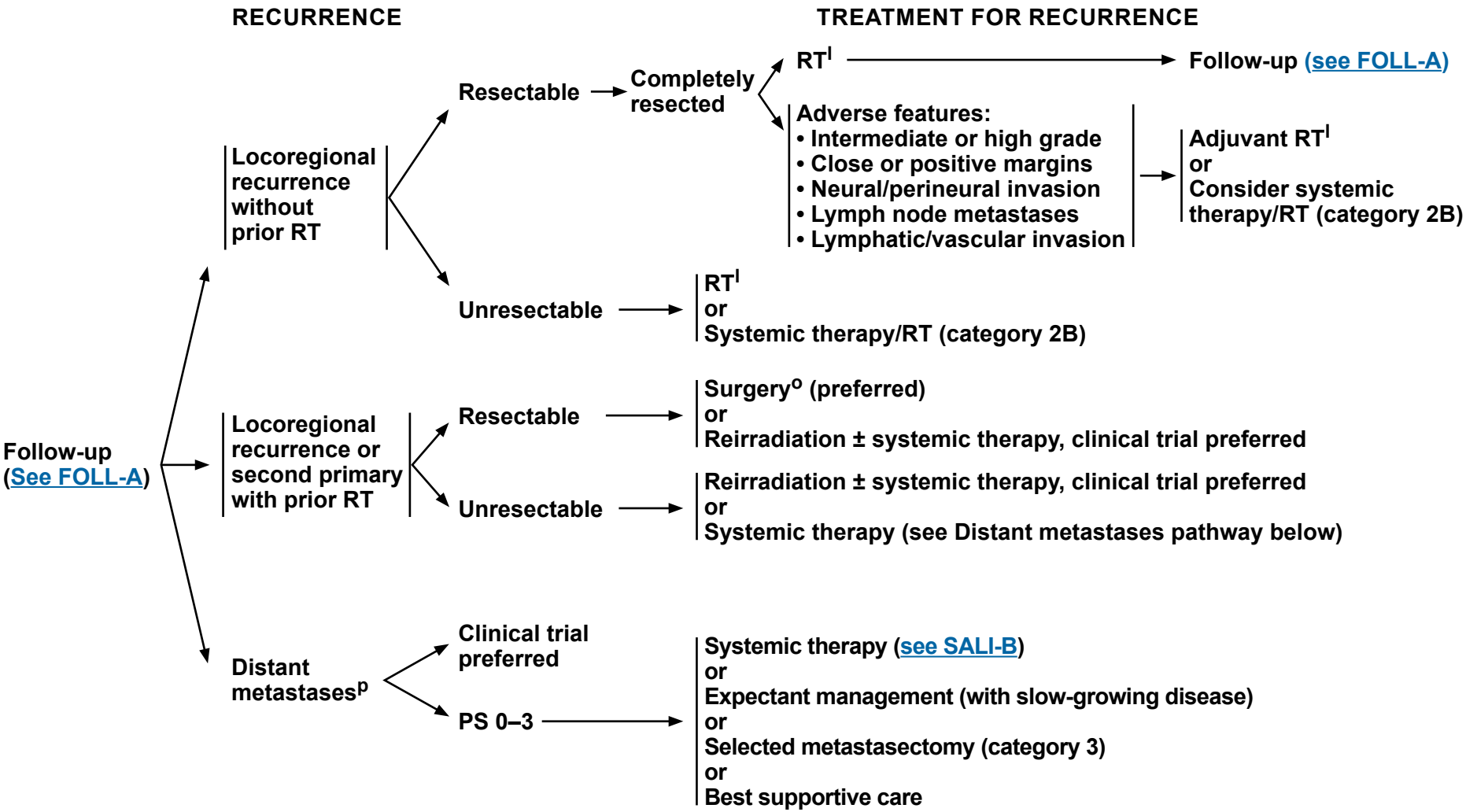

[l] See Principles of Radiation Therapy (SALI-A).
[o] See Principles of Surgery (SURG-A).
[p] For salivary ductal carcinomas and adenocarcinomas, check androgen receptor (AR) status and HER2 status prior to treatment for distant metastases. Check NTRK status for mammary analog secretory carcinoma (MASC).

PS = Performance Status (ECOG)

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PRINCIPLES OF RADIATION THERAPY[1,2,3]

DEFINITIVE:

RT Alone or Concurrent Systemic Therapy/RT

- **Photon or photon/electron therapy or highly conformal radiation therapy techniques**
- **PTV:**
  - **High risk: Primary tumor and involved lymph nodes [this includes possible local subclinical infiltration at the primary and at the high-risk level lymph node(s)]**
    - ◊ **Fractionation: 66 Gy (2.0 Gy/fraction) to 70–70.2 Gy (1.8–2.0 Gy/fraction); daily Monday–Friday in 6–7 weeks[4]**
  - **Low to intermediate risk: Sites of suspected subclinical spread**
    - ◊ **44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[5]**

POSTOPERATIVE RT:

RT Alone or Concurrent Systemic Therapy/RT

- **Preferred interval between resection and postoperative RT is ≤6 weeks**
- **Photon or photon/electron therapy**
- **PTV**
  - **High risk: Adverse features such as positive margins (see SALI-3)**
    - ◊ **60–66 Gy (2.0 Gy/fraction); daily Monday–Friday in 6–7 weeks**
  - **Low to intermediate risk: Sites of suspected subclinical spread**
    - ◊ **44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)[5]**

Either IMRT or 3D conformal RT is recommended. Proton therapy can be considered when normal tissue constraints cannot be met by photon-based therapy.

[1]See Principles of Radiation Techniques (RAD-A) and Discussion.

[2]Neutron therapy was historically considered a promising solution for unresectable salivary gland cancers, but this therapy is currently offered at only one center in the United States. Pfister DG, Spencer S, Brizel DM, et al. NCCN Head and Neck Cancers, Version 1.2015. J Natl Compr Canc Netw 2015;13:847-855.

[3]In general, the reirradiated population of head and neck cancer patients described in current literature represents a diverse but highly selected group of patients treated in centers where there is a high level of expertise and systems in place for managing acute and long-term toxicities. When the goal of treatment is curative and surgery is not an option, reirradiation strategies can be considered for patients who: develop locoregional failures or second primaries at ≥6 months after the initial radiotherapy; can receive additional doses of radiotherapy of at least 60 Gy; and can tolerate concurrent chemotherapy. Organs at risk for toxicity should be carefully analyzed through review of dose-volume histograms, and consideration for acceptable doses should be made on the basis of time interval since original radiotherapy, anticipated volumes to be included, and patient's life expectancy. For reirradiation dosing, see Principles of Radiation Techniques (RAD-A). Proton therapy can be considered when normal tissue constraints cannot be met by photon-based therapy. (Takiar V, Garden AS, Ma D, et al. Reirradiation of head and neck cancers with intensity modulated radiation therapy: Outcomes and analyses. Int J Radiat Oncol Biol Phys 2016;95:1117-1131.)

[4]For doses >70 Gy, some clinicians feel that the fractionation should be slightly modified (eg, <2.0 Gy/fraction for at least some of the treatment) to minimize toxicity. An additional 2–3 doses can be added depending on clinical circumstances.

[5]Suggest 44–50 Gy in 3D conformal RT and sequentially planned IMRT or 54–63 Gy with IMRT dose painting technique (dependent on dose per fraction).

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SYSTEMIC THERAPY FOR SALIVARY GLAND TUMORS

Recurrent, Unresectable, or Metastatic Salivary Gland Tumors (with no surgery or RT option)

- **The choice of systemic therapy should be individualized based on patient characteristics (eg, PS, goals of therapy).**

Preferred Regimens

- None

Other Recommended Regimens

- Chemotherapy (eg, cisplatin/vinorelbine, or cisplatin/doxorubicin/cyclophosphamide [category 2B])

Useful in Certain Circumstances

- Androgen receptor therapy for AR+ tumors
  - Leuprolide[1]
  - Bicalutamide[1,2]
- NTRK therapy for NTRK gene fusion-positive tumors
  - Larotrectinib[3,4]
  - Entrectinib[5]
- HER2 targeted therapy for HER2+ tumors[a]
  - Trastuzumab[6]
  - Ado-trastuzumab emtansine (TDM-1)[7]
  - Trastuzumab/pertuzumab[8]
  - Docetaxel/trastuzumab[9]
- Lenvatinib (category 2B) for adenoid cystic carcinoma[10]
- Axitinib (category 2B)[11]
- Sorafenib (category 2B)[12]
- Pembrolizumab (for TMB-H tumors)[13]

[a] Refer to ASCO/CAP guidelines for HER2 testing. (Wolff AC, Hammond MEH, Allison KH, et al. Human Epidermal Growth Factor Receptor 2 Testing in Breast Cancer: American Society of Clinical Oncology/College of American Pathologists Clinical Practice Guideline Focused Update. J Clin Oncol. 2018;36(20):2105-2122.)

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Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

References

SYSTEMIC THERAPY FOR SALIVARY GLAND TUMORS

[1] Fushimi C, Tada Y, Takahashi H, et al. A prospective phase II study of combined androgen blockade in patients with androgen receptor-positive metastatic or locally advanced unresectable salivary gland carcinoma. Ann Oncol 2018;29:979-984.
[2] Boon E, van Boxtel W, Buter J, et al. Androgen deprivation therapy for androgen receptor-positive advanced salivary duct carcinoma: a nationwide case series of 35 patients in the Netherlands. Head Neck 2018;40:605-613.
[3] Drilon A, Laetsch TW, Kummar S, et al. Efficacy of larotrectinib in TRK fusion-positive cancers in adults and children. N Engl J Med 2018;378:731-739.
[4] Hong DS, Bauer TM, Lee JJ, et al. Larotrectinib in adult patients with solid tumours: a multi-centre, open-label, phase I dose-escalation study. Ann Oncol 2019;30:325-331.
[5] Doebele RC, Drilon A, Paz-Ares L, et al. Entrectinib in patients with advanced or metastatic NTRK fusion-positive solid tumours: integrated analysis of three phase 1-2 trials. Lancet Oncol 2020;21:271-282.
[6] Thorpe LM, Schrock AB, Erlich RL, et al. Significant and durable clinical benefit from trastuzumab in 2 patients with HER2-amplified salivary gland cancer and a review of the literature. Head Neck 2017;39:E40-E44.
[7] Jhaveri KL, Wang XV, Makker V, et al. Ado-trastuzumab emtansine (T-DM1) in patients with HER2-amplified tumors excluding breast and gastric/gastroesophageal junction (GEJ) adenocarcinomas: results from the NCI-MATCH trial (EAY131) subprotocol Q. Ann Oncol 2019;30:1821-1830.
[8] Kurzrock R, Bowles DW, Kang H, et al. Targeted therapy for advanced salivary gland carcinoma based on molecular profiling: results from MyPathway, a phase IIa multiple basket study. Ann Oncol. 2020;31(3):412-421.
[9] Takahashi H, Tada Y, Saotome T, et al. Phase II Trial of Trastuzumab and Docetaxel in Patients With Human Epidermal Growth Factor Receptor 2-Positive Salivary Duct Carcinoma. J Clin Oncol. 2019;37(2):125-134.
[10] Tchekmedyian V, Sherman EJ, Dunn L, et al. Phase II study of lenvatinib in patients with progressive, recurrent or metastatic adenoid cystic carcinoma. J Clin Oncol 2019;37:1529-1537.
[11] Locati LD, Cavalieri S, Bergamini C, et al. Phase II trial with axitinib in recurrent and/or metastatic salivary gland cancers of the upper aerodigestive tract. Head Neck. 2019;41(10):3670-3676.
[12] Thomson DJ, Silva P, Denton K, et al. Phase II trial of sorafenib in advanced salivary adenoid cystic carcinoma of the head and neck. Head Neck. 2015;37(2):182-7.
[13] Marabelle A, Fakih M, Lopez J, et al. Association of tumour mutational burden with outcomes in patients with advanced solid tumours treated with pembrolizumab: prospective biomarker analysis of the multicohort, open-label, phase 2 KEYNOTE-158 study. Lancet Oncol 2020;21:1353-1365.

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PRESENTATION **WORKUP** **TREATMENT**

Biopsy confirms diagnosis of mucosal malignant melanoma[a]

WORKUP

- **H&P[b,c] including complete head and neck exam; mirror and fiberoptic examination as clinically indicated**
- **Verification of pathology using appropriate staining (HMB-45, S-100, Melan-A)**
- **CT with contrast and/or MRI with contrast to determine anatomic extent of disease, particularly for sinus disease[d]**
- **As clinically indicated:**
  - **Chest CT (with or without contrast)[d]**
  - **Consider FDG PET/CT or chest/abdominal/pelvic CT with contrast, and brain MRI (with and without contrast) to rule out metastatic disease[d]**
  - **Dental/prosthodontic evaluation[e]**
  - **Nutrition, speech and swallowing evaluation/therapy[f]**
  - **Smoking cessation counseling[a]**
  - **Fertility/reproductive counseling[g]**

Multidisciplinary consultation as clinically indicated

Sinus or nasal cavity mucosal melanoma → **See Primary Treatment (MM-2)**

Oral cavity, oropharynx, larynx, or hypopharynx mucosal melanoma → **See Primary Treatment (MM-3)**

[a] Image-guided (US or CT) needle biopsy of cystic neck nodes may offer better diagnostic yield than FNA by palpation alone for initial diagnosis in this setting.
[b] H&P should include documentation and quantification (pack years smoked) of tobacco use history. All current smokers should be advised to quit smoking, and former smokers should be advised to remain abstinent from smoking. For additional cessation support, refer to the Patient/Provider Smoking Cessation Resources in the NCCN Guidelines for Smoking Cessation.
[c] Screen for depression (See NCCN Guidelines for Distress Management).
[d] See Principles of Imaging (IMG-A).
[e] See Principles of Dental Evaluation and Management (DENT-A).
[f] See Principles of Nutrition: Management and Supportive Care (NUTR-A).
[g] See fertility and reproductive endocrine considerations in the NCCN Guidelines for Adolescent and Young Adult (AYA) Oncology.

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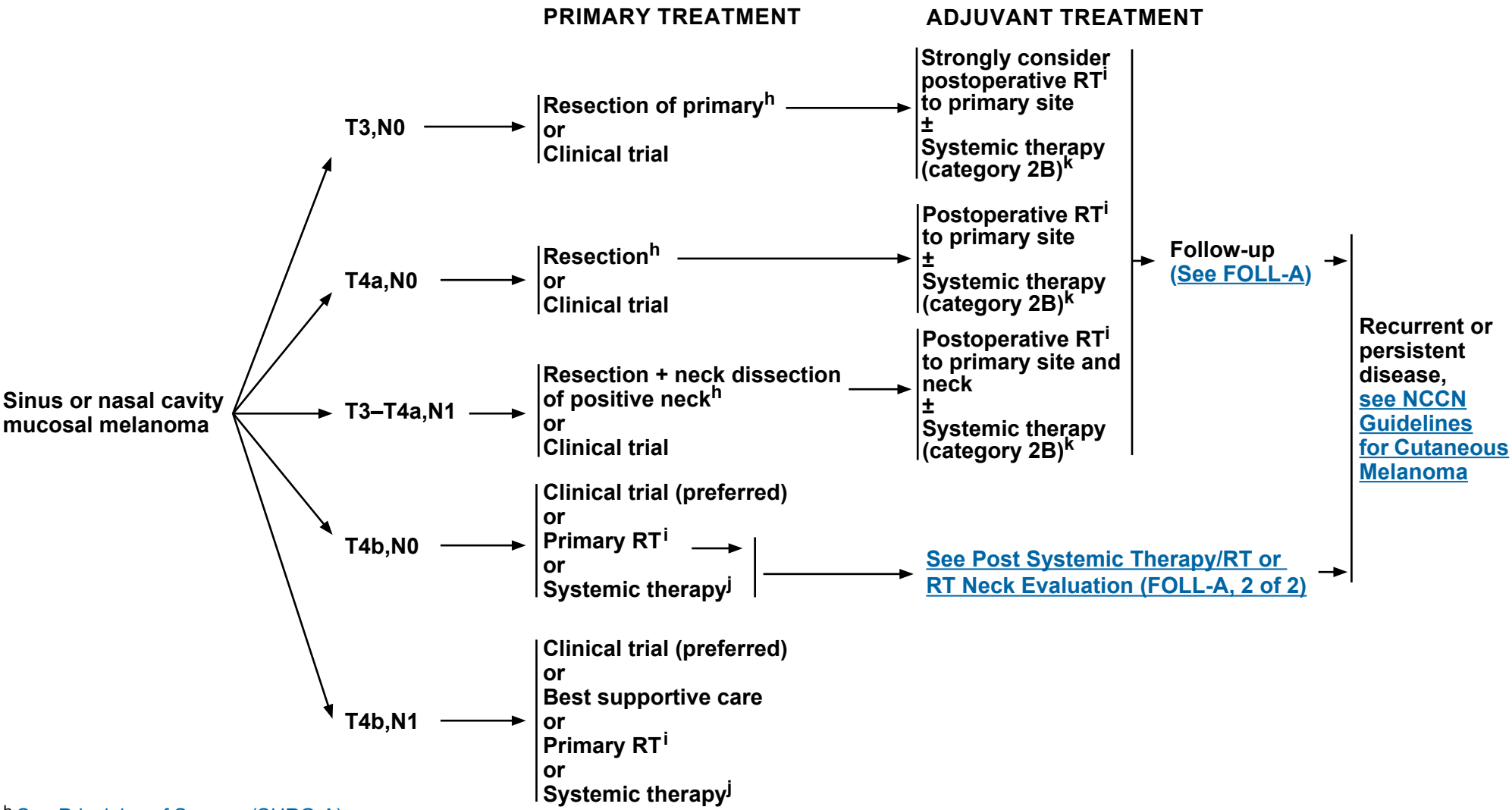

[h] See Principles of Surgery (SURG-A).
[i] See Principles of Radiation Therapy (MM-A).
[j] See Systemic Therapy for Metastatic or Unresectable Disease (page ME-I) from the NCCN Guidelines for Cutaneous Melanoma.
[k] While adjuvant systemic therapy may be used for mucosal melanoma, the data to support its use are far thinner than for cutaneous melanoma. Options may include nivolumab (category 2B) or cisplatin/temozolomide (category 2B). See Discussion.

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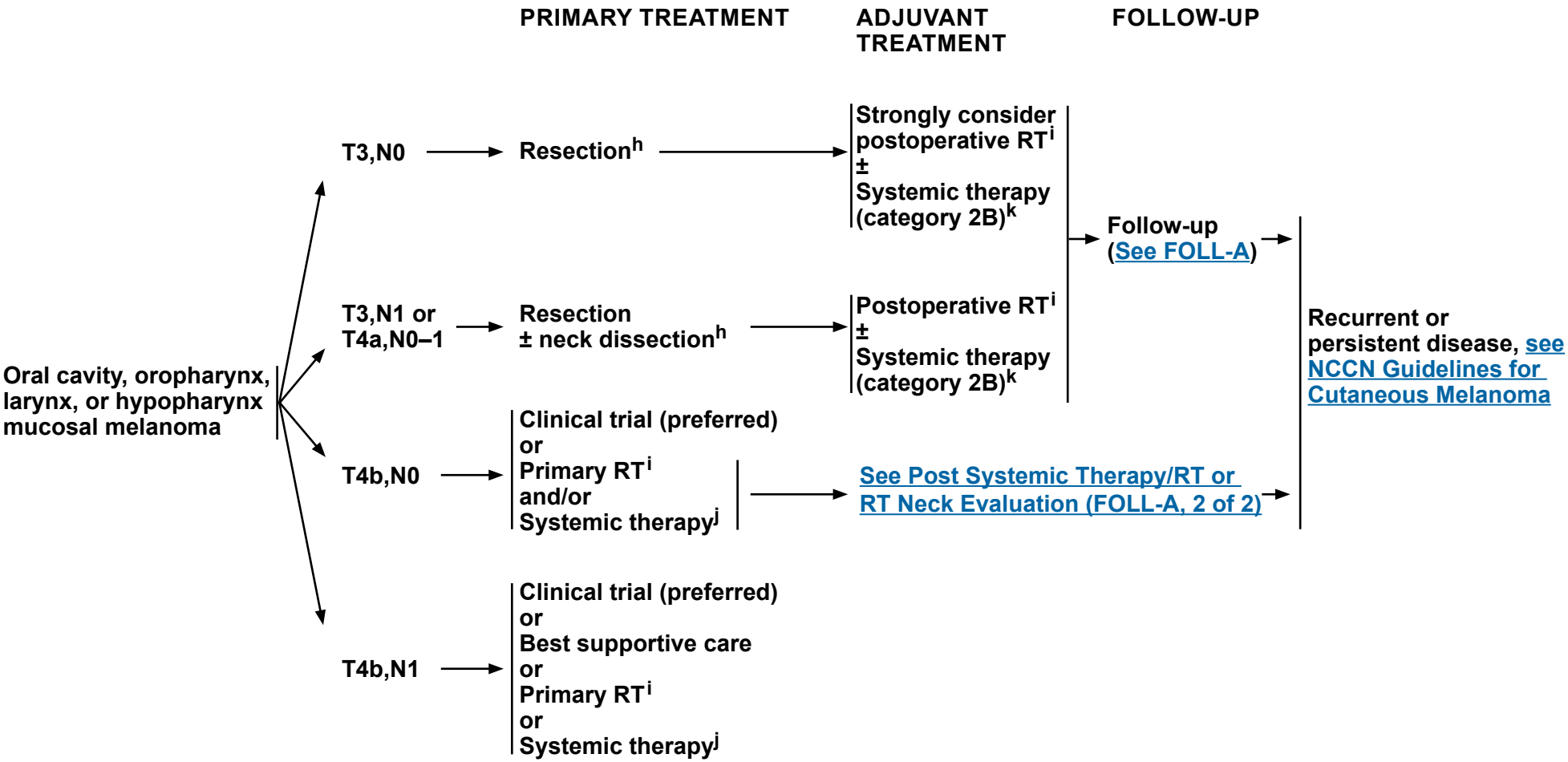

[h] See Principles of Surgery (SURG-A).
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PRIMARY THERAPY FOR OCCULT PRIMARY- MELANOMA (Also see NCCN Guidelines for Occult Primary)

[h] See Principles of Surgery (SURG-A).
[i] See Principles of Radiation Therapy (MM-A).
[l] High-risk: adverse features: >2 nodes, single node >3 cm, extranodal extension, recurrence in nodal basin after previous surgery.

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PRINCIPLES OF RADIATION THERAPY[1,2]

DEFINITIVE:

RT Alone (unresectable locally advanced melanoma):

- **PTV:**
  - **High risk: Primary tumor and involved lymph nodes [this includes possible local subclinical infiltration at the primary site and at the high-risk-level lymph node(s)]**
    - ◊ **66 Gy (2.2 Gy/fraction) to 70 Gy (2.0 Gy/fraction) daily Monday–Friday in 6–7 weeks**
  - **Low to intermediate risk: Sites suspected of subclinical spread**
    - ◊ **44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)**
- **Palliative RT doses and schedules may be considered.**
- **Optional dosing schedules may be considered.[3]**

POSTOPERATIVE:

RT:

- **Preferred interval between resection and postoperative RT is <6 weeks.**
- **PTV**
  - **High risk: adverse features >2 nodes, single node >3 cm, extranodal extension, recurrence in nodal basin after previous surgery[2]**
    - ◊ **60–66 Gy (2.0 Gy/fraction; daily Monday–Friday) in 6–6.5 weeks**
  - **Low to intermediate risk: sites of suspected subclinical spread**
    - ◊ **44–50 Gy (2.0 Gy/fraction) to 54–63 Gy (1.6–1.8 Gy/fraction)**
- **Optional dosing schedules may be considered.[3]**

Either IMRT or 3D conformal RT is recommended. Proton therapy can be considered when normal tissue constraints cannot be met by photon-based therapy.

[1] See Principles of Radiation Techniques (RAD-A) and Discussion.

[2] Recent studies suggest that increased toxicity may occur when RT is used in combination with BRAF inhibitors. [Anker CJ, Grossmann KF, Atkins MB, et al. Avoiding severe toxicity from combined BRAF inhibitor and radiation treatment: Consensus guidelines from the Eastern Cooperative Oncology Group (ECOG). Int J Radiat Oncol Biol Phys 2016;95:632-646.]

[3] Optional dose schedules include 48–50 Gy (2.4–3.0 Gy/fraction) and 30–36 Gy (6 Gy/fraction). (Burmeister BH, Henderson MA, Ainslie J, et al. Adjuvant radiotherapy versus observation alone for patients at risk of lymph-node field relapse after therapeutic lymphadenectomy for melanoma: a randomised trial. Lancet Oncol 2012;13:589-597; Ballo MT, Bonnen MD, Garden AS, et al. Adjuvant irradiation for cervical node metastases from melanoma. Cancer 2003;97:1789-1796; and Moreno MA, Roberts DB, Kupferman ME, et al. Mucosal melanoma of the nose and paranasal sinuses, a contemporary experience from the M. D. Anderson Cancer Center. Cancer 2010;116:2215-2223).

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FOLLOW-UP RECOMMENDATIONS[a]
(based on risk of relapse, second primaries, treatment sequelae, and toxicities)

- **H&P exam (including a complete head and neck exam; and mirror and fiberoptic examination):[b]**
  - **Year 1, every 1–3 mo**
  - **Year 2, every 2–6 mo**
  - **Years 3–5, every 4–8 mo**
  - **>5 years, every 12 mo**
- **Imaging (See Principles of Imaging, IMG-A)**
- **Thyroid-stimulating hormone (TSH) every 6–12 mo if neck irradiated.**
- **Dental evaluation[c] for oral cavity and sites exposed to significant intraoral radiation treatment.**
- **Consider EBV DNA monitoring for nasopharyngeal cancer (category 2B).**
- **Supportive care and rehabilitation:**
  - **Speech/hearing and swallowing evaluation[d] and rehabilitation as clinically indicated.**
  - **Nutritional evaluation and rehabilitation as clinically indicated until nutritional status is stabilized.[d]**
  - **Ongoing surveillance for depression (See NCCN Guidelines for Distress Management).**
  - **Smoking cessation[e] and alcohol counseling as clinically indicated.**
- **Integration of survivorship care and care plan within 1 year, complementary to ongoing involvement from a head and neck oncologist (See NCCN Guidelines for Survivorship).[f]**

[a]Most recurrences are reported by the patient.
[b]For mucosal melanoma and paranasal sinus cancers, a physical exam should include endoscopic inspection for paranasal sinus disease.
[c]See Principles of Dental Evaluation and Management (DENT-A).
[d]See Principles of Nutrition: Management and Supportive Care (NUTR-A).
[e]All current smokers should be advised to quit smoking, and former smokers should be advised to remain abstinent from smoking. For additional cessation support, refer to the Patient/Provider Smoking Cessation Resources in the NCCN Guidelines for Smoking Cessation.
[f]Cohen EE, LaMonte SJ, Erb NL, et al. American Cancer Society Head and Neck Cancer Survivorship Care Guideline. CA Cancer J Clin 2016;66:203-239.

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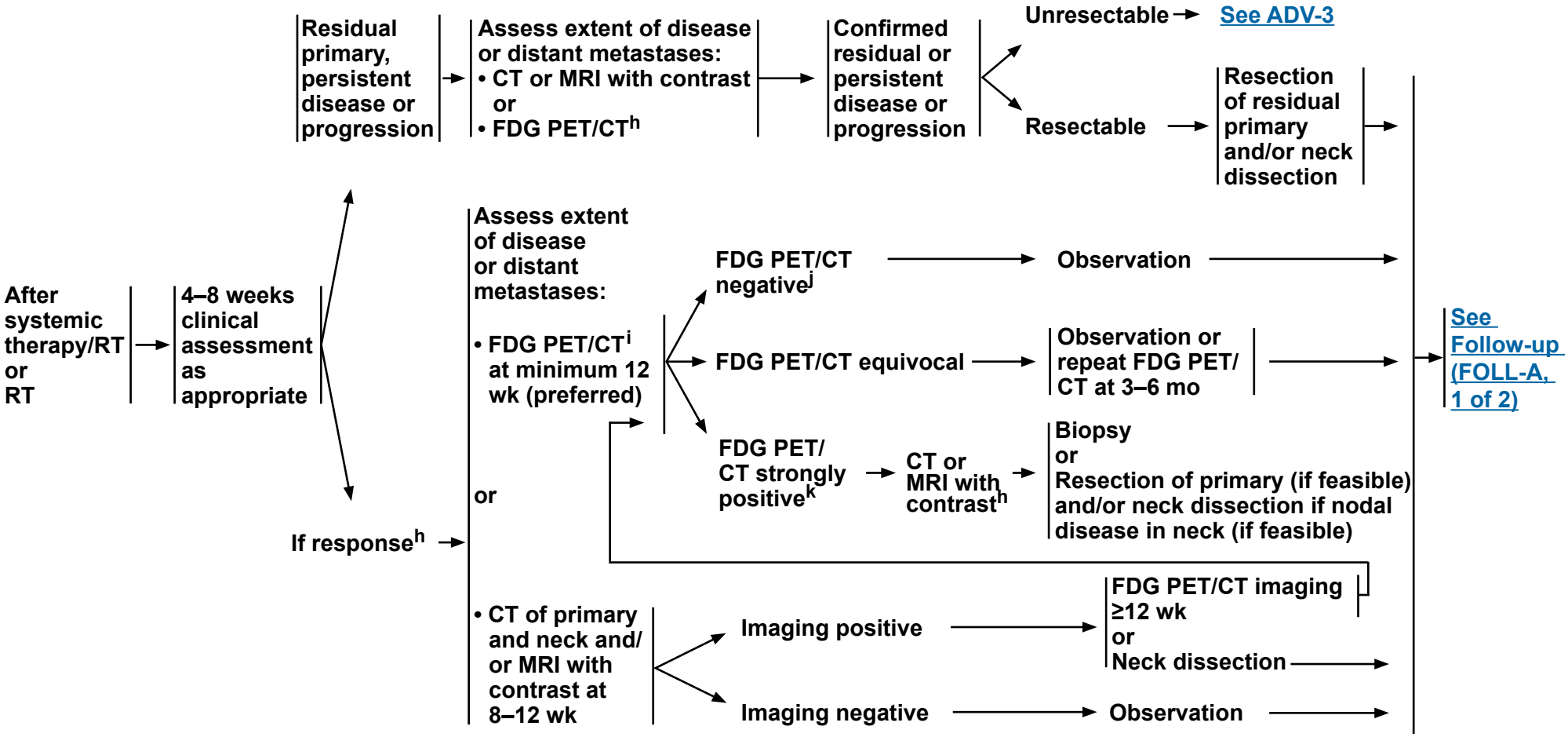
FOLLOW-UP RECOMMENDATIONS
POST SYSTEMIC THERAPY/RT OR RT NECK EVALUATION[g]



[g]Adapted with permission from Kutler DI, Patel SG, Shah JP. The role of neck dissection following definitive chemoradiation. Oncology 2004;18:993-998.
[h] See Principles of Imaging (IMG-A).
[i]If an FDG PET/CT is performed and negative for suspicion of persistent cancer, further cross-sectional imaging is optional.
[j]PET negative = No or low-grade uptake, felt not suspicious for disease.
[k]PET positive = PET suspicious for disease.

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PRINCIPLES OF IMAGING

- **Imaging plays an essential role in the clinical management of head and neck cancer patients. The proper selection and utilization of imaging studies is critical in managing head and neck cancer patients.**
- **Imaging is done with contrast, unless contraindicated.**

Initial Workup

- **Primary Site:**
  - **Imaging assessment of primary site can be performed with CT of the soft tissues of the neck or MRI of the neck.**
  - **MRI is preferred over CT for the following conditions:**
    - ◊ **Oral cavity cancer, if there is a need to evaluate the extent of bone marrow invasion or in patients with extensive dental amalgam that may obscure the anatomy on CT**
    - ◊ **Nasopharyngeal cancer, to assess skull base invasion and cranial nerve involvement**
    - ◊ **Sinonasal cancer, to evaluate skull base or intracranial or orbital invasion, and to differentiate tumor from obstructed sinuses**
    - ◊ **Any head and neck cancer with cranial nerve symptoms or if radiographic perineural tumor spread is a possibility**
  - **CT is complementary to MRI for the following conditions:**
    - ◊ **Oral cavity cancer, to evaluate cortical bone erosion or periosteal invasion**
    - ◊ **Laryngeal cancer, to evaluate cartilage invasion**
    - ◊ **Sinonasal and skull base lesions, to evaluate bony erosion/destruction**
  - **To achieve complete evaluation of the primary and any nodal disease, CT or MRI of the neck should image the anatomy from the skull base to the thoracic inlet. For certain conditions, such as involved lymph nodes in the low neck or cancers that frequently involve the upper mediastinum (such as thyroid cancer), the imaging should extend to the carina.**
  - **If imaging fails to reveal an obvious primary, PET/CT should be ordered before EUA, biopsies, and tonsillectomy, to help identify potential primary sites before any intervention occurs. In addition, FNA biopsy of metastatic nodes may be pathologically informative. Image-guided (US or CT) needle biopsy of cystic neck nodes may offer better diagnostic yield than FNA by palpation alone for initial diagnosis in this setting.**
  - **Panoramic dental x-ray is recommended for oral cavity cancers requiring mandibulotomy and/or mandibulectomy. When postoperative radiation therapy is anticipated (including such sites as the lip, other oral cavity subsites, or the oropharynx), panoramic x-ray is part of a comprehensive pre-radiation dental evaluation to assess the health of the affected dentition and determine if pre-radiation dental procedures or extractions are needed.**

Continued

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PRINCIPLES OF IMAGING

Initial Workup (continued)

- **Nodal Metastases**
  - **Evaluation of lymph node metastases should be conducted with CT or MRI of the neck, using whichever imaging study is suitable for primary site evaluation (see IMG-A, 1 of 4).**
  - **For patients with multistation or lower neck nodal involvement or high-grade tumor histology, consider CT of the chest to assess for mediastinal lymph node metastases or FDG PET/CT, which is associated with higher sensitivity for both nodal and distant metastases.**
  - **For patients who are under consideration for a surgical primary approach, the higher sensitivity of FDG PET/CT is warranted for tumors approaching the midline, to determine the surgical approach to the contralateral neck. Similarly, patients who are scheduled for a definitive radiation therapy approach may benefit from the higher sensitivity of FDG PET/CT for identifying involved lymph nodes.**

- **Distant Metastases**
  - **For patients with locoregionally advanced cancer (eg, T3–T4 primary or ≥N1 nodal staging), FDG PET/CT[1] is preferred to evaluate for distant disease and thoracic metastases. However, FDG PET/CT cannot rule out brain metastasis, and for cancers where this is a concern, such as mucosal melanoma or high-grade neuroendocrine carcinomas or adenocarcinomas, contrast-enhanced brain MRI should be additionally obtained.**
  - **If FDG PET/CT is not performed, CT of the chest should be performed to assess for presence of pulmonary metastases as well as mediastinal lymph node involvement.**
  - **Non-contrast CT of the chest can be sufficient to screen for lung parenchymal metastases but is not adequate for assessment of mediastinal adenopathy. This is an appropriate lung cancer screening intervention for patients with a history of smoking. See NCCN Guidelines for Lung Cancer Screening.**
  - **Following primary definitive treatment (surgery, RT, or systemic therapy/RT) the role of annual CT screening for lung metastasis is controversial. While this approach does detect early metastasis, further study is needed to determine the extent of the positive effect and/or cost-effectiveness of this approach in specific subpopulations and timepoints post-treatment. For patients with a substantial smoking history or who are at high risk for lung metastases, annual chest CT can be considered. Historically, annual chest x-ray has been obtained but this is a much less sensitive test than CT.**
  - **If clinical concern for metastatic disease is confined to a specific anatomical area, the assessment of distant disease can be performed with directed CT or MRI examination. For example, pulmonary metastasis can be followed and assessed by non-contrast chest CT, or spinal metastasis can be followed and assessed by contrast-enhanced spine MRI. The frequency of such imaging tests depends on the planned treatment regimen and type of cancer.**
  - **FDG PET/CT may complement or replace other imaging modalities when staging recurrent disease before any therapy for relapsed/refractory disease in order to explore distant disease or second primaries that may significantly impact choice of therapy.[2]**

[1] PET/CT is preferred over PET scan alone (ie, without superimposed CT scan). PET/CT provides more accurate anatomical localization of abnormalities.
[2] Pantvaidya GH, Agarwal JP, Deshpande MS, et al. PET-CT in recurrent head neck cancers: a study to evaluate impact on patient management. J Surg Oncol 2009;100:401-403.

Continued

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PRINCIPLES OF IMAGING

Locoregionally Advanced Disease: <6 Months Post-Treatment (Short-Term)

- **Following surgery in patients with locoregionally advanced cancer, short-term post-treatment imaging is recommended for those who show signs of early recurrence or who are at high risk of early recurrence prior to starting adjuvant postoperative therapy.**
- **Obtain CT and/or MRI within 3–4 months after definitive treatment for patients with locoregionally advanced disease or with altered anatomy causing challenging physical exam assessment, in order to establish a new baseline for future comparisons.**
- **In cases of concern for incomplete response, a CT or MRI scan may be obtained much earlier, such as 4–8 weeks post-treatment or even immediately based on the specific clinical situation. US of the neck for targeted sampling of any suspicious tissues may also be helpful, but results can be variably interpreted depending on the specific clinical situation.**
- **FDG PET/CT should be performed within 3–6 months of definitive radiation or systemic therapy/RT for assessment of treatment response and to identify any residual tumor.[3-6]**
  - **Early FDG PET/CT scans before 12 weeks are associated with significant false-positive rates and should be avoided in the absence of signs of recurrence or progression.**
  - **The optimal timing of PET scans after radiation treatment appears to be at the 3- to 6-month window.[3,4] A negative PET at this time point predicts improved overall survival at 2 years.**
  - **In patients receiving definitive RT-based treatment of mucosal squamous cell carcinoma with AJCC 7th edition N2–N3 nodal disease, FDG PET/CT surveillance approach led to fewer neck dissections and considerable cost savings compared to a routine approach of planned post-treatment neck dissection. The majority of cases studied were p16-positive oropharyngeal cancers.[5]**
- **In the special case of patients who are treated initially with induction chemotherapy prior to the initiation of definitive therapy, either CT or MRI has typically been obtained after 2–3 cycles of induction. Chest CT and/or FDG PET/CT (with diagnostic-quality imaging of the regions of the body at risk) may be obtained if there is concern for locoregional or distant metastatic progression.**

Continued

[3] Cheung PK, Chin RY, Eslick GD. Detecting residual/recurrent head neck squamous cell carcinomas using PET or PET/CT: Systematic review and meta-analysis. Otolaryngol Head Neck Surg 2016;154(3):421-432.
[4] Heineman TE, Kuan EC, St John MA. When should surveillance imaging be performed after treatment for head and neck cancer? Laryngoscope 2017;127(3):533-534.
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PRINCIPLES OF IMAGING

Locoregionally Advanced Disease: ≥6 Months to 5 Years Post-Treatment (Long-Term)

- **The majority of recurrences after treatment of head and neck cancer occur in the first two years. Surveillance can be challenging because of altered anatomy and/or fibrosis from surgery, radiation, and/or chemotherapy. There are no consensus guidelines on the frequency and modality of routine post-treatment imaging in the asymptomatic patient. Practice varies widely across institutions.**
- **US, CT, MRI, and PET/CT all have unique advantages and disadvantages when used as surveillance imaging. There is evidence that FDG PET/CT may be the most sensitive of these modalities. A 12-month PET has been shown to reveal recurrent or second primary cancers in approximately 10% of treated patients; a 24-month FDG PET/CT imaging revealed these findings in approximately 5% of treated cases.[4] Most cases of asymptomatic FDG PET/CT lesion localization occur at distant sites.[7] Whether earlier detection leads to improved disease-specific survival is not established.**
- **Standardized multi-institutional imaging-based trials are needed to clearly elucidate the value of routine imaging in the clinically asymptomatic patient. There may be little proven benefit in further imaging if the initial 3-month FDG PET/CT scan was negative. Ho et al. reported no significant difference in 3-year disease-free survival in patients undergoing imaging surveillance versus those only receiving clinical surveillance (41% vs. 46%, *P* = .91) in this setting.[8]**
- **If an FDG PET/CT at 3 months post-treatment is negative, there are no data to support substantial benefit for further routine imaging in an asymptomatic patient with negative exam. In the absence of multi-institutional prospective data, a tailored approach to surveillance with attention to tumor type, stage, prognostic factors, symptomatology, and physical exam changes or restrictions is appropriate.**
- **US of the neck is useful for nodal surveillance. US is generally widely available, safe, fast, inexpensive, and an accurate modality for examination of the neck for any suspicious nodal disease.[9]**
- **Additional post-treatment imaging is indicated for worrisome or equivocal signs/symptoms.**
- **Routine annual imaging (repeat use of pretreatment imaging modality) may be indicated to visualize areas inaccessible to routine clinical examination (deep-seated anatomic locations or areas obscured by extensive treatment change).**

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PRINCIPLES OF SURGERY

Evaluation

All patients should be evaluated by a head and neck surgical oncologist prior to treatment to ensure the following:

- **Review the adequacy of biopsy material, review staging and imaging to determine the extent of disease, exclude the presence of a synchronous primary tumor, assess current functional status, and evaluate for potential surgical options, including those applicable if initial non-surgical treatment is unsuccessful.**
- **Pre-treatment evaluation should include consultations with a medical oncologist, radiation oncologist, dental oncologist, speech-language pathologist, and reconstructive surgeon as appropriate.**
- **Tumor staging for untreated patients is essential based on review of the head and neck diagnostic imaging studies and chest imaging as appropriate.**
- **In addition to the office-based head and neck examination to include fiberoptic nasopharyngolaryngoscopy, examination under anesthesia to assess the tumor extent and to obtain a biopsy is indicated. In the setting of metastatic carcinoma to the neck an examination under anesthesia to search for the putative primary site is important for diagnosis and treatment planning.**
- **Participate in the multidisciplinary team discussions regarding patient treatment options with the goal of maximizing survival with preservation of form and function.**
- **Develop a prospective surveillance plan that includes adequate dental, nutritional, and health behavioral evaluation and intervention and any other ancillary evaluations that would provide for comprehensive rehabilitation.**

Integration of Therapy

- **It is critical that multidisciplinary evaluation and treatment be coordinated and integrated prospectively by all disciplines involved in patient care before the initiation of any treatment.**
- **For patients undergoing an operation, the surgical procedure, margins, and reconstructive plan should be developed and designed to resect all gross tumors with adequate tumor-free surgical margins. The surgical procedure should rarely be modified based on any response observed as a result of prior therapy except in instances of tumor progression that mandate a more extensive procedure in order to encompass the tumor at the time of definitive resection.**
- **Once the multidisciplinary team has established a proposed treatment regimen, the responsible physician and a member of the team should discuss the recommendations in detail with the patient to include the risks, benefits, and potential outcomes. The patient should be offered the opportunity to participate in the final decision (shared decision-making).**

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Continued

PRINCIPLES OF SURGERY

Special Considerations: Suspected HPV-Associated Metastatic Squamous Cell Carcinoma to the Neck

- **Often, the patient's first presenting sign of oropharyngeal squamous cell carcinoma (OPSCC) is a neck mass. Commonly, the primary is small and asymptomatic and may not be detectable on inspection, palpation, fiberoptic examination, or imaging of the oropharynx. It is incumbent upon the treating physician or surgeon to diligently search for and pathologically confirm the primary site, which is usually located in the base of tongue or tonsil.**
- **Information obtained from a thorough workup evaluation is vital to enable the multidisciplinary team to develop a comprehensive and focused treatment plan individualized to the patient. Identification of the primary site will either permit definitive transoral surgery to remove the primary disease or permit focused radiation, thus sparing adjacent sites in the oropharynx. As therapy becomes more personalized, biomarker assessment of the primary tumor may be instrumental determining a patient's eligibility for a clinical trial or adjuvant therapy.**
- **Cross-sectional imaging should be performed to facilitate identification of the primary site, followed by direct examination and confirmatory biopsies.**
- **EUA and confirmatory biopsies for patients with suspected OPSCC should be performed before beginning therapy. EUA may entail unilateral or bilateral palatine tonsillectomy, biopsies or excision of the lingual tonsil(s), or biopsies of any suspicious areas in the base of tongue or glossopharyngeal sulcus as indicated. Lingual tonsillectomy may be considered if the palatine tonsils are negative for tumor and other biopsies are negative.**
- **FNA biopsy of the neck mass, often performed under US guidance, will usually establish the diagnosis of metastatic carcinoma. A definitive cytologic diagnosis of squamous cell carcinoma is highly accurate, and further assessment of immunostaining for p16 can support the diagnosis of HPV-associated OPSCC in the presence of an oropharyngeal primary tumor. See Principles of p16 Testing for HPV-Mediated Oropharyngeal Cancer (ORPH-B). If there is any uncertainty, a core biopsy under image guidance can be performed. Rarely is an open excisional biopsy of the suspected metastatic node necessary for definitive diagnosis. The surgeon should be prepared to do perform a neck dissection at the time of open biopsy if frozen section confirms squamous cell carcinoma.**

Assessment of Resectability

Tumor involvement of the following sites is associated with poor prognosis or function[a] or with T4b cancer (ie, unresectable based on technical ability to obtain clear margins). None of these sites of involvement is an absolute contraindication to resection in selected patients in whom total cancer removal is possible:

- **Involvement of the pterygoid muscles, particularly when associated with severe trismus or pterygopalatine fossa involvement with cranial neuropathy;[a]**
- **Gross extension of the tumor to the skull base (eg, erosion of the pterygoid plates or sphenoid bone, widening of the foramen ovale);**
- **Direct extension to the superior nasopharynx or deep extension into the Eustachian tube and lateral nasopharyngeal walls;**
- **Invasion (encasement) of the common or internal carotid artery;**
- **Direct extension of neck disease to involve the external skin;[a]**
- **Direct extension to mediastinal structures, prevertebral fascia, or cervical vertebrae; and[a]**
- **Presence of subdermal metastases.**

[a] In selected cases, surgery might still be considered.

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PRINCIPLES OF SURGERY

Primary Tumor Resection

The resection of advanced tumors of the oral cavity, oropharynx, hypopharynx, larynx, or paranasal sinus will vary in extent depending on the structures involved. The primary tumor should be considered surgically curable by appropriate resection using accepted criteria for adequate excision, depending on the region involved.

- **En bloc resection of the primary tumor should be attempted whenever feasible.**
- **In-continuity neck dissection is necessary when there is direct extension of the primary tumor into the neck.**
- **Resection should be planned based on the extent of the primary tumor as ascertained by clinical examination and careful interpretation of appropriate radiographic images.**
- **For oral cavity cancers, as depth of invasion increases, the risk of regional metastases and the need for adjuvant elective neck dissection also increases.**
- **Perineural invasion should be suspected when tumors are adjacent to motor or sensory nerves. The goal is total cancer resection. When gross invasion is present and the nerve can be resected without significant morbidity, the nerve should be dissected both proximally and distally and should be resected to obtain clearance of disease (See Surgical Management of Cranial Nerves on SURG-A, 5 of 8). Frozen section determination of the proximal and distal nerve margins may prove helpful to facilitate tumor clearance.**
- **Partial or segmental resection of the mandible may be necessary to adequately encompass the cancer with adequate tumor-free margins. Adequate resection may require partial, horizontal, or sagittal resection of the mandible for tumors involving or adherent to mandibular periosteum. Segmental or marginal resection should be considered in tumors that grossly involve mandibular periosteum (as determined by tumor fixation to the mandible) or show evidence of direct tumor involvement of the bone at the time of operation or through preoperative imaging (CT or MRI). A panorex may be useful for assessing mandibular height when a marginal or coronal mandibulectomy is a consideration. In the edentulous patient due to mandibular atrophy that occurs over time, a partial mandibulectomy may not be possible. The extent of mandibular resection will depend on the degree of involvement accessed clinically and in the operating room.**
- **Medullary space invasion is an indication for segmental resection. Frozen section examination of available marrow may be considered to guide resection.**
- **For tumors of the larynx, the decision to perform either total laryngectomy or conservation laryngeal surgery (eg, transoral resection, hemilaryngectomy, supracricoid partial laryngectomy, supraglottic laryngectomy) will be decided by the surgeon and the patient but should adhere to the principles of complete tumor extirpation with curative intent and function preservation. Partial laryngeal surgery should be avoided if adjuvant radiation therapy is likely following surgery.**
- **Transoral robotic surgery (TORS) or laser-assisted resections of primary cancers of the larynx and pharynx are increasingly used approaches for cancer resection in selected patients with accessible tumors. Oncologic principles are similar to open procedures. Successful application of these techniques requires specialized skills and experience. Postoperative hemorrhage can be a major and rarely life-threatening complication. It is incumbent upon the TORS surgeon to use appropriate surgical strategies to diminish the risk of postoperative hemorrhage.**

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PRINCIPLES OF SURGERY

Margins

An overarching goal of oncologic surgery is complete tumor resection with histologic verification of tumor-free margins. Margin assessment may be done in real time by frozen section or by assessment of formalin-fixed tissues. Tumor-free margins are an essential surgical strategy for diminishing the risk for local tumor recurrence. Conversely, positive margins increase the risk for local relapse and are an indication for postoperative adjuvant therapy. Clinical pathologic studies have demonstrated the significance of close or positive margins and their relationship with local tumor recurrence.[1] When there is an initial cut-through with an invasive tumor at the surgical margin, obtaining additional adjacent margins from the patient may also be associated with a higher risk for local relapse and should be described in the operative report. Obtaining additional margins from the patient is subject to ambiguity regarding whether the tissue taken from the surgical bed corresponds to the actual site of margin positivity.[2] If positive surgical margins are reported, re-resection and/or adjuvant therapy should be considered in selected patients.

Frozen section margin assessment is always at the discretion of the surgeon and should be considered when it will facilitate complete tumor removal. The achievement of adequate wide margins may require resection of an adjacent structure in the oral cavity or laryngopharynx such as the base of the tongue and/or anterior tongue, mandible, larynx, or portions of the cervical esophagus.

- Adequate resection is defined as clear resection margins with at least enough clearance from the gross tumor to obtain clear frozen section and permanent margins (often 1.0–1.5 cm of visible and palpable normal mucosa). However, for glottic cancers, a 1- to 2-mm margin is considered adequate. In general, frozen section examination of the margins will usually be undertaken intraoperatively, and, importantly, when a line of resection has uncertain clearance because of indistinct tumor margins, or there is suspected residual disease (ie, soft tissue, cartilage, carotid artery, mucosal irregularity). In transoral endoscopic and robotic approaches for oropharynx cancers, margins of 1.5–2.0 mm may be acceptable, but the data are based on retrospective studies and caution is indicated.[3] Such margins would be considered "close" and are inadequate for certain sites such as oral tongue.
- The details of resection margins should be included in the operative dictation. The margins may be assessed on the resected specimen or alternatively from the surgical bed with proper orientation. Adequacy of the margins may very by site. For a glottic cancer 1- to 2-mm margins are sufficient but inadequate for an invasive carcinoma of the oral tongue.
- A clear margin is defined as the distance from the invasive tumor front that is 5 mm or more from the resected margin.
- A close margin is defined as the distance from the invasive tumor front to the resected margin that is less than 2–5 mm, depending on the anatomic site involved.
- A positive margin is defined as carcinoma in situ or as invasive carcinoma at the margin of resection. If carcinoma in situ is present and if additional margins can be obtained that is the favored approach. Carcinoma in situ should not be considered an indication for concurrent postoperative systemic therapy/RT.
- The primary tumor should be marked in a fashion adequate for orientation by the surgical pathologist. The primary tumor should be assessed histologically for depth of invasion and for distance from the invasive portion of the tumor to the margin of resection, including the peripheral and deep margins. The pathology report should be template-driven and describe how the margins were assessed. The report should provide information regarding the primary specimen to include the distance from the invasive portion of the tumor to the peripheral and deep margin. If the surgeon obtains additional margins from the patient, the new margins should refer back to the geometric orientation of the resected tumor specimen with a statement by the pathologist that this is the final margin of resection and its histologic status.
- The neck dissection should be oriented or sectioned in order to identify levels of lymph nodes encompassed in the dissection.
- Reconstruction of surgical defects should be performed using conventional techniques at the discretion of the surgeon. Primary closure is recommended when appropriate but should not be pursued at the expense of obtaining wide, tumor-free margins. Reconstructive closure with local/regional flaps, free-tissue transfer, or split-thickness skin or other grafts with or without mandibular reconstruction is performed at the discretion of the surgeon. To improve efficiency and address both oncologic and reconstructive goals, a two-team approach is advisable.

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Continued

PRINCIPLES OF SURGERY

Surgical Management of Cranial Nerves VII, X (including the recurrent laryngeal nerve), XI, and XII

Operative management of the facial nerve and other major cranial nerves during primary or regional node resection is influenced by the preoperative clinical function of the nerve.

- **When the nerve is functioning, thorough efforts should be made to preserve the structure and function of the nerve (main trunk and/or branches)—even if otherwise adequate tumor margins are not achieved—recognizing that the surgeon should leave no gross residual disease.**
- **Adjuvant postoperative radiation or systemic therapy/RT is generally prescribed when a microscopic residual or gross residual tumor is suspected.**
- **Direct nerve invasion by a tumor and/or preoperative paralysis of the nerve may warrant segmental resection (and sometimes nerve grafting) at the discretion of the surgeon if tumor-free margins are ensured throughout the remainder of the procedure.**

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PRINCIPLES OF SURGERY

Neck Management

The surgical management of regional lymphatics is dictated by the extent of the tumor at initial tumor staging. These guidelines apply to the performance of neck dissections as part of treatment of the primary tumor. In general, patients undergoing surgery for resection of the primary tumor will undergo dissection of the ipsilateral side of the neck that is at greatest risk for metastases.

- **Tumor sites that frequently have bilateral lymphatic drainage (eg, base of tongue, palate, supraglottic larynx, hypopharynx, nasopharynx, deep pre-epiglottic space involvement) often should have both sides of the neck dissected with the extent of dissection determined as suggested below. For those patients with tumors at or approaching the midline, both sides of the neck are at risk for metastases, and bilateral neck dissections should be performed.**

Patients with advanced lesions involving the anterior tongue, floor of the mouth, or alveolus that approximate or cross the midline should undergo contralateral selective/modified neck dissection as necessary to achieve adequate tumor resection.

- **Elective neck dissection should be based on risk of occult metastasis in the appropriate nodal basin. For oral cavity squamous cell carcinoma, SLN biopsy or the primary tumor depth of invasion is currently the best predictor of occult metastatic disease and should be used to guide decision-making. For tumors with a depth greater than 3 mm, elective dissection should be strongly considered if RT is not already planned. Recent randomized trial evidence supports the effectiveness of elective neck dissection in patients with oral cavity cancers >3 mm in depth of invasion.[10] For a depth less than 2 mm, elective dissection is only indicated in highly selective situations. For a depth of 2–4 mm, clinical judgment (as to reliability of follow-up, clinical suspicion, and other factors) must be utilized to determine appropriateness of elective dissection. Elective dissections are generally selective, preserving all major structures, unless operative findings dictate otherwise.**

- **The type of neck dissection (comprehensive or selective) is defined according to preoperative clinical staging, is determined at the discretion of the surgeon, and is based on the initial preoperative staging as follows:**

N0	**Selective neck dissection** • **Oral cavity at least levels I–III** • **Oropharynx at least levels II–IV** • **Hypopharynx at least levels II–IV and level VI when appropriate** • **Larynx at least levels II–IV and level VI when appropriate**
N1–N2a–c	**Selective or comprehensive neck dissection (See Discussion)**
N3	**Comprehensive neck dissection**

- **Level VI neck dissections are performed for certain primary sites (such as the larynx and hypopharynx) as required to resect the primary tumor and any clinically evident neck nodes. Elective dissection depends on primary tumor extent and site. For advanced glottic and hypopharyngeal cancers treated with primary surgery, a level VI dissection (including pretracheal lymph nodes, the delphian lymph node, and unilateral or bilateral paratracheal lymph nodes) and hemithyroidectomy to total thyroidectomy is appropriate. For primary subglottic tumors or glottic cancers with significant subglottic extension, a level VI dissection with unilateral or total thyroidectomy is considered appropriate based on the extent of the primary tumor. For example, a T4a glottic tumor with extension through the cricothyroid membrane and subglottic extension should include thyroidectomy and pretracheal and bilateral paratracheal lymph node dissection. Parathyroid glands should be preserved in situ or auto transplanted as indicated.**

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PRINCIPLES OF SURGERY

Sentinel Lymph Node Biopsy

- SLN biopsy is an alternative to elective neck dissection for identifying occult cervical metastasis in patients with early (T1 or T2) oral cavity carcinoma in centers where expertise for this procedure is available. Technical experience and judgment are required for successful execution of lymphatic mapping and SLN. Its advantages include reduced morbidity and an improved cosmetic outcome. Rates of detection of sentinel nodes in excess of 95% have been widely reported.[4-6] Patients with metastatic disease in their sentinel nodes must undergo a completion neck dissection while those without may be observed. Accuracy of sentinel node biopsy for nodal staging of early oral carcinoma has been tested extensively in multiple single-center studies and two multi-institutional trials against the reference standard of immediately performed neck dissection or subsequent extended follow-up with a pooled estimate of sensitivity of 0.93 and negative predictive values ranging from 0.88 to 1.[5-10] While direct comparisons with the policy of elective neck dissection are lacking, available evidence points towards comparable survival outcomes.[10]
- Sentinel node biopsy is a technically demanding procedure. Procedural success rates for sentinel node identification as well as accuracy of detecting occult lymphatic metastasis depend on technical expertise and experience. Hence, sufficient caution must be exercised when offering it as an alternative to elective neck dissection. This is particularly true in cases of floor-of-mouth cancer where accuracy of sentinel node biopsy has been found to be lower than for other locations such as the tongue.[4,5] Also, cancers of certain locations such as upper gingiva and hard palate may not lend themselves well technically to this procedure. Likewise, occult cervical metastases are uncommon in early lip cancer, but SLN biopsy has been shown to be feasible and effective in patients with lip cancers deemed to be at high risk of metastases generally based on tumor size or depth.[11]

Management of Recurrences

Resectable primary cancers should be re-resected with curative intent if feasible, and recurrences in a previously treated neck should undergo surgery as well. Neck disease in an untreated neck should be addressed by formal neck dissection or modification depending on the clinical situation. Non-surgical therapy may also be utilized as clinically appropriate.

Surveillance

All patients should have regular follow-up visits to assess for symptoms and possible tumor recurrence, health behaviors, nutrition, dental health, and speech and swallowing function.

- Tumor evaluations must be performed by specialists skilled in head and neck clinical examination.
- The frequency of evaluation is summarized elsewhere in the NCCN Guidelines for Head and Neck Cancers.
  - See Follow-up Recommendations (FOLL-A 1 of 2)
  - See Principles of Imaging (IMG-A)
- For post systemic therapy/RT or RT neck evaluations, see Follow-up Recommendations: Post Systemic Therapy/RT or RT Neck Evaluation (FOLL-A 2 of 2).

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PRINCIPLES OF SURGERY
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PRINCIPLES OF RADIATION TECHNIQUES[1-8]

Assessment of Radiotherapy

- All patients should be evaluated by a radiation oncologist prior to treatment to ensure the following:
  - Review staging and imaging to determine the extent of disease, exclude the presence of a synchronous primary tumor, assess functional status, and evaluate for potential radiation therapy options.
  - Participate in the multidisciplinary team discussions regarding patient treatment options with the goal of maximizing survival with preservation of form and function.
  - Develop a prospective surveillance plan that includes adequate dental, swallowing, nutritional, and health behavior evaluation and intervention and any other ancillary evaluations that would provide for comprehensive rehabilitation.

General Principles

- Target delineation and optimal dose distribution require experience in head and neck imaging and a thorough understanding of patterns of disease spread. Standards for target definition, dose specification, fractionation (with and without concurrent chemotherapy), and normal tissue constraints are still evolving. Published contouring guidelines referenced are in patients who have not been operated upon.[9,10]
  - IMRT or other conformal techniques (3D conformal RT, helical tomotherapy, volumetric modulated arc therapy [VMAT], and proton beam therapy [PBT]) may be used as appropriate depending on the stage, tumor location, physician training/experience, and available physics support.[a]
  - Close interplay exists between radiation technology, techniques, fractionation, cumulative radiation dose, surgery, and chemotherapy options resulting in a large number of combinations that may impact toxicity or tumor control.
  - FDG PET/CT or MRI with contrast can be used for fusion in treatment planning.
- Advanced radiation therapy technologies such as IMRT, tomotherapy, VMAT, image-guided radiation therapy (IGRT), and PBT may offer clinically relevant advantages in specific instances to spare important organs at risk (OARs), such as the brain, brain stem, cochlea, semicircular canals, optic chiasm and cranial nerves, retina, lacrimal glands, cornea, spinal cord, brachial plexus, mucosa, salivary glands, bone (skull base and mandible), pharyngeal constrictors, larynx, and esophagus, and decrease the risk for late, normal tissue damage while still achieving the primary goal of local tumor control.
  - The demonstration of clinically significant dose-sparing of these OARs reflects best clinical practice.
- Since the advantages of these techniques include tightly conformal doses and steep gradients next to normal tissues, target definition and delineation and treatment delivery verification require careful monitoring to avoid the risk of tumor geographic miss and subsequent decrease in local tumor control.
  - Initial diagnostic imaging with contrast-enhanced CT, MRI, FDG PET/CT, and other imaging modalities facilitate target definition.
- Image guidance is required to provide assurance of accurate daily delivery. Anatomical changes including rapidly shrinking tumors, changes in air cavities, or significant weight loss may necessitate repeat diagnostic imaging and replanning (adaptive treatment).
- Randomized studies to test these concepts are unlikely to be done since the above specific clinical scenarios represent complex combinations of multiple variables. In light of that, the modalities and techniques that are found best to reduce the doses to the clinically relevant OARs without compromising target coverage should be considered.

[a] For additional resources regarding the technical details of radiation, see the American College of Radiology Guidelines: http://www.acr.org/Quality-Safety/Standards-Guidelines/Practice-Guidelines-by-Modality/Radiation-Oncology.

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PRINCIPLES OF RADIATION TECHNIQUES[a]

Techniques/Dosing

- **IMRT**
  - IMRT has been shown to be useful in reducing long-term toxicity in oropharyngeal, nasal cavity, paranasal sinus, salivary gland, and nasopharyngeal cancers by reducing the dose to salivary glands, temporal lobes, auditory structures (including cochlea), and optic structures. IMRT is useful for thyroid cancers because of its ability to spare the larynx, brachial plexus, and esophagus.
  - The application of IMRT to other sites (eg, oral cavity, larynx, hypopharynx) is evolving and may be used at the discretion of treating physicians.
  - Helical tomotherapy and VMAT are advanced forms of IMRT.

- **PBT**[11-31]
  - Achieving highly conformal dose distributions is especially important for patients whose primary tumors are periocular in location and/or invade the orbit, skull base, and/or cavernous sinus; extend intracranially or exhibit extensive perineural invasion; and who are being treated with curative intent and/or who have long life expectancies following treatment. Nonrandomized single-institution clinical reports and systematic comparisons demonstrate safety and efficacy of PBT in the above-mentioned specific clinical scenarios.
  - Proton therapy can be considered when normal tissue constraints cannot be met by photon-based therapy.

- **IMRT, PBT, and Fractionation**[32-34]
  - A number of ways exist to integrate IMRT or PBT, target volume dosing, and fractionation.
    - The Simultaneous Integrated Boost (SIB) technique uses differential "dose painting" (66–72 Gy to gross disease; 44–63 Gy to subclinical disease) for each fraction of treatment throughout the entire course of radiation.[4] SIB is commonly used in the conventional (5 fractions/wk) and the "6 fractions/wk accelerated" schedule.[5]
    - The Sequential (SEQ) technique typically delivers the initial (lower dose) phase (weeks 1–5) followed by the high-dose boost volume phase (weeks 6–7) using 2–3 separate dose plans, and is commonly applied in standard fractionation and hyperfractionation.
    - The Concomitant Boost Accelerated schedule may utilize a "Modified SEQ" dose plan by delivering the dose to the subclinical targets once a day for 6 weeks, and a separate boost dose plan as a second daily fraction for the last 12 treatment days.[6]
    - Another accelerated approach, aside from concomitant boost, is to simply treat 6 fractions per week.[5]
  - Altered fractionation may be used for select patients with comorbidities who are not good candidates for 6–7 weeks of adjuvant RT or systemic therapy/RT.
  - Altered fractionation has not proven to be beneficial in the context of concurrent chemotherapy. The best available evidence is that the benefit of accelerated fractionation is specific to hyperfractionation, hazard ratio (HR) = 0.83 for overall survival. The benefit of other methods of altered fractionation is not clearly advantageous on meta-analysis.[35]

[a] For additional resources regarding the technical details of radiation, see the American College of Radiology Guidelines: http://www.acr.org/Quality-Safety/Standards-Guidelines/Practice-Guidelines-by-Modality/Radiation-Oncology.

Continued

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Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

PRINCIPLES OF RADIATION TECHNIQUES[a]

- **Palliative 3D Conformal RT, IMRT, and Stereotactic Body RT (SBRT)**
  - **Palliative radiation should be considered in the advanced cancer setting when curative-intent treatment is not appropriate.**
  - **No general consensus exists for appropriate palliative RT regimens in head and neck cancer. For those who are either medically unsuitable for standard RT or who have widely metastatic disease, palliative RT should be considered for relief or prevention of locoregional symptoms if the RT toxicities are acceptable. RT regimens should be tailored individually; severe RT toxicities should be avoided when treatment is for palliation.**
  - **Some recommended RT regimens include:**
    - ◊ **50 Gy in 20 fractions;[36]**
    - ◊ **37.5 Gy in 15 fractions (if well tolerated, consider adding 5 additional fractions to 50 Gy);**
    - ◊ **30 Gy in 10 fractions;**
    - ◊ **30 Gy in 5 fractions:[b] give 2 fractions/wk with ≥3 days between the 2 treatments; and[37]**
    - ◊ **44.4 Gy in 12 fractions, in 3 cycles (for each cycle, give 2 fractions 6 hours apart for 2 days in a row; treatments must exclude the spinal cord after second cycle).[38,39] Reassessment should be done at 1- to 3-week intervals.**
  - **The use of shorter more hypofractionated treatment courses may be indicated, but the dose tolerance of the spinal cord and neural structures must be evaluated carefully in light of fraction size.**
  - **Carefully evaluate the patient's performance status, treatment tolerance, tumor response, and/or any systemic progression. Other palliative/supportive care measures include analgesics, nutrition support, targeted therapy, immunotherapy, or chemotherapy, if indicated (see the NCCN Guidelines for Supportive Care).**

[a] For additional resources regarding the technical details of radiation, see the American College of Radiology Guidelines: http://www.acr.org/Quality-Safety/Standards-Guidelines/Practice-Guidelines-by-Modality/Radiation-Oncology.
[b] For end-stage disease, patients can be given more hypofractionated schedules because of the very limited prognosis.

Continued

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PRINCIPLES OF RADIATION TECHNIQUES[a]

- **Reirradiation with 3D Conformal RT, SBRT, PBT, or IMRT[40-51]**
  - **If the area in consideration overlaps with the previously radiated volume, the prior radiotherapy should have been more than 6 months from the appearance of new disease.**
  - **In certain rare circumstances, reirradiation with intraoperative RT (IORT) or brachytherapy may be considered in high-volume centers with expertise in these techniques.**
  - **Before reirradiation, the patient should have a reasonable ECOG performance status of 0–1. Patients who are more than 2 years from prior radiation, who have surgery to remove gross disease prior to reirradiation, and who are free of organ dysfunction (eg, laryngectomy, feeding tube) have better outcomes.[52]**
  - **The incidence of myelopathy is thought to increase after a cumulative biologic effective dose (BED) of 120 Gy,[53] but this risk is increased if large fraction sizes (≥2.5 Gy/fraction) are used.**
  - **Radiation volumes should include known disease only to minimize the volume of tissue receiving very high doses in regions of overlap. Prophylactic treatment of subclinical disease (eg, elective nodal irradiation) is therefore not routinely indicated.**
  - **When using SBRT techniques for reirradiation, careful selection of patients is advised. The best outcomes are seen in patients with smaller tumors and no skin involvement. Caution should be exercised in cases of circumferential carotid artery involvement.**
  - **Reirradiation dosing:**
    - ◊ **Conventional fractionation**
      - **Postoperative: 56–60 Gy at 1.8–2 Gy/fraction**
      - **Definitive: 66–70 Gy at 1.8–2 Gy/fraction**
    - ◊ **Accelerated fractionated: 60–70 Gy at 1.2–1.5 Gy/fraction twice daily**
    - ◊ **Current SBRT schedules being used or investigated are in the range of 35–44 Gy using 5 fractions.**
    - ◊ **Clinical trials should be strongly considered for patients receiving reirradiation.**

[a] For additional resources regarding the technical details of radiation, see the American College of Radiology Guidelines: http://www.acr.org/Quality-Safety/Standards-Guidelines/Practice-Guidelines-by-Modality/Radiation-Oncology.

Continued

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National Comprehensive Cancer Network®

NCCN Guidelines Version 1.2021
Head and Neck Cancers

NCCN Guidelines Index
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Discussion

PRINCIPLES OF SYSTEMIC THERAPY FOR NON-NASOPHARYNGEAL CANCERS
(Lip, Oral Cavity, Oropharynx, Hypopharynx, Glottic Larynx, Supraglottic Larynx, Ethmoid Sinus, Maxillary Sinus, Occult Primary)

- **The choice of systemic therapy should be individualized based on patient characteristics (eg, PS, goals of therapy).**
- **The preferred chemoradiotherapy approach for fit patients with locally advanced disease remains concurrent cisplatin and radiotherapy.**
- **Cisplatin-based induction chemotherapy can be used, followed by radiation-based locoregional treatment (ie, sequential chemoRT). However, an improvement in overall survival with the incorporation of induction chemotherapy compared to proceeding directly to state-of-the-art concurrent chemoRT (cisplatin preferred, category 1) has not been established in randomized studies.**
- **Cisplatin-based induction chemotherapy followed by high-dose, every-3-week cisplatin chemoradiotherapy is associated with toxicity concerns.[1,2]**
- **After induction chemotherapy, multiple options can be used for the radiation-based portion of therapy, including radiotherapy alone, particularly for patients with complete response after induction chemotherapy.**

Primary Systemic Therapy + Concurrent RT

Preferred Regimens

- High-dose cisplatin (category 1)[3,4]
- Carboplatin/infusional 5-FU (category 1)[5,6]

Other Recommended Regimens

- Carboplatin/paclitaxel (category 2B)[7]
- Weekly cisplatin 40 mg/m^2 (category 2B)[8,9]

Useful in Certain Circumstances

- 5-FU/hydroxyurea (category 2B)[10]
- Cetuximab (category 2B)[11]
- Cisplatin/infusional 5-FU (category 2B)[12]
- Cisplatin/paclitaxel (category 2B)[10]

Select ethmoid/maxillary sinus cancers (small cell, SNEC, high-grade olfactory esthesioneuroblastoma, SNUC with neuroendocrine features):

- Carboplatin/etoposide ± concurrent RT[13]
- Cisplatin/etoposide ± concurrent RT[13,14]
- Cyclophosphamide/doxorubicin/vincristine (followed by RT-based treatment) (category 2B)

Induction[a]/Sequential Systemic Therapy

Preferred Regimens

- Docetaxel/cisplatin/5-FU[15-18] (category 1 if induction is chosen)

Other Recommended Regimens

- Paclitaxel/cisplatin/infusional 5-FU[19]

Systemic Therapy/RT Following Induction Therapy, or Combination Chemotherapy for Recurrent/Persistent Disease[2,20,21]

Preferred Regimens

- Weekly carboplatin + concurrent RT
- Weekly cisplatin (category 2B) + concurrent RT

Useful in Certain Circumstances Regimens

- Weekly cetuximab + concurrent RT

Postoperative Systemic Therapy/RT

Preferred Regimens

- Cisplatin (category 1 for high-risk[b] non-oropharyngeal cancers)[22-27]

Other Recommended Regimens

- None

Useful in Certain Circumstances

- Docetaxel/cetuximab (category 2B)[28] (if cisplatin ineligible and positive margins and/or extranodal extension)

Regimens for Recurrent, Unresectable, or Metastatic Disease

[a]The categories of evidence and consensus for induction therapy vary depending on site. (See disease-specific site in the Head and Neck Table of Contents)
[b]Adverse features: extranodal extension and/or positive margins or close margins.

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PRINCIPLES OF SYSTEMIC THERAPY FOR NON-NASOPHARYNGEAL CANCERS
(Lip, Oral Cavity, Oropharynx, Hypopharynx, Glottic Larynx, Supraglottic Larynx, Ethmoid Sinus, Maxillary Sinus, Occult Primary)

• The choice of systemic therapy should be individualized based on patient characteristics (eg, PS, goals of therapy).

Recurrent, Unresectable, or Metastatic (with no surgery or RT option)

Preferred Regimens

First-line[c]
- Pembrolizumab/platinum (cisplatin or carboplatin)/5-FU (category 1)[c,29]
- Pembrolizumab (for tumors that express PD-L1 with CPS ≥1) (category 1 if CPS ≥ 20)[c,29]

Subsequent-Line (if not previously used)
- Nivolumab[30] (if disease progression on or after platinum therapy) (category 1)
- Pembrolizumab[31-33] (if disease progression on or after platinum therapy) (category 1)

Other Recommended Regimens
(First- and Susbsequent-Line)

Combination regimens
- Cetuximab/platinum (cisplatin or carboplatin)/5-FU[34] (category 1)
- Cisplatin/cetuximab[35]
- Cisplatin or carboplatin/docetaxel[36] or paclitaxel[37]
- Cisplatin/5-FU[37,38]
- Cisplatin or carboplatin/docetaxel/cetuximab[39]
- Cisplatin or carboplatin/paclitaxel/cetuximab[40]
- Pembrolizumab/platinum (cisplatin or carboplatin)/paclitaxel (category 2B)[29,37]
- Pembrolizumab/platinum (cisplatin or carboplatin)/docetaxel (category 2B)[29,36]

Single Agents
- Cisplatin[35,41]
- Carboplatin[42]
- Paclitaxel[43]
- Docetaxel[44,45]
- 5-FU[41]
- Methotrexate[38,46]
- Cetuximab[47]
- Capecitabine[48]
- Afatinib[49] (subsequent-line only, if disease progression on or after platinum therapy) (category 2B)

Useful in Certain Circumstances
(First- and Susbsequent-Line)
- For select ethmoid/maxillary sinus cancers (small cell, SNEC, high-grade olfactory esthesioneuroblastoma, SNUC with neuroendocrine features):
  - Cisplatin/etoposide or carboplatin/etoposide[14]
  - Cyclophosphamide/doxorubicin/vincristine (category 2B)
- Pembrolizumab (for MSI-H tumors)[50]

[c] If not previously used, these regimens may be considered in subsequent-lines, as other recommended regimens.

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PRINCIPLES OF SYSTEMIC THERAPY
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PRINCIPLES OF NUTRITION: MANAGEMENT AND SUPPORTIVE CARE[1-3]

Most head and neck cancer patients lose weight and are nutritionally compromised as a result of their disease, health behaviors, and treatment-related toxicities. Nutritional management is very important in head and neck cancer patients to improve outcomes and to minimize significant temporary or permanent treatment-related complications (eg, severe weight loss). A registered dietitian and a speech language/swallowing therapist should be part of the multidisciplinary team for treating patients with head and neck cancer throughout the continuum of care.

Assessment and Management

- **Nutrition**
  - **Close monitoring of nutritional status is recommended in patients who have: 1) significant weight loss (5% weight loss over prior 1 month, or 10% weight loss over 6 months); and/or 2) difficulty swallowing because of pain or tumor involvement prior to treatment. All patients should be evaluated for nutritional risks and should receive nutrition counseling by a registered dietitian and/or indicated treatment with various nutrition interventions, such as feeding tubes (eg, nasogastric [NG] tubes, percutaneous endoscopic gastrostomy [PEG] tubes) or intravenous nutrition support (but only if enteral support is not feasible).**
  - **Pre- and post-treatment functional evaluation including nutritional status should be undertaken using subjective and objective assessment tools. All patients should receive dietary counseling with the initiation of treatment, especially with radiotherapy-based treatments. Regular follow-up with the registered dietitian should continue at least until the patient has achieved a nutritionally stable baseline following treatment. For some patients with chronic nutritional challenges, this follow-up should be ongoing.**
- **Speech and Swallowing**
  - **A formal speech and swallowing evaluation at baseline is recommended for either:**
    1) patients with speech and/or swallowing dysfunction; or
    2) patients whose treatment is likely to affect speech and/or swallowing.
  - **Patients with ongoing abnormal function should be seen regularly by speech-language pathologists. Dysphagia and swallowing function can be measured by clinical swallowing assessments or by videofluoroscopic swallowing studies. Patient evaluations should also include assessment for any changes in speech and communication; changes in taste; and assessment for xerostomia, pain, and trismus. Follow-up with the speech-language pathologist should continue at least until the patient has achieved a stable baseline following treatment. For some patients with chronic speech and swallowing challenges, this follow-up may need to be indefinite.**
- **Pain**
  - **Assess pain from oral mucositis and prescribe gabapentin,[4] doxepin,[5,6] or diphenhydramine/lidocaine/antacid mouthwash[6] as clinically indicated.**

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Continued

PRINCIPLES OF NUTRITION: MANAGEMENT AND SUPPORTIVE CARE[1-3]

Use of Alternative Routes for Nutrition (NG and PEG tubes)

- **The panel does not recommend prophylactic PEG or NG tube placement in patients with very good PS and without significant pretreatment weight loss, significant airway obstruction, or severe dysphagia.**

- **Prophylactic feeding tube placement should be strongly considered for patients with:**
  - **Severe weight loss prior to treatment, 5% weight loss over prior 1 month, or 10% weight loss over 6 months;**
  - **Ongoing dehydration or dysphagia, anorexia, or pain interfering with the ability to eat/drink adequately;**
  - **Significant comorbidities that may be aggravated by poor tolerance of dehydration, lack of caloric intake, or difficulty swallowing necessary medications;**
  - **Severe aspiration; or mild aspiration in elderly patients or in patients who have compromised cardiopulmonary function; or**
  - **Patients for whom long-term swallowing disorders are likely, including those anticipated to receive large fields of high-dose radiation to the mucosa and adjacent connective tissues. However, consideration of other risk factors for swallowing dysfunction must be taken into account as well.**
- **For those who did not warrant prophylactic PEG or NG tube placement pre-treatment, caloric intake, treatment related side effects, and change in body weight should be monitored by a registered dietitian nutritionist (RDN) weekly during treatment.[4] Consider reactive feeding tube placement if two or more of the following criteria apply:**
  - **Inadequate food intake (60% of estimated energy expenditure) anticipated for more than 10 days.[5]**
  - **Consider weight loss of 5% or more in 1 month**
  - **Severe mucositis, odynophagia, dysphagia (grade 3+) or aspiration**
  - **Consider age >60 years[6]**
- **To maintain swallowing function during and following treatment (eg, radiation), patients who may have feeding tube placement should be encouraged to intake orally if they can swallow without aspiration or any other compromises. Alterations in swallowing function can occur long after treatment (especially after radiation-based treatment) and should be monitored for the lifetime of the patient.**

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PRINCIPLES OF DENTAL EVALUATION AND MANAGEMENT

Radiation therapy to the head and neck causes xerostomia and salivary gland dysfunction, which dramatically increases the risk of dental caries and its sequelae, including dentoalveolar infection and osteoradionecrosis. Radiation therapy also affects the dental hard tissues, which increases their susceptibility to demineralization[1] within the presence of xerostomia, microbial changes following RT, and changes to a more cariogenic diet. IMRT and salivary gland-sparing techniques are associated with dose-dependent recovery of salivary function over time[2] and with reduced risk for dental caries long term for some patients.[3] Radiation-related caries and other dental hard tissue changes can appear within the first 3 months following RT.[4,5]

Goals of Pre-RT Dental/Oral Evaluation:

1. Patient education, both oral and written, regarding oral and dental complications of RT and need for compliance with preventive protocols.

- **Effect on salivary glands**
  - **Dry mouth strategies**
    - ◊ **Increased hydration**
    - ◊ **Avoid ingestion of caffeinated products**
    - ◊ **Salivary substitutes (eg, gels containing lysozyme, lactoferrin, peroxidase, and supersaturated calcium phosphate solutions)[6]**
    - ◊ **Alcohol-free mouthwash (stabilized 0.1% chlorine dioxide oral rinse preferred)**
    - ◊ **Salivary stimulation**
      - – **Gustatory stimulants (eg, xylitol chewing gum, sorbitol/malic acid lozenges, xylitol lozenges)**
      - – **Cholinergic agonists (eg, pilocarpine, cevimeline)[7,8]**
    - ◊ **Consider submandibular gland transfer before start of RT[9]**
  - **Dental caries prevention**
    - ◊ **Diet counseling**
    - ◊ **Meticulous oral hygiene**
      - – **Brushing teeth twice daily**
      - – **Floss or interdental cleaner daily**
      - – **Alcohol-free mouthwash twice daily**
    - ◊ **High potency topical fluoride – continue long term after therapy**
      - – **Daily 1.1% NaF gel or SNF_2 gel, brush on or in custom dental trays; or**
      - – **Daily 1.1% NaF dentifrice; or**
      - – **Fluoride varnish application, three times per year; or**
      - – **Calcium phosphate artificial saliva rinse**
    - ◊ **Regular frequent dental evaluations to detect dental disease**
    - ◊ **Candidiasis prevention and control**
      - – **Topical therapy (anti-fungal lozenges or suspensions)**
      - – **Systemic antifungal therapy if refractory to topicals (consider infectious disease consult)**
- **Effect on bone in irradiated field**
  - **Need for pre-RT dental evaluation and determine need for dental extractions[3,10,11]**
    - ◊ **If yes, should be completed at least 2 weeks prior to start of RT**
    - ◊ **Long-term prognosis of teeth and patient motivation should be considered**
    - ◊ **Need to contact oncology team if any future extractions or surgery in irradiated field**
- **Effect on masticatory muscles – potential for trismus[4,5]**
  - **Maintain range of motion**
    - ◊ **Tongue blades and gentle stretching**
    - ◊ **Custom mouth-opening devices for rehabilitation of trismus and jaw motion**

Continued

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PRINCIPLES OF DENTAL EVALUATION AND MANAGEMENT

Goals of Pre-RT Dental/Oral Evaluation—(continued):

2. Examination and assessment of patient with treatment plan[4]

- Complete oral and head and neck examination, including radiographs of all teeth
- Risk assessment for caries and periodontal disease
  - Existing periodontal and dental conditions
  - Radiographic evidence of periapical pathology
  - Oral hygiene
  - Past dental history
  - Patient motivation and compliance
- Treatment plan
  - Eliminate potential sources of infection
  - Extractions at least 2 weeks before start of RT
  - Treat active dental caries, periodontal disease
  - Silicone guards to minimize radiation backscatter, if patients have metal restorations
  - Prescribe potent topical fluoride for daily use. Duration of use to be determined by periodic caries risk assessment over time
  - Return visit for re-evaluation and reinforcement of preventive protocol, 6–12 weeks after completion of RT
  - Evaluate for oral candidiasis and treat appropriately with antifungal agents

Goals of Dental Management During Cancer Therapy:

1. Manage xerostomia
2. Prevent trismus of masticatory muscles
3. Evaluate for oral candidiasis and treat as clinically indicated

Goals of Dental Management Post-Treatment:

1. Manage xerostomia
2. Prevent and minimize trismus
3. Prevent and treat dental caries
4. Prevent and manage post-radiation osteonecrosis
   - See Special Section on the MASCC/ISOO Clinical Practice Guidelines for the Management of Mucositis - 2019 Update[12]
   - Stabilized 0.1% chlorine dioxide oral rinse[13]
5. Prevent and manage oral candidiasis
6. Consultation with treating radiation oncologist is recommended before considering implants or extraction.

Dental recall visit interval based on risk, at least once every 6 months, or more frequently for those with xerostomia, or for those with new caries or lesions following radiotherapy.

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PRINCIPLES OF DENTAL EVALUATION AND MANAGEMENT
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Table 1
American Joint Committee on Cancer (AJCC)
TNM Staging Classification for the Oral Cavity (including mucosa of lip) (8th ed., 2017)
(Nonepithelial tumors such as those of lymphoid tissue, soft tissue, bone, and cartilage, mucosal melanoma, and cutaneous squamous cell carcinoma of the vermilion lip are not included)

Primary Tumor (T)

TX	Primary tumor cannot be assessed
Tis	Carcinoma *in situ*
T1	Tumor ≤2 cm with depth of invasion (DOI)* ≤5 mm
T2	Tumor ≤2 cm, with DOI* >5 mm *or* tumor >2 cm and ≤4 cm, with DOI* ≤10 mm
T3	Tumor >2 cm and ≤4 cm, with DOI* >10 mm *or* tumor >4 cm, with DOI* ≤10 mm
T4	Moderately advanced or very advanced local disease
T4a	Moderately advanced local disease Tumor >4 cm, with DOI* >10 mm *or* tumor invades adjacent structures only (eg, through cortical bone of the mandible or maxilla, or involves the maxillary sinus or skin of the face) Note: Superficial erosion of bone/tooth socket (alone) by a gingival primary is not sufficient to classify a tumor as T4.
T4b	Very advanced local disease Tumor invades masticator space, pterygoid plates, or skull base and/or encases the internal carotid artery

*DOI is depth of invasion and *not* tumor thickness.

Regional Lymph Nodes (N)

Clinical N (cN)

NX	Regional lymph nodes cannot be assessed
N0	No regional lymph node metastasis
N1	Metastasis in a single ipsilateral lymph node, 3 cm or smaller in greatest dimension ENE(–)
N2	Metastasis in a single ipsilateral node larger than 3 cm but not larger than 6 cm in greatest dimension and ENE(–); *or* metastases in multiple ipsilateral lymph nodes, none larger than 6 cm in greatest dimension and ENE(–); *or* in bilateral or contralateral lymph nodes, none larger than 6 cm in greatest dimension, and ENE(–)
N2a	Metastasis in a single ipsilateral lymph node larger than 3 cm but not larger than 6 cm in greatest dimension, and ENE(–)
N2b	Metastases in multiple ipsilateral lymph nodes, none larger than 6 cm in greatest dimension, and ENE(–)
N2c	Metastases in bilateral or contralateral lymph nodes, none larger than 6 cm in greatest dimension, and ENE(–)
N3	Metastasis in a lymph node larger than 6 cm in greatest dimension and ENE(−); *or* metastasis in any node(s) and clinically overt ENE(+)
N3a	Metastasis in a lymph node larger than 6 cm in greatest dimension and ENE(−)
N3b	Metastasis in any node(s) and clinically overt ENE(+)

Note: A designation of “U” or “L” may be used for any N category to indicate metastasis above the lower border of the cricoid (U) or below the lower border of the cricoid (L). Similarly, clinical and pathological ENE should be recorded as ENE(−) or ENE(+).

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Table 1 — Continued

American Joint Committee on Cancer (AJCC)
TNM Staging Classification for the Oral Cavity (including mucosa of lip) (8th ed., 2017)
(Nonepithelial tumors such as those of lymphoid tissue, soft tissue, bone, and cartilage, mucosal melanoma, and cutaneous squamous cell carcinoma of the vermilion lip are not included)

Regional Lymph Nodes (N)

Pathological N (pN)

NX		Regional lymph nodes cannot be assessed
N0		No regional lymph node metastasis
N1		Metastasis in a single ipsilateral lymph node, 3 cm or smaller in greatest dimension and ENE(–)
N2		Metastasis in a single ipsilateral lymph node, 3 cm or smaller in greatest dimension and ENE(+); *or* larger than 3 cm but not larger than 6 cm in greatest dimension and ENE(–); *or* metastases in multiple ipsilateral lymph nodes, none larger than 6 cm in greatest dimension and ENE(−); *or* in bilateral or contralateral lymph node(s), none larger than 6 cm in greatest dimension, ENE(−)
	N2a	Metastasis in single ipsilateral node 3 cm or smaller in greatest dimension, and ENE(+); *or* a single ipsilateral node larger than 3 cm but not larger than 6 cm in greatest dimension and ENE(–)
	N2b	Metastases in multiple ipsilateral node(s), none larger than 6 cm in greatest dimension and ENE(−)
	N2c	Metastases in bilateral or contralateral lymph node(s), none larger than 6 cm in greatest dimension, and ENE(–)
N3		Metastasis in a lymph node larger than 6 cm in greatest dimension and ENE(−); *or* metastasis in a single ipsilateral node larger than 3 cm in greatest dimension and ENE(+); *or* multiple ipsilateral, contralateral or bilateral nodes any with ENE(+); *or* a single contralateral node of any size and ENE (+)
	N3a	Metastasis in a lymph node larger than 6 cm in greatest dimension and ENE(−)
	N3b	Metastasis in a single ipsilateral node larger than 3 cm in greatest dimension and ENE(+); *or* multiple ipsilateral, contralateral or bilateral nodes any with ENE(+); *or* a single contralateral node of any size and ENE (+)

Note: A designation of “U” or “L” may be used for any N category to indicate metastasis above the lower border of the cricoid (U) or below the lower border of the cricoid (L).
Similarly, clinical and pathological ENE should be recorded as ENE(−) or ENE(+).

Distant Metastasis (M)

M0	No distant metastasis
M1	Distant metastasis

Histologic Grade (G)

GX	Cannot be assessed
G1	Well differentiated
G2	Moderately differentiated
G3	Poorly differentiated

Prognostic Stage Groups

Stage 0	Tis	N0	M0
Stage I	T1	N0	M0
Stage II	T2	N0	M0
Stage III	T1,T2	N1	M0
	T3	N0,N1	M0
Stage IVA	T1	N2	M0
	T2	N2	M0
	T3	N2	M0
	T4a	N0,N1,N2	M0
Stage IVB	Any T	N3	M0
	T4b	Any N	M0
Stage IVC	Any T	Any N	M1

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Table 2
American Joint Committee on Cancer (AJCC)
TNM Staging System for the Nasopharynx (8th ed., 2017)
(The following types of cancer are not included: Mucosal melanoma, lymphoma, sarcoma of the soft tissue, bone and cartilage.)

Primary Tumor (T)

TX	Primary tumor cannot be assessed
T0	No tumor identified, but EBV-positive cervical node(s) involvement
Tis	Carcinoma *in situ*
T1	Tumor confined to nasopharynx, or extension to oropharynx and/or nasal cavity without parapharyngeal involvement
T2	Tumor with extension to parapharyngeal space, and/or adjacent soft tissue involvement (medial pterygoid, lateral pterygoid, prevertebral muscles)
T3	Tumor with infiltration of bony structures at skull base, cervical vertebra, pterygoid structures, and/or paranasal sinuses
T4	Tumor with intracranial extension, involvement of cranial nerves, hypopharynx, orbit, parotid gland, and/ or extensive soft tissue infiltration beyond the lateral surface of the lateral pterygoid muscle

Regional Lymph Nodes (N)

NX	Regional lymph nodes cannot be assessed
N0	No regional lymph node metastasis
N1	Unilateral metastasis in cervical lymph node(s) and/or unilateral or bilateral metastasis in retropharyngeal lymph node(s), 6 cm or smaller in greatest dimension, above the caudal border of cricoid cartilage
N2	Bilateral metastasis in cervical lymph node(s), 6 cm or smaller in greatest dimension, above the caudal border of cricoid cartilage
N3	Unilateral or bilateral metastasis in cervical lymph node(s), larger than 6 cm in greatest dimension, and/or extension below the caudal border of cricoid cartilage

Distant Metastasis (M)

M0	No distant metastasis
M1	Distant metastasis

Histologic Grade (G)
A grading system is not used for NPCs.

Anatomic Stage/Prognostic Groups

Stage 0	Tis	N0	M0
Stage I	T1	N0	M0
Stage II	T0,T1	N1	M0
	T2	N0,N1	M0
Stage III	T0,T1,T2	N2	M0
	T3	N0,N1,N2	M0
Stage IVA	T4	N0,N1,N2	M0
	Any T	N3	M0
Stage IVB	Any T	Any N	M1

Continued

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Table 3
American Joint Committee on Cancer (AJCC)
TNM Staging System for the Oropharynx (p16-) and Hypopharynx (8th ed., 2017)
(Not included: P16-positive (p16+) oropharyngeal cancers and nasopharyngeal cancer)

Oropharynx (p16-)

TX		Primary tumor cannot be assessed
Tis		Carcinoma *in situ*
T1		Tumor 2 cm or smaller in greatest dimension
T2		Tumor larger than 2 cm but not larger than 4 cm in greatest dimension
T3		Tumor larger than 4 cm in greatest dimension or extension to lingual surface of epiglottis
T4		Moderately advanced or very advanced local disease
	T4a	Moderately advanced local disease Tumor invades the larynx, extrinsic muscle of tongue, medial pterygoid, hard palate, or mandible*
	T4b	Very advanced local disease Tumor invades lateral pterygoid muscle, pterygoid plates, lateral nasopharynx, or skull base or encases carotid artery

**Note:* Mucosal extension to lingual surface of epiglottis from primary tumors of the base of the tongue and vallecula does not constitute invasion of the larynx.

Hypopharynx

TX		Primary tumor cannot be assessed
Tis		Carcinoma *in situ*
T1		Tumor limited to one subsite of hypopharynx and/or 2 cm or smaller in greatest dimension
T2		Tumor invades more than one subsite of hypopharynx or an adjacent site, or measures larger than 2 cm but not larger than 4 cm in greatest dimension without fixation of hemilarynx
T3		Tumor larger than 4 cm in greatest dimension or with fixation of hemilarynx or extension to esophageal mucosa
T4		Moderately advanced or very advanced local disease
	T4a	Moderately advanced local disease Tumor invades thyroid/cricoid cartilage, hyoid bone, thyroid gland, esophageal muscle or central compartment soft tissue*
	T4b	Very advanced local disease Tumor invades prevertebral fascia, encases carotid artery, or involves mediastinal structures

**Note:* Central compartment soft tissue includes prelaryngeal strap muscles and subcutaneous fat.

Continued

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Table 3 — Continued
American Joint Committee on Cancer (AJCC)
TNM Staging System for the Oropharynx (p16-) and Hypopharynx (8th ed., 2017)
(Not included: P16-positive (p16+) oropharyngeal cancers and nasopharyngeal cancer)

Regional Lymph Nodes (N)		
Clinical N (cN) - Oropharynx (p16-) and Hypopharynx		
NX		Regional lymph nodes cannot be assessed
N0		No regional lymph node metastasis
N1		Metastasis in a single ipsilateral lymph node, 3 cm or smaller in greatest dimension and ENE(−)
N2		Metastasis in a single ipsilateral node larger than 3 cm but not larger than 6 cm in greatest dimension and ENE(–); *or* metastases in multiple ipsilateral lymph nodes, none larger than 6 cm in greatest dimension and ENE(−); *or* in bilateral or contralateral lymph nodes, none larger than 6 cm in greatest dimension and ENE(−)
	N2a	Metastasis in a single ipsilateral node larger than 3 cm but not larger than 6 cm in greatest dimension and ENE(−)
	N2b	Metastases in multiple ipsilateral nodes, none larger than 6 cm in greatest dimension and ENE(−)
	N2c	Metastases in bilateral or contralateral lymph nodes, none larger than 6 cm in greatest dimension and ENE(−)
N3		Metastasis in a lymph node larger than 6 cm in greatest dimension and ENE(−); *or* metastasis in any node(s) and clinically overt ENE(+)
	N3a	Metastasis in a lymph node larger than 6 cm in greatest dimension and ENE(−)
	N3b	Metastasis in any node(s) and clinically overt ENE(+)

Note: A designation of “U” or “L” may be used for any N category to indicate metastasis above the lower border of the cricoid (U) or below the lower border of the cricoid (L).
Similarly, clinical and pathological ENE should be recorded as ENE(−) or ENE(+).

Continued

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Table 3 — Continued
American Joint Committee on Cancer (AJCC)
TNM Staging System for the Oropharynx (p16-) and Hypopharynx (8th ed., 2017)
(Not included: P16-positive (p16+) oropharyngeal cancers and nasopharyngeal cancer)

Regional Lymph Nodes (N):

Pathological N (pN) - Oropharynx (p16-) and Hypopharynx

NX		Regional lymph nodes cannot be assessed
N0		No regional lymph node metastasis
N1		Metastasis in a single ipsilateral lymph node, 3 cm or smaller in greatest dimension and ENE(−)
N2		Metastasis in a single ipsilateral lymph node, 3 cm or smaller in greatest dimension and ENE(+); *or* larger than 3 cm but not larger than 6 cm in greatest dimension and ENE(−); *or* metastases in multiple ipsilateral lymph nodes, none larger than 6 cm in greatest dimension and ENE(−); *or* in bilateral or contralateral lymph node(s), none larger than 6 cm in greatest dimension and ENE(−)
	N2a	Metastasis in single ipsilateral node 3 cm or smaller in greatest dimension and ENE(+); *or* a single ipsilateral node larger than 3 cm but not larger than 6 cm in greatest dimension and ENE(−)
	N2b	Metastases in multiple ipsilateral nodes, none larger than 6 cm in greatest dimension and ENE(−)
	N2c	Metastases in bilateral or contralateral lymph node(s), none larger than 6 cm in greatest dimension and ENE(−)
N3		Metastasis in a lymph node larger than 6 cm in greatest dimension and ENE(−); *or* in a single ipsilateral node larger than 3 cm in greatest dimension and ENE(+); *or* multiple ipsilateral, contralateral or bilateral nodes, any with ENE(+); *or* a single contralateral node of any size and ENE(+)
	N3a	Metastasis in a lymph node larger than 6 cm in greatest dimension and ENE(−)
	N3b	Metastasis in a single ipsilateral node larger than 3 cm in greatest dimension and ENE(+); *or* multiple ipsilateral, contralateral or bilateral nodes, any with ENE(+) *or* a single contralateral node of any size and ENE(+)

Note: A designation of “U” or “L” may be used for any N category to indicate metastasis above the lower border of the cricoid (U) or below the lower border of the cricoid (L).
Similarly, clinical and pathological ENE should be recorded as ENE(−) or ENE(+).

Distant Metastasis (M)

M0	No distant metastasis
M1	Distant metastasis

Histologic Grade (G)

GX	Grade cannot be assessed
G1	Well differentiated
G2	Moderately differentiated
G3	Poorly differentiated
G4	Undifferentiated

Prognostic Stage Groups

Stage 0	Tis	N0	M0
Stage I	T1	N0	M0
Stage II	T2	N0	M0
Stage III	T3	N0	M0
	T1	N1	M0
	T2	N1	M0
	T3	N1	M0
Stage IVA	T1	N2	M0
	T2	N2	M0
	T3	N2	M0
	T4a	N0,N1,N2	M0
Stage IVB	T4b	Any N	M0
	Any T	N3	M0
Stage IVC	Any T	Any N	M1

Continued

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Table 4
American Joint Committee on Cancer (AJCC)
TNM Staging System for HPV-Mediated (p16+) Oropharyngeal Cancer (8th ed., 2017)
(Not including: P16-negative (p16-) cancers of the oropharynx)

Primary Tumor (T)
T0 No primary identified
T1 Tumor 2 cm or smaller in greatest dimension
T2 Tumor larger than 2 cm but not larger than 4 cm in greatest dimension
T3 Tumor larger than 4 cm in greatest dimension or extension to lingual surface of epiglottis
T4 Moderately advanced local disease
Tumor invades the larynx, extrinsic muscle of tongue, medial pterygoid, hard palate, or mandible or beyond*

Mucosal extension to lingual surface of epiglottis from primary tumors of the base of the tongue and vallecula does not constitute invasion of the larynx.

Regional Lymph Nodes (N)
Clinical N (cN)
NX Regional lymph nodes cannot be assessed
N0 No regional lymph node metastasis
N1 One or more ipsilateral lymph nodes, none larger than 6 cm
N2 Contralateral or bilateral lymph nodes, none larger than 6 cm
N3 Lymph node(s) larger than 6 cm

Pathological N (pN)
NX Regional lymph nodes cannot be assessed
pN0 No regional lymph node metastasis
pN1 Metastasis in 4 or fewer lymph nodes
pN2 Metastasis in more than 4 lymph nodes

Distant Metastasis (M)
M0 No distant metastasis
M1 Distant metastasis

Histologic Grade (G)
No grading system exists for HPV-mediated oropharyngeal tumors

Prognostic Stage Groups

Clinical

Stage I	T0,T1,T2	N0,N1	M0
Stage II	T0,T1,T2	N2	M0
	T3	N0,N1,N2	M0
Stage III	T0,T1,T2,T3	N3	M0
	T4	N0,N1,N2,N3	M0
Stage IV	Any T	Any N	M1

Pathological

Stage I	T0,T1,T2	N0,N1	M0
Stage II	T0,T1,T2	N2	M0
	T3,T4	N0,N1	M0
Stage III	T3,T4	N2	M0
Stage IV	Any T	Any N	M1

Continued

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Table 5

American Joint Committee on Cancer (AJCC) TNM Staging System for the Larynx (8th ed., 2017)

(Nonepithelial tumors such as those of lymphoid tissue, soft tissue, bone and cartilage, and mucosal melanoma of the lip and oral cavity are not included)

Primary Tumor (T)

TX Primary tumor cannot be assessed

Tis Carcinoma *in situ*

Supraglottis

T1 Tumor limited to one subsite of supraglottis with normal vocal cord mobility

T2 Tumor invades mucosa of more than one adjacent subsite of supraglottis or glottis or region outside the supraglottis (eg, mucosa of base of tongue, vallecula, medial wall of pyriform sinus) without fixation of the larynx

T3 Tumor limited to larynx with vocal cord fixation and/or invades any of the following: postcricoid area, preepiglottic space, paraglottic space, and/or inner cortex of thyroid cartilage

T4 Moderately advanced or very advanced

T4a Moderately advanced local disease
Tumor invades through the outer cortex of the thyroid cartilage and/or invades tissues beyond the larynx (eg, trachea, soft tissues of neck including deep extrinsic muscle of the tongue, strap muscles, thyroid, or esophagus)

T4b Very advanced local disease
Tumor invades prevertebral space, encases carotid artery, or invades mediastinal structures

Glottis

T1 Tumor limited to the vocal cord(s) (may involve anterior or posterior commissure) with normal mobility

T1a Tumor limited to one vocal cord

T1b Tumor involves both vocal cords

T2 Tumor extends to supraglottis and/or subglottis, and/or with impaired vocal cord mobility

T3 Tumor limited to the larynx with vocal cord fixation and/or invasion of paraglottic space and/or inner cortex of the thyroid cartilage

T4 Moderately advanced or very advanced

T4a Moderately advanced local disease
Tumor invades through the outer cortex of the thyroid cartilage and/or invades tissues beyond the larynx (eg, trachea, cricoid cartilage, soft tissues of neck including deep extrinsic muscle of the tongue, strap muscles, thyroid, or esophagus)

T4b Very advanced local disease
Tumor invades prevertebral space, encases carotid artery, or invades mediastinal structures

Subglottis

T1 Tumor limited to the subglottis

T2 Tumor extends to vocal cord(s) with normal or impaired mobility

T3 Tumor limited to larynx with vocal cord fixation and/or inner cortex of the thyroid cartilage

T4 Moderately advanced or very advanced

T4a Moderately advanced local disease
Tumor invades cricoid or thyroid cartilage and/or invades tissues beyond the larynx (eg, trachea, soft tissues of neck including deep extrinsic muscles of the tongue, strap muscles, thyroid, or esophagus)

T4b Very advanced local disease
Tumor invades prevertebral space, encases carotid artery, or invades mediastinal structures

Continued

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Table 5 — Continued
American Joint Committee on Cancer (AJCC)
TNM Staging System for the Larynx (8th ed., 2017)
(Nonepithelial tumors such as those of lymphoid tissue, soft tissue, bone, and cartilage are not included)

Regional Lymph Nodes (N)		
Clinical N (cN)		
NX		Regional lymph nodes cannot be assessed
N0		No regional lymph node metastasis
N1		Metastasis in a single ipsilateral lymph node, 3 cm or smaller in greatest dimension ENE(–)
N2		Metastasis in a single ipsilateral node, larger than 3 cm but not larger than 6 cm in greatest dimension and ENE(–); *or* metastases in multiple ipsilateral lymph nodes, none larger than 6 cm in greatest dimension and ENE(–); *or* metastasis in bilateral or contralateral lymph nodes, none larger than 6 cm in greatest dimension and ENE(–)
	N2a	Metastasis in a single ipsilateral lymph node, larger than 3 cm but not larger than 6 cm in greatest dimension and ENE(–)
	N2b	Metastases in multiple ipsilateral lymph nodes, none larger than 6 cm in greatest dimension and ENE(–)
	N2c	Metastases in bilateral or contralateral lymph nodes, none larger than 6 cm in greatest dimension and ENE(–)
N3		Metastasis in a lymph node, larger than 6 cm in greatest dimension and ENE(–); *or* metastasis in any lymph node(s) with clinically overt ENE(+)
	N3a	Metastasis in a lymph node, larger than 6 cm in greatest dimension and ENE(−)
	N3b	Metastasis in any lymph node(s) with clinically overt ENE(+)

Note: A designation of “U” or “L” may be used for any N category to indicate metastasis above the lower border of the cricoid (U) or below the lower border of the cricoid (L)
Similarly, clinical and pathological ENE should be recorded as ENE(−) or ENE(+)

Continued

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Table 5 — Continued
American Joint Committee on Cancer (AJCC)
TNM Staging System for the Larynx (8th ed., 2017)
(Nonepithelial tumors such as those of lymphoid tissue, soft tissue, bone, and cartilage are not included)

Pathological N (pN)

NX	Regional lymph nodes cannot be assessed
N0	No regional lymph node metastasis
N1	Metastasis in a single ipsilateral lymph node, 3 cm or smaller in greatest dimension ENE(–)
N2	Metastasis in a single ipsilateral lymph node, 3 cm or smaller in greatest dimension and ENE(+); *or* larger than 3 cm but not larger than 6 cm in greatest dimension and ENE(−); *or* metastases in multiple ipsilateral lymph nodes, none larger than 6 cm in greatest dimension and ENE(−); *or* in bilateral or contralateral lymph node(s), none larger than 6 cm in greatest dimension and ENE(−)
N2a	Metastasis in a single ipsilateral node, 3 cm or smaller in greatest dimension and ENE(+); *or* metastasis in a single ipsilateral node, larger than 3 cm but not larger than 6 cm in greatest dimension and ENE(−)
N2b	Metastases in multiple ipsilateral nodes, none larger than 6 cm in greatest dimension and ENE(−)
N2c	Metastases in bilateral or contralateral lymph node(s), none larger than 6 cm in greatest dimension and ENE(−)
N3	Metastasis in a lymph node, larger than 6 cm in greatest dimension and ENE(−); *or* metastasis in a single ipsilateral node, larger than 3 cm in greatest dimension and ENE(+); *or* multiple ipsilateral, contralateral, or bilateral lymph nodes and any with ENE(+); *or* a single contralateral node of any size and ENE(+)
N3a	Metastasis in a lymph node, larger than 6 cm in greatest dimension and ENE(−)
N3b	Metastasis in a single ipsilateral node, larger than 3 cm in greatest dimension and ENE(+); *or* multiple ipsilateral, contralateral, or bilateral lymph nodes any with ENE(+); or a single contralateral node of any size and ENE(+)

**Note:* A designation of “U” or “L” may be used for any N category to indicate metastasis above the lower border of the cricoid (U) or below the lower border of the cricoid (L)
Similarly, clinical and pathological ENE should be recorded as ENE(−) or ENE(+)

Distant Metastasis (M)

M0	No distant metastasis
M1	Distant metastasis

Histologic Grade (G)

GX	Grade cannot be assessed
G1	Well differentiated
G2	Moderately differentiated
G3	Poorly differentiated

Prognostic Stage Groups

Stage 0	Tis	N0	M0
Stage I	T1	N0	M0
Stage II	T2	N0	M0
Stage III	T3	N0	M0
	T1	N1	M0
	T2	N1	M0
	T3	N1	M0
Stage IVA	T1	N2	M0
	T2	N2	M0
	T3	N2	M0
	T4a	N0,N1,N2	M0
Stage IVB	Any T	N3	M0
	T4b	Any N	M0
Stage IVC	Any T	Any N	M1

Continued

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Table 6
American Joint Committee on Cancer (AJCC)
TNM Staging System for the Nasal Cavity and Paranasal Sinuses (8th ed., 2017)
(Mucosal melanoma of the nasal cavity and paranasal sinuses are not included)

Primary Tumor (T)

TX Primary tumor cannot be assessed

Tis Carcinoma *in situ*

Maxillary Sinus

T1 Tumor limited to maxillary sinus mucosa with no erosion or destruction of bone

T2 Tumor causing bone erosion or destruction including extension into the hard palate and/or middle nasal meatus, except extension to posterior wall of maxillary sinus and pterygoid plates

T3 Tumor invades any of the following: bone of the posterior wall of maxillary sinus, subcutaneous tissues, floor or medial wall of orbit, pterygoid fossa, ethmoid sinuses

T4 Moderately advanced or very advanced local disease

T4a Moderately advanced local disease
Tumor invades anterior orbital contents, skin of cheek, pterygoid plates, infratemporal fossa, cribriform plate, sphenoid or frontal sinuses

T4b Very advanced local disease
Tumor invades any of the following: orbital apex, dura, brain, middle cranial fossa, cranial nerves other than maxillary division of trigeminal nerve (V2), nasopharynx, or clivus

Nasal Cavity and Ethmoid Sinus

T1 Tumor restricted to any one subsite, with or without bony invasion

T2 Tumor invading two subsites in a single region or extending to involve an adjacent region within the nasoethmoidal complex, with or without bony invasion

T3 Tumor extends to invade the medial wall or floor of the orbit, maxillary sinus, palate, or cribriform plate

T4 Moderately advanced or very advanced local disease

T4a Moderately advanced local disease
Tumor invades any of the following: anterior orbital contents, skin of nose or cheek, minimal extension to anterior cranial fossa, pterygoid plates, sphenoid or frontal sinuses

T4b Very advanced local disease
Tumor invades any of the following: orbital apex, dura, brain, middle cranial fossa, cranial nerves other than (V2), nasopharynx, or clivus

Continued

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Table 6 — Continued
American Joint Committee on Cancer (AJCC)
TNM Staging System for the Nasal Cavity and Paranasal Sinuses (8th ed., 2017)
(Mucosal melanoma of the nasal cavity and paranasal sinuses are not included)

Regional Lymph Nodes (N)		
Clinical N (cN)		
NX		Regional lymph nodes cannot be assessed
N0		No regional lymph node metastasis
N1		Metastasis in a single ipsilateral lymph node, 3 cm or smaller in greatest dimension and ENE(–)
N2		Metastasis in a single ipsilateral lymph node larger than 3 cm but not larger than 6 cm in greatest dimension and ENE(–); *or* metastases in multiple ipsilateral lymph nodes, none larger than 6 cm in greatest dimension and ENE(–); *or* in bilateral or contralateral lymph nodes, none larger than 6 cm in greatest dimension and ENE(–)
	N2a	Metastasis in a single ipsilateral node larger than 3 cm but not larger than 6 cm in greatest dimension and ENE(–)
	N2b	Metastases in multiple ipsilateral nodes, none larger than 6 cm in greatest dimension and ENE(–)
	N2c	Metastases in bilateral or contralateral lymph nodes, none larger than 6 cm in greatest dimension and ENE(–)
N3		Metastasis in a lymph node larger than 6 cm in greatest dimension and ENE(–); *or* metastasis in any node(s) with clinically overt ENE(+)
	N3a	Metastasis in a lymph node larger than 6 cm in greatest dimension and ENE(–)
	N3b	Metastasis in any node(s) with clinically overt ENE (ENE_c)

Note: A designation of “U” or “L” may be used for any N category to indicate metastasis above the lower border of the cricoid (U) or below the lower border of the cricoid (L).
Similarly, clinical and pathological ENE should be recorded as ENE(−) or ENE(+).

Continued

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Table 6 — Continued
American Joint Committee on Cancer (AJCC)
TNM Staging System for the Nasal Cavity and Paranasal Sinuses (8th ed., 2017)
(Mucosal melanoma of the nasal cavity and paranasal sinuses are not included)

Regional Lymph Nodes (N)		
Pathological N (pN)		
NX		Regional lymph nodes cannot be assessed
N0		No regional lymph node metastasis
N1		Metastasis in a single ipsilateral lymph node, 3 cm or smaller in greatest dimension and ENE(–)
N2		Metastasis in a single ipsilateral lymph node, 3 cm or smaller in greatest dimension and ENE(+); *or* larger than 3 cm but not larger than 6 cm in greatest dimension and ENE(–); *or* metastases in multiple ipsilateral lymph nodes, none larger than 6 cm in greatest dimension and ENE(−); *or* in bilateral or contralateral lymph node(s), none larger than 6 cm in greatest dimension and ENE(–);
	N2a	Metastasis in single ipsilateral node 3 cm or less in greatest dimension and ENE(+); or a single ipsilateral node larger than 3 cm but not larger than 6 cm in greatest dimension and ENE(−)
	N2b	Metastases in multiple ipsilateral nodes, none larger than 6 cm in greatest dimension and ENE(–)
	N2c	Metastases in bilateral or contralateral lymph node(s), none larger than 6 cm in greatest dimension and ENE(–)
N3		Metastasis in a lymph node larger than 6 cm in greatest dimension and ENE(−); *or* in a single ipsilateral node larger than 3 cm in greatest dimension and ENE(+); *or* multiple ipsilateral, contralateral or bilateral nodes, any with ENE(+); *or* a single contralateral node of any size and ENE(+)
	N3a	Metastasis in a lymph node larger than 6 cm in greatest dimension and ENE(–)
	N3b	Metastasis in a single ipsilateral node larger than 3 cm in greatest dimension and ENE(+); *or* multiple ipsilateral, contralateral or bilateral nodes, any with ENE(+); *or* a single contralateral node of any size and ENE(+)

Note: A designation of “U” or “L” may be used for any N category to indicate metastasis above the lower border of the cricoid (U) or below the lower border of the cricoid (L).
Similarly, clinical and pathological ENE should be recorded as ENE(−) or ENE(+).

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Table 6 — Continued
American Joint Committee on Cancer (AJCC)
TNM Staging System for the Nasal Cavity and Paranasal Sinuses (8th ed., 2017)
(Mucosal melanoma of the nasal cavity and paranasal sinuses are not included)

Prognostic Stage Groups

Stage 0	Tis	N0	M0
Stage I	T1	N0	M0
Stage II	T2	N0	M0
Stage III	T1	N1	M0
	T2	N1	M0
	T3	N0, N1	M0
Stage IVA	T1	N2	M0
	T2	N2	M0
	T3	N2	M0
	T4a	N0,N1,N2	M0
Stage IVB	Any T	N3	M0
	T4b	Any N	M0
Stage IVC	Any T	Any N	M1

Distant Metastasis (M)

M0 No distant metastasis (no pathologic M0; use clinical M to complete stage group)
M1 Distant metastasis

Histologic Grade (G)

GX Grade cannot be assessed
G1 Well differentiated
G2 Moderately differentiated
G3 Poorly differentiated

Continued

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Table 7
American Joint Committee on Cancer (AJCC)
TNM Staging System for Cervical Lymph Nodes and Unknown Primary Tumors of the Head and Neck (8th ed., 2017)
(Squamous cell carcinoma and salivary gland carcinoma of all head and neck sites *except* HPV-related oropharynx cancer, nasopharynx cancer, melanoma, thyroid carcinoma, and sarcoma. Staging of the patient who presents with an occult primary tumor and EBV-unrelated and HPV-unrelated metastatic cervical lymphadenopathy is also included.)

Regional Lymph Nodes (N)

Clinical N (cN): For patients who are treated with primary nonsurgical treatment without a cervical lymph node dissection.

NX		Regional lymph nodes cannot be assessed
N0		No regional lymph node metastasis
N1		Metastasis in a single ipsilateral lymph node, 3 cm or smaller in greatest dimension and ENE(-)
N2		Metastasis in a single ipsilateral lymph node larger than 3 cm but not larger than 6 cm in greatest dimension and ENE(-); *or* metastases in multiple ipsilateral lymph nodes, none larger than 6 cm in greatest dimension and ENE(-); *or* in bilateral or contralateral lymph nodes, none larger than 6 cm in greatest dimension, ENE(-)
	N2a	Metastasis in a single ipsilateral node larger than 3 cm but not larger than 6 cm in greatest dimension and ENE(-)
	N2b	Metastases in multiple ipsilateral nodes, none larger than 6 cm in greatest dimension and ENE(-)
	N2c	Metastases in bilateral or contralateral lymph nodes, none larger than 6 cm in greatest dimension and ENE(-)
N3		Metastasis in a lymph node larger than 6 cm in greatest dimension and ENE(-); *or* metastasis in any node(s) with clinically overt ENE(+) (ENE_c)[2]
	N3a	Metastasis in a lymph node larger than 6 cm in greatest dimension and ENE(−)
	N3b	Metastasis in any node(s) with clinically overt ENE(+) (ENE_c)[2]

[1]Midline nodes are considered ipsilateral nodes.
[2]ENE_c is defined as invasion of skin, infiltration of musculature, dense tethering or fixation to adjacent structures, or cranial nerve, brachial plexus, sympathetic trunk, or phrenic nerve invasion with dysfunction.

Note: A designation of “U” or “L” may be used for any N category to indicate metastasis above the lower border of the cricoid (U) or below the lower border of the cricoid (L). Similarly, clinical and pathological ENE should be recorded as ENE(−) or ENE(+).`

Continued

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Table 7 — Continued

American Joint Committee on Cancer (AJCC)
TNM Staging System for Cervical Lymph Nodes and Unknown Primary Tumors of the Head and Neck (8th ed., 2017)
(Squamous cell carcinoma and salivary gland carcinoma of all head and neck sites *except* HPV-related oropharynx cancer, nasopharynx cancer, melanoma, thyroid carcinoma, and sarcoma. Staging of the patient who presents with an occult primary tumor and EBV-unrelated and HPV-unrelated metastatic cervical lymphadenopathy is also included.)

Regional Lymph Nodes (N)

Pathological N (pN): For patients who are treated surgically with a cervical lymph node dissection.

NX		Regional lymph nodes cannot be assessed
N0		No regional lymph node metastasis
N1		Metastasis in a single ipsilateral lymph node, 3 cm or smaller in greatest dimension and ENE(-)
N2		Metastasis in a single ipsilateral lymph node, 3 cm or smaller in greatest dimension and ENE(+); *or* larger than 3 cm but not larger than 6 cm in greatest dimension and ENE(-); *or* metastases in multiple ipsilateral lymph node(s), none larger than 6 cm in greatest dimension and ENE(-); *or* in bilateral or contralateral lymph nodes, none larger than 6 cm in greatest dimension and ENE(-)
	N2a	Metastasis in a single ipsilateral node 3 cm or less in greatest dimension and ENE(+); *or* a single ipsilateral node larger than 3 cm but not larger than 6 cm in greatest dimension and ENE(-)
	N2b	Metastases in multiple ipsilateral nodes, none larger than 6 cm in greatest dimension and ENE(-)
	N2c	Metastases in bilateral or contralateral lymph nodes, none larger than 6 cm in greatest dimension and ENE(-)
N3		Metastasis in a lymph node larger than 6 cm in greatest dimension and ENE(-); *or* metastasis in a single ipsilateral node larger than 3 cm in greatest dimension and ENE(+); *or* multiple ipsilateral, contralateral, or bilateral nodes any size and ENE(+) in any node; *or* a single contralateral node of any size and ENE(+)
	N3a	Metastasis in a lymph node larger than 6 cm in greatest dimension and ENE(−)
	N3b	Metastasis in a single ipsilateral node larger than 3 cm in greatest dimension and ENE(+); *or* multiple ipsilateral, contralateral, or bilateral nodes any size and ENE(+) in any node; *or* a single contralateral node of any size and ENE(+)

Anatomic Stage/Prognostic Groups

Stage III	T0	N1	M0
Stage IVA	T0	N2	M0
Stage IVB	T0	N3	M0
Stage IVC	T0	Any N	M1

[1]Midline nodes are considered ipsilateral nodes.
[2]ENE detected on histopathologic examination is designated as ENE_{mi} (microscopic ENE ≤ 2 mm) or ENE_{ma} (major ENE > 2 mm). Both ENE_{mi} and ENE_{ma} qualify as ENE(+) for definition of pN.
Note: A designation of "U" or "L" may be used for any N category to indicate metastasis above the lower border of the cricoid (U) or below the lower border of the cricoid (L). Similarly, clinical and pathological ENE should be recorded as ENE(−) or ENE(+).

Continued

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Table 8
American Joint Committee on Cancer (AJCC)
TNM Staging System for the Major Salivary Glands (8th ed., 2017)
(Parotid, submandibular, and sublingual)

Primary Tumor (T)

TX	Primary tumor cannot be assessed
T0	No evidence of primary tumor
Tis	Carcinoma *in situ*
T1	Tumor 2 cm or smaller in greatest dimension without extraparenchymal extension*
T2	Tumor larger than 2 cm but not larger than 4 cm in greatest dimension without extraparenchymal extension*
T3	Tumor larger than 4 cm and/or tumor having extraparenchymal extension*
T4	Moderately advanced or very advanced disease
T4a	Moderately advanced disease Tumor invades skin, mandible, ear canal, and/or facial nerve
T4b	Very advanced disease Tumor invades skull base and/or pterygoid plates and/or encases carotid artery

Note: Extraparenchymal extension is clinical or macroscopic evidence of invasion of soft tissues. Microscopic evidence alone does not constitute extraparenchymal extension for classification purposes.

Regional Lymph Nodes (N)

Clinical N (cN)

NX	Regional lymph nodes cannot be assessed
N0	No regional lymph node metastasis
N1	Metastasis in a single ipsilateral lymph node, 3 cm or smaller in greatest dimension and ENE(-)
N2	Metastasis in a single ipsilateral lymph node, larger than 3 cm but not larger than 6 cm in greatest dimension and ENE(-); *or* metastases in multiple ipsilateral lymph node(s), none larger than 6 cm in greatest dimension and ENE(-); *or* in bilateral or contralateral lymph nodes, none larger than 6 cm in greatest dimension and ENE(-)
N2a	Metastasis in a single ipsilateral node larger than 3 cm but not larger than 6 cm in greatest dimension and ENE(-)
N2b	Metastases in multiple ipsilateral nodes, none larger than 6 cm in greatest dimension and ENE(-)
N2c	Metastases in bilateral or contralateral lymph nodes, none larger than 6 cm in greatest dimension and ENE(-)
N3	Metastasis in a lymph node larger than 6 cm in greatest dimension and ENE(-); *or* metastasis in any node(s) with clinically overt ENE(+)
N3a	Metastasis in a lymph node larger than 6 cm in greatest dimension and ENE(−)
N3b	Metastases in any node(s) with clinically overt ENE(+)

Note: A designation of “U” or “L” may be used for any N category to indicate metastasis above the lower border of the cricoid (U) or below the lower border of the cricoid (L). Similarly, clinical and pathological ENE should be recorded as ENE(−) or ENE(+)

Continued

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Table 8 — Continued
American Joint Committee on Cancer (AJCC)
TNM Staging System for the Major Salivary Glands (8th ed., 2017)
(Parotid, submandibular, and sublingual)

Regional Lymph Nodes (N)

Pathological N (pN)

NX		Regional lymph nodes cannot be assessed
N0		No regional lymph node metastasis
N1		Metastasis in a single ipsilateral lymph node, 3 cm or less smaller in greatest dimension and ENE(-)
N2		Metastasis in a single ipsilateral lymph node, 3 cm or smaller in greatest dimension and ENE(+); *or* larger than 3 cm but not larger than 6 cm in greatest dimension and ENE(−); *or* metastases in multiple ipsilateral lymph node(s), none larger than 6 cm in greatest dimension and ENE(−); *or* in bilateral or contralateral lymph nodes, none larger than 6 cm in greatest dimension and ENE(−)
	N2a	Metastasis in a single ipsilateral lymph node 3 cm or smaller in greatest dimension and ENE(+) *or* a single ipsilateral node larger than 3 cm but not larger than 6 cm in greatest dimension and ENE(-)
	N2b	Metastases in multiple ipsilateral lymph nodes, none larger than 6 cm in greatest dimension and ENE(-)
	N2c	Metastases in bilateral or contralateral lymph node(s), none more than 6 cm in greatest dimension and ENE(-)
N3		Metastasis in a lymph node larger than 6 cm in greatest dimension and ENE(-); *or* in a single ipsilateral node larger than 3 cm in greatest dimension and ENE(+); *or* multiple ipsilateral, contralateral, or bilateral nodes any with ENE(+); *or* a single contralateral node of any size and ENE(+)
	N3a	Metastasis in a lymph node larger than 6 cm in greatest dimension and ENE(−)
	N3b	Metastasis in a single ipsilateral node larger than 3 cm in greatest dimension and ENE(+); *or* multiple ipsilateral, contralateral, or bilateral nodes any with ENE(+); *or* a single contralateral node of any size and ENE(+)

Distant Metastasis (M)

M0	No distant metastasis
M1	Distant metastasis

Anatomic Stage/Prognostic Groups

Stage 0	Tis	N0	M0
Stage I	T1	N0	M0
Stage II	T2	N0	M0
Stage III	T3	N0	M0
	T0,T1,T2,T3	N1	M0
Stage IVA	T0	N2	M0
	T1	N2	M0
	T2	N2	M0
	T3	N2	M0
	T4a	N0,N1,N2	M0
Stage IVB	Any T	N3	M0
	T4b	Any N	M0
Stage IVC	Any T	Any N	M1

Note: A designation of “U” or “L” may be used for any N category to indicate metastasis above the lower border of the cricoid (U) or below the lower border of the cricoid (L). Similarly, clinical and pathological ENE should be recorded as ENE(−) or ENE(+)

Continued

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Table 9
American Joint Committee on Cancer (AJCC)
TNM Staging System for Mucosal Melanoma of the Head and Neck (8th ed., 2017)

Primary Tumor (T)

T3 Tumors limited to the mucosa and immediately underlying soft tissue, regardless of thickness or greatest dimension; for example, polypoid nasal disease, pigmented or nonpigmented lesions of the oral cavity, pharynx, or larynx

T4 Moderately advanced or very advanced

T4a Moderately advanced disease
Tumor involving deep soft tissue, cartilage, bone, or overlying skin

T4b Very advanced disease
Tumor involving brain, dura, skull base, lower cranial nerves (IX, X, XI, XII), masticator space, carotid artery, prevertebral space, or mediastinal structures

Regional Lymph Nodes (N)

NX Regional lymph nodes cannot be assessed

N0 No regional lymph node metastases

N1 Regional lymph node metastases present

Distant Metastasis (M)

M0 No distant metastasis

M1 Distant metastasis

Histologic Grade (G)

There is no recommended histologic grading system at this time.

Prognostic Stage Groups

Currently, there is no clear ability to determine prognosis based on histologic differences.

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NCCN Categories of Evidence and Consensus	
Category 1	Based upon high-level evidence, there is uniform NCCN consensus that the intervention is appropriate.
Category 2A	Based upon lower-level evidence, there is uniform NCCN consensus that the intervention is appropriate.
Category 2B	Based upon lower-level evidence, there is NCCN consensus that the intervention is appropriate.
Category 3	Based upon any level of evidence, there is major NCCN disagreement that the intervention is appropriate.

All recommendations are category 2A unless otherwise indicated.

NCCN Categories of Preference	
Preferred intervention	Interventions that are based on superior efficacy, safety, and evidence; and, when appropriate, affordability.
Other recommended intervention	Other interventions that may be somewhat less efficacious, more toxic, or based on less mature data; or significantly less affordable for similar outcomes.
Useful in certain circumstances	Other interventions that may be used for selected patient populations (defined with recommendation).

All recommendations are considered appropriate.

Discussion

This discussion corresponds to the NCCN Guidelines for Head and Neck Cancers. Last updated: June 9, 2020.

Table of Contents

Overview

The NCCN Guidelines for Head and Neck Cancers address tumors arising in the lip, oral cavity, pharynx, larynx, and paranasal sinuses; occult primary cancer, salivary gland cancer, and mucosal melanoma (MM) are also addressed.[1,2] In 2020, it is estimated that about 65,630 new cases of oral cavity, pharyngeal, and laryngeal cancers will occur, which account for about 3.6% of new cancer cases in the United States.[3] An estimated 14,500 deaths from head and neck (H&N) cancers will occur during the same time period.[4] Squamous cell carcinoma or a variant is the histologic type in more than 90% of these tumors. Alcohol and tobacco abuse are the most common etiologic factors in cancers of the oral cavity, hypopharynx, larynx, and human papillomavirus (HPV)-unrelated oropharynx. Because the entire aerodigestive tract epithelium may be exposed to these carcinogens, patients with H&N cancers are at risk for harboring synchronous primary tumors and developing second primary neoplasms of the H&N, lung, esophagus, and other sites that share these risk factors.

Stage at diagnosis predicts survival rates and guides management in patients with H&N cancers. In general, stage I or II disease defines a relatively small primary tumor with no nodal involvement. Stage III or IV cancers generally include larger primary tumors, which may invade underlying structures and/or spread to regional nodes. Distant metastases are less common at presentation than in lung and esophagus cancers. More advanced TNM stages are associated with worse survival.

Literature Search Criteria and Guidelines Update Methodology

Prior to the update of this version of the NCCN Guidelines for Head and Neck Cancers, an electronic search of the PubMed database was performed to obtain key literature in the field of H&N cancers using the following search terms: (head and neck cancer) OR (lip cancer) OR (oral cavity cancer) OR (oropharynx cancer) OR (hypopharynx cancer) OR (nasopharynx cancer) OR (larynx cancer) OR (paranasal tumor) OR (ethmoid sinus tumor) OR (maxillary sinus tumor) OR (salivary gland tumor) OR (mucosal melanoma head) OR (mucosal melanoma neck). The PubMed database was chosen because it remains the most widely used resource for medical literature and indexes peer-reviewed biomedical literature.[5]

Human Papillomavirus Infection

HPV infection is a cause predominantly of squamous cell carcinomas of the oropharynx (particularly cancers of the tonsils and tongue base).[6-13] However, small subsets of squamous cell carcinomas of the oral cavity, larynx, nasopharynx, and paranasal sinuses are HPV-positive.[14] The overall incidence of HPV-positive oropharynx cancers is increasing in the United States, while the incidence of HPV-negative (primarily tobacco- and alcohol-related) cancer is decreasing.[15] Patients with HPV-positive cancer have tended to be younger;[13,16] however, HPV-positive oropharynx cancer rates are rising among older adults.[17,18] Oral HPV16 infection increases the risk of oropharynx cancer,[6,12,19,20] and a strong causal relationship has been established.[6,19] HPV18, 33, and 35 are responsible for the vast majority of the remaining fraction.[13] Expression of HPV E6 and E7 oncogenes inactivates the tumor-suppressor proteins p53 and pRb, respectively, which promote genomic instability and the development of cancer.[21] Genetic profiling of HPV-positive cancer has demonstrated it to be genetically distinct from HPV-negative H&N cancers.[22] Though some non-oropharynx cancers are HPV-positive,[14,23-25] routine testing on non-oropharyngeal cancers is not currently recommended.[26] Analyses from the National Health and Nutrition Examination Survey (2011–2014), including 2,627 adults aged 18 to 33 years, showed that HPV vaccination was associated with reduced vaccine-type, oral HPV prevalence (0.1% in vaccinated individuals vs. 1.6% in unvaccinated individuals; $P = .008$).[27] Moreover, HPV vaccination in the United States has led to herd protection

against oral HPV16, 18, 6, and 11 infections in unvaccinated men.[28] Randomized clinical trials to investigate the efficacy of HPV vaccines in the prevention of oral HPV infections have not been performed to date.

Patients with locally advanced HPV-positive H&N cancers have improved response to treatment and survival (overall survival [OS] and progression-free survival [PFS]) when compared with HPV-negative tumors.[29-34] Treatment response is improved in patients receiving both chemoradiation[29,30] and conventional radiation therapy (RT).[35] A meta-analysis including 18 studies with 4,424 patients with squamous cell carcinoma of the H&N showed that patients with tumors that are both HPV-positive and p16-positive had better 5-year OS and 5-year disease-free survival (DFS), compared to patients with tumors that are HPV-negative/p16-negative, HPV-positive/p16-negative, and HPV-negative/p16-positive.[36] However, patients with tumors that are HPV-negative/p16-positive had greater 5-year OS, compared to patients with tumors that are p16-negative (regardless of HPV status). Analyses of non-oropharyngeal squamous H&N cancers have shown mixed results regarding whether or not p16-positive disease is associated with better prognosis.[37-41] A prospective two-institution study showed that, among 194 patients with HPV-positive squamous cell carcinoma of the oral cavity or oropharynx, 2-year OS (68% vs. 95%, respectively; HR, 6.61; 95% CI, 1.86–23.44; $P = .003$) and relapse-free survival (RFS) (55% vs. 88%, respectively; HR, 3.72; 95% CI, 1.71–8.09; $P < .001$) were lower for patients with persistent detection of tumor-type, oral HPV DNA, compared to patients who no longer had detectable oral HPV DNA following treatment.[42] Analysis of cell-free plasma HPV DNA (cfHPV DNA) has demonstrated that two consecutive positive tests have high positive predictive value (94%) for disease progression, with an average lead time of approximately 4 months prior to development of clinical progression.[43] cfHPV DNA may therefore be used at some point in the future for disease surveillance.

The relationship between HPV and other prognostic or predictive factors such as smoking history and stage has been investigated.[44-46] For example, analyses of patients with oropharyngeal cancer who were enrolled in RTOG 9003 or 0129 ($n = 165$) showed that smoking was associated with decreased OS and PFS, regardless of p16 status.[44] A retrospective analysis from a clinical trial showed no difference in the rate of distant metastasis in patients with p16-positive disease, relative to patients with p16-negative disease.[29] Additional analyses have suggested that individuals with T4 or N3 disease or radiographically detectable matted lymph nodes may have a worse prognosis, and therefore should be excluded from deintensification trials.[47-50]

Management Approaches

The specific site of disease, stage, and pathologic findings guide treatment (eg, the appropriate surgical procedure, radiation targets, dose and fractionation of radiation, indications for systemic therapy). Single-modality treatment with surgery or RT is generally recommended for the approximately 30% to 40% of patients who present with early-stage disease (stage I or II). Surgery and RT result in similar survival for many H&N cancers, but surgery is usually preferred for oral cavity and paranasal sinus cancers, while RT with or without chemotherapy is nearly always preferred for all stages of nasopharyngeal carcinoma (NPC). The choice of surgery or RT is often based on local institutional expertise and/or perceived relative morbidity of these treatment options. With evolving techniques of RT and less invasive surgery, as well as improving supportive care for patients receiving systemic therapy, morbidity is also a moving target. Combined modality therapy is generally recommended for the approximately 60% of patients with locally or regionally advanced disease at diagnosis.

Participation in clinical trials is a preferred or recommended treatment option in many situations. In formulating these NCCN Guidelines, panel

members have tried to make them evidence-based while providing a statement of consensus as to the acceptable range of treatment options. In numerous population-based studies, patients treated at high-volume centers appear to have better outcomes relative to patients treated at low-volume centers.[51-55]

Multidisciplinary Team Involvement

The initial evaluation and development of a plan for treating the patient with H&N cancer requires a multidisciplinary team of health care providers with expertise in caring for these patients.[56,57] Similarly, managing and preventing sequelae after surgery, RT, and systemic therapy (eg, pain, lymphedema and muscle spasm of the neck, xerostomia, dysphagia, speech and swallowing problems, depression) requires professionals familiar with the disease.[58-60] Follow-up for these sequelae should include a comprehensive H&N examination and supportive care and rehabilitation (see *Follow-Up Recommendations* in the NCCN Guidelines for Head and Neck Cancers).[56] Adequate nutritional support can help to prevent severe weight loss in patients receiving treatment for H&N cancers; therefore, patients should be encouraged to see a registered dietitian at diagnosis and as needed during and after treatment (see *Principles of Nutrition: Management and Supportive Care* in the NCCN Guidelines for Head and Neck Cancers and *Principles of Nutrition and Supportive Care,* below).[61] Dental care to prevent and treat RT effects should be provided (see *Principles of Dental Evaluation and Management* in the NCCN Guidelines for Head and Neck Cancers and below). Evaluation by a speech-language/swallowing therapist before and after treatment is recommended. Patients are at risk for depression from H&N cancer and its sequelae, so screening for depression is advised (see the NCCN Guidelines for Distress Management, available at www.NCCN.org).[62-65] Fertility/reproductive counseling should be offered to younger patients (see the NCCN Guidelines for Adolescent and Young Adult Oncology, available at www.NCCN.org). Specific components of patient support and follow-up are listed in the algorithm (see *Team Approach* in the NCCN Guidelines for Head and Neck Cancers). Panel members also recommend referring to the NCCN Guidelines for Palliative Care and NCCN Guidelines for Adult Cancer Pain as needed (available at www.NCCN.org).

Tobacco use is associated with at least 30% of cancer deaths.[66] Therefore, patients' tobacco use history should be assessed. Patients should be encouraged to stop smoking (and remain abstinent) and to modify alcohol consumption if excessive, because these habits decrease the efficacy of treatment and adversely affect other health outcomes.[67,68] Information on smoking cessation resources and support can be found in the NCCN Guidelines for Smoking Cessation (available at www.NCCN.org).

Resectable Versus Unresectable Disease

The term *unresectable* has resisted formal definition by H&N cancer specialists. The experience of the surgeon and the support available from reconstructive surgeons, physiatrists, and prosthodontists often strongly influence recommendations, especially in institutions where only a few patients with locally advanced H&N cancers are treated. The NCCN Member Institutions have teams experienced in the treatment of H&N cancers and maintain the multidisciplinary infrastructure needed for reconstruction and rehabilitation. A patient's cancer is deemed unresectable if H&N surgeons at NCCN Member Institutions do not think they can remove the gross tumor on anatomic grounds or if local control is unlikely to be achieved with the use of surgery (even with the addition of RT to the treatment approach). Typically, these unresectable tumors densely involve the cervical vertebrae, brachial plexus, deep muscles of the neck, or carotid artery (see *Principles of Surgery* in the NCCN Guidelines for Head and Neck Cancers). Tumor involvement of certain sites is associated with poor prognosis (ie, direct extension of neck

disease to involve the external skin; direct extension to mediastinal structures, prevertebral fascia, or cervical vertebrae).

Unresectable tumors should be distinguished from inoperable tumors in those patients whose constitutional state precludes an operation (even if the cancer could be readily resected with few sequelae). Additionally, a subgroup of patients will decline surgical management, but their tumors should not be deemed unresectable. In some patients, adequate reconstructive options may be lacking; therefore, the patient's disease is considered functionally unresectable. Examples include bilateral orbital exenteration or exenteration in the only seeing eye, extensive mandibular resection without reconstruction options, or total pharyngectomy when reconstitution of the alimentary tract is not feasible. Though these are rare occurrences, the impact on quality of life and the need for continual supportive care are significant and open ended. Although local and regional disease may be surgically treatable, patients with distant metastases are usually treated as though the primary tumor was unresectable. Thus, patient choice or a physician's expectations regarding cure and morbidity will influence or determine treatment. Patients with resectable tumors who can also be adequately treated without surgery represent a very important group. Definitive treatment with RT alone or RT combined with systemic therapy may represent equivalent or preferable approaches to surgery in these individuals. Although such patients may not undergo surgery, their tumors should not be labeled as unresectable. Their disease is usually far less extensive than those with disease that truly cannot be removed.

Comorbidity and Quality of Life

Comorbidity

Comorbidity refers to the presence of concomitant disease (in addition to H&N cancers) that may affect diagnosis, treatment, and prognosis.[69,70] Documentation of comorbidity is important to facilitate optimal treatment selection. Comorbidity is known to be a strong independent predictor for mortality in patients with H&N cancers,[71-74] and comorbidity also influences costs of care, utilization, and quality of life.[75-77] Traditional indices of comorbidity include the Charlson Comorbidity Index[78] and the Kaplan-Feinstein Index and its modifications.[70,79] The Adult Comorbidity Evaluation-27 (ACE-27) is a validated instrument for assessing comorbidity in numerous cancer types including H&N cancers.[80] An important consideration when interpreting published clinical trial data is the applicability of the results to patients with significant comorbidities, who may have been ineligible/excluded from such studies.

Quality of Life

Health-related quality-of-life issues are important in H&N cancers. These tumors affect basic physiologic functions (ie, the ability to chew, swallow, and breathe), the senses (ie, taste, smell, hearing), and uniquely human characteristics (ie, appearance, voice). *Health status* describes an individual's physical, emotional, and social capabilities and limitations. *Function* and *performance* refer to how well an individual is able to perform important roles, tasks, or activities. *Quality of life* differs, because the central focus is on the *value* (determined by the patient alone) that individuals place on their health status and function.[81]

Patient-completed scales should be used to measure quality of life.[82] Three validated and accepted measures for H&N cancer-specific issues are: 1) the University of Washington Quality of Life Questionnaire (UW-QOL);[83] 2) the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Head and Neck Module (EORTC-QLQ-H&N35);[84] and 3) the Functional Assessment of Cancer Therapy Head and Neck (FACT-H&N) scale.[85] The Performance Status Scale is a clinician-rated performance scale that is widely used for patients with H&N cancers.[86]

Head and Neck Surgery

All patients should be evaluated by an H&N surgical oncologist before treatment. In addition, it is critical that multidisciplinary evaluation and treatment be well coordinated. Minimally invasive surgery may be useful for decreasing morbidity.[87,88] Use of robotic surgery is increasing in the United States. For H&N cancer surgery, transoral resection using robotic, endoscopic, or direct access surgery may offer advantages over conventional methods.[89,90] Evaluation, integration of therapy, assessment of resectability, principles for primary tumor resection, margins, surgical management of the neck and the cranial nerves (VII, X–XII), management of recurrences, and principles for surveillance (including post-treatment neck evaluation) are discussed in the algorithm (see *Principles of Surgery* in the NCCN Guidelines for Head and Neck Cancers).[91,92]

Neck Dissection

Historically, cervical lymph node (ie, neck) dissections have been classified as *radical* or *modified radical* procedures. The less radical procedures preserved the sternocleidomastoid muscle, jugular vein, spinal accessory nerve, or selective lymph node levels. The NCCN Panel prefers to classify cervical lymphadenectomy using contemporary nomenclature; thus, cervical lymph node dissections are classified as either *comprehensive* or *selective.*[93] A *comprehensive* neck dissection is one that removes all lymph node groups that would be included in a classic radical neck dissection. Whether the sternocleidomastoid muscle, jugular vein, or spinal accessory nerve is preserved does not affect whether the dissection is classified as comprehensive. Depending on the site, comprehensive neck dissection is often recommended for N3 disease (see the algorithm for specific sites and *Neck Management* in *Principles of Surgery* in the NCCN Guidelines for Head and Neck Cancers).

Selective neck dissections have been developed based on the common pathways for spread of H&N cancers to regional nodes (see Figure 2).[94,95] Depending on the site, selective neck dissection is often recommended for N0 disease (see the algorithm for specific sites and *Neck Management* in *Principles of Surgery* in the NCCN Guidelines for Head and Neck Cancers). To remove the nodes most commonly involved with metastases from the oral cavity, a selective neck dissection is recommended that includes the nodes found above the omohyoid muscle (levels I–III and sometimes the superior parts of level V).[93,96] Similarly, to remove the nodes most commonly involved with metastases from the pharynx and larynx, a selective neck dissection is recommended that includes the nodes in levels II to IV and level VI when appropriate.[93] H&N squamous cell cancer with no clinical nodal involvement rarely presents with nodal metastasis beyond the confines of an appropriate selective neck dissection (<10% of the time).[97-99]

The chief role of selective neck dissections in these NCCN Guidelines is to determine which patients are candidates for possible adjuvant therapy (ie, systemic therapy/RT or RT), although selective neck dissections may be used as treatment when neck tumor burden is low.[100] In general, patients undergoing selective neck dissection should not have clinical nodal disease; however, selective neck dissection may prevent morbidity in patients with nodal disease and may be appropriate in certain patients with N1 to N2 disease.[101-103] In patients with pathologically positive lymph nodes, radiation with or without chemotherapy should be considered and a decision should be made following multidisciplinary evaluation. In the NCCN Guidelines, patients with cervical node metastases who undergo operations with therapeutic intent are generally treated with cervical lymphadenectomy to remove all clinically positive nodes, other levels of the neck that may be at high risk for harboring metastasis, and non-lymphatic structures that are directly involved with cancer. Determining whether an ipsilateral or bilateral neck dissection is needed depends on tumor thickness, the extent of the tumor, and the site of the tumor.[91] For

example, bilateral neck dissection is often recommended for tumors at or near the midline and/or for tumor sites with bilateral drainage.

Guidance on neck management following definitive RT or systemic therapy/RT treatment can be found in *Follow-Up Recommendations: Post Systemic Therapy/RT or RT Neck Evaluation* in the NCCN Guidelines for Head and Neck Cancers.

Postoperative Management of High-Risk Disease

Many factors influence survival and locoregional tumor control in patients with H&N cancers. The role of systemic therapy/RT in the postoperative management of the patient with adverse prognostic risk factors has been clarified by two separate multicenter randomized trials for patients with high-risk cancers of the oral cavity, oropharynx, larynx, or hypopharynx.[104,105] A combined analysis of data from the two trials has been done.[106]

The US Intergroup trial (RTOG 9501) randomly assigned patients with two or more involved nodes, positive margins, or extracapsular nodal spread of tumor to receive standard postoperative RT or the same RT plus cisplatin (100 mg/m^2 every 3 weeks for three doses).[105] Note that long-term results from RTOG 9501 have been published.[107] The European trial (EORTC 22931) was designed using the same chemotherapy treatment and similar RT dosing but also included as high-risk factors the presence of perineural or perivascular disease and nodal involvement at levels IV and V from an oral cavity or oropharyngeal cancer.[104] The RTOG trial showed statistically significant improvement in locoregional control and DFS but not OS, whereas the EORTC trial found significant improvement in survival and the other outcome parameters.

In a randomized phase III trial from a single institution in India, cisplatin 30 mg/m^2 weekly was compared to cisplatin 100 mg/m^2 every 3 weeks, when given concurrently with RT, in 300 patients with locally advanced squamous cell H&N cancer (93% in the adjuvant setting).[108] Two-year locoregional control was superior in patients randomized to receive cisplatin once every 3 weeks (73.1%), compared to patients randomized to receive weekly cisplatin (58.5%) (HR, 1.76; 95% CI, 1.11–2.79; P = .014). However, patients randomized to receive cisplatin once every 3 weeks developed more severe acute toxicities, compared to patients randomized to receive weekly cisplatin (84.6% vs. 71.6%, respectively, P = .006). The acute adverse events that were significantly more likely to have been reported in patients who received cisplatin once every 3 weeks were hyponatremia, leukopenia, neutropenia, and lymphocytopenia (P < .001 for all). A schedule using cisplatin at 50 mg intravenously weekly has also been shown to improve survival in the adjuvant setting in a randomized trial.[109]

To better define risk, a combined analysis of prognostic factors and outcome from the RTOG 9501 and EORTC 22931 trials was performed. This analysis showed that patients in both trials with extranodal extension of tumor and/or positive resection margins benefited from the addition of cisplatin to postoperative RT. For those with multiple involved regional nodes without extranodal extension, there was no survival advantage.[106,107] However, it is important to note that the combined analysis was considered exploratory by the authors.[106] These publications form the basis for the NCCN recommendations regarding adjuvant treatment.

In NCCN Member Institutions, most patients with extranodal extension with or without positive surgical margins receive adjuvant chemoradiotherapy after surgery.[109-115] The presence of other adverse risk factors—multiple positive nodes (without extranodal extension), perineural invasion, vascular invasion, lymphatic invasion, pT3 or pT4 primary, and oral cavity or oropharyngeal primary cancers with positive level IV or V nodes—are generally established indications for postoperative RT.

Because patients with these other adverse features were also included in the EORTC 22931 trial that showed a survival advantage for patients receiving cisplatin concurrently with postoperative RT compared to RT alone, the NCCN Panel added a recommendation to consider chemoradiation for these features.[104]

In the randomized phase II RTOG-0234 trial, two regimens in patients with stage III and IV squamous cell carcinoma of the H&N were compared: 1) adjuvant chemoradiotherapy with cetuximab and docetaxel; and 2) adjuvant chemoradiotherapy with cetuximab and weekly cisplatin (*N* = 238).[116] After a median follow-up of 4.4 years, patients randomized to receive docetaxel experienced a 31% reduction in DFS failure rate (HR, 0.69; 95% CI, 0.50–0.96; *P* = .01), and a 44% reduction in mortality (HR, 0.56; 95% CI, 0.39–0.82; *P* = .001). The randomized phase II/III RTOG 1216 trial is continuing to investigate docetaxel/cetuximab with postoperative RT, compared to cisplatin or docetaxel with postoperative RT (NCT01810913). For patients with high-risk adverse features following surgery (ie, extranodal extension and/or positive margins) who are ineligible for platinum therapy, docetaxel/cetuximab is a category 2B option for postoperative systemic therapy/RT.

Surgery for Relapsed/Refractory Disease

Patients with advanced carcinoma (any T, N2–3) who undergo nonsurgical treatment, such as concurrent chemotherapy and RT, need very close follow-up both to evaluate for local recurrence and to assess for ipsilateral or contralateral neck recurrence (see *Follow-up Recommendations* in the NCCN Guidelines for Head and Neck Cancers). For patients who do not have a complete clinical response to systemic therapy/RT, surgery plus neck dissection is recommended as indicated. However, all panel members emphasized that it may be difficult to detect local or regional recurrence due to radiation-related tissue changes, and this may result in a delayed diagnosis of persistent or recurrent disease.

Panel members also emphasized the increased risk of complications when surgery in patients with relapsed/refractory disease is attempted. Some of these patients may require microvascular free flap reconstruction to cover the defects at the primary site. The patients undergoing neck dissection may develop complications related to delayed wound healing, skin necrosis, or carotid exposure. Laryngectomy may be indicated to obtain clear surgical margins or to prevent aspiration (eg, in patients with advanced oropharyngeal cancer). After laryngectomy for relapsed/refractory disease, patients may have a higher incidence of pharyngocutaneous fistula, pharyngeal and stomal stenosis, and other wound complications.[117] Flaps may be advantageous (either a free flap reconstruction of the laryngopharyngeal defect, or a myocutaneous flap to buttress the suture line if the pharynx can be closed primarily).

Head and Neck Radiation Therapy

RT for H&N cancers has grown increasingly complex. The availability and technical precision of techniques such as intensity-modulated RT (IMRT) or intensity-modulated proton therapy (IMPT) has markedly increased. A thorough understanding of natural history, anatomy, clinical circumstances, and imaging continue to guide the use of radiation as primary or adjuvant treatment. Principles regarding radiation prescriptions and techniques as described in the NCCN Guidelines for Head and Neck Cancers are not all-inclusive. The physics and engineering of RT are rapidly improving, and these advanced technologies provide much opportunity for variations and individualization in targeting and dose delivery, obviating traditional notions of *standard* fields and targets. Guidelines from the American College of Radiology may be useful for technical details (http://www.acr.org/Quality-Safety). Frequently used and cited contouring guidelines for treatment of H&N cancers are based on patients who have not undergone surgical resection.[118,119] A commonly used radiation prescription for gross disease is 70 Gy (2 Gy/fraction) for the following sites: lip, oral cavity, oropharynx, hypopharynx, glottic larynx,

supraglottic larynx, occult primary, salivary gland tumors, and MM. For patients with cancer of the nasopharynx, a fractionation schedule of 69.96 Gy at 2.12 Gy/fraction daily (Monday–Friday) for 6 to 7 weeks has often been used in prospective clinical trials.[120]

Although several palliative RT regimens are provided, no single regimen is preferred;[121,122] specific regimens vary widely among NCCN Member Institutions. Any palliative RT regimen that might cause severe toxicities should be avoided. More hypofractionated regimens may be useful for patients with end-stage disease. For example, the QUAD SHOT regimen consists of a dose of 44.4 Gy, delivered in 12 fractions over three cycles, with each cycle separated by 2 to 3 weeks.[123]

Radiation Doses

Selection of radiation total dose depends on the primary tumor and neck node size, fractionation, and clinical circumstances, including whether to use concurrent systemic therapy (see *Radiation Techniques* in the NCCN Guidelines for Head and Neck Cancers and see the individual *Principles of Radiation Therapy* for each primary site). The demonstration of clinically significant dose sparing of organs at risk (eg, brain, cochlea, optic chiasm and nerves, spinal cord) reflects best clinical practice. Target definition and delineation is crucial, and imaging should be used to ensure accurate radiation delivery. Anatomical changes (eg, rapidly shrinking tumors, changes in air cavities, significant weight loss) may necessitate repeat imaging and treatment replanning.

When treating definitively, the primary tumor and involved lymph nodes (ie, high-risk sites) generally require a total of 66 Gy (2.2 Gy/fraction) to 70 Gy (2.0 Gy/fraction).[124-127] For doses greater than 70 Gy, some clinicians feel that the fractionation should be slightly modified (eg, <2.0 Gy/fraction for at least some of the treatment) to minimize toxicity; an additional two to three doses can be added depending on clinical circumstances. Care must be taken if prescribing doses exceed 72 Gy using conventional fractionation (2.0 Gy/fraction), as this may lead to unacceptable rates of normal tissue injury; however, these data are in the era prior to advanced techniques such as IMRT or IMPT.[124,128] When using hyperfractionation, gross disease may be prescribed up to 81.6 Gy (1.2 Gy/fraction).[124,125] In contrast, elective irradiation to low-risk and intermediate-risk sites requires 44 Gy (2.0 Gy/fraction) to 63 Gy (1.6–1.8 Gy/fraction), depending on the estimated level of tumor burden, and on whether 3D conformal RT (3D-CRT) or IMRT is used. For 3D-CRT and sequentially planned IMRT, 44 to 50 Gy (2.0 Gy/fraction) is suggested.[129,130] For IMRT, 54 to 63 Gy (1.6–1.8 Gy/fraction) is suggested.[130-132] Delivery of six fractions per week is an acceptable accelerated schedule, if chemotherapy is not prescribed concurrently.[126]

Postoperative irradiation is recommended based on stage, histology, and surgical-pathologic findings. In general, postoperative RT is recommended for selected risk factors, including advanced T-stage, depth of invasion, multiple positive nodes (without extranodal extension), or perineural/lymphatic/vascular invasion. Higher doses of postoperative RT alone (60–66 Gy), or with systemic therapy, are recommended for the high-risk features of extranodal extension and/or positive margins.[106,107,127] The preferred interval is 6 weeks or less, between resection and commencement of postoperative RT. Dosing schedules are the same regardless of whether or not systemic therapy is administered concurrently with postoperative RT. Hypofractionation may be considered for patients who are not good candidates for 6 to 7 weeks of RT due to comorbidities.

Fractionation in RT Alone

No single fractionation schedule has proven to be best for all tumors. Data strongly indicate that squamous cancers of the H&N can grow rapidly and may compensate for RT-induced cell loss through the mechanism of accelerated repopulation.[133,134] Especially in RT alone settings, schedules

delivering at least 1000 cGy per week are recommended,[135-137] with the exception of salivary gland tumors, which may have slower cell kinetics. Trials in early-stage glottic laryngeal cancer have shown higher recurrence rates with daily fraction sizes <200 cGy where the cumulative weekly dose is <1000 cGy.[138,139]

Two large randomized trials from Europe have reported improved locoregional control using altered fractionation. The EORTC protocol 22791 compared hyperfractionation (1.15 Gy twice daily, or 80.5 Gy over 7 weeks) with conventional fractionation (2 Gy once daily, or 70 Gy over 7 weeks) in the treatment of T2, T3, N0–1 oropharyngeal carcinoma excluding base of tongue primaries. At 5 years, a statistically significant increase in local control was observed in the hyperfractionation arm (38% vs. 56%; *P* = .01) and no increase in late complications was observed.[140] A long-term follow-up analysis has also shown a small survival advantage for hyperfractionation (*P* = .05).[141] Another EORTC protocol (22851) compared accelerated fractionation (1.6 Gy 3 times daily, or 72 Gy over 5 weeks) with conventional fractionation (1.8–2.0 Gy once daily, or 70 Gy over 7–8 weeks) in various intermediate to advanced H&N cancers (excluding cancers of the hypopharynx). Patients in the accelerated fractionation arm had significantly better locoregional control at 5 years (*P* = .02). Disease-specific survival showed a trend in favor of the accelerated fractionation arm (*P* = .06). Acute and late toxicity were increased with acceleration, however, raising questions about the net advantages of accelerated fractionation.[142]

The RTOG reported the results of a four-armed, phase III, randomized clinical trial (RTOG 90-03) comparing hyperfractionation and two variants of accelerated fractionation versus standard fractionation.[124,125,143] After 2 years of follow-up, both accelerated fractionation with a concomitant boost (AFX-C) and hyperfractionation were associated with improved locoregional control and DFS compared with standard fractionation. However, acute toxicity was increased with accelerated fractionation. No significant difference was shown in the frequency of grade 3 or worse late effects reported at 6 to 24 months after treatment start, among the various treatment groups. Long-term follow-up confirmed a statistically significant improvement in locoregional control and OS with hyperfractionation compared to standard fractionation.[125]

The MARCH meta-analysis, including individual patient data from 15 randomized trials, analyzed the effect of hyperfractionated or accelerated RT on survival of patients with H&N cancers.[144] Standard fractionation constituted the control arm in all of the trials in this meta-analysis.[126] An absolute survival benefit for altered fractionation of 3.4% at 5 years (HR, 0.92; 95% CI, 0.86–0.97; *P* = .003) was reported. This benefit, however, was limited to patients younger than 60 years of age.[144] Hyperfractionation was associated with a benefit of 8% after 5 years.[145] An update to the MARCH meta-analysis, including data from 33 trials, continued to show a survival benefit of hyperfractionation, compared to standard fractionation (HR, 0.83; 95% CI, 0.74–0.92; *P* < .001), in patients with locally advanced squamous cell cancers of the H&N.[146]

Consensus regarding altered fractionation schedules with concomitant boost or hyperfractionation for stage III or IV oral cavity, oropharynx, supraglottic larynx, and hypopharyngeal squamous cell cancers has not yet emerged among NCCN Member Institutions.[144,147,148]

Fractionation in Concurrent Chemoradiation

Panel members do not agree about the optimal radiation dose fractionation scheme to use with concurrent systemic therapy in the definitive treatment setting. Most published studies have used conventional fractionation (at 2.0 Gy/fraction to a typical dose of 70 Gy in 7 weeks) with single-agent high-dose cisplatin (given every 3 weeks at 100 mg/m^2).[29] Other fraction sizes (eg, 1.8 Gy, conventional), other dosing

schedules of cisplatin, other single agents, multiagent systemic therapy, and altered fractionation with systemic therapy have been evaluated alone or in combination. Numerous trials have shown that modified fractionation and concurrent chemotherapy are more efficacious than modified fractionation alone.[148-150] The GORTEC 99-02 trial reported that altered fractionation did not improve outcomes when compared with conventional fractionation given with concurrent chemotherapy.[151,152] RTOG 0129 assessed accelerated fractionation with two cycles of concurrent cisplatin versus standard fractionation with three cycles of concurrent cisplatin. There was no significant difference in OS between the two arms,[29,153,154] indicating that accelerated fractionation is not more efficacious than conventional fractionation when concurrent chemotherapy is added.

Concurrent chemoradiation increases acute toxicity compared to radiation alone, although an increase in late toxicity beyond that caused by RT alone is less clear.[155-157] Altered fractionation and/or multiagent systemic therapy may further increase the toxicity burden.[158] For any chemotherapeutic approach, close attention should be paid to published reports for the specific chemotherapy agent, dose, and schedule of administration. Chemoradiation should be performed by an experienced team and should include substantial supportive care.

Radiation Techniques

IMRT

The intensity of the radiation beam can be modulated to decrease doses to normal structures without compromising the doses to the cancer targets.[159,160] Over the last 15 years, IMRT has displaced other techniques in the treatment of most H&N malignancies.[161-168] IMRT is an advanced form of CRT permitting more precise cancer targeting while reducing dose to normal tissues.[130,169-172]

IMRT dose painting refers to the method of assigning different dose levels to different structures within the same treatment fraction (eg, 2.0 to gross tumor, 1.7 to microscopic tumor, <1.0 Gy to parotid gland) resulting in different total doses to different targets (eg, 70 Gy, 56 Gy, <26 Gy).[173,174] Although dose painting has been used to simplify radiation planning, hot spots associated with higher toxicity can occur.[174,175] Alternatively, separate dose plans for the low versus higher dose targets can be delivered sequentially (reduce target size and boost) or on the same day as separate fractions in twice-daily schemas (see *Radiation Techniques* in the NCCN Guidelines for Head and Neck Cancers).[126,171,176,177]

IMRT is now widely used in H&N cancers and is the predominant technique used at NCCN Member Institutions.[178,179] OS is similar between patients treated with IMRT and those receiving conventional RT.[161,180-182] For example, a prospective Korean study showed that 3D and IMRT techniques were superior to 2D radiation for both PFS and OS in patients with NPC, and IMRT was associated with improved survival in multivariate analysis, particularly in T3–T4 tumors.[183]

Xerostomia is a common long-term side effect of RT, which can be reduced with use of IMRT, drug therapy (eg, pilocarpine, cevimeline), salivary substitutes, and other novel approaches (eg, relocation of submandibular gland).[166,184-188] Reports indicate that xerostomia has decreased due to the transition from older 2D and 3D radiotherapy techniques, such as IMRT.[161,163] Numerous phase II studies show a decrease in late toxicity (xerostomia) without compromising tumor control for nasopharyngeal, sinonasal, and other sites.

Three randomized trials have supported the clinical benefits of IMRT in H&N cancers with regard to the reduction in xerostomia. Pow et al evaluated treatment of early-stage NPC with conventional RT techniques versus with IMRT.[185] The results showed a statistical improvement in salivary flow and in patient-reported quality-of-life parameters.[185] In the

study by Kam et al, patients with NPC were randomly assigned to either IMRT or conventional 2D-RT.[166] At one year after treatment, patients in the IMRT arm had significantly lower rates of clinician-rated severe xerostomia than patients in the 2D-RT arm (39.3% vs. 82.1%; *P* = .001). Salivary flow rates were also higher with IMRT. The mean parotid dose was 32 Gy in the IMRT group and 62 Gy in the conventional group. Although a trend for improvement in patient-reported dry mouth was observed after IMRT, recovery was incomplete and there was no significant difference in patient-reported outcomes between the two arms. The authors concluded that other salivary glands may also be important and merit protection. Finally, data from a phase III randomized trial (PARSPORT) indicate that IMRT decreases xerostomia when compared with conventional RT in patients with non-NPC.[161] In this trial, patients with T1–T4, N0–N3, M0 disease were treated to a total dose of 60 or 65 Gy in 30 fractions either with conventional RT (ie, parallel opposed technique) or with IMRT; 80 patients with oropharyngeal and 14 patients with hypopharyngeal tumors were included. Grade 2 or worse (LENT-SOMA scale) xerostomia 2 years after treatment was seen in 83% of patients receiving conventional RT versus 29% of patients in the IMRT group (*P* < .0001). No differences were seen in the rates of locoregional control or survival.

IMRT may be useful in reducing other long-term toxicities by reducing doses to other structures such as pharyngeal constrictors, larynx, temporal lobes, mandible, auditory structures (including cochlea), and optic structures.[131,166,185,189-194] IMRT may be useful to preserve the optic pathway in patients with sinonasal malignancies.[189] Retrospective analyses including 2,993 patients who received RT for treatment of H&N cancer showed that patients who received IMRT had a shorter duration of feeding tube placement, compared to those who received 3D-RT (*P* = .03).[195] However, the randomized phase III COSTAR trial showed that cochlear-sparing IMRT did not significantly reduce hearing loss in patients with parotid tumors, compared to 3D-CRT.[194] Care must be taken with IMRT techniques as it can create new unexpected acute toxicities to organs radiated in the beam path.[196,197]

Proton Beam Therapy

At present, proton therapy is the predominant particle therapy under active clinical investigation in the United States.[198-201] Proton therapy has been used to treat oropharyngeal cancers, sinonasal malignancies, adenoid cystic carcinomas, and MMs.[202-210] Proton therapy has typically been used to treat patients with the most challenging disease, for which other RT options were not felt to be safe or of any benefit.[203,206,211]

Data supporting the use of proton beam therapy (PBT) come mainly from nonrandomized institutional reports and a small number of systematic reviews. A systematic review and meta-analysis of non-comparative observation studies concluded that patients with malignant diseases of the nasal cavity and paranasal sinuses who received proton therapy appeared to have better outcomes than those receiving photon therapy.[212] A review of proton therapy in patients with H&N cancers included 14 retrospective reviews and four prospective nonrandomized studies.[199] The 2- to 5-year local control rates were as low as 17.5% for T4 or recurrent paranasal sinus cancers and as high as 95% for other types of tumors.

In institutional reports, outcomes for proton therapy have been reported, including good locoregional control, freedom from distant metastasis, and acceptable toxicity.[199,208,213-216] PBT may be associated with greater normal tissue sparing without sacrificing target coverage, which may be associated with reduced toxicity compared to IMRT.[213]

Occasional fatal outcomes have been reported with proton therapy, including a small number of deaths secondary to brainstem injury.[217-219] However, clinicians have reported low rates of serious toxicities when using strict dose limits for proton therapy.[203,220] In patients with tumors that are periocular in location and/or invade the orbit, skull base, and/or

cavernous sinus, and tumors that extend intracranially or exhibit extensive perineural invasion, as well as in patients being treated with curative intent and/or have long life expectancies, achieving highly conformal dose distributions is crucial.

As described above, nonrandomized institutional reports and a small number of systematic reviews have shown that PBT may be safe to use in some settings. Without high-quality prospective comparative data, it is premature to conclude that proton therapy has been established as superior to other modern radiation techniques such as IMRT, particularly with regard to tumor control. An accurate comparison of benefits to other RT options should ideally take place in the controlled setting of randomized clinical trials. An alternative approach may be to develop prospectively maintained databases to raise the quality of institutional reports of clinical experiences.[219] In cancers of the oropharynx, supraglottic larynx, paranasal sinus, and salivary glands, as well as MM, and unknown primary tumors of the H&N, proton therapy can be considered when normal tissue constraints cannot be met by photon-based therapy. There are ongoing efforts to develop models to predict which patients would benefit the most from proton therapy.

Brachytherapy

Brachytherapy is now being used less often because of improved local control and lower toxicities obtained with IMRT with or without systemic therapy. However, brachytherapy still has a role primarily for lip and oral cavity cancers (see *Principles of Radiation Therapy* in the NCCN Guidelines for Cancer of the Lip and Cancer of the Oral Cavity).[221]

Stereotactic Body Radiation Therapy

Stereotactic body RT (SBRT) is an advanced technique of external beam RT (EBRT) that delivers large ablative doses of radiation. Advantages of SBRT include shorter treatment time, promising local control rates, and acceptable toxicity.[222] There is currently insufficient evidence to recommend SBRT for treatment of H&N cancers, but the NCCN Panel acknowledges that it might be beneficial in the settings of re-irradiation, palliation, or for older adults.[223,224]

Follow-up After RT

For patients whose cancer has been treated with RT, the recommended follow-up (see *Follow-up Recommendations* in the NCCN Guidelines for Head and Neck Cancers) includes an assessment of thyroid function (ie, the thyroid-stimulating hormone [TSH] level should be determined every 6–12 months). Increased TSH levels have been detected in 20% to 25% of patients who have received neck irradiation.[225-227]

Imaging of Head and Neck Cancers

Appropriate selection and utilization of imaging studies is crucial for proper management of patients with H&N cancers. Initial imaging of the primary site is done with CT and/or MRI. MRI is generally preferred over CT in patients with cranial nerve symptoms or to evaluate cranial nerve involvement or tumors that encroach upon the skull base. CT, on the other hand, is complementary to MRI for evaluation of bony erosion or cartilage invasion that may occur with some H&N tumors. In patients with oral cavity cancer with bone involvement, MRI is needed to evaluate the extent of bone marrow invasion, while CT may be appropriate to evaluate cortical bone erosion or periosteal invasion. In patients with sinonasal tumors, MRI is useful for differentiating tumor extent from obstructed sinuses or secretions and to evaluate intracranial/dural involvement. Evaluation of lymph node metastases can be done with either CT or MRI, depending on the primary site, although both have lower accuracy as compared with FDG PET/CT.[228] Ultimately, choosing CT or MRI should be driven by the information desired; routinely ordering both may not be indicated.

There is evidence supporting the superiority of FDG PET/CT for detecting locoregional nodal and distant metastases in patients with H&N cancers. A

meta-analysis including 24 studies with 1,270 patients with newly diagnosed H&N cancer showed sensitivity and specificity values of 91% and 87%, respectively, for detection of regional nodal metastasis by FDG PET/CT.[229] In the analysis of per-neck-level data (13 studies), sensitivity was 84%, compared to 63% for CT and/or MRI. Two meta-analyses have shown that sensitivity of FDG PET/CT for detection of cervical lymph node involvement may be lower in patients with clinically node-negative H&N squamous cell carcinoma (HNSCC) (50%–58%).[230,231] A meta-analysis including 10 studies showed that PET/CT had a sensitivity value of 89% and a specificity value of 98% for detection of bone metastases in patients with H&N cancer.[232] In a prospective cohort study including 307 patients with oral, pharyngeal, or laryngeal cancer, FDG PET/CT detected distant metastasis more often than chest x-ray/H&N MRI ($P < .001$) and chest CT/H&N MRI ($P = .02$).[233] However, if there is concern about metastasis to a specific anatomic area, then directed CT or MRI may also be done (eg, contrast-enhanced chest CT to evaluate pulmonary metastases and/or mediastinal lymph node involvement; contrast-enhanced brain MRI for evaluation of brain metastases or skull base invasion). H&N cancers rarely metastasize to the brain by a hematogenous route. Therefore, routinely ordering a full brain study as part of the initial imaging workup is not routine.

For patients who are dentulous and expected to receive postoperative RT, a panoramic dental x-ray should be completed before treatment as part of the dental evaluation (see *Principles of Dental Evaluation and Management* in the NCCN Guidelines for Head and Neck Cancers and below).

Short-Term Evaluation of Locoregionally Advanced Disease

Serial imaging may be part of response assessment. Which modality is best suited for follow-up should be carefully considered. It is unlikely all three modalities (CT, MRI, FDG PET/CT) will be needed, as this may add cost and inconvenience without significant added value.

Patients treated with induction chemotherapy may receive imaging with CT or MRI after two to three cycles of induction. If there is high concern for distant metastasis, chest CT or FDG PET/CT may be needed to evaluate whether to proceed to the planned definitive local therapy.

For patients with locoregionally advanced disease who have undergone surgery, postoperative imaging is recommended if there are signs of early recurrence, or for patients considered high risk of early recurrence. This may be needed to evaluate whether to proceed to the planned adjuvant radiation-based therapy and/or to determine targets and dosing of radiation in case of unexpected recurrence. Patients with positive margins, advanced T or N stage, or oral cavity cancers are at particular risk for rapid recurrence after surgery.[234]

After definitive-intent treatment completion, the panel generally recommends imaging 3 to 4 months after the end of treatment, or as early as 4 to 8 weeks after definitive treatment if there is concern about an incomplete treatment response. Of note, proximity to recent treatment can complicate interpretation of radiographic studies, and communication with the interpreting radiologist is important to distinguish recurrent disease from post-treatment effect. PET scans can be particularly difficult to interpret at earlier time points.

Careful and regular follow-up examinations are recommended so that any local or regional recurrence is detected early. After RT-based treatment, evaluation with imaging (ie, CT and/or MRI with contrast, or preferably, FDG PET/CT) guides the use of neck dissection (see *Follow-Up Recommendations: Post Systemic Therapy/RT or RT Neck Evaluation* in the NCCN Guidelines for Head and Neck Cancers).[235-239] A meta-analysis including five studies with 359 patients showed that the sensitivity and

specificity for FDG PET/CT to detect local residual or recurrent disease were 81% and 90%, respectively, and 73% and 89%, respectively, for detection of nodal residual or recurrent disease.[240] If PET/CT is used for follow-up, the first scan should be performed at a minimum of 12 weeks after treatment to reduce the false-positive rate.[228,240-242] PET/CT surveillance in patients with advanced nodal disease who received systemic therapy/RT yielded a comparable survival rate and quality of life and may be more cost-effective, relative to planned neck dissection.[243,244] Care should be taken regarding the timing and interpretation of PET studies, as false-positive results may occur due to recent infection or treatment-related inflammation.

Note that a *complete clinical response* (ie, clinically negative) may be defined as no visible or palpable evidence of residual neck disease and no concerning findings on CT or MRI (ie, the absence of either focally abnormal lymph nodes or large nodes);[235,245] a complete pathologic response requires pathologic confirmation. If a complete clinical response to RT-based treatment has been achieved, then the panel recommends observing the patient.[235,245,246] In patients who have a clinically negative neck, PET/CT is associated with negative predictive values ranging from 97% to 100%.[247-249] Panel members also concur that any patient with residual disease after RT-based treatment should be considered for surgical resection for refractory disease, including a neck dissection if indicated.[235] If the residual, persistent, or progressing disease is unresectable, then these patients should receive systemic therapy and/or RT as described for recurrent or persistent disease in the NCCN Guidelines for Head and Neck Cancers. For patients with equivocal PET/CT scan results in the neck, a prospective study suggests that a repeat PET/CT scan 4 to 6 weeks later may help identify those patients who can be safely observed without surgery to the neck.[250] These patients may also continue to be observed if the clinical examination is reassuring.

Long-Term Evaluation of Recurrent Disease

Recurrences in patients with H&N cancer tend to occur in the first 3 years following treatment, with more occurring earlier rather than later in this interval. There is little evidence to support imaging surveillance in the long-term (ie, >6 months following treatment) in patients who have negative imaging results,[242,251] though delayed or late recurrences are more common in patients with HPV-related H&N cancer.[252] A meta-analysis including seven studies with 577 scans showed that FDG PET/CT showed high sensitivity (92%) and specificity (91%) values for detection of H&N cancer recurrence 12 months after treatment.[253] However, a retrospective study including 1,114 patients with H&N cancer showed that PET/CT scans conducted at 12 and 24 months after treatment completion become less equivocal with time.[251] Further, among patients with negative 3-month scans, there were no significant differences in subsequent survival outcomes in patients whose recurrences were detected through PET/CT versus those with clinically detected recurrences. Despite this, the danger of distant metastasis from occult or asymptomatic disease should be acknowledged. A single-institution retrospective study including 123 patients with treated H&N cancer showed that asymptomatic lesions were detected in 20% of patients, with half of these being thoracic lesions.[254]

H&N cancer treatment can result in fibrosis and altered anatomy, which frequently leads to challenges in physical examination that may be assisted by follow-up imaging. Ultimately, the plan for long-term surveillance should take into account tumor site, stage, prognostic factors, presence of symptoms, and changes based on clinical exam. Neck ultrasound, which is widely available, inexpensive, safe, and accurate, may be used to evaluate suspected nodal disease.[228] For areas difficult to visualize by clinical examination (ie, due to anatomy or areas obscured by treatment change), routine annual imaging using the pretreatment imaging modality (usually CT or MRI) may be indicated. The impact of annual screening for lung metastasis or synchronous lung cancer in patients with

a heavy smoking history is an area in need of investigation. Annual chest CT should be considered for these patients. Many clinicians obtain chest x-ray for lung screening, but this is not supported by strong evidence due to limited sensitivity[255,256] (see NCCN Guidelines for Lung Cancer Screening, available at www.NCCN.org).

Principles of Nutrition and Supportive Care

The *Principles of Nutrition* section in the NCCN Guidelines for Head and Neck Cancers outlines nutritional management and supportive care for patients with H&N cancers who are prone to weight loss, which can often be severe, as a result of treatment-related toxicity, disease, and health behaviors such as poor nutritional habits.[58,257,258] Patients with H&N cancers are also at risk for dehydration. The multidisciplinary expertise of a registered dietitian and a speech-language/swallowing therapist should be utilized throughout the continuum of care.

Patients who have had significant weight loss (5% body weight loss over 1 month, or 10% body weight loss over 6 months) need nutritional evaluation and close monitoring of their weight to prevent further weight loss.[259,260] In addition, all patients should receive nutritional evaluation before and after treatment to assess the need for interventions (eg, enteral support via feeding tubes).[261-263] Patients are also at risk for problems with speech. Treatment and/or the progression of their disease may cause deterioration in their ability to speak and/or swallow.[264-267] Evaluation by a speech-language/swallowing therapist is needed before and after treatment to help mitigate potential problems.[268-270] Patients are also at risk for dental problems (see *Principles of Dental Evaluation and Management* in the NCCN Guidelines for Head and Neck Cancers and below).[58] Long-term swallowing and dental dysfunction are particular risks that are worsened by multimodality therapy and require long-term specialized attention.

Oral mucositis, or tissue damage, is common in patients treated with RT for H&N cancers,[271-276] though use of advanced RT techniques (eg, IMRT) may decrease the incidence and duration of this damage.[271,277] Oral mucositis causes pain in the mouth and when swallowing, which may affect the ability to eat and drink.[271,273,275,276] Oral mucositis is also associated with breaks and/or delays in treatment, as well as hospitalization.[272,274,276] Oral mucositis is worse in patients receiving concurrent systemic therapy/RT.[276] The Multinational Association of Supportive Care in Cancer and the International Society of Oral Oncology have published clinical practice guidelines for treatment of oral mucositis, though there are few high-quality studies in this area.[278] In the randomized phase III Alliance A221304 trial, patients with H&N cancer who were treated with RT (N = 275) were randomized to receive a diphenhydramine-lidocaine-antacid mouthwash, doxepin mouthwash, or a placebo.[279] The reduction in mucositis pain during the first 4 hours of treatment was significantly greater in the patients who received the diphenhydramine-lidocaine-antacid mouthwash (P = .004) or the doxepin mouthwash (P = .02), compared to the placebo. Two small retrospective studies including patients with H&N cancer treated with RT or systemic therapy/RT showed that treatment with gabapentin for pain from oral mucositis is associated with a reduced need for narcotic pain medication and high doses of opioids.[275,280] A single-institution study demonstrated that very-high-dose prophylactic gabapentin (2,700 mg daily) also reduced the number of patients requiring narcotics.[281] The toxicity of large dosages should not be underestimated and was not adequately explored in this single-institution study. Larger scale studies are awaited to fully assess the generalizability and toxicity of this dosing schedule. The panel recommends consideration of doxepin, diphenhydramine-lidocaine-antacid mouthwash, or gabapentin for pain related to oral mucositis, as clinically indicated and as tolerated.

NCCN Panel Members agree that reactive feeding tube placement is appropriate in selected patients with H&N cancers.[258,262] There is no

consensus about whether prophylactic tube placement is appropriate. Advantages of prophylactic tube placement include reductions in hospitalizations and treatment-related weight loss, as well as improved quality of life.[282] However, this practice is also associated with disadvantages, such as longer dependence on feeding tubes and worse long-term functional outcomes, compared to a reactive approach.[282] The NCCN Guidelines provide recommendations for prophylactic tube placement, which should be strongly considered in high-risk patients (eg, those with severe pretreatment weight loss, ongoing dehydration or dysphagia, significant comorbidities, severe aspiration, anticipated swallowing issues).[258,260] In patients with adequate swallowing function, care must be given with the help of speech and language pathologists to ensure that patients continue to swallow in order to prevent severe fibrosis and permanent feeding tube dependence (see *Principles of Nutrition: Management and Supportive Care* in the NCCN Guidelines for Head and Neck Cancers). With swallowing therapy, adequate pain control, and access to IV fluids, feeding tubes can be avoided in most patients. The NCCN Guidelines do not recommend prophylactic tube placement in lower-risk patients (ie, those without significant pretreatment weight loss, significant aspiration, or severe dysphagia), although these patients' weights should be carefully monitored during and after treatment.

Principles of Dental Evaluation and Management

Patients with H&N cancers are at risk of oral and dental complications after surgery or RT because of treatment-induced xerostomia and salivary gland dysfunction, which are associated with increased dental caries.[267,271,283-285] In addition, RT to the salivary and oral soft tissues is also associated with bone demineralization and trismus of the masticatory muscles. Using IMRT and limiting the RT dose to the salivary glands and oral cavity have been shown to decrease xerostomia and damage to the teeth.[283,284,286-292] Dental/oral evaluation and management can help decrease dental caries and associated problems such as dentoalveolar infection and osteoradionecrosis.[271,286,292-301]

The recommended dental/oral evaluations before, during, and after RT are described in detail in the algorithm and summarized here. A dental/oral treatment plan needs to be implemented before RT and should include the following: 1) eliminating potential sources of infection; 2) if performing dental extractions, allow adequate time for healing before RT; 3) treating active dental caries and periodontal disease; 4) treating oral candidiasis; and 5) educating patients about preventive strategies.[302] Some of the general strategies to decrease oral and dental complications include: 1) decrease dry mouth (eg, by using salivary substitutes and stimulation);[303-307] 2) reduce risk of dental caries (eg, by using topical fluoride);[293,308-311] 3) decrease dentoalveolar infection (eg, with frequent evaluations to detect and treat disease promptly); 4) prevent and address osteoradionecrosis;[312] 5) decrease trismus of the masticatory muscles (eg, by using custom mouth-opening devices to maintain range of motion);[313-315] and 6) have patient undergo evaluations during and after treatment to help minimize complications.[303,304,316,317] Major dental work such as extractions can be problematic for an irradiated mandible. Therefore, any planned procedures should be carried out by dentists well-acquainted with this treatment setting and potential related morbidities, and in consultation with the treating radiation oncologist.

During and after treatment, the goals of dental/oral management include: 1) addressing xerostomia; 2) preventing trismus; and 3) detecting and treating oral candidiasis.[302] Additional goals after treatment include: 1) preventing and treating dental caries; 2) surveying the mouth for early signs of post-radiation osteonecrosis; and 3) preventing oral candidiasis.[302]

Cancer of the Lip

The NCCN Guidelines for squamous cell carcinoma of the mucosal lip generally follow accepted clinical practice patterns established over several decades. The incidence of lymph node metastases (especially in early-stage lower lip cancer) is low, averaging less than 10%. The risk of lymph node metastases is related to the location, size, and grade of the primary tumor.

Workup and Staging

The workup for patients with squamous cell carcinoma of the lip consists of a complete H&N examination, biopsy, and other appropriate studies (see *Workup* in the NCCN Guidelines for *Cancer of the Lip*).

For the 8th edition of the AJCC Cancer Staging Manual, cancers of the external vermilion lip are now staged as cutaneous carcinomas of the H&N, given the similarity of these cancers to non-melanoma skin cancer.[318] Cancers of the lip mucosa continue to be staged as cancers of the oral cavity (see Table 1). The AJCC TNM staging system reflects tumor size, extension, and nodal disease.[318] This system does predict the risk for local recurrence. The location of the primary tumor also is predictive. Squamous cell carcinomas of the upper lip and commissure areas have a higher incidence of lymph node metastases at the time of diagnosis. Systemic dissemination is rare, occurring in approximately 10% to 15% of patients, most often in those with uncontrolled locoregional disease.

Treatment

Treatment of the Primary

Treatment recommendations are based on clinical stage, medical status of the patient, anticipated functional and cosmetic results, and patient preference. No randomized clinical trials have been conducted that can be used to direct therapy. In early-stage cancers (T1–2, N0), surgery is preferred, and radiation is an option for local control (see the NCCN Guidelines for *Cancer of the Lip*).[319-321] Some very small or superficial cancers are managed more expeditiously with a surgical resection without resultant functional deformity or an undesired cosmetic result. Occult cervical metastases are not common in patients with early-stage lip cancer, but sentinel lymph node biopsy (SLNB) has been shown to be feasible and effective in patients who may be at high risk of metastases based on tumor size and depth.[322-324]

Some advanced lip cancers can cause a great deal of tissue destruction and secondary deformity; surgery is preferred in this clinical setting. Surgery is also preferred for advanced cancers with extension into the bone. Patients who are unfit for surgery or who have M1 disease at initial presentation should be treated as for very advanced disease (see the NCCN Guidelines for *Very Advanced Head and Neck Cancers*).[325]

Management of the Neck

The management of the neck is also governed by stage and the location of the tumor. For example, the lymphatics of the upper lip are very extensive. Thus, tumors in this location are more apt to spread to deep superior jugular nodes. The position of the tumor along the lip also can be helpful in predicting the pattern of lymph node spread. A midline location can place a patient at higher risk for contralateral disease. Elective neck dissection or neck irradiation can be avoided in patients with early-stage disease and a clinically negative neck. For patients with advanced disease (T3, T4a) and an N0 neck, an ipsilateral or bilateral neck dissection is an option (see the NCCN Guidelines for *Cancer of the Lip*). When a patient presents with palpable disease, all appropriate nodal levels should be dissected. In patients who appear to have a complete response after either RT or chemoradiation, post-treatment evaluation with imaging can be used to guide the use of neck dissection (see *Principles of Surgery* in the algorithm).

Radiation Therapy

RT, when used as definitive treatment, may consist of EBRT with (or without) brachytherapy, depending on the size of the tumor. Brachytherapy should only be performed at centers with expertise. The NCCN algorithm provides recommendations for low dose-rate and high dose-rate brachytherapy (see *Principles of Radiation Therapy* in the NCCN Guidelines for *Cancer of the Lip*).[326,327] The conventional fractionation dose required also depends on tumor size, but doses of 66 to 70 Gy are adequate to control high-risk disease (see *Principles of Radiation Therapy* in the NCCN Guidelines for *Cancer of the Lip*).

In the adjuvant setting, simple T1–T2 lesions are generally treated the same as a skin lesion (see NCCN Guidelines for Non-Melanoma Skin Cancers; available at www.NCCN.org). Otherwise, doses of 60 to 66 Gy are required, depending on the pathologic features. In both definitive and adjuvant settings, the neck is treated with doses that address adverse features, such as positive margins or perineural/vascular/lymphatic invasion.[328] The fraction size to the intermediate- and low-risk sites ranges from 44 Gy (2.0 Gy/fraction) to 63 Gy (1.6 Gy fraction.) For these sites of suspected subclinical spread, suggested doses are 44–50 Gy if 3D-CRT is used or 54–63 Gy if IMRT is used, depending on the dose/fraction (1.6–2.0 Gy/fraction).

Follow-up/Surveillance

Recommendations for surveillance are provided in the algorithm (see *Follow-up Recommendations* in the NCCN Guidelines for Head and Neck Cancers).

Cancer of the Oral Cavity

The oral cavity includes the following subsites: buccal mucosa, upper and lower alveolar ridge, retromolar trigone, floor of the mouth, hard palate, and anterior two thirds of the tongue. The area has a rich lymphatic supply, and initial regional node dissemination to nodal groups at levels I to III. Regional node involvement at presentation is evident in approximately 30% of patients, but the risk varies according to subsite. For example, primaries of the alveolar ridge and hard palate infrequently involve the neck, whereas occult neck metastasis is common (50%–60%) in patients with anterior tongue cancers.

Workup and Staging

Imaging studies to evaluate mandibular involvement and a careful dental evaluation are particularly important for staging (see Table 1) and planning therapy for oral cavity cancers in addition to a complete H&N examination, biopsy, and other appropriate studies (see *Workup* in the NCCN Guidelines for *Cancer of the Oral Cavity*). Nutrition, speech, and swallowing evaluations are recommended for selected at-risk patients (see *Principles of Nutrition and Supportive Care* in this Discussion and in the NCCN Guidelines for Head and Neck Cancers).

Treatment

Surgery is recommended for early-stage and locally advanced resectable lesions in the oral cavity. Adjuvant radiation is recommended based on stage of disease and pathologic findings following surgery. The specific treatment is dictated by the TN stage and, if N0 at diagnosis, by the risk of nodal involvement (see the NCCN Guidelines for *Cancer of the Oral Cavity*). Multidisciplinary team involvement is particularly important for this site, because critical physiologic functions may be affected such as mastication, deglutition, and articulation of speech. Most panel members prefer surgical therapy for resectable oral cavity tumors, even for more advanced tumors. The functional outcome after primary surgical management is often quite good, given advances in reconstruction using microvascular techniques. Therefore, organ preservation using systemic therapy has received less attention and is generally less effective in obtaining locoregional control than upfront surgery for the initial

management of patients with oral cavity cancers. Definitive RT may be offered to selected patients who are medically inoperable or refuse surgery.

For patients with early-stage oral cavity cancers, the recommended initial options are resection (preferred) of the primary tumor. In general, many patients undergo either ipsilateral or bilateral neck dissection, which is guided by tumor thickness. It is debatable whether or not patients with early-stage node-negative oral cavity cancers should receive elective neck dissection. A meta-analysis including four studies with 283 patients with N0 oral cancer showed that elective neck dissection reduces the risk of disease-specific mortality (RR, 0.57; 95% CI, 0.36–0.89; *P* = .014 for fixed-effects model; RR, 0.59; 95% CI, 0.37–0.96; *P* = .034 for random-effects model), compared to patients undergoing observation only.[329] A more recent meta-analysis including five trials of patients with N0 cancer of the oral cavity showed that elective neck dissection was not associated with a statistically significant OS and DFS benefit, compared to delayed/therapeutic neck dissection.[330] However, this analysis was limited by variation in the type of surgery and follow-up duration. A prospective randomized controlled trial (RCT) (*n* = 496) showed that patients receiving elective neck dissection were less likely to have experienced nodal recurrence (29.6%), relative to patients who did not (45.1%). Subgroup analyses from this study showed that elective neck dissection may be most beneficial in patients with tumor thickness >3 mm, though this interaction was not statistically significant (*P* = .12).[331]

SLNB may be used to identify occult cervical metastases (see *Sentinel Lymph Node Biopsy* in the *Principles of Surgery* in the NCCN Guidelines for Head and Neck Cancers).[332-338] SLNB is less accurate for floor of the mouth tumors and should be done in centers with expertise in this technique.[332,333] Some diagnostic agents for use in SLNB in patients with squamous cell carcinoma of the oral cavity have been evaluated (eg, technetium Tc99m tilmanocept),[339,340] but the data are currently too limited for the panel to recommend a specific agent.

Postsurgical adjuvant treatment options depend on whether adverse features are present. For patients with resected oral cavity cancers who have the adverse pathologic features of extranodal extension with or without a positive mucosal margin, postoperative systemic therapy/RT (category 1) is the recommended treatment. For patients with positive or close margins, re-resection is preferred if feasible. If not, RT is an option for these patients, and systemic therapy/RT may be considered. For patients with other risk features, options include RT or to consider systemic therapy/RT.

For patients with advanced-stage, resected oral cavity cancers who have the adverse pathologic features of extranodal extension with or without a positive mucosal margin, the recommended postoperative adjuvant treatment is systemic therapy/RT (category 1).[104-107,109] Adjuvant treatment options for positive or close margins are the same, but re-resection is an option if technically feasible, with consideration of subsequent RT. For other risk features—such as pT3 or pT4 primary, pN2 or pN3 nodal disease, nodal disease in levels IV or V, perineural invasion, vascular invasion, or lymphatic invasion, RT alone is recommended, or systemic therapy/RT may be considered (see the NCCN Guidelines for *Cancer of the Oral Cavity*).

Radiation Therapy

If definitive RT is chosen for treatment of T1–2, N0 disease, the fraction size to the intermediate- and low-risk sites ranges from 44 Gy (2.0 Gy/fraction) to 63 Gy (1.6 Gy/fraction) (see *Principles of Radiation Therapy* in the NCCN Guidelines for *Cancer of the Oral Cavity*). For these sites of suspected subclinical spread, suggested doses are 44–50 Gy if 3D-CRT is used or 54–63 Gy if IMRT is used, depending on the dose/fraction (1.6–2.0 Gy/fraction).

Follow-up/Surveillance

Recommendations for surveillance are provided in the algorithm (see *Follow-up Recommendations* in the NCCN Guidelines for Head and Neck Cancers).

Cancer of the Oropharynx

The oropharynx includes the base of the tongue, tonsils, soft palate, and posterior pharyngeal wall. The oropharynx is extremely rich in lymphatics. Depending on the subsite involved, 15% to 75% of patients present with lymph node involvement. Oropharyngeal cancer that is p16-positive (ie, HPV-mediated) is a different disease than p16-negative cancer. For example, patients with HPV-associated H&N cancer tend to be younger[13,16] and have an improved response to treatment when compared with patients with HPV-negative tumors.[29-33,341] To take into account these differences, separate staging criteria were published for p16-negative and p16-positive oropharyngeal cancer in the 8th edition of the AJCC Cancer Staging Manual.[318] In 2018, the panel created separate algorithms for p16-positive (HPV-mediated) oropharyngeal cancer. See the section below on *Staging*.

Workup and Staging

A multidisciplinary consultation is encouraged including a registered dietitian and a speech-language/swallowing therapist as clinically indicated (see *Principles of Nutrition* in this Discussion and in the NCCN Guidelines for Head and Neck Cancers). Accurate staging (see Table 3 for p16-negative oropharyngeal cancer and Table 4 for p16-positive oropharyngeal cancer) depends on a complete H&N examination and appropriate imaging studies (see *Workup* in NCCN Guidelines for *Cancer of the Oropharynx*).[318,342]

Skipping examination under anesthesia (EUA) with confirmation biopsy for oropharyngeal cancer that presents as a metastatic lymph node may introduce error based on lack of rigor and precision. There may be situations in which the EUA is undesirable or could be bypassed. These include patients at high risk for general anesthesia and those who undergo a thorough examination including tongue base palpation. Those who require systemic therapy/RT will not have their treatment plan affected, regardless of surgical evaluation. These situations remain the minority of cases. Therefore, the panel recommends EUA with biopsy confirmation for patients presenting with a p16-positive cervical lymph node prior to treatment decision-making.

Tumor HPV testing through p16 immunohistochemistry (IHC) is required for cancers of the oropharynx, because prior HPV infection is related to the development of a significant proportion of oropharyngeal cancers (see the following section on *HPV Testing*).

HPV Testing

The attributable fraction for HPV in newly diagnosed oropharyngeal cancer is estimated at 60% to 70% in the United States and parts of the European Union.[15,343-346] There are currently no diagnostic tests with regulatory approval. A few HPV testing options are available for use in the clinical setting. Expression of p16 as detected by IHC is a widely available surrogate biomarker that has very good agreement with HPV status as determined by HPV E6/E7 mRNA expression.[347-350] Other tests include HPV detection by polymerase chain reaction (PCR) and in situ hybridization (ISH).[347,349] Sensitivity of IHC staining for p16 and PCR-based assay is high, though specificity is highest for ISH.[349] Analyses of HPV testing methods have shown that sensitivity and specificity of p16 IHC range from 94% to 97% and 83% to 84%, respectively, with sensitivity and specificity of HPV16 ISH ranging from 85% to 88% and 88% to 95%.[347,350] The reduced specificity for p16 IHC may be due to the presence of p16-positive tumors that do not have evidence of HPV DNA, while the reduced sensitivity for HPV16 ISH may be due to the presence

of other high-risk HPV types in the tumor. Due to variations in sensitivity and specificity values of testing options, multiple methods may be used in combination for HPV detection.[13,349-352] Sufficient pathologic material for HPV testing can be obtained by fine-needle aspiration (FNA).[13,353] Guidelines for HPV testing have also been published by the College of American Pathologists.[354] HPV testing may prompt questions about prognosis (ie, a favorable or a less favorable forecast) and sexual history that the clinician should be prepared to address.

Staging

The algorithms in the NCCN Guidelines for Oropharyngeal Cancer reflect the new staging criteria published in the 8th edition of the AJCC Cancer Staging Manual for p16-negative oropharyngeal cancer and p16-positive oropharyngeal cancer.[318] In the updated staging criteria for p16-negative oropharyngeal cancer, separate pathologic criteria are now presented for involvement of regional lymph nodes, since extranodal extension is difficult to accurately capture through the imaging workup that is routinely done for clinical staging.[355] The treatment algorithm for p16-negative disease is divided into three staging categories: 1) T1–2, N0–1; 2) T3–4a, N0–1; and 3) any T, N2–3. Of note, the following categories are treated as advanced cancer: T4b, any N; unresectable nodal disease; unfit for surgery; or M1 disease at initial presentation (see the NCCN Guidelines for *Very Advanced Head and Neck Cancers*).

A clinical staging system for p16-positive oropharyngeal cancer was developed using data from 1907 patients with non-metastatic HPV-positive oropharyngeal cancer from seven cancer centers in Europe and the United States.[356] OS did not significantly differ between T4a and T4b disease (P = .41). Five-year OS rates did not significantly differ in patients with N1, N2a, or N2b disease, based on the AJCC 7th edition N classification,[357] so the study investigators reasoned that these patients could be grouped into one category (ie, at least one ipsilateral metastatic node ≤6 cm).

An analysis of 704 patients with resected p16-positive oropharyngeal squamous cell carcinoma from five cancer centers showed that the N-classification system for oropharyngeal cancer that was described in the 7th edition of the AJCC Cancer Staging Manual[357] was not significantly associated with OS.[358] However, patients with 4 or fewer pathologically confirmed metastatic nodes had a higher 5-year OS rate, compared to patients with five or more pathologically confirmed metastatic nodes (89% vs. 71%, respectively). The results from this analysis were used to construct a pathologic staging system for patients with p16-positive disease: 1) pT1–T2 and fewer than five metastatic nodes; 2) pT1–T2 and more than four metastatic nodes, or pT3–T4 and fewer than five metastatic nodes; and 3) pT3–T4 and more than four metastatic nodes. The 5-year OS rates for these staging groups were 90% (95% CI, 87%–93%), 84% (95% CI, 77%–90%), and 48% (95% CI, 30%–66%), respectively. Five-year DFS rates for the three staging groups were 86% (95% CI, 82%–90%), 72% (95% CI, 64%–79%), and 40% (95% CI, 24%–56%), respectively. The results from this analysis are consistent with an earlier study that showed that the presence of five or more metastatic nodes, but not N-classification, was associated with disease recurrence and survival in 220 patients with surgically resected p16-positive oropharyngeal cancer.[359]

The modifications to the NCCN Guidelines for p16 (HPV)-positive oropharyngeal cancer accommodate the new staging system for p16-positive oropharyngeal cancer. However, the changes are relatively modest, since the staging system changes are based on prognostic models and are not based on prospective data from clinical trials that guide clinical decision-making. Based on differences in features associated with prognosis,[356,358] the staging criteria for p16-positive

oropharyngeal cancer differs from staging for p16-negative oropharyngeal cancer in the following ways:[318]

- T4b disease has been removed from the staging criteria for defining the primary tumor.
- Criteria for defining nodal involvement (both clinical and pathologic) have been simplified for p16-positive disease. Clinical N staging for p16-positive oropharyngeal cancer is based on lymph node size and laterality, while pathologic N staging is based on number of lymph nodes. Further, pN3 disease has been removed for pathologic N.

The treatment algorithms for p16-positive disease have been divided by the panel into four staging categories:

1) cT1–2, cN0
2) cT1–2, cN1 (single node ≤3 cm)
3) cT1–2, cN1 (single node >3 cm, or 2 or more ipsilateral nodes ≤6 cm); or cT1–2, cN2; or cT3, cN0–2
4) cT4 or cN3

The algorithms in the NCCN Guidelines for p16 (HPV)-positive oropharyngeal cancer incorporate the staging criteria presented in the revised 8th Edition of the AJCC Cancer Staging Manual[318] based on clinical staging criteria. This is to acknowledge that decision-making is currently frequently based on data from trials that included oropharyngeal as well as other anatomic sites that were staged utilizing AJCC 7th edition nodal staging criteria.[357]

Treatment

Consensus is increasing that HPV status should be used as a stratification factor or should be addressed in separate trials (HPV-related vs. unrelated disease) for which patients with oropharyngeal cancer are eligible.[360-362]

Some clinicians have suggested that less-intense treatment may be adequate for HPV-positive oropharyngeal cancers (ie, deintensification).[48] However, the available data supporting this assertion are limited by retrospective analyses, single-institution phase 3 trials, variability in HPV testing method used, and short follow-up periods.[48,363-365] Deintensification treatment protocols for HPV-associated locally advanced oropharyngeal cancer are being investigated in ongoing clinical trials (eg, NCT01154920, NCT01706939, NCT01855451, NCT01687413, NCT01898494, NCT02215265). Strategies under active investigation include reducing or using response-stratified RT dose, using RT alone versus chemoradiation, using less invasive surgical procedures such as transoral robotic surgery (TORS), using sequential systemic therapy/RT, and using immunotherapy and targeted therapy agents such as cetuximab.[365-367]

Results from multiple phase II trials show that RT deintensification is associated with promising PFS rates in patients with p16-positive oropharyngeal cancer.[368-372] Analyses of quality-of-life outcomes from one of these trials showed that RT deintensification was associated with a quicker and more robust return to baseline-level functioning.[373] In a subset analysis from the EORTC 24971 study,[374] p16 status was not significantly associated with survival outcomes in this analysis, but the investigators pointed out that the planned analysis was powered to detect a large treatment by marker interaction.[375]

With some exceptions, which are noted in this section below, the treatment algorithms for p16-negative and p16-positive oropharyngeal cancer are identical. There is currently no evidence that the new staging criteria published in the 8th edition of the AJCC Cancer Staging Manual[318] should drive clinical decision-making. The difference between p16-positive and p16-negative oropharyngeal cancer is mainly prognostic. Panel members urge that patients with HPV-related cancers be enrolled in clinical trials evaluating biological and treatment-related questions.[365,367,376]

Early-stage (T1–2, N–1 for p16-negative disease; T1–2, N0 or single node ≤3 cm for p16-positive disease) oropharyngeal cancers may be treated with: 1) resection of the primary with neck dissection; or 2) definitive RT.[87,90,377,378] Results from the randomized phase II ORATOR trial, which included 68 patients with early-stage oropharyngeal cancer, showed that quality-of-life outcomes were generally better for patients treated with RT, compared to patients who received TORS with neck dissection.[379] Tumors at or approaching the midline (ie, tumors in the base of the tongue, posterior pharyngeal wall, soft palate, and tonsil invading the tongue base) are at risk of contralateral metastasis and warrant bilateral treatment.

Based on results from the phase III randomized GORTEC trial[155] and retrospective analyses from the National Cancer Database (NCDB),[380,381] systemic therapy/RT is a treatment option for patients with p16-negative N1 disease. However, this is a category 2B option, since the number of patients with T1–T2, N1 disease enrolled in the GORTEC trial is small, and more data from prospective trials are needed. For patients with p16-positive disease, systemic therapy/RT is also a category 2B option for T1–T2 disease and the involvement of a single node ≤3 cm.

Research on the impact of adverse features such as extranodal extension and number of involved nodes on outcomes in patients with p16-positive disease who have undergone resection is rapidly evolving. Currently, data from only retrospective trials are available,[45,359,360,382-385] and clinical trials are being conducted to validate the revised AJCC staging[318] for clinical decision-making. Analyses from the RTOG 9501[105] and EORTC 22931 trials[104] showed that extranodal extension is associated with poor prognosis in patients with locally advanced H&N cancer who have undergone surgical resection.[106] However, in a review of published data from these RCTs, it was noted that these studies did not investigate the impact of HPV or p16 status.[386] In response to this review, the investigators from RTOG 9501 and EORTC 22931 pointed out that the prevalence of HPV-positive/p16-positive tumors was likely to be low in these trials.[387] Other limitations noted in this review included unplanned subgroup analyses, the grouping of multiple H&N subsites, inconsistent quantitative reporting and lack of reporting on tumor and lymph node classification, treatment effect sizes, multivariable analyses, and quality-of-life outcomes. Therefore, the investigators who carried out this review argued that these trials lack the generalizability necessary to rationalize the use of adjuvant systemic therapy/RT in patients with p16-positive disease. Based on this controversy and a lack of high-quality, prospective clinical evidence, this recommendation is a category 2A option for both patients with p16-positive disease and p16-negative disease. Adjuvant systemic therapy/RT remains a category 1 recommendation for patients with other types of H&N cancer who have extranodal extension. Since patients with p16-positive oropharyngeal cancer have a generally favorable prognosis and may live longer, toxicity and quality of life are concerns for these patients.[365,367] On the other hand, recent retrospective analyses including 4,443 patients with HPV-positive oropharyngeal cancer from the NCDB showed that deintensification by using a single primary treatment modality such as definitive RT may be associated with worse treatment outcomes in the long-term.[388] Omitting systemic therapy and administering radiotherapy alone is a category 2B option for patients with p16-positive cT1–2, cN0–1 disease (single node ≤3 cm) who have extranodal extension following surgery.

For patients with positive or close margins, re-resection (if feasible), RT, and systemic therapy/RT are treatment options.[127] For patients with other risk features, options include RT or systemic therapy/RT. For patients with p16-positive disease and other risk features such as pT3 or pT4 primary, one positive node >3 cm or multiple positive nodes, nodal disease in levels IV or V, perineural invasion, vascular invasion, or lymphatic invasion, systemic therapy/RT is a category 2B option.

For locally advanced resectable disease (T3–4a, N0–1, or N2–3 for p16-negative disease; T1–2, cN1 [single node >3 cm, or 2 or more ipsilateral nodes ≤6 cm] or N2, or T3, N0–3, or T4 for p16-positive disease), three treatment options are recommended (see the NCCN Guidelines for *Cancer of the Oropharynx*), in addition to enrollment in clinical trials. The three options are: 1) concurrent systemic therapy/RT;[127,155] 2) resection of the primary and neck dissection (with appropriate adjuvant therapy [systemic therapy/RT or RT]); or 3) induction chemotherapy (category 3) (followed by RT or systemic therapy/RT).[87,90,389] As with early-stage disease, tumors at or approaching the midline should be strongly considered for bilateral treatment of the neck. An NCDB analysis including 3,063 patients with cT1, N2 or cT2, N1–2 HPV-positive oropharyngeal cancer showed no statistically significant difference in 3-year OS between patients who received upfront surgery and patients who received definitive systemic therapy/RT.[390] However, concurrent systemic therapy/RT is preferred in patients with locoregionally advanced HPV-positive disease who have clinical evidence of fixed or matted nodes or obvious extranodal extension in patients, as surgery is not recommended for these patients. Panel recommendations regarding adjuvant therapy for locally advanced disease do not differ between p16-positive and p16-negative oropharyngeal cancer.

Concurrent systemic therapy/RT—with high-dose cisplatin as the preferred systemic agent—is recommended for treatment of locoregionally advanced p16-positive and p16-negative cancer of the oropharynx (see *Principles of Systemic Therapy* in the NCCN Guidelines for Head and Neck Cancers). Patients with cN2–3 disease have a higher likelihood of needing triple-modality therapy because of poor-risk factors present pathologically after resection, which can be associated with increased toxicity. Beginning treatment with concurrent systemic therapy/RT may help decrease the need for triple modality therapy and additional treatment-induced morbidity. Therefore, definitive concurrent systemic therapy/RT is preferred over upfront surgery for p16-positive T4 or N3 oropharyngeal cancer.

Many panel members did not agree that induction chemotherapy should be recommended for locally or regionally advanced cancer of the oropharynx. This disagreement is reflected by the category 3 recommendations for oropharyngeal cancer (see *The Induction Chemotherapy Controversy* in this Discussion and the NCCN Guidelines for *Cancer of the Oropharynx*).[155,374,391-398]

The Induction Chemotherapy Controversy

Defining the role of induction chemotherapy in the management of locally or regionally advanced H&N cancers has generated considerable discussion within the NCCN Panel. The algorithm for the management of advanced p16-positive and p16-negative oropharyngeal cancer (see the NCCN Guidelines for *Cancer of the Oropharynx*) illustrates the lack of consensus among NCCN Member Institutions despite the extensive discussion. Thus, induction chemotherapy has a category 3 recommendation (ie, major disagreement) for the management of locoregionally advanced p16-negative and p16-positive oropharyngeal cancer. However in other sites, category 2A and 2B recommendations for induction chemotherapy are common based on the update from RTOG 91-11 (see *Cancer of the Glottic Larynx*, *Cancer of the Supraglottic Larynx*, and *Cancer of the Hypopharynx* in the NCCN Guidelines for Head and Neck Cancers).[399] For selected patients with hypopharyngeal and laryngeal cancers less than T4a in extent (for which total laryngectomy is indicated, if managed surgically), induction chemotherapy—used as part of a larynx preservation strategy—is listed as a category 2A designation.

Panel members feel that induction chemotherapy should only be done in centers with expertise in these regimens because of challenges associated with appropriate patient selection and management of treatment-related toxicities.[391] Residual toxicity from induction

chemotherapy may also complicate the subsequent delivery of definitive RT or systemic therapy/RT.

A summary of the data helps provide some perspective on the NCCN Panel's recommendations. Most randomized trials of induction chemotherapy followed by RT and/or surgery compared to locoregional treatment alone, which were published in the 1980s and 1990s, did not show an improvement in OS with the incorporation of chemotherapy.[396] However, a change in the pattern of failure with less distant metastases was noted in some studies.[400] Also, a correlation was noted between response to induction chemotherapy and subsequent durable response to radiation.[400,401] Thus, the concept developed that, in selected patients, induction chemotherapy could facilitate organ preservation, avoid morbid surgery, and improve overall quality of life of the patient even though OS was not improved. Because total laryngectomy is among the procedures most feared by patients,[402] larynx preservation was the focus of initial studies.

Two randomized studies—the Veterans Affairs (VA) Laryngeal Cancer Study Group trial in advanced laryngeal cancer and the EORTC trial predominantly in advanced hypopharynx cancer—established the role of induction cisplatin/5-FU chemotherapy followed by definitive RT in responding patients as an alternative treatment to primary total laryngectomy and postoperative radiation, offering potential larynx preservation without compromise in survival (see *Cancer of the Larynx* and *Cancer of the Hypopharynx* in this Discussion).[400,401] Yet even in this setting, the role of induction chemotherapy decreased with time. Randomized trials and related meta-analyses indicated that concurrent systemic therapy/RT (with cisplatin being the best-studied agent) offered superior locoregional tumor control and survival compared to radiation alone,[403-411] and shorter duration of therapy compared to induction therapy followed by radiation. Meta-analyses reported that concurrent systemic therapy/RT was more efficacious than an induction chemotherapy strategy.[396,398] In the larynx preservation setting, Intergroup 91-11 compared radiation alone, concurrent cisplatin/radiation, and induction cisplatin/5-FU followed by radiation; all arms had surgery for relapsed/refractory disease. The concurrent cisplatin/radiation arm had the highest larynx preservation rate (see *Cancer of the Larynx* in this Discussion).[412] A long-term follow-up of 91-11 confirmed that concomitant systemic therapy/RT improved the larynx preservation rate and that induction chemotherapy was not superior to RT alone.[399] However, OS did not differ among the treatment arms.

Nonetheless, interest in the role of induction chemotherapy endures for a few reasons. Advances in surgery, RT, and concurrent systemic therapy/RT have yielded improvements in locoregional control; thus, the role of distant metastases as a source of treatment failure has increased and induction chemotherapy allows greater drug delivery for this purpose.[413,414] Clinicians have increasing concern regarding the long-term morbidity of concurrent systemic therapy/RT, and thus have increasing interest in exploring alternative approaches that might have a more favorable side effect profile.[415] Finally, a more effective triplet chemotherapy regimen has been identified for induction chemotherapy compared to the standard cisplatin/5-FU used in induction trials of the 1980s and 1990s, and in the related meta-analyses. Three phase III trials compared induction cisplatin plus infusional 5-FU with (or without) the addition of a taxane (docetaxel or paclitaxel) followed by the same locoregional treatment. Results showed significantly improved outcomes (response rates, DFS, or OS, depending on the trial) for patients in the three-drug induction group compared to those receiving two drugs (cisplatin plus 5-FU).[374,394,395,397] A randomized phase III trial in the larynx preservation setting similarly showed superior larynx preservation outcome when induction docetaxel/cisplatin/5-FU (TPF) and cisplatin/5-FU were compared.[416,417] A meta-analysis including five RCTs (*N* = 1772)

showed that the TPF induction chemotherapy regimen was associated with reduced risk of death (HR, 0.72; 95% CI, 0.63–0.83; *P* < .001) and greater reductions in progression (HR, 0.78; 95% CI, 0.69–0.87; *P* < .001), locoregional failure (HR, 0.79; 95% CI, 0.66–0.94; *P* = .007), and distant failure (HR, 0.63; 95% CI, 0.45–0.89; *P* = .009) compared with cisplatin plus 5-FU.[418]

Whether adding induction chemotherapy to concurrent chemoradiation results in a clear advantage in OS continues to be unclear.[393,419,420] Both the DeCIDE and the PARADIGM trials did not convincingly show a survival advantage with the incorporation of induction chemotherapy.[419,420] In patients with stage III or IV squamous cell H&N cancers, a randomized phase II study compared induction TPF followed by concurrent cisplatin/5-FU with RT versus concurrent cisplatin/5-FU with RT alone. A higher radiologic complete response rate was reported with the incorporation of induction chemotherapy.[421] Results from a larger follow-up study suggest a survival advantage.[422]

Other induction chemotherapy regimens have been evaluated in phase II trials. The ECOG-ACRIN trial (E2303) showed promising results in terms of primary site response and survival for cetuximab, paclitaxel, and carboplatin as induction chemotherapy, followed by systemic therapy/RT with the same drug regimen in patients with stage III or IV squamous cell H&N cancers (*N* = 74),[423] but the incremental benefit of induction chemotherapy requires further validation using randomized design. Two phase II studies have evaluated the feasibility of TPF with cetuximab followed by systemic therapy/RT or RT alone.[424,425] The DeLOS-II trial showed that TPF followed by RT, with cetuximab administered throughout, was feasible but not superior to TPF and subsequent RT without cetuximab.[424] An EORTC trial evaluating this induction regimen followed by systemic therapy/RT was stopped prematurely due to numerous serious adverse events.[425]

There is currently a lack of consensus regarding the most appropriate regimen to be administered following induction chemotherapy.[426] Of note, investigators in the DeCIDE trial used the combination of docetaxel/hydroxyurea/5-FU with RT after induction chemotherapy in this setting.[420] Panel members agree that weekly cetuximab or carboplatin are reasonable agents to use with concurrent radiation.[419,427-429] Results of the phase III GORTEC 2007-02 trial, in which 370 patients with bulky nodal disease (N2b, N2c, or N3) were randomized to receive carboplatin/5-FU with concurrent RT or TPF followed by cetuximab/RT, showed no significant differences between the study arms for survival outcomes and local control.[430] There was a trend towards a lower rate of distant metastases in the TPF arm (HR, 0.54; 95% CI, 0.30–0.99; *P* = .05). Weekly cisplatin with RT following induction chemotherapy is a category 2B option, based on extrapolation.[419,428,429] However, because of toxicity concerns, high-dose cisplatin (100 mg/m^2 every 21 days × 3) is not recommended after induction cisplatin-based chemotherapy.[393,428] Thus, this highlights concerns that any efficacy gains of induction may be offset by the use of better-tolerated—but potentially less effective—concurrent regimens or poorer patient compliance with the radiation-based part of treatment. Because of these uncertainties, enrollment of patients in appropriate clinical trials is particularly encouraged. Outside of a clinical trial, proceeding directly to concurrent systemic therapy/RT—high-dose cisplatin preferred—is considered the gold standard by many NCCN Panel Members in several settings (see *Principles of Systemic Therapy* in the NCCN Guidelines for Head and Neck Cancers).[104-107,403,431] When induction chemotherapy is used, data show that the addition of a taxane to cisplatin/5-FU, of which TPF is the most extensively studied, is more efficacious than cisplatin/5-FU.[418,426] Therefore, when used as induction chemotherapy for squamous cell H&N cancer, this regimen is a category 1 preferred recommendation. Paclitaxel, cisplatin, and 5-FU is also an option for induction chemotherapy.[394]

Radiation Therapy Fractionation

The recommended schedules are shown in the algorithm (see *Principles of Radiation Therapy* in the NCCN Guidelines for *Cancer of the Oropharynx*). IMRT is preferred, as it may be useful for decreasing toxicity.[432,433] A fractionation schedule of 69.96 Gy at 2.12 Gy/fraction daily (Monday–Friday) for 6 to 7 weeks is recommended for patients with high-risk subclinical disease, consistent with the fractionation schedule used for these patients in RTOG 0615.[120] Moderate acceleration of treatment is acceptable in patients with early-stage oropharyngeal cancer.[127,434] Despite the evidence that RT dose deintensification may improve long-term function while preserving PFS in patients with p16-positive disease,[368-370,373] more studies are needed in this area.

Follow-up/Surveillance

Recommendations for surveillance are provided in the algorithm (see *Follow-up Recommendations* in the NCCN Guidelines for Head and Neck Cancers).

Cancer of the Hypopharynx

The hypopharynx extends from the superior border of the hyoid bone to the lower border of the cricoid cartilage and is essentially a muscular, lined tube extending from the oropharynx to the cervical esophagus. For staging purposes, the hypopharynx is divided into three areas: 1) the pyriform sinus (the most common site of cancer in the hypopharynx); 2) the posterior pharyngeal walls; and 3) the postcricoid area.

Workup and Staging

A multidisciplinary consultation is encouraged. Accurate staging (see Table 3) depends on a complete H&N examination coupled with appropriate studies (see *Workup* in the NCCN Guidelines for *Cancer of the Hypopharynx*).[318] For patients with cancer of the hypopharynx, the prognosis can be quite poor despite aggressive combined modality treatment.

Treatment

Patients with resectable disease are divided into two groups based on the indicated surgical options: 1) those with early-stage cancer who are amenable to larynx-preserving (conservation) surgery (most T1, N0; selected T2, N0); and 2) those with advanced resectable cancer who require pharyngectomy with total or partial laryngectomy (T1–4a, any N). The surgery and RT options for the former group (see the NCCN Guidelines for *Cancer of the Hypopharynx*) represent a consensus among the panel members.

Patients with T1–3, any N disease, for whom the indicated surgical option is partial or total laryngopharyngectomy, may be managed with three approaches (see the NCCN Guidelines for *Cancer of the Hypopharynx*) in addition to enrollment in clinical trials: 1) induction chemotherapy followed by additional treatment, depending on the response; 2) surgery with neck dissection, lymph node dissection, and postoperative radiation or chemoradiation as dictated by pathologic risk features; or 3) concurrent systemic therapy/RT. When using concurrent systemic therapy/RT, the preferred systemic agent is high-dose cisplatin (category 1) (see *Principles of Systemic Therapy* in the NCCN Guidelines for Head and Neck Cancers). Given the functional loss resulting from this surgery and the overall poor prognosis, participation in clinical trials is encouraged.

The recommendation of the induction chemotherapy/definitive RT option is based on an EORTC randomized trial.[400] This trial enrolled 194 eligible patients with stage II to IV resectable squamous cell carcinoma of the pyriform sinus (152 patients) and aryepiglottic fold (42 patients), excluding patients with T1 or N2c disease. Patients were randomly assigned either to laryngopharyngectomy and postoperative RT, or to systemic therapy

with cisplatin and 5-FU for a maximum of 3 cycles, followed by definitive RT. In contrast to a similar approach used for laryngeal cancer, a complete response to induction chemotherapy was required before proceeding with definitive RT. The published results showed equivalent survival, with median survival duration and a 3-year survival rate of 25 months and 43% (95% CI, 27%–59%), respectively, for the surgery group versus 44 months and 57% (95% CI, 42%–72%), respectively, for the induction chemotherapy group.[400] A functioning larynx was preserved in 42% of patients who did not undergo surgery. Local or regional failure rates did not differ between the surgery-treated patients and chemotherapy-treated patients, although the chemotherapy recipients did show a significant reduction in distant metastases as a site of first failure (P = .041).

For induction chemotherapy as part of a larynx preservation strategy, inclusion of only patients with the specified TNM stages is recommended. Success on larynx preservation with an induction chemotherapy strategy is best established for patients who had a complete response to induction therapy at the primary site and stable or improved disease in the neck. A randomized trial showed that an alternating regimen of cisplatin/5-FU with RT yielded larynx preservation, progression-free interval, and OS rates equivalent to those obtained with induction platinum/5-FU followed by RT.[435,436] However, a long-term update from this trial showed that larynx preservation rate was higher in patients who were randomized to receive the alternating regimen (32%), compared to patients who received the sequential regimen (25%).[436] Given available randomized data demonstrating the superiority of TPF compared with PF for induction chemoradiation, the triplet is now recommended as induction for this approach.[416,417]

As noted in the algorithm, surgery is recommended if a partial response or less occurs after induction chemotherapy (see the NCCN Guidelines for *Cancer of the Hypopharynx*). The nature of the operation will depend on the stage and extent of the tumor. Partial laryngeal surgery may still be considered, although most patients will require total laryngectomy, and at least a partial pharyngectomy. In this situation, or when primary surgery is the selected management path, postoperative systemic therapy/RT is recommended (category 1) for the adverse pathologic features of extranodal extension and/or positive or close mucosal margin. For other risk features, clinical judgment should be used when deciding to use RT alone or when considering adding systemic therapy to RT (see the NCCN Guidelines for *Cancer of the Hypopharynx*). Severe late toxicity appears to be associated with the amount of RT[415] and treatment with radiosensitizing systemic therapy.

Options for patients with T4a, any N disease include: 1) total laryngopharyngectomy plus neck dissection(s) followed by adjuvant systemic therapy/RT or RT; 2) enrollment in clinical trials; 3) induction chemotherapy (category 3); or 4) systemic therapy/RT (category 3) (see the NCCN Guidelines for *Cancer of the Hypopharynx*, and *Newly Diagnosed Locoregionally Advanced Disease* under *Very Advanced Head and Neck Cancers* in the Discussion, below).

Radiation Therapy Fractionation

Fractionation for RT is discussed in the algorithm (see *Principles of Radiation Therapy* in the NCCN Guidelines for *Cancer of the Hypopharynx*).

Follow-up/Surveillance

Recommendations for surveillance are provided in the algorithm (see *Follow-up Recommendations* in the NCCN Guidelines for Head and Neck Cancers).

Cancer of the Nasopharynx

NPC is an uncommon cancer, accounting for 0.7% of all cancers diagnosed worldwide in 2018.[437] However, there are areas of the world with endemic disease; global incidence rates are highest in Southeast Asia (especially southern China), Micronesia/Polynesia, Eastern Asia, and North Africa.[438] Rates are two to three times higher in men than in women.[439] Among H&N cancers, NPC has one of the highest propensities to metastasize to distant sites, affecting up to one-third of patients in the highest-risk subgroups.[440] On the other hand, with modern radiotherapy techniques, locoregional recurrences are uncommon, occurring in fewer than 10% among all but the most locally advanced patients.[441]The NCCN Guidelines for the evaluation and management of NPC provide recommendations aimed at addressing the risks for local, regional, and distant disease.

Workup and Staging

The workup of nasopharyngeal cancer includes a complete H&N examination and other studies (see the NCCN Guidelines for *Cancer of the Nasopharynx*). These studies are important to determine the full extent of tumor in order to assign stage appropriately and to design radiation ports that will encompass all the disease with appropriate doses. Multidisciplinary consultation is encouraged. The 2017 AJCC staging classification (8th edition) is used as the basis for treatment recommendations (see Table 2).[318]

Epstein-Barr virus (EBV) DNA testing may also be considered (see *Epstein-Barr Virus*, below). HPV infection has been associated with World Health Organization type I NPC in case reports and very small case series, but the limited data regarding the impact on chemoradiation outcomes are conflicting.[442-444] Therefore, routine testing for HPV in NPC is not recommended by the NCCN Panel.

Epstein-Barr Virus

Infection with EBV is an etiologic factor in the development of NPC.[445,446] Workup for NPC may include EBV testing of both the tumor itself and the blood, particularly in the presence of nonkeratinizing and undifferentiated histology.[447-449] Testing methods for detection of EBV in tumor include ISH for EBV-encoded RNA (EBER)[450] and IHC staining for LMP1.[451] ISH for EBER tends to be a more sensitive testing method for carcinomas, relative to LMP1 IHC staining.[452] Real-time PCR may be used to evaluate EBV DNA load in serum or plasma. Sensitivity and specificity values range from 53% to 96%, and 88% to 100%, respectively.[453] Testing for plasma EBV DNA has been used in select centers as a means of residual disease monitoring. It should be noted as an important caveat that no standardized testing procedure has been established worldwide, and there is little consensus on sample preparation or assay specifications.[454] For patients with locoregionally confined NPC, studies have shown that high initial levels of plasma EBV DNA, or persistently elevated levels near or at the end of RT, are associated with a significantly poorer outcome following RT or chemoradiation.[455-460] A meta-analysis including 13 studies showed that plasma EBV DNA levels assessed pre-treatment were independent prognostic factors for mortality (HR, 2.81; 95% CI, 2.44–3.24; $P < .001$) and distant metastasis (HR, 3.89; 95% CI, 3.39–4.47; $P < .001$), though these studies were significantly heterogeneous ($P = .03$).[461] Plasma EBV DNA has also been studied as an indicator of disease response to chemotherapy or chemoradiation prior to additional treatment[462,463] and in the setting of distant metastases.[464] Most of these studies have been based on real-time PCR assays amplifying the *BamHI-W* fragment.

Treatment

Patients with T1, N0, M0 nasopharyngeal tumors should be treated with definitive RT alone, including elective RT to the neck. Advanced radiation techniques are needed for the appropriate treatment of NPC and to minimize the long-term side effects that are common in survivors. IMRT is

preferred due to its ability to encompass all areas of cancer spread, which can be located in close proximity to the brainstem, cochleae, and optic nerves; proton therapy is considered if the normal tissue constraints cannot be met by IMRT. Population-based studies have indicated that high-volume radiation centers have better outcomes when treating this disease.[465,466]

Locoregionally Advanced Disease

The Intergroup trial 0099, which randomly assigned patients to EBRT with concurrent cisplatin plus adjuvant chemotherapy with cisplatin and 5-fluorouracil (PF) for three cycles versus EBRT alone, closed early when an interim analysis disclosed a highly significant survival advantage favoring the combined chemotherapy and radiation group.[431] The addition of chemotherapy also decreased local, regional, and distant recurrence rates. Subsequent phase III randomized trials in Asia confirmed that concurrent chemoradiation without adjuvant PF increased survival when compared with RT alone.[467-470] In one of these trials, 5-year OS was 70% for the chemoradiation group versus 59% for the RT group.[467] A randomized study conducted in Singapore, which was modeled after the Intergroup 0099 treatment regimen, confirmed the benefit of adding concurrent platinum to RT with adjuvant PF, using a multiday infusion of platinum instead of a single bolus high-dose approach.[469] However, one of the largest phase III randomized trials ever conducted in NPC comparing concurrent cisplatin/RT with (or without) adjuvant PF showed that adjuvant chemotherapy did not significantly improve survival following chemoradiation (HR, 0.74; 95% CI, 0.49–1.10; *P* = .13).[471]

An individual patient data meta-analysis by Blanchard et al,[472] which included 19 trials and 4806 patients with non-metastatic NPC, showed that both adjuvant chemotherapy following chemoradiation and chemoradiation without adjuvant chemotherapy were associated with better OS (HR, 0.65; 95% CI, 0.56–0.76 and HR, 0.80; 95% CI, 0.70–0.93, respectively) and PFS (HR, 0.62; 95% CI, 0.53–0.72 and HR, 0.81; 95% CI, 0.71–0.92, respectively). However, differences between the included studies assessing chemoradiation with and without adjuvant chemotherapy (eg, different length of follow-up, fewer patients with stage II disease in trials assessing adjuvant chemotherapy) limited the ability to make a firm conclusion regarding the efficacy of one treatment modality over the other. A network meta-analysis based on this individual patient data meta-analysis[472] (including 20 trials and 5,144 patients) showed that the addition of adjuvant chemotherapy to chemoradiation was associated with better PFS (HR, 0.81; 95% CI, 0.66–0.98), compared to chemoradiation only.[473] The authors argued that more chemotherapy, in addition to concurrent chemoradiation, could reduce recurrence rates. The NRG-HN001 trial (NCT02135042) is currently in progress to further investigate the role of adjuvant chemotherapy following chemoradiation in patients with locoregionally advanced NPC. This phase II/III study aims to investigate whether delivery of adjuvant chemotherapy can be individualized based on EBV DNA plasma levels after chemoradiation.

Results from three systematic reviews suggest that induction chemotherapy prior to systemic therapy/RT in patients with locally advanced NPC may potentially impact tumor control, compared to systemic therapy/RT without additional chemotherapy.[473-475] However, these reviews had inconsistent results when evaluating the impact on survival. Two reviews showed that induction chemotherapy prior to systemic therapy/RT had superior OS and PFS rates, compared to systemic therapy/RT alone,[474,475] while another review showed that induction chemotherapy prior to systemic therapy/RT did not have better survival outcomes than systemic therapy/RT alone or systemic therapy/RT followed by adjuvant chemotherapy.[473] Expert groups (eg, ESMO, NCI) differ in their clinical practice guidelines regarding use of induction chemotherapy for these patients,[476] and the NCCN expert panel could not reach uniform consensus in this regard. Clinical trials are continuing to

investigate the role of induction chemotherapy prior to systemic therapy/RT for patients with locoregionally advanced NPC, and two recently published randomized phase III trials from China show a survival benefit for induction chemotherapy followed by concurrent systemic therapy/RT, compared to concurrent systemic therapy/RT alone.[477,478] Currently available evidence shows trends favoring the addition of chemotherapy to concurrent systemic therapy/RT in patients with locoregionally advanced NPC;[473-475] however, it remains unclear whether to administer chemotherapy to these patients before or after systemic therapy/RT.

For patients with locoregionally advanced NPC (T1, N1–3; T2–T4, any N), enrollment in a clinical trial is preferred. The panel recommends concurrent systemic therapy/RT (cisplatin) with either induction or adjuvant chemotherapy for locoregionally advanced NPC. Concurrent systemic therapy/RT (cisplatin) alone is a category 2B recommendation. Concurrent cisplatin with radiation is recommended for all patients who do not have a contraindication to the drug, because the vast majority of randomized trials support the use of cisplatin in this setting.[431,467] If using adjuvant chemotherapy, the standard remains PF. The substitution of carboplatin for cisplatin in induction, concurrent, and adjuvant regimens, while studied to some extent, should be limited to cisplatin-ineligible patients.[429,479,480]

Induction chemotherapy (followed by systemic therapy/RT) is also a recommended option for patients with NPC with either T1, N1–3 or T2–T4, any N lesions. Gemcitabine/cisplatin is a category 1 preferred option,[478] and modified TPF is also a category 1 option, but only for EBV-associated disease, as panel members observed that the dosing schedule used in the study by Sun et al[481] (docetaxel 60 mg/m^2 every 3 weeks, cisplatin 60 mg/m^2 every 3 weeks, and 5-FU 600 mg/m^2 as a continuous 120-hour infusion on days 1–5, 22–26, and 43–47) may not be effective for non–EBV-associated disease in patients in the United States. Besides TPF, several other induction/sequential chemotherapy regimens are lower-level recommendations included in the algorithm for NPC.[395,429,467,477,482]

Radiation Therapy Fractionation

Radiation dose-fractionation schedules may vary slightly depending on institutional preference (see *Principles of Radiation Therapy* in the NCCN Guidelines for *Cancer of the Nasopharynx*). Radiation doses of 66 to 70.2 Gy given in standard fractions of 1.8 to 2.0 Gy/fraction are recommended for control of the gross primary tumor and involved lymph nodes; an alternative schedule consists of 2.12 Gy/fraction daily (Monday–Friday) for 33 to 35 fractions to all areas of gross disease to a total dose of approximately 70 Gy.[120] Low- to intermediate-risk subclinical disease, such as in the low neck, is often treated with 44 to 50 Gy at 2.0 Gy/fraction or can be treated simultaneously with the main plan for the gross disease to 54 to 63 Gy at 1.6 to 1.8 Gy/fraction. For areas considered to be at intermediate risk, slightly higher doses such as 59.4 to 63 Gy in 1.8 to 2.0 Gy/fraction can be given to different regions of the skull base and neck. The total doses and fractionation should be prescribed in relationship to each other and the overall schedule as part of an integrated plan to address the varying areas at risk.

Follow-up/Surveillance

Recommendations for surveillance are provided in the algorithm (see *Follow-up Recommendations* in the NCCN Guidelines for Head and Neck Cancers). Since the deep areas of the skull base are inaccessible to clinical examination, periodic cross-sectional imaging may be necessary. The clinical benefit of blood EBV DNA monitoring is currently uncertain (see *Epstein-Barr Virus*, above), but it may be considered in centers with experience (category 2B).

Cancer of the Larynx

The larynx is divided into three regions: supraglottis, glottis, and subglottis. The distribution of cancers is as follows: 30% to 35% in the supraglottic region, 60% to 65% in the glottic region, and 5% in the subglottic region. The incidence and pattern of metastatic spread to regional nodes vary with the primary region. The lymphatic drainage of the glottis is sparse and early-stage primaries rarely spread to regional nodes. Because hoarseness is an early symptom, most glottic cancers are early stage at diagnosis. Thus, glottic cancer has an excellent cure rate of 80% to 90%. Nodal involvement adversely affects survival rates and is rare in T1–2 disease. In contrast, more than 50% of patients with supraglottic primaries present with spread to regional nodes because of an abundant lymphatic network that crosses the midline. Bilateral cervical metastases are not uncommon with early-stage supraglottic primaries. Thus, supraglottic cancer is often locally advanced at diagnosis. Subglottic cancer is not discussed, because it is so uncommon.

Workup and Staging

The evaluation of the patient to determine tumor stage is similar for glottic and supraglottic primaries (see *Cancer of the Glottic Larynx* and *Cancer of the Supraglottic Larynx* in the NCCN Guidelines for Head and Neck Cancers). Multidisciplinary consultation is frequently indicated for both sites because of the potential impact on voice quality, speech, and swallowing functions (see *Principles of Nutrition: Management and Supportive Care* in the NCCN Guidelines for Head and Neck Cancers). The 2017 AJCC staging classification (8th edition) for laryngeal primary tumors is determined by the number of subsites involved, vocal cord mobility, extranodal extension, the presence of metastases, and invasion of thyroid/cricoid cartilage (see Table 5).[318]

Treatment

In the NCCN Guidelines, the treatment of patients with laryngeal cancer is divided into 2 categories: 1) tumors of the glottic larynx; or 2) tumors of the supraglottic larynx.

For patients with carcinoma in situ of the larynx, recommended treatment options include: 1) endoscopic resection, which is preferred; or 2) RT.[483,484] For early-stage glottic or supraglottic cancer, a systematic review published in 2009 showed that surgery or RT have similar effectiveness[485] (see *Cancer of the Glottic Larynx* and *Cancer of the Supraglottic Larynx* in the NCCN Guidelines for Head and Neck Cancers), though the quality of studies comparing the effectiveness of RT and surgery in early laryngeal cancer is low.[486] A systematic review including 48 studies of patients with T2 glottic cancer specifically showed no difference in 5-year local control between transoral surgery (1,156 patients; 77.3%) and EBRT (3,191 patients; 75.8%).[487] However, a meta-analysis including 11 studies showed that OS (P = .04) and laryngeal preservation (P < .001) were both better in patients who were treated with transoral laser microsurgery, compared to patients treated with RT.[488] The choice of treatment modality depends on anticipated functional outcome, the patient's wishes, reliability of follow-up, and general medical condition.[489] In patients with significant pulmonary comorbidity, total laryngectomy may be preferable over endoscopic or open partial laryngectomy. Consideration should be given to any suspicious lymphadenopathy and risk of metastatic nodal disease. Neck dissection should be performed as indicated when the primary site is treated surgically. T1–T2 supraglottic cancers have a significant risk of occult nodal disease at presentation.

Postoperative adjuvant treatment depends on the presence or absence of adverse features, such as margin status, nodal staging, and any extranodal extension. In the event of close or positive margins in organ

preservation surgery, re-resection to negative margins should be considered. This may or may not require a total laryngectomy to achieve.

Resectable, advanced-stage glottic and supraglottic primaries are usually managed with a combined modality approach (see *Cancer of the Glottic Larynx* and *Cancer of the Supraglottic Larynx* in the NCCN Guidelines for Head and Neck Cancers). If total laryngectomy is indicated but laryngeal preservation is desired, concurrent systemic therapy/RT is recommended, based on results from Intergroup trial RTOG 91-11.[399,412] R91-11 was a successor trial to the VA trial and compared 3 non-surgical regimens: 1) induction cisplatin/5-FU followed by RT (control arm and identical to that in the VA trial); 2) concurrent RT and high-dose cisplatin 100 mg/m^2 days 1, 22, and 43; and 3) RT alone. RT was uniform in all 3 arms (70 Gy/7 weeks, 2 Gy/fraction), as was the option of surgery (including total laryngectomy) for relapsed/refractory disease in all arms. Patients with stage III and IV (M0) disease were eligible, excluding T1 primaries and high-volume T4 primaries (tumor extending more than 1 cm into the base of the tongue or tumor penetrating through cartilage). The key findings of the R91-11 trial were: 1) a statistically significant higher 2-year laryngeal preservation (local control) rate of 88% for concurrent RT with cisplatin, compared to 74% for induction chemotherapy and 69% for RT alone; 2) no significant difference in laryngeal preservation between induction and RT alone treatments; and 3) similar survival for all treatment groups. Based on these results, concurrent RT and systemic therapy (cisplatin preferred [category 1]) is a treatment option for achieving laryngeal preservation for T3, any N glottic and supraglottic cancers.[412] Long-term follow-up (10 years) of R91-11 indicates that laryngeal preservation continues to be better (ie, statistically different) with concurrent cisplatin/RT when compared with either induction chemotherapy or RT alone.[399] OS was not statistically different for all treatment groups; there was more non–cancer-related mortality among patients treated with concurrent cisplatin/RT.

Definitive RT (without systemic therapy) is an option for patients with T3, N0–1 disease who are medically unfit or refuse systemic therapy (see *Cancer of the Glottic Larynx* and *Cancer of the Supraglottic Larynx* in the NCCN Guidelines for Head and Neck Cancers). Surgery is reserved for managing the neck as indicated, for those patients whose disease persists after systemic therapy/RT or RT (see *Post-Chemoradiation or RT Neck Evaluation* in *Follow-up Recommendations* in the NCCN Guidelines for Head and Neck Cancers).

Induction chemotherapy with management based on response is an option for all but T1–2, N0 glottic and supraglottic cancer. Based on the long-term update of RTOG 91-11, induction chemotherapy is an option for patients who require (are amenable to) total laryngectomy.[399] After a complete or partial response with induction chemotherapy for patients with laryngeal cancer, RT alone is recommended (category 1);[399] systemic therapy/RT is a category 2B recommendation after a partial response[416,417,490] (see NCCN Guidelines for *Cancer of the Glottic Larynx* and NCCN Guidelines for *Cancer of the Supraglottic Larynx*).

For patients with glottic and supraglottic T4a tumors, the recommended treatment approach is total laryngectomy with possible hemi- or total thyroidectomy and appropriate neck dissection followed by adjuvant treatment (RT or systemic therapy/RT)[491] (see *Cancer of the Glottic Larynx, Cancer of the Supraglottic Larynx,* and *Principles of Surgery* in the NCCN Guidelines for Head and Neck Cancers). For selected patients with T4a tumors who decline surgery, the NCCN Panel recommends: 1) considering concurrent systemic therapy/RT; 2) clinical trials; or 3) induction chemotherapy with additional management based on response.[399,412]

Radiation Therapy Fractionation

Fractionation for RT is discussed in the algorithm (see *Principles of Radiation Therapy* in the NCCN Guidelines for *Cancer of the Glottic*

Larynx and *Cancer of the Supraglottic Larynx*). For patients with T1, N0 disease of the glottic larynx, an accelerated dosing schedule of 63 Gy (2.25 Gy/fraction) is preferred over conventional fractionation (66 Gy, 2.0 Gy/fraction), based on results of a prospective randomized trial showing that this accelerated dosing schedule was associated with better 5-year local control, compared to a conventional dosing schedule (92% vs. 77%, respectively; *P* = .004), in 180 patients with stage I cancer of the glottic larynx.[138] A dosing schedule of 50–52 Gy (3.12–3.28 Gy/fraction) may also be considered for patients with comorbidities or travel logistics or who are older adults.[492]

Follow-up/Surveillance

Recommendations for surveillance are provided in the algorithm (see *Follow-up Recommendations* in the NCCN Guidelines for Head and Neck Cancers). Serial endoscopy is recommended during follow-up examinations and may be supplemented with high-resolution, advanced radiologic imaging because of the scarring, edema, and fibrosis that occur in the laryngeal tissues and neck after high-dose radiation.

Paranasal Tumors (Maxillary and Ethmoid Sinus Tumors)

Tumors of the paranasal sinuses are rare, and patients are often asymptomatic until late in the course of their disease. Tumors of the maxillary sinus are more common than those of the ethmoid sinus or nasal cavity.[357] Workup is similar for ethmoid and maxillary sinus tumors (see *Ethmoid Sinus Tumors* and *Maxillary Sinus Tumors* in the NCCN Guidelines for Head and Neck Cancers).

Although the most common histology for these tumors is squamous cell carcinoma, multiple histologies have been reported including adenocarcinoma, esthesioneuroblastoma (also known as olfactory neuroblastoma), minor salivary gland tumors, and undifferentiated carcinoma (eg, sinonasal undifferentiated carcinoma [SNUC], small cell, or sinonasal neuroendocrine carcinoma [SNEC]).[493-496] The defining features of esthesioneuroblastoma, SNUC, and SNEC continue to be debated,[497] and patients diagnosed with these diseases should be referred to a center of expertise and encouraged to enroll in clinical trials. Locoregional control and incidence of distant metastasis are dependent on T stage, N stage, and tumor histology.[498] However, T stage remains the most reliable predictor of survival and locoregional control (see Table 6).[318] MM also occurs in the paranasal sinus region, nasal cavity, and oral cavity (see *Mucosal Melanoma* in the NCCN Guidelines for Head and Neck Cancers). Sarcoma and lymphoma should also be considered in the differential diagnosis when evaluating a patient with a paranasal tumor. (see the NCCN Guidelines for Soft Tissue Sarcoma and the NCCN Guidelines for Non-Hodgkin's Lymphomas, available at www.NCCN.org).[499,500]

Ethmoid Sinus Tumors

Patients with early-stage ethmoid sinus cancer are typically asymptomatic. These neoplasms are often found after a routine nasal polypectomy or during the course of a nasal endoscopic procedure. For a patient with gross residual disease left behind after an initial endoscopic procedure, an oncologically complete endoscopic procedure is required for complete surgical resection of the residual tumor. In some instances, this procedure may entail an anterior craniofacial resection to remove the cribriform plate and intracranial component of the tumor to ensure clear surgical margins. Nodal involvement is rare in ethmoid sinus tumors, and lymph node metastasis is associated with poor prognosis.[501] Patients with ethmoid sinus cancer who have N+ neck disease should undergo neck dissection with appropriate risk-based adjuvant therapy. Patients with high-grade tumors have worse survival outcomes compared to those with low-grade tumors.[502]

Most patients with ethmoid sinus cancer present after having had an incomplete resection. The patient who is diagnosed after incomplete

resection (eg, polypectomy)—and has no documented residual disease on physical examination, imaging, and/or endoscopy—should be treated with surgical resection if feasible (see the NCCN Guidelines for *Ethmoid Sinus Tumors*). If no adverse pathologic factors are found, complete surgical resection may obviate the need for postoperative RT in T1 patients only (category 2B). In patients with high-risk pathologic features, such as positive or close margins, high-grade lesions, and intracranial extension (category 2B), postoperative RT should be considered.

RT may be considered as definitive treatment in patients for whom a surgical resection is not possible. Radiation therapy fractionation for patients with ethmoid sinus tumors is described in the *Principles of Radiation Therapy* in the NCCN Guidelines for *Ethmoid Sinus Tumors*. IMRT is preferred due to the proximity of this anatomic area to the optic structures; proton therapy is preferred if the normal tissue constraints cannot be met by IMRT.

Systemic therapy/RT may be considered to preserve the orbital contents and avoid surgery in patients with T4 disease.[503,504] In these patients, induction and concurrent chemotherapy may be given in combination with RT. Systemic therapy should routinely be part of the overall treatment for patients with SNUC with neuroendocrine features; small cell, high-grade olfactory esthesioneuroblastoma; or SNEC histologies.[505-514] After curative-intent treatment, long-term follow-up is necessary for esthesioneuroblastomas, because recurrence can occur even after 15 years.[513,515,516]

For patients with metastatic disease, options include a platinum combined with etoposide (with or without concurrent RT)[505,517,518] and cyclophosphamide/doxorubicin/vincristine (category 2B).

Maxillary Sinus Tumors

Surgical resection followed by postoperative therapy remains a cornerstone of treatment for most maxillary sinus tumors, except limited extent T1–2 tumors resected with negative margins (see the NCCN Guidelines for *Maxillary Sinus Tumors*).[519-522] The principles are generally similar to those described above for ethmoid sinus tumors. For patients with SNUC with neuroendocrine features; small cell, high-grade olfactory esthesioneuroblastoma; or SNEC histologies, systemic therapy should be routinely included as part of the treatment plan (see *Ethmoid Sinus Tumors* in this Discussion). Participation in clinical trials is recommended for patients with malignant tumors of the paranasal sinuses.

RT fractionation for patients with maxillary sinus tumors is described in the *Principles of Radiation Therapy* in the NCCN Guidelines for *Maxillary Sinus Tumors*. Studies using IMRT have shown that it reduces the incidence of complications, such as radiation-induced ophthalmologic toxicity, although the 5-year OS rate was not improved.[192,521,523-526] Similar to the recommendation for ethmoid sinus tumors, IMRT is preferred in this anatomic area due to proximity to the visual structures and proton therapy is preferred if the normal tissue constraints cannot be met by IMRT.

Follow-up

Recommendations for surveillance are provided in the algorithm (see *Follow-up Recommendations* in the NCCN Guidelines for Head and Neck Cancers).

Very Advanced Head and Neck Cancers

Very advanced H&N cancers include: 1) newly diagnosed locally advanced T4b (M0); 2) newly diagnosed unresectable regional nodal disease, typically N3; 3) metastatic disease at initial presentation (M1); or 4) recurrent or persistent disease. The treatment goal is usually cure for patients with newly diagnosed locoregional but unresectable disease. For

recurrent disease, the goal is cure if surgery or radiation remains feasible, or palliation if the patient has received previous RT and the disease is unresectable. For patients with widely metastatic disease, the goal is palliation or prolongation of life.

Treatment

The treatment of patients with unresectable locoregional, persistent, recurrent, or metastatic H&N cancers is dictated by the patient's performance status (PS) and intent of treatment (ie, palliative vs. curative). Patients with good PS may tolerate a wide range of treatment options; whereas, patients with reduced PS cannot.

Newly Diagnosed Locoregionally Advanced Disease

Many randomized trials[109,403-407,527-530] and meta-analyses[396,408-411] show significantly improved OS, DFS, and locoregional control when a systemic therapy and radiation regimen (concomitant or, less commonly, sequential) is compared with RT alone for locoregionally advanced disease. Limited data are available comparing the efficacy of different chemoradiotherapy regimens.

High-dose cisplatin plus RT is effective and typically uses conventional fractionation at 2.0 Gy per fraction to 70 Gy in 7 weeks with concurrent single-agent cisplatin given every 3 weeks at 100 mg/m^2.[127,403] Because of concern about toxicity, a weekly lower dose cisplatin regimen (40 mg/m^2/wk) may be substituted, or other better tolerated regimens, although the categories of evidence for these regimens are lower than for high-dose cisplatin. In the absence of clearly definitive prospective comparison trials, it is unclear whether weekly cisplatin is either less toxic or equally efficacious as high-dose cisplatin.

Epidermal growth factor receptor (EGFR) overexpression is common in squamous cell H&N cancers and is associated with poor survival outcomes.[531,532] These findings have led to the development of EGFR inhibitors, such as the EGFR monoclonal antibody cetuximab. Bonner et al randomly assigned 424 patients with locally advanced stage III to IV squamous cell carcinomas of the hypopharynx, oropharynx, and larynx to receive definitive RT with or without cetuximab.[533] Locoregional control and median OS (49 months vs. 29.3 months, $P = .03$) were significantly improved in patients treated with RT and cetuximab compared to RT alone. Five-year OS in these patients was 45.6% in patients treated with RT and cetuximab and 36.4% in patients who received RT alone (HR, 0.73; 95% CI, 0.56–0.95; $P = .018$).[534]

The addition of cetuximab to cisplatin and RT was hypothesized to improve efficacy outcomes compared to cisplatin and RT. However, the randomized phase III RTOG 0522 trial showed that the addition of cetuximab to cisplatin and RT did not significantly improve OS in patients with stage III or IV H&N cancer and, importantly, was more toxic.[535] In the phase III GORTEC 2007-01 trial, cetuximab combined with carboplatin/5-FU and RT was compared to cetuximab and RT.[536] Three-year PFS (52.3% vs. 40.5%, respectively; HR, 0.73; 95% CI, 0.57–0.94; $P = .015$) and locoregional failure (21.6% vs. 38.8%, respectively; HR, 0.54; 95% CI, 0.38–0.76; $P < .001$) rates were significantly better for the combination regimen, but OS and distant metastases rates were not statistically significant. Grade 3 or 4 mucositis (73% vs. 61%, respectively; $P = .014$) and hospitalization for toxicity (42% vs. 22%, respectively; $P < .001$) were significantly more prevalent in patients who received cetuximab combined with carboplatin/5-FU and RT. Cetuximab combined with chemoradiation continues to not be routinely used in the definitive treatment setting.

Cetuximab and RT was compared to cisplatin and RT in two randomized phase III trials as a deintensification treatment strategy for HPV-associated locally advanced oropharyngeal cancer, but proved inferior to cisplatin in this setting in terms of OS and was also not better tolerated.[537,538] In the RTOG 1016 non-inferiority trial, 849 patients with

locally advanced HPV-positive oropharyngeal cancer were randomized to receive accelerated IMRT with either cetuximab or cisplatin.[537] After a median follow-up of 4.5 years, the cetuximab arm did not meet the criterion for non-inferiority (based on 5-year OS). Five-year OS was 77.9% for the cetuximab arm and 84.6% for the cisplatin arm. PFS and risk of locoregional failure were significantly worse in the cetuximab arm compared to the cisplatin arm (HR, 1.72; 95% CI, 1.29–2.29; *P* < .001 for PFS; HR, 2.05; 95% CI, 1.35–3.10; *P* < .001 for locoregional failure), with 5-year PFS and locoregional failure rates being 67.3% and 17.3% for the cetuximab arm, and 78.4% and 9.9% for the cisplatin arm, respectively. In the smaller but similarly designed randomized phase III De-ESCALaTE HPV trial, cetuximab and RT was compared to cisplatin and RT in 334 patients with locally advanced p16-positive oropharyngeal squamous cell carcinoma.[538] Patients given cisplatin and RT had significantly better 2-year OS (97.5% vs. 89.4%, respectively; HR, 5.0; 95% CI, 1.7–14.7; *P* = .001) and a lower recurrence rate (6.0% vs. 16.1%, respectively; HR, 3.4; 95% CI, 1.6–7.2; *P* < .001) compared to patients given cetuximab and RT. These phase III trials demonstrate that cetuximab and RT is inferior to cisplatin and RT in patients with HPV-related oropharyngeal cancer.[537,538]

Therefore, in patients with a PS of 0 or 1, the recommended treatment of newly diagnosed, very advanced disease is concurrent systemic therapy/RT, with a large amount of phase III data supporting high-dose cisplatin as a category 1 preferred recommendation. [399,403] There is also considerable phase III data from Europe that supports the use of carboplatin/5-FU with concurrent RT.[151] This treatment is also considered a category 1 preferred option. Cisplatin-based induction systemic therapy can be used, followed by radiation-based locoregional treatment (ie, sequential chemoradiation). However, an improvement in OS with the incorporation of induction chemotherapy, compared to proceeding directly to state-of-the-art concurrent systemic therapy/RT, has not been established in randomized studies.[419,420] Cetuximab with concurrent RT is a category 2B option based on phase II and phase III data but is distinctly inferior to cisplatin with concurrent RT, as discussed above.[534,537-539] Other chemoradiation options that are also category 2B based on less panel consensus include 5-FU/hydroxyurea, cisplatin with infusional 5-FU, platinum combined with paclitaxel, and weekly cisplatin 40 mg/m^2.[540-544] Other options for patients with a PS of 2–3 are described in the algorithm (see *Treatment of Newly Diagnosed (M0) T4b, N0–3 or Unresectable Nodal Disease or Unfit for Surgery* in the NCCN Guidelines for Head and Neck Cancers). Primary systemic therapy/RT regimens are listed in the *Principles of Systemic Therapy* in the NCCN Guidelines for Head and Neck Cancers. Radiation therapy fractionation for patients with newly diagnosed, very advanced disease is described in the *Principles of Radiation Therapy* in the NCCN Guidelines for *Very Advanced Head and Neck Cancers*.

Metastatic Disease

For patients with metastatic (M1) disease at initial presentation, palliative adjunctive measures include analgesics, and other measures to control manifestations of disease spread (eg, pain, hypercalcemia, malnutrition). Locoregional treatment (eg, surgery, RT, or ablative therapies) may be used for oligometastatic disease.[545-547]

Single-agent and combination systemic therapy are both used.[548] Response rates to single-agent therapies range from 15% to 35%.[549-551] Randomized trials assessing a cisplatin-based combination regimen (cisplatin/5-FU) versus single-agent therapy with cisplatin, 5-FU, or methotrexate showed significantly higher response rates, but no difference in OS and greater toxicity for the combination regimen.[552-556] Complete response is associated with longer survival and, although infrequent, has been reported more often with combination regimens.[553] A phase III randomized trial (EXTREME) of 442 patients found that cetuximab plus cisplatin/5-FU or carboplatin/5-FU improved median survival compared to

the standard chemotherapy doublet of platinum/5-FU (10.1 vs. 7.4 months, *P* = .04).[557] The response rate was improved with the addition of cetuximab (36% vs. 20% [*P* < .001]). A randomized phase III trial found no significant difference in survival when comparing cisplatin/5-FU and cisplatin/paclitaxel.[552]

Trials evaluating immune checkpoint inhibitors demonstrated efficacy in patients with recurrent or metastatic HNSCC.[558-560] Pembrolizumab, an anti-PD-1 antibody, was evaluated as a first-line option for recurrent or metastatic HNSCC in the KEYNOTE-048 trial (*N* = 882).[558] Patients were randomized to receive pembrolizumab, pembrolizumab with a platinum and 5-FU, or the EXTREME regimen. In the total population, an OS benefit was observed in the pembrolizumab + platinum + 5-FU arm, compared to the EXTREME arm (median OS 13 months vs. 10.7 months, respectively; HR, 0.77; 95% CI, 0.63–0.93; *P* = .003). PFS, however, did not significantly differ between these two study arms. In patients with a PD-L1 combined positive score (CPS) of ≥20 or ≥1, median OS was better in patients who received pembrolizumab monotherapy, compared to those who received the EXTREME regimen (median 14.9 months vs. 10.7 months, respectively; HR, 0.61; 95% CI, 0.45–0.83; *P* < .001, for CPS ≥20; median 12.3 months vs. 10.3 months, respectively; HR, 0.78; 95% CI, 0.64–0.96; *P* = .009, for CPS ≥1). Median duration of response was greater in patients treated with pembrolizumab monotherapy or pembrolizumab with chemotherapy, compared to patients treated with the EXTREME regimen.

Based on the results of KEYNOTE-048,[558] the panel considers pembrolizumab/platinum/5-FU to be a preferred first-line option (category 1) for all patients with recurrent, unresectable, or metastatic disease who have no surgical or radiotherapeutic option. The panel also considers pembrolizumab monotherapy to be a preferred first-line option for patients with CPS ≥1 (category 1 if CPS ≥20). Other combination regimens recommended by the panel for treatment of metastatic HNSCC include: 1) cisplatin or carboplatin, plus 5-FU with cetuximab (category 1; preferred);[557] 2) cisplatin or carboplatin, plus a taxane;[552,561] 3) cisplatin with cetuximab;[562,563] 4) cisplatin with 5-FU;[552,553] or 5) cetuximab with a platinum and a taxane.[563-566] Single agents recommended by the panel include cisplatin, carboplatin, paclitaxel, docetaxel, 5-FU, methotrexate, capecitabine, and cetuximab.[548,551,553,554,562,567-575]

Metastatic Nasopharyngeal Cancer

For patients with nasopharyngeal cancer who present with metastatic disease, enrollment in a clinical trial is preferred. Population-based data appear to support the role of earlier RT in the management of metastatic disease,[576] but treatment ultimately depends on whether disease is localized or widespread and if it is symptomatic or posing a clinical risk to the patient.[431,467,577] Gemcitabine plus cisplatin is the preferred combination systemic therapy regimen for initial therapy for these patients based on category 1 level evidence demonstrating a survival advantage over PF.[578] For patients with oligometastatic disease, potentially curative therapy (ie, RT alone or surgery) is indicated and is often used following robust anti-tumor effects observed with systemic chemotherapy.[579,580]

Other combination regimens for these patients include [578,581]cisplatin or carboplatin, plus a taxane;[552,561] cisplatin/5-FU;[552,553] gemcitabine/carboplatin;[582] or carboplatin/cetuximab.[582] Results from a comparison of five different cisplatin-based regimens for NPC showed that all had substantial anti-cancer activity.[583] Active and more commonly used single agents are listed in the algorithm (see *Principles of Systemic Therapy* in the NCCN Guidelines for Head and Neck Cancers).[548,551,553,554,562,567-570,572,574,575,584]

The anti-PD-1 antibodies pembrolizumab and nivolumab have been evaluated for previously treated, recurrent or metastatic NPC in nonrandomized trials. Pembrolizumab in patients with PD-L1–positive

recurrent or metastatic NPC was assessed in the nonrandomized multi-institutional phase IB KEYNOTE-028 trial (*N* = 27).[585] All of the patients but two had previously received systemic therapy for their recurrent or metastatic disease. The objective response rate (partial response only, since no patients had a complete response) was 26%, with a median duration of response of 17.1 months. The OS rate at 6 and 12 months was 85% and 63%, respectively, with PFS rates of 39% and 34%, respectively. About 30% of patients experienced a grade 3–5 drug-related adverse event. The panel voted to include pembrolizumab for patients with previously treated, PD-L1–positive recurrent or metastatic NPC for the 2018 update, but this is a category 2B option based on panel consensus.

Nivolumab as treatment for recurrent or metastatic NPC has been evaluated in two phase I/II trials. In the CheckMate 358 trial, nivolumab had an overall response rate (ORR) of 20.8% and a disease control rate of 45.8% in 24 patients with recurrent or metastatic NPC.[586] These data are currently only reported as an abstract. In the second trial, 44 patients with previously treated recurrent or metastatic NPC (>80% non-keratinizing disease) were treated with nivolumab.[587] The ORR was 20.5%, 1-year OS was 59%, and 1-year PFS was 19.3%. Based on the results of these trials, nivolumab is a category 2B treatment option for patients with previously treated, recurrent or metastatic non-keratinizing NPC.

Recurrent or Persistent Disease

Surgery is recommended for resectable recurrent or persistent locoregional disease, in the absence of distant metastatic disease; adjuvant therapy depends on the risk factors. Patients with resectable recurrent or persistent locoregional disease who have not previously been treated with RT may also be treated with concurrent systemic therapy/RT [high-dose cisplatin is the preferred (category 1) systemic agent[403]].

Combination systemic therapy followed by RT or systemic therapy/RT is a category 3 recommendation for these patients. If the recurrence is unresectable and the patient had not had prior RT, then RT with concurrent systemic therapy is recommended, depending on the PS. For patients with recurrent disease who are not amenable to curative-intent radiation or surgery, the treatment approach is the same as that for patients with metastatic disease. Locoregional treatment may be considered in the presence of distant metastasis with locoregional failure. RT fractionation for patients with recurrent or persistent disease is described in the *Principles of Radiation Therapy* in the NCCN Guidelines for *Very Advanced Head and Neck Cancers*).

Reirradiation

Reirradiation may be done in patients with locally and/or regionally recurrent H&N cancer, using IMRT, PBT, or SBRT. A randomized phase III multicenter trial in France (*N* = 130) showed that reirradiation combined with systemic therapy in patients following a resected recurrence improves DFS, compared to patients receiving only surgery (HR, 1.68; 95% CI, 1.13–2.50; *P* = .01).[588] However, toxicity of this regimen was considerable, although older techniques were used, with grade 3 of 4 acute toxicity (mucositis/pharyngitis) in 28% of patients. SBRT with or without cetuximab following surgery for relapsed or refractory disease has been investigated in an institutional report (*N* = 28).[589]

Advanced RT techniques should be used for reirradiation. A retrospective review of 227 patients who were treated at an NCCN Member Institution showed that IMRT-based reirradiation of the H&N may be associated with local control and improved survival rates, but toxicity rates were considerable, with adverse events grade 3 or higher occurring in 16% of patients at 2 years.[590,591] Use of concurrent systemic therapy may be associated with greater risk of toxicity. Rates for 1-year

local control, distant control, DFS, and OS were 51%, 90%, 49%, and 64%, respectively, and adverse events grade 3 or higher were rare. The best outcomes for SBRT for reirradiation are in patients with smaller tumors (<25 cc) and no skin involvement. Intraoperative RT (IORT) and brachytherapy may also be used for select patients at high-volume centers.[592-594]

The decision to treat with reirradiation should take into account comorbidity, the toxicity of previous treatment methods, organ dysfunction, and the amount of time that has passed since previous treatment.[595-598] Treatment planning should take spinal cord limits into account so that the safest maximum dose is delivered.[595,599,600] PBT may be used for reirradiation when normal tissue constraints cannot be met by photon-based therapy.[590,601-603] Retrospective studies show that PBT used for reirradiation may be associated with good outcomes (eg, 65%–84% OS, improved locoregional control, freedom from distant metastasis) and acceptable toxicity.[601,602] However, in one retrospective study, three patients died (out of 60), possibly due to reirradiation-related effects.[601]

Dosing schedules that may be used for reirradiation are described in *Radiation Techniques* in the NCCN Guidelines for Head and Neck Cancers. Radiation volumes should include known disease only to minimize the volume of tissue receiving very high doses in regions that overlap. Therefore, prophylactic treatment (eg, elective nodal irradiation) is not routinely indicated.[604] There are currently knowledge gaps regarding appropriate use of irradiation, and patients should be encouraged to enroll in clinical trials.[590,595]

Disease That Has Progressed on or After Platinum Therapy

For failure of platinum-based therapy, options are listed in the Guidelines (see *Principles of Systemic Therapy for Non-Nasopharyngeal Cancer: Recurrent, Unresectable, or Metastatic* in the NCCN Guidelines for Head and Neck Cancers).

Nivolumab was assessed in a phase III RCT including 361 patients with recurrent HNSCC whose disease had progressed within 6 months following platinum-based chemotherapy.[560] With a median follow-up of 5.1 (range 0–16.8) months, the OS was significantly greater in patients given nivolumab, compared to patients given standard second-line single-agent systemic therapy (methotrexate, docetaxel, or cetuximab), (HR, 0.70; 97.73% CI, 0.51–0.96; *P* = .01). One-year survival was also greater for patients who received nivolumab, relative to patients who received standard therapy (36.0% vs. 16.6%, respectively), and response rate was higher (13.3% vs. 5.8%, respectively), but median PFS was not significantly different between the two groups (2.0 months vs. 2.3 months, respectively; *P* = 0.32). In prespecified exploratory analyses, the OS benefit in patients treated with nivolumab appeared to be confined to those patients with a tumor PD-L1 expression level of 1% or more (*n* = 149) (8.7 vs. 4.6 months, HR, 0.55; 95% CI, 0.36–0.83). In patients with tumor PD-L1 expression level less than 1% (*n* = 111), no OS advantage was demonstrated for the nivolumab-treated patients (5.7 vs. 5.8 months; HR, 0.89; 95% CI, 0.54–1.45). Grade 3 or 4 treatment-related adverse events occurred in 13.1% of patients who received nivolumab, compared to 35.1% of patients who received standard therapy. These results indicate that nivolumab prolongs survival in patients with recurrent or metastatic squamous cell H&N cancer that has progressed after platinum-based chemotherapy, relative to patients who receive standard single-agent systemic therapy.

Pembrolizumab was initially studied at a dose of 10 mg/kg given every two weeks in the HNSCC cohort of the KEYNOTE-012 trial, and clinical activity was identified.[605] A lower, fixed-dose schedule using pembrolizumab 200 mg every 3 weeks was subsequently assessed in a

phase 1b expansion cohort of 132 patients with recurrent or metastatic HNSCC.[606] At 6 months, the OS rate was 59%, and the PFS was 23%, with an ORR of 18%. Observed responses appeared durable, although the follow-up was limited (median 9 months). Pembrolizumab was also generally well-tolerated.[605] Pooled analyses after long-term follow-up of the initial and expansion cohorts (*N* = 192) showed a 1-year OS rate of 38%.[607] Among the 34 responders, 85% of the responses lasted 6 months or longer, and 71% lasted 12 months or longer.

Based on results of the phase Ib KEYNOTE-012 trial, pembrolizumab was evaluated in the phase III KEYNOTE-040 trial.[559] Patients with recurrent or metastatic HNSCC (*N* = 495) were randomized to receive pembrolizumab or another systemic therapy (methotrexate, docetaxel, or cetuximab). Median OS was greater for the pembrolizumab arm compared to the standard-of-care arm (8.4 months vs. 6.9 months; HR, 0.80; 95% CI, 0.65–0.98; *P* = .016). When analyses were stratified by PD-L1 status, the results for OS were significantly better with pembrolizumab only for patients with tumors that have PD-L1 expression.

The nonrandomized phase II KEYNOTE-055 trial studied pembrolizumab in 171 patients with HNSCC that progressed following treatment with both a platinum and cetuximab.[608] The ORR was 16% (95% CI, 11%–23%), and the mean duration of response was 8 months.

Afatinib, was evaluated in the phase III LUX-Head & Neck 1 RCT. Afatinib was compared to methotrexate in patients with recurrent or metastatic H&N cancer who had progressed on or after platinum-based therapy (*N* = 483).[609] Patients randomized to receive afatinib had greater PFS compared to patients randomized to receive methotrexate (2.6 months vs. 1.7 months; *P* = .03). There were no significant differences for OS.[609] The PFS benefit with afatinib seemed to be most clear in the HPV-negative group.[610] A randomized phase II trial comparing afatinib to cetuximab in patients with recurrent or metastatic H&N cancer who had progressed on or after platinum-based therapy (*N* = 121) showed comparable response rates between the two drugs.[611]

The panel recommends immunotherapy (nivolumab and pembrolizumab) as category 1 preferred options for patients with recurrent or metastatic HNSCC who have progressed on or following platinum-based chemotherapy based on high-quality evidence.[559,560] Despite the ambiguities of PD-L1 testing and definitions, PD-L1 expression may be associated with better outcomes from treatment with immunotherapy for recurrent or metastatic HNSCC (ie, greater likelihood of response to pembrolizumab and greater survival benefit in response to nivolumab). For all other systemic therapy options recommended by the panel, there are no clear advantages of one agent over another in the subsequent-line setting, though response rates seem to be highest with taxanes. Afatinib has a PFS benefit, but not an OS benefit, over methotrexate[609] and is a category 2B systemic therapy option for non-nasopharyngeal persistent H&N cancer or cancer that has progressed on or after platinum-containing chemotherapy.

Occult Primary Cancer

Occult or unknown primary H&N cancer is defined as metastatic carcinoma in a cervical lymph node without an identifiable primary site after appropriate investigation. This is an uncommon disease entity, accounting for about 5% of patients presenting to referral centers. The most frequent histology is squamous cell carcinoma. Although patients with very small tonsil and tongue base cancers frequently present with enlarged neck nodes and are initially classified as having an unknown primary, most will eventually be diagnosed by directed biopsy and tonsillectomy. The emergence of the primary site after therapy and during follow up is rare. H&N cancer of unknown primary site is a highly curable

disease. After appropriate evaluation and treatment, most patients experience low morbidity and long-term disease control.

Workup

The majority of patients older than 40 years who present with a neck mass prove to have metastatic cancer. The source of the lymphadenopathy is almost always discovered in the course of a complete H&N examination and imaging evaluation. FNA is the preferred diagnostic procedure when a malignant cervical lymph node is suspected. FNA obtained from cystic and necrotic lymph nodes may be non-diagnostic, and, in these situations, a core biopsy may be obtained. Open biopsy should not be performed unless the patient is prepared for definitive surgical management of the malignancy, which may entail a neck dissection, and patients should be counseled accordingly in the preoperative period.

Patients with a biopsy-proven carcinoma of a cervical lymph node require dedicated imaging of the head and neck. This can be accomplished through contrast-enhanced CT imaging. An FDG PET/CT may reveal a primary site not visible on contrast-enhanced CT imaging.[612]

When a needle biopsy shows squamous cell carcinoma, adenocarcinoma, or anaplastic/undifferentiated epithelial cancer without a primary site, additional studies are needed (see *Occult Primary* in the NCCN Guidelines for Head and Neck Cancers). High-risk HPV and EBV testing are recommended for squamous cell or undifferentiated histology.[26,584,613-616] High-risk HPV and EBV testing can be useful in workup and management of cancers of the neck of unknown primary, and patients with EBV- or HPV-related cervical adenopathy are staged according to the classification for nasopharyngeal and HPV-positive oropharyngeal cancer, respectively.[617,618]

A thorough operative examination of at-risk mucosal sites is an important component in the workup of a patient with an occult primary, especially in scenarios where CT or PET imaging do not reveal the primary site. During this procedure, directed biopsies of areas of mucosal abnormalities suspicious for the primary site are undertaken. Randomly directed biopsies of normal-appearing mucosa in potential primary sites have a low yield and seldom disclose a primary cancer. Many primary cancers are identified after tonsillectomy. However, the therapeutic benefit of this surgery is uncertain because, when patients have been treated without tonsillectomy, only a few develop a clinically significant primary tumor.

Treatment

Neck dissection is recommended for all patients with thyroglobulin-negative and calcitonin-negative adenocarcinoma (see *Occult Primary* in the NCCN Guidelines for Head and Neck Cancers). If the metastatic adenocarcinoma presents high in the neck, parotidectomy may be included with the neck dissection. After neck dissection, management depends on the findings (ie, N1 without extranodal extension, N2 or N3 without extranodal extension, or extranodal extension) (see *Occult Primary* in the NCCN Guidelines for Head and Neck Cancers).

Due to the infrequency of this disease, high-level prospective evidence to guide clinical management is lacking. Among NCCN Member Institutions, significant variation exists regarding the management of squamous cell carcinoma, poorly differentiated or nonkeratinizing squamous cell carcinoma, anaplastic cancer (not thyroid) of unknown primary site, or other uncommon histologies. Most panel members believe such patients should be managed with a neck dissection (preferred for patients with N1 disease). Postoperative therapy among patients with occult primary squamous cell carcinoma is based on the amount of nodal disease and the presence or absence of extranodal extension. For N1 disease without extranodal extension, NCCN panel members recommend either: 1) RT that encompasses the target volume; or 2) careful observation with regular

H&N examinations. Postoperative RT or consideration of concurrent chemoradiation (category 2B for chemoradiation) is recommended for N2 or N3 disease without extranodal extension (see *Occult Primary* in the NCCN Guidelines for Head and Neck Cancers). For extranodal extension, concurrent chemoradiation is a category 1 recommendation; RT alone is an option (see *Occult Primary* in the NCCN Guidelines for Head and Neck Cancers).[104,105]

Among squamous cell carcinomas with occult primary that are not managed surgically, recommendations are based on less panel consensus: 1) concurrent systemic therapy/RT for those with N2–3 disease (category 2B); 2) primary RT for those with N1 disease (category 2B); or 3) induction chemotherapy for patients with N2–3 disease (category 3) followed by chemoradiation or RT (see *Occult Primary* in the NCCN Guidelines for Head and Neck Cancers). A neck dissection may be recommended after treatment with RT and/or systemic therapy, depending on the clinical response. Since HPV-positive occult primary is likely located in the tonsil or base of tongue regions, radiation targets may be limited to these mucosal regions (see *Cancer of the Oropharynx [p16-positive]* in the NCCN Guidelines for Head and Neck Cancers).[353] Treatment of EBV-positive disease should be treated as nasopharyngeal cancer (see *Cancer of the Nasopharynx* in the NCCN Guidelines for Head and Neck Cancers).[619]

Salivary Gland Tumors

Guidelines recommendations regarding treatment of salivary gland tumors have recently been considerably revised, notably systemic therapy recommendations. Salivary gland tumors can arise in the major salivary glands (ie, parotid, submandibular, sublingual) or in one of the minor salivary glands, which are widely spread throughout the aerodigestive tract.[620] Many minor salivary gland tumors are located on the hard palate. Approximately 20% of the parotid gland tumors are malignant; the incidence of malignancy in submandibular and minor salivary gland tumors is approximately 50% and 80%, respectively. These malignant tumors constitute a broad spectrum of histologic types, including mucoepidermoid, acinic, adenocarcinoma, adenoid cystic carcinoma, malignant myoepithelial tumors, and squamous cell carcinoma. The primary diagnosis of squamous cell carcinoma of the parotid gland is rare; however, the parotid gland is a frequent site of metastasis from skin cancer.[621] Prognosis and tendency to metastasize vary among these histologic types. Major prognostic factors are histologic grade, tumor size, and local invasion. Staging is done using the AJCC Cancer Staging Manual (8th edition).[318]

Treatment

The major therapeutic approach for salivary gland tumors is adequate and appropriate surgical resection.[622-625] Surgical intervention requires careful planning and execution, particularly in parotid tumor surgery because the facial nerve is in the gland. The gland should be preserved if the nerve is not directly involved by the tumor. Most parotid gland tumors are located in the superficial lobe. If the facial nerve is functioning preoperatively, the nerve can be preserved in most patients.[626] The facial nerve should be sacrificed if there is preoperative facial nerve involvement with facial palsy or if there is direct invasion of the tumor into the nerve where the tumor cannot be separated from the nerve. Malignant deep lobe parotid tumors are quite rare; however, they are generally a challenge for the surgeon because the patient may require superficial parotidectomy and identification and retraction of the facial nerve to remove the deep lobe parotid tumor.

The panel recommends highly conformal RT techniques such as IMRT, proton, or other heavy ions for definitive radiation treatment. Results from a retrospective cohort study including 545 patients with salivary gland tumors treated between 1997 and 2010 showed better local control and

survival outcomes with neutron therapy, relative to photon therapy.[627] However, risk of late effects with neutron therapy is high and tends to increase over time, with estimates as high as 20% at 9 years.[628,629] The panel no longer recommends neutron therapy as a general solution for salivary gland cancers due to the diminishing demand, concerns regarding the methodologic robustness of available randomized trial data, and closure of all but one center in the United States. The panel recognizes the potential clinical value of neutron therapy for select patients.

Most malignant deep lobe parotid tumors will require postoperative RT because of adverse features such as the limitations of surgical margins in the resection of these tumors.[622,624,630] RT is also used in an adjuvant setting for tumors with other adverse features (eg, intermediate, high grade, T3–4 tumors, or positive lymph nodes);[623,631,632] systemic therapy/RT (category 2B) can also be considered.[633] Efficacy data for systemic therapy/RT for patients with advanced salivary gland tumors that have been resected are limited. Extensive safety data are available and may be extrapolated from the management of HNSCC, with some NCCN Member Institutions using platinum-based regimens for these patients. With regard to unresectable salivary gland tumors, the NCCN Panel had less consensus about chemoradiation (which is reflected in the category 2B recommendations), because there are few published trials. Clinical trials are ongoing in this area (eg, NCT01220583, NCT02776163).

Systemic therapy may be used for palliation in advanced disease. Targeted therapy is increasingly becoming an option for patients with distantly metastatic salivary gland tumors. A significant number of advanced salivary gland tumors with distant metastases are androgen receptor-positive (AR+).[634-638] Therefore, the panel recommends that patients with tumors that are AR+ receive androgen receptor therapy (eg, leuprolide, bicalutamide).[638-641] Two phase I/II studies including patients with advanced *NTRK* gene fusion-positive cancer (with 22%–38% being salivary gland tumors) showed promising objective response rates of 75% to 100% with the TRK inhibitor larotrectinib.[642,643] A pooled analysis from a phase II trial and two phase I trials including 54 patients with *NTRK* gene fusion-positive cancer (13% being mammary analogue secretory carcinoma of the salivary gland) showed an objective response rate of 57.4% for entrectinib, another TRK inhibitor.[644] The FDA recently approved larotrectinib and entrectinib for treatment of patients with *NTRK* gene fusion-positive tumors, and the panel also recommends *NTRK* therapy options such as larotrectinib and entrectinib for patients with recurrent *NTRK* gene fusion-positive salivary gland tumors and distant metastases. Finally, HER2 positivity has also been found in some advanced salivary gland tumors.[636,638,645] It is recommended that these patients receive a HER2-targeted treatment option such as trastuzumab,[638,646,647] but this is a category 2B recommendation based on less consensus among the panel. Small series demonstrate that ado-trastuzumab emtansine may be active in patients with previously treated metastatic HER2-positive salivary gland cancers.[648,649] AR and HER2 status should be checked in patients with distant metastases. *NTRK* status should be evaluated in mammary analogue secretory carcinoma of the salivary gland.[650] Various combinations of chemotherapy agents (eg, cisplatin/cyclophosphamide/doxorubicin and cisplatin/vinorelbine) have been shown in small series to be active for some salivary gland malignant histologies, with ORRs ranging from 27% to 60%,[651-653] and chemotherapy regimens such as these are acknowledged by the Guidelines panel as treatment options for patients with advanced disease (category 2B). A phase II trial including 32 patients with recurrent or metastatic adenoid cystic carcinoma showed a disease control rate of 88% (partial response of 15.6%, stable disease in 75%) for lenvatinib.[654] Based on these results and lack of other evidence-based options for recurrent or metastatic adenoid cystic carcinoma, lenvatinib is a category 2B option. Use of other tyrosine kinase inhibitors such as axitinib,[655] sorafenib,[656] sunitinib,[657] and

dovitinib[658] have been evaluated in phase II trials for salivary gland tumors, but larger trials are needed in this area.

Mucosal Melanoma of the Head and Neck

MM is a rare but highly aggressive neoplasm with a poor prognosis.[659,660] It mainly occurs throughout the upper aerodigestive tract.[661] Most MM (70%–80%) occurs in the nasal cavity or paranasal sinus region, and most of the remainder develops in the oral cavity.[662] The incidence of nasal cavity MM appears to be increasing.[659] Sinonasal MM is typically confined to the primary site at presentation.[663] Oral cavity MM more frequently presents with clinically apparent lymph node metastasis.[664] No etiologic risk factors are yet apparent.

Workup and Staging

The AJCC Cancer Staging Manual (8th edition) includes a staging system for MM (see Table 9).[318] The AJCC staging recognizes two key factors specific to MM: 1) the poor prognosis of MM even with a limited primary burden of disease; and 2) there is still some gradation of survival based on the burden of disease as reflected in local, regional, and distant extent. Thus, the AJCC staging system for MM begins with T3, N0 disease as the most limited form of disease (similar to anaplastic thyroid carcinoma), and the staging reflects the local burden of disease, as well as regional and distant extent. In addition, the AJCC staging system reflects the fact that MM occurs at all mucosal sites in the H&N. Therefore, rules for classifying, staging, and surgical principles should be based on the appropriate anatomic site of origin. Workup for these tumors is described in the NCCN Guidelines for Head and Neck Cancers.

Treatment

Although limited data exist on treatment options, primary treatment should be surgical for T3, N0–1 and T4a, N0–1 disease. For T4b disease, although surgery is not generally considered, a multidisciplinary team discussion is suggested to ensure appropriate care.[665] Neck dissection with postoperative radiation is recommended for clinical nodal disease.[666,667] Adjuvant radiation appears effective in improving local control and survival in most case series, depending on the extent of nodal involvement.[668-670] Postoperative radiation to the primary site is typically indicated in most cases to improve local disease control.[671] NCCN strongly encourages clinical trials for all patients with MM to better define treatment choices at all stages of the disease.

Radiation Therapy

The role of RT in MM has not been evaluated in prospective trials. However, results of a randomized trial in cutaneous melanoma are considered relevant to MM in the postoperative setting after neck dissection (see third paragraph in this section).[672] Retrospective studies in MM have shown local recurrence to be common after surgery alone.[673] After using postoperative radiation, lower rates of local and neck recurrence have been seen in historical comparison series.[670,674-677] In unresectable or medically inoperable cases, reasonable local control outcomes using RT followed by systemic therapy have been reported in small cohort series of MMs.[678-680]

Primary size or thickness is not used as a risk factor when considering RT to the primary site; all invasive primaries are considered at high risk for local recurrence. For sinonasal primary sites, target volumes may include the primary site without elective treatment of the neck (see the NCCN Guidelines for *Mucosal Melanoma*). Because oral cavity primary sites are felt to be at a higher risk for failure in the neck, elective management with neck dissection and RT may be applied (see the NCCN Guidelines for *Mucosal Melanoma*).

RT is often recommended in the postoperative management of MMs. Indications for postoperative radiation to the neck are generally extrapolated from cutaneous melanoma. An Australian-New Zealand

consortium reported on a randomized trial (250 patients) of postoperative RT versus observation in patients with palpable adenopathy from cutaneous primaries. Postoperative RT was associated with a significant reduction in relapse in the nodal basin (19% vs. 31%) and a significant improvement in lymph node field control.[672] Only 20 patients relapsed who received RT, whereas 34 patients relapsed who received observation only (*P* = .04). However, no significant differences in OS were reported.

Considering this trial and retrospective studies in MM, the NCCN Panel recommends postoperative RT for the following high-risk features: extranodal extension, involvement of two or more neck or intraparotid nodes, any node 3 cm or greater, neck dissection (alone) with no further basin dissection, or recurrence in the neck or soft tissue after initial surgical resection.[681,682] Conventional fractionation is recommended (at 2 Gy per fraction to a total postoperative dose of 60–66 Gy). The Australian-New Zealand randomized trial used 48 Gy in 20 fractions (240 cGy/fraction) to the neck, axilla, or groin.[672] However, the NCCN Panel prefers conventional fractionation to somewhat higher total doses (60–66 Gy) in the neck because of concerns about late effects from larger dose per fraction, which may not be fully expressed for many years after treatment. The following schedules may also be used: 1) 48 to 50 Gy (2.4–3 Gy/fraction); or 2) 30 to 36 Gy (6 Gy/fraction).[672,674,682]

IMRT may be very useful in helping to achieve homogenous dose distributions and to spare critical organs, especially in paranasal sinus sites.[192,524,683] 3D-CRT may also be used. Reports suggest that the use of hypofractionation in cutaneous melanomas (which is convenient) is associated with good outcomes but no clear advantage in cancer control. Little experience is available using large dose per fraction in mucosal sites. Because of the close proximity of neural structures and risk of late effects, hypofractionation (if used) must be carefully planned and delivered.[683] RT should not be used concurrently with BRAF/MEK inhibitor therapy, as concurrent use has been found to be associated with grade ≥3 dermatologic reactions, and potentially lethal hemorrhaging in the liver, lung, and brain have all been reported.[684]

Systemic Therapy

Systemic therapy used for cutaneous melanoma (eg, immunotherapy) is recommended for MM (see *Systemic Therapy for Metastatic or Unresectable Disease* in the NCCN Guidelines for Cutaneous Melanoma, available at www.NCCN.org).[663,685] In the metastatic setting, immune checkpoint inhibitors are being used to treat MM.[685-688] Data suggest that *c-KIT* inhibitors (eg, imatinib) may be useful in selected patients with metastatic MM and specific mutations.[689-692] Therefore, *c-KIT* inhibitors are reasonable to use in patients with MM who have *c-KIT* mutations (ie, exon 11 or 13 mutations).[685,693,694] Combination BRAF/MEK inhibitors are recommended for patients with melanoma who have the V600 mutation of the *BRAF* gene; patients with MM rarely have mutations in this codon.[685,694-696] Adjuvant systemic therapy for mucosal melanomas is limited. However, immunotherapy and BRAF/MEK inhibitor therapy are indicated in the appropriate setting.[697] There are no data for adjuvant KIT-inhibitor therapy.

Follow-up

Recommendations for surveillance are provided in the algorithm (see *Follow-up Recommendations* in the NCCN Guidelines for Head and Neck Cancers). Note that physical examination for MM should include endoscopic inspection for paranasal sinus disease.

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Figure 1: Anatomic Sites and Subsites of the Head and Neck

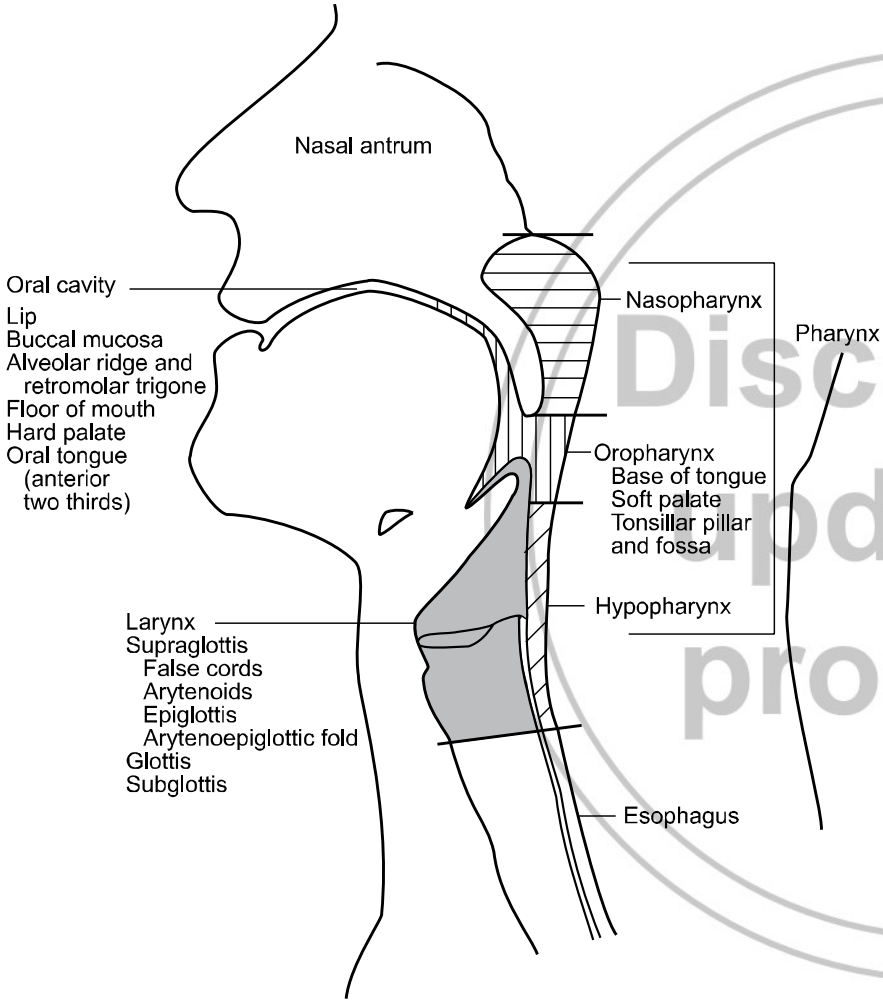

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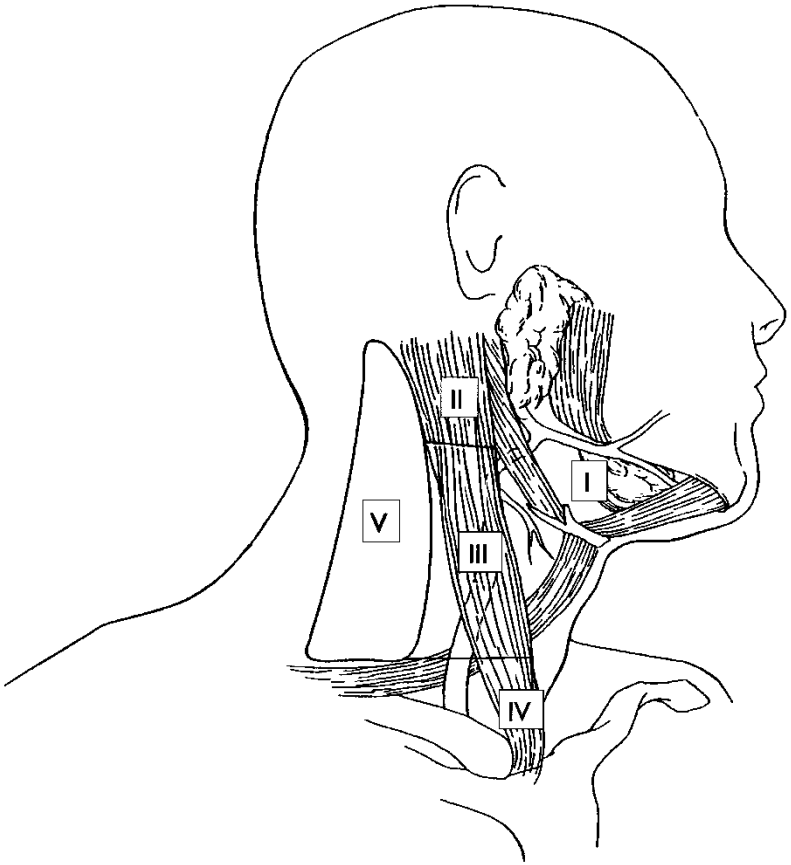
Figure 2: Level Designation for Cervical Lymphatics in the Right Neck



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