



CLINICAL GUIDELINES

Neck Imaging Guidelines

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eviCore healthcare Clinical Decision Support Tool Diagnostic Strategies: This tool addresses common symptoms and symptom complexes. Imaging requests for individuals with atypical symptoms or clinical presentations that are not specifically addressed will require physician review. Consultation with the referring physician, specialist and/or individual's Primary Care Physician (PCP) may provide additional insight.

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Abbreviations for Neck Imaging Guidelines

ALS	amyotrophic lateral sclerosis
CT	computed tomography
ENT	Ear, Nose, Throat
FNA	fine needle aspiration
GERD	gastroesophageal reflux disease
GI	gastrointestinal
HIV	human immunodeficiency virus
MRI	magnetic resonance imaging

Neck-1: General

Neck-1.0: General Guidelines

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Neck-1.0: General Guidelines

- A pertinent clinical evaluation including a detailed history, physical examination, appropriate laboratory studies and basic imaging such as plain radiography or ultrasound should be performed prior to considering advanced imaging (CT, MR, Nuclear Medicine), unless the patient is undergoing guideline-supported scheduled imaging evaluation. A meaningful technological contact (telehealth visit, telephone call, electronic mail or messaging) can serve as a pertinent clinical evaluation
- Advanced imaging of the neck covers the following areas:
 - ◆ Skull base (thus a separate CPT® code for head imaging in order to visualize the skull base is not necessary).
 - ◆ Nasopharynx
 - ◆ Upper oral cavity to the head of the clavicle
 - ◆ Parotid glands and the supraclavicular region
- Ultrasound of the soft tissues of the neck including thyroid, parathyroid, parotid and other salivary glands, lymph nodes, cysts, etc. is coded as CPT® 76536. This can be helpful in more ill-defined masses or fullness and differentiating adenopathy from mass or cyst, to define further advanced imaging.
- CT Neck
 - ◆ CT Neck is usually obtained with contrast only (CPT® 70491).
 - Little significant information is added by performing a CT Neck without and with contrast (CPT® 70492), and there is the risk of added radiation exposure, especially to the thyroid.
 - CT Neck without contrast (CPT® 70490) can be difficult to interpret due to difficulty identifying the blood vessels
 - Exception: Contrast is not generally used when evaluating the trachea with CT. Evaluate salivary duct stones in the appropriate clinical circumstance where intravenous contrast may obscure high attenuation stones
 - Contrast enhanced CT is helpful in the assessment of cervical adenopathy and preoperative planning in the setting of thyroid carcinomas
 - Contrast is recommended as an adjunct to US for patients with clinical suspicion for advanced disease, including invasive primary tumor, or clinically apparent multiple or bulky lymph node involvement
 - Contrast may cause intense and prolonged enhancement of the thyroid gland which interferes with radioactive iodine nuclear medicine studies.
 - Use of IV contrast is an important adjunct because it helps to delineate the anatomic relationship between the primary tumor and metastatic disease. Iodine is generally cleared within four to eight weeks in most patients, so concern about iodine burden from IV contrast causing a clinically significant delay in subsequent whole-body scans (WBSs) or radioactive iodine (RAI) treatment after the imaging followed by surgery is generally unfounded. The benefit gained from improved anatomic imaging generally outweighs any potential risk of a several week delay in RAI imaging or therapy. Where there is concern, a urinary iodine to creatinine ratio can be measured.

➤ MRI Neck

- ◆ MRI Neck is used less frequently than CT Neck.
- ◆ MRI Neck without and with contrast (CPT® 70543) is appropriate if CT suggests the need for further imaging or if ultrasound or CT suggests any of the following:
 - Neurogenic tumor (schwannoma, neurofibroma, glomus tumor, etc.)
 - Vascular malformations
 - Deep neck masses
 - Angiofibromas

Reference

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Neck-2: Cerebrovascular and Carotid Disease

- See these related topics in the Head Imaging Guidelines:
 - ◆ **HD-1.5: General Guidelines – CT and MR Angiography (CTA and MRA)**
 - ◆ **HD-12: Aneurysm and AVM**
 - ◆ **HD-21: Stroke/TIA**
 - ◆ **HD-22: Cerebral Vasculitis**
 - ◆ **HD-23: Dizziness, Vertigo and Syncope**
 - ◆ **HD-27: Hearing Loss and Tinnitus**
 - ◆ **HD-32: Eye Disorders and Visual Loss**
- See **PVD-3: Cerebrovascular and Carotid Disease** in Peripheral Vascular Disease Imaging Guidelines.

Neck-3: Dysphagia and Esophageal Disorders

Neck-3.1: Dysphagia and Esophageal Disorders

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Neck-3.1: Dysphagia and Esophageal Disorders

- Gastroesophageal Reflux Disease (GERD)^{5,14}
 - ◆ Advanced imaging is generally not indicated for the evaluation of GERD, the diagnosis of which is usually made on the basis of clinical history, in conjunction with endoscopy, pH monitoring, Upper GI Barium Studies, and occasionally manometry. Exceptions would include the following:
 - Non-cardiac chest pain suspected of being GERD should be evaluated first to exclude cardiac and other etiologies. See **CH-4.1: Non-Cardiac Chest Pain-Imaging** in the Chest Imaging Guidelines.
 - Gastric emptying study (CPT® 78264) can be approved for patients with refractory GERD symptoms, and gastroparesis is being considered.
- Suspected foreign body impaction and ingested foreign bodies:¹⁻³
 - ◆ Initial imaging is performed with appropriate plain films.
 - ◆ If imaging is negative, or there is suspicion of a radiolucent foreign body (such as fish or chicken bones, wood, plastic, thin metal objects, aluminum can pop-ups, etc.):
 - CT Neck and/or Chest with or without contrast
 - 3-D reconstruction (CPT® 76377 or CPT® 76376) can be approved in this setting
 - ◆ The use of oral contrast is discouraged for acute dysphagia or foreign body impaction, as the contrast may not pass, may be aspirated, and can interfere with subsequent endoscopic intervention.
- Oropharyngeal or esophageal dysphagia^{4,6,10,11}
 - ◆ Oropharyngeal dysphagia (difficulty in transferring food from the mouth to the pharynx)
 - Suspected neurologic causes: See appropriate sections in **Head Imaging Guidelines**
 - Video fluoroscopic swallowing study
 - ◆ Esophageal dysphagia (difficulty in transferring food down the esophagus in the retrosternal region, e.g. food sticking in the chest)
 - Initial barium esophagram or upper gastrointestinal endoscopy
 - Esophageal manometry if indicated
 - Structural lesions identified on esophagram or endoscopy requiring further evaluation (e.g. tumors, extrinsic compression):
 - CT Neck (CPT® 70491), CT Chest (CPT® 71260) and/or CT Abdomen (CPT® 74160) depending on the level of the lesion.
- Suspected perforation, abscess, or fistula
 - ◆ CT Neck, Chest, and/or Abdomen, preferably with contrast, as requested, depending on location
- Evaluation of structural abnormalities demonstrated on barium esophagram or endoscopy (e.g., external compression, tumor, stricture, diverticulum, etc.)
 - ◆ CT Chest (CPT® 71260), CT Neck (CPT® 70491), and/or CT Abdomen (CPT® 74160) depending on location

- Hiatal hernia
 - ◆ See **AB-12.3: Hiatal Hernia** in the Abdomen Imaging Guidelines
- Globus Sensation⁷⁻⁹
 - ◆ Globus sensation is a feeling of a lump or foreign body in the throat. In general, laryngoscopy, endoscopy, and physical examination will rule out malignant causes and advanced imaging is usually not needed for evaluation.
 - If alarm symptoms are present (dysphagia, weight loss, odynophagia, throat pain, hoarseness, and lateralization of symptoms)
 - Laryngoscopy and upper endoscopy should be performed prior to advanced imaging.
 - CT Neck with contrast (CPT® 70491) for ANY of the following:
 - Negative or equivocal findings on laryngoscopy and/or upper endoscopy
 - Known history of upper aerodigestive or esophageal malignancy
 - Known history of lymphoma
 - History of previous neck, esophageal, or gastric surgery
 - Palpable abnormality on physical examination
- Suspected Vascular Ring^{8,9,12,13,15}
 - ◆ CTA Chest with contrast (CPT® 71275) or CT Chest with contrast (CPT® 71260) can be used in the evaluation of suspected vascular ring
 - ◆ MRI Chest without contrast, or MRI Chest without and with contrast (CPT® 71550 or CPT® 71552), can be performed if vascular ring is suspected
- Post-operative dysphagia
 - ◆ Dysphagia following surgery on the oropharynx, soft tissues of the neck, cervical spine, esophagus, or stomach:
 - In the immediate post-operative period the concern is for fluid collections, anastomotic leaks, perforations, and abscess. In the delayed post-operative period (>1 month) the concern is recurrent disease or a late post-operative fluid collection.
 - CT Neck with contrast (CPT® 70491) and, if requested CT Chest with contrast (CPT® 71260) can be approved (IV contrast better defines the anatomic structures than a non-contrast study as soft-tissue and blood vessel enhancement are better delineated from post-operative fluid collections, such as hematomas and abscesses – Note: CT without and with contrast offers little additional benefit compared to a CT with contrast alone¹⁰)

Practice Notes

- A detailed history of the dysphagia symptoms is important to distinguish neurogenic, pharyngeal and esophageal disorders
- Dysphagia (difficulty swallowing) can be caused by a wide range of benign and malignant causes that affects the body's ability to move food or liquid from the mouth to the pharynx and into the esophagus.
- A short duration (weeks to months) of rapidly progressive esophageal dysphagia with associated weight loss is highly suggestive of esophageal cancer.
- Advanced imaging for patients presenting with isolated globus rarely impacts clinical management. In a study of 148 neck CTs and 104 barium esophagrams done for the evaluation of globus sensation, there were no malignancies detected.

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Neck-4: Cervical Lymphadenopathy

Neck-4.1: Imaging

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Neck-4.1: Imaging

- See **Neck-5.1: Neck Masses – Imaging**

Neck-5: Neck Masses

Neck-5.1: Neck Masses – Imaging

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Neck-5.1: Neck Masses – Imaging

- Cervical lymphadenitis is common and follows most viral or bacterial infections of the ears, nose and throat. Painful acute lymphadenopathy should be treated with a trial of conservative therapy for 2 weeks, including antibiotics if appropriate. If there is improvement with conservative treatment, advanced imaging is not indicated but if the adenopathy persists it may be imaged as per below.^{1,2,4}
- Ultrasound (CPT® 76536) can be considered for ANY of the following:^{1,2,4}
 - ◆ Anterior neck masses²
 - ◆ Cervical adenopathy/lymphadenitis or an inflammatory, infective, or reactive mass that has failed a 2 week trial of treatment or observation (including antibiotics if appropriate)^{1,2}
 - ◆ Any ill-defined mass, fullness or asymmetry²
 - ◆ High suspicion of malignancy^{2,4}
- CT Neck with contrast (CPT® 70491) can be considered if:^{2,4}
 - ◆ Neck mass with any ONE of the following:
 - Non-tender neck masses⁴
 - Size $\geq 1.5\text{cm}$ ⁴
 - Firm texture or fixation of the mass⁴
 - Absence of infectious etiology⁴
 - Cervical adenopathy/lymphadenitis or an inflammatory, infective, or reactive mass that has failed a 2 week trial of treatment or observation (including antibiotics if appropriate)^{2,4}
 - Ear pain ipsilateral to the neck mass⁴
 - Associated onset of persistent hoarseness, tonsil asymmetry, oral or oropharyngeal ulceration, or ulceration of skin overlying the neck mass⁴
 - History of malignancy that would be primary or metastatic to the neck⁴
 - Prior ultrasound results are suspicious or indeterminate for malignancy²
 - ◆ Carcinoma found in a lymph node or other neck mass²
 - ◆ Suspected peritonsillar, retropharyngeal or other deep neck space abscess²
 - ◆ Suspected or known sarcoidosis⁵
 - ◆ Preoperative evaluation of any neck mass²
- MRI Neck without and with contrast (CPT® 70543) is supported if:²
 - ◆ CT suggests the need for further imaging²
 - ◆ Ultrasound or CT suggests neurogenic tumor (schwannoma, neurofibroma, glomus tumor, etc.), vascular malformations, deep neck masses, or angiofibroma.²

Practice Notes

- Painful acute lymphadenopathy associated with uncomplicated pharyngitis, URI or tonsillitis should undergo conservative therapy for two weeks including antibiotics, if appropriate. If there is improvement with conservative treatment, advanced imaging is not indicated if:^{3,4,5}
 - ◆ Inflammatory neck adenopathy is often associated with URI, pharyngitis, dental infection, HIV and toxoplasmosis. Occasionally it is associated with sarcoidosis and tuberculosis.
- Malignancy is a greater possibility in adults that are heavy drinkers and smokers, but HPV associated disease is on the rise and there can be a high suspicion for malignancy even without these traditional risk factors.
- ENT evaluation can be helpful in determining the need for advanced imaging.
- Although CT and MRI can have characteristic appearances for certain entities, biopsy and histological diagnosis are the only way to obtain a definitive diagnosis. The preferred initial method of biopsy is Ultrasound guided core needle biopsy of the mass.^{5,6}
- The most common causes of neoplastic cervical adenopathy are metastasis from head and neck tumors or lymphoma.

References

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Neck-6: Malignancies Involving the Neck

- See the **Oncology Imaging Guidelines**

Neck-7: Recurrent Laryngeal Palsy

- See **HD-7: Recurrent Laryngeal Palsy** in the Head Imaging Guidelines

Neck-8: Thyroid and Parathyroid

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Neck-8.1: Thyroid Nodule

- Serum thyrotropin (TSH) should be measured in the initial evaluation of thyroid nodule/mass/asymmetry/goiter.^{1,3,6,8}
- Nuclear scan (CPT® 78013 or CPT® 78014) should be performed as the initial imaging study if the serum TSH is subnormal and ANY of the following:
 - ◆ Single or multiple thyroid nodules^{1,3,6,8}
 - ◆ Suspicion of ectopic thyroid tissue³
 - ◆ Presence of thyroid nodule in the setting of Grave's disease.^{3,8}
- Ultrasound (US) Neck (CPT® 76536) is the appropriate initial study for evaluation of suspected thyroid abnormalities, including goiter and thyroid mass(es) in the following clinical scenarios:^{2,3,6,8}
 - ◆ Normal or High serum thyrotropin (TSH)^{1,3,6,8}
 - ◆ Thyroid nodule(s) being monitored with imaging: US is the indicated imaging modality rather than CT or MRI^{1,2,3,6,8}
 - ◆ Incidentally found on CT, MRI, or PET (focal activity) – irrespective of TSH^{2,3,6}
 - ◆ Nodules ≤1 cm with very low suspicion US pattern including spongiform pattern (>50% small cystic spaces) and pure cysts do not require repeat US.^{6,10}
- ACR Thyroid Imaging, Reporting, and Data System (TI-RADS), consisting of five levels, is utilized for recommendations in determining US follow-up vs FNA of thyroid nodule(s).¹⁰
 - ◆ TI-RADS 1 (Benign) and TI-RADS 2 (Not Suspicious): Follow-up US is not indicated
 - ◆ Additional sonograms are indicated for more suspicious thyroid nodules that do not meet size criteria for FNA, such as TI-RADS 3 (Mildly Suspicious), TI-RADS 4 (Moderately Suspicious) and TI-RADS 5 (Highly Suspicious) as follows:

ACR TI-RADS Levels for Thyroid Nodule Follow-Up Ultrasound or FNA			
TI-RADS 3 Mildly Suspicious	≥1.5 to 2.4 cm - US at 1, 3, and 5 years ≥2.5 cm - FNA	No further imaging if stable and no increase at 5 years*	TI-Rads level increases but is still below FNA range: Re-image with US in 1 year.
TI-RADS 4 Moderately Suspicious	≥1.0 to 1.4 cm - US at 1, 2, 3, and 5 years ≥1.5 cm - FNA	No further imaging if stable and no increase at 5 years*	TI-Rads level increases but is still below FNA range: Re-image with US in 1 year.
TI-RADS 5 Highly Suspicious	≥0.5 to 0.9 cm – US annually for 5 years ≥1.0 cm - FNA	No further imaging if stable and no increase at 5 years*	

- *Nodule enlarges on follow-up US but remains below the FNA size threshold for their ACR TI-RADS level at 5 years or for active surveillance of proven thyroid cancer.
 - ◆ Growth rates do not reliably distinguish benign from malignant nodules
 - ◆ Additional follow-Up US imaging at discretion of Thyroid Specialist, Endocrinologist, Neck/Thyroid Surgeon or in consultation with the Thyroid Specialist, Endocrinologist, Neck/Thyroid Surgeon. However, scanning intervals of <1 year are not warranted, except for biopsy proven cancers under active surveillance, as these may require more frequent follow-up at the discretion of the Thyroid Specialist, Endocrinologist, or Neck/Thyroid Surgeon or in consultation with the Thyroid Specialist, Endocrinologist, Neck/Thyroid Surgeon.
- TSH is not required prior to follow up US imaging
- Nuclear medicine thyroid scan (CPT® 78013 or CPT® 78014) is considered for ANY of the following (TSH is not required prior to imaging in the below settings):
 - ◆ Evaluate eligibility for radioiodine therapy³
 - ◆ Select nodules to biopsy in multinodular goiter even if TSH not low^{1,6,8}
 - ◆ Substernal goiter with compressive symptoms (e.g. dyspnea, stridor, cough, dysphonia, dysphagia)
 - ◆ Non-diagnostic or indeterminate FNA of thyroid nodule, (e.g. follicular lesion of undetermined significance) to see if hot (functioning) nodule that may be benign vs cold nodule.
- CT Neck with contrast (CPT® 70491) or CT Neck without contrast (CPT® 70490), or MRI Neck without and with contrast (CPT® 70543). CT is preferred since there is less motion artifact than with MRI. MRI and CT **are not** indicated for routine thyroid nodule evaluation and should only be considered for:
 - ◆ Evaluation of extent of known substernal goiter^{3,8}
 - ◆ Airway compression^{3,8}
 - ◆ Presence of pathologic lymph nodes in cervical regions not visualized on ultrasound³
 - ◆ Clinically suspected advanced disease confirmed by FNA, including invasive primary tumor^{3,6,8}
 - ◆ Preoperative planning for thyroid disease^{3,6}
 - ◆ Fine-Needle Aspiration (FNA) is indicated for suspicious and/or large thyroid nodules prior to CT or MRI imaging⁶
- A thyroid nodule detected for the first time during pregnancy should be managed in the same way as in non-pregnant patients, except for avoiding the use of radioactive agents for diagnostic and therapeutic purposes³

Practice Notes

- TI-RADS levels are determined based on the ultrasound appearance of the nodule. Grading criteria are available at <https://www.acr.org/-/media/ACR/Files/RADS/TI-RADS/TI-RADS-chart.pdf?la=en>
- The basis of thyroid nodule management is the use of ultrasonography (US), thyrotropin (TSH, formerly thyroid-stimulating hormone) assay, and FNA biopsy, together with clinical findings.
- A thyroid nodule is distinct either on palpation or radiologically (incidentaloma). Nonpalpable nodules have the same risk of cancer as palpable. Nodules >1 cm are evaluated, while smaller nodules are generally evaluated if suspicious, associated with adenopathy or a history of radiation or cancer exists.
- Ultrasound is not used to screen: 1) the general population, 2) patients with normal thyroid on palpation with a low risk of thyroid cancer, 3) patients with hyperthyroidism, 4) patients with hypothyroidism or 5) patients with thyroiditis. Conversely, US can be considered in patients who have no symptoms but are high risk as a result of: history of head and neck irradiation, total body irradiation for bone marrow transplant, exposure to fallout from radiation during childhood or adolescence, family history, thyroid cancer syndromes such as MEN2, medullary or papillary thyroid cancer, Cowden's disease, familial adenomatous polyposis, Carney complex, Werner syndrome/progeria.
- There is insufficient evidence supporting the use of PET to distinguish indeterminate thyroid nodules that are benign from those that are malignant.
- 18FDG-PET imaging is not routinely recommended for the evaluation of thyroid nodules with indeterminate cytology. Routine preoperative 18FDG-PET scanning is not recommended.
- Incidental focal FDG-PET uptake often corresponds to a clinically relevant thyroid nodule and ultrasound is recommended; incidentally noted diffuse thyroid FDG-PET uptake most often corresponds to inflammatory uptake, however, ultrasound should be done to ensure that there is no evidence of clinically relevant nodularity.
- Elastography provides information about nodule stiffness that is complementary to gray scale ultrasound findings in nodules with indeterminate cytology or ultrasound findings. It should not be used as a substitute for gray scale ultrasound.
- Use of ultrasound contrast medium is not recommended for the diagnostic evaluation of thyroid nodules and its current use is restricted to definition of size and limits of necrotic zones after minimally invasive nodule ablation techniques.

Neck-8.2: Hyperthyroidism and Hypothyroidism

- Hyperthyroidism suspected^{4,7}
 - ◆ Thyroid Uptake Study (CPT® 78012 or CPT® 78014) if ONE of the following:
 - TSH below normal range and elevated free T4 and/or free T3, OR
 - Subclinical hyperthyroidism with TSH <0.1 mU/L and normal free T4 and free T3, OR
 - Subclinical hyperthyroidism with TSH below the lower limit of normal but ≥0.1 and normal free T4 and free T3 in the setting of any of the following:
 - Age ≥65
 - Symptoms of hyperthyroidism
 - Presence of cardiac disease or osteoporosis
 - ◆ Ultrasound (US) Neck (CPT® 76536) if any of the following:
 - Palpable nodule on examination
 - Nuclear scanning is suggestive of thyroid nodular disease
 - Diagnostic uncertainty regarding the etiology of hyperthyroidism based on clinical presentation and initial biochemical evaluation.
 - To evaluate thyroid dimensions for planning RAI treatment
 - Nuclear scanning is contraindicated (ie. pregnancy, breastfeeding etc).
- Hyperthyroidism on therapy---For patients with thyroid hormone levels (TSH, free T4 and free T3) within the normal range while receiving treatment with an anti-thyroid medication (methimazole or propylthiouracil/PTU)⁹
 - ◆ Nuclear Scan (CPT® 78013 or CPT® 78014) if ONE of the following:
 - To characterize the uptake in a thyroid nodule (s) to determine the cause of hyperthyroidism if there was no diagnostic scan prior to the start of medical therapy.
 - To characterize the uptake in a thyroid nodule (s) to properly triage the nodule for FNA if there was no diagnostic scan prior to the start of medical therapy.
 - ◆ Thyroid Uptake Study (CPT® 78012 or CPT® 78014) if:
 - Plan is for radioactive iodine therapy as definitive hyperthyroidism treatment.
- Hypothyroidism: There is no role for thyroid imaging in the workup of hypothyroidism in adults. Imaging for thyroid morphology does not help differentiate among causes of hypothyroidism, and all causes of hypothyroidism will have decreased radioiodine uptake.

Neck-8.3: Parathyroid Imaging

- Classic primary hyperparathyroidism
 - ◆ Parathyroid Planar Imaging (CPT® 78070), Parathyroid Planar Imaging with SPECT (CPT® 78071), or Parathyroid Planar Imaging with SPECT/CT (preferred study) (CPT® 78072)^{2,3,5} AND/OR Ultrasound (CPT® 76536)^{1,2} AND/OR 4D CT Neck without and with contrast (CPT® 70492) are approvable if BOTH of the following conditions are met^{1,2,3}:
 - PTH and Calcium levels are elevated (See Practice Notes).
 - Intention of the study is preoperative localization.

Note: Ultrasound (CPT® 76536) may be ordered independently to evaluate the thyroid per criteria in **Neck-8.1: Thyroid Nodule** or **NECK-8.2: Hyperthyroidism and Hypothyroidism**

- ◆ 3D Imaging (CPT® 76376 or CPT® 76377) may be approved with a 4D CT Neck when requested.
 - ◆ All parathyroid nuclear scan codes (CPT® 78070, CPT® 78071, CPT® 78072) include thyroid subtraction when performed and no additional thyroid nuclear scan CPT codes are required unless otherwise indicated in **Neck-8.1: Thyroid Nodule** or **Neck 8.2 Hyperthyroidism and Hypothyroidism**.
 - ◆ Reporting or billing CPT® 78800 for the purpose of intraoperative parathyroid localization using a gamma probe is not supported if performed along with a parathyroid nuclear scan (CPT® 78070, CPT® 78071, CPT® 78072).
 - ◆ The following studies may be ordered by an Endocrinologist, Parathyroid surgeon or Radiologist or any provider in consultation with one of these specialists^{1,3}.
 - MRI Neck without and with contrast (CPT® 70543) for cases of re-operation, difficult localization or ionizing radiation contraindication^{1,6}.
 - CT Chest with contrast (CPT® 71260) may be indicated in rare circumstances in the evaluation of ectopic mediastinal parathyroid adenomas¹⁴.
 - ◆ Repeat imaging may be approved in cases of recurrent or persistent hyperparathyroidism if reimaging is being ordered by a surgeon or any provider after consultation with a surgeon with expertise in parathyroidectomy¹.
 - ◆ Choline PET/CT (CPT® 78815 or CPT® 78816) is considered experimental and investigational for preoperative localization in cases of primary hyperparathyroidism.¹⁵⁻¹⁷
- Primary hyperparathyroidism variants
- ◆ Primary hyperparathyroidism with non-elevated serum calcium. (Serum Calcium level normal and PTH elevated).
 - Confirmatory study is elevated ionized calcium, elevated albumin corrected calcium or elevated historic calcium levels.^{1,4}
 - ◆ Hypercalcemia with inappropriately non-suppressed PTH (Calcium level elevated and PTH normal).
 - PTH level ≥ 25 pg/mL is consistent with primary hyperparathyroidism.
 - See Practice notes for more information.
 - ◆ Intention of parathyroid imaging should be for pre-operative localization.
 - ◆ Use the same guidance on imaging modalities as described in “classic” primary hyperparathyroidism.

Primary Hyperparathyroidism variants:

	Calcium	PTH	Confirms/strongly suggests primary hyperparathyroidism
Classic primary hyperparathyroidism	High	High	Yes
Primary hyperparathyroidism with non-elevated serum calcium	Normal	High	Elevated ionized albumin corrected or historic calcium levels*
Hypercalcemia with inappropriately non-suppressed PTH	High	Normal	PTH ≥ 25 pg/ml

- Normocalcemic hyperparathyroidism
 - ◆ Serum calcium levels (including ionized calcium levels) are always normal and PTH levels are elevated.
 - ◆ Secondary causes of PTH elevation are excluded. See Practice Notes for differential diagnosis of secondary hyperparathyroidism.
 - ◆ Calcium, PTH and clinical status should be monitored annually.
 - In the event of laboratory progression to hypercalcemia, refer to “classic” primary hyperparathyroidism for imaging guidance.
 - In the event of clinical progression (decline in bone mineral density or new fracture/renal stone/nephrocalcinosis), imaging for the intent of preoperative localization is as requested by or after consultation with a specialist or any provider in consultation with a specialist¹⁸.
- Secondary renal hyperparathyroidism
 - ◆ Serum calcium levels are low or normal (but may also be elevated in more advanced disease) and PTH levels are very elevated.
 - ◆ Imaging for the intent of preoperative localization as requested by or after consultation with a specialist if all of the following are met:
 - Patients has stage 3a-stage 5 chronic kidney disease (GFR<60).
 - PTH level is >9x upper limit of normal reference range for the lab testing facility (~585 pg/mL) despite standard medical or pharmacologic therapy (calcimimetics, calcitriol and/or vitamin D analogs)¹⁹.
- Tertiary hyperparathyroidism
 - ◆ Serum calcium and PTH levels are elevated as a result of long standing secondary hyperparathyroidism in patients on renal replacement therapy or after renal transplant.
 - ◆ Imaging for the intent of preoperative localization as requested by or in consultation with a specialist.

Hyperparathyroidism subtypes:

	Calcium	PTH	Clinical Hallmarks
Normocalcemic Hyperparathyroidism	Normal	High	Calcium never elevated
Secondary renal Hyperparathyroidism	Low/Normal/High	Very High	Stage 3a-5 CKD, PTH >9x ULN
Tertiary Hyperparathyroidism	High	High	ESRD/renal transplant

Practice Notes

- *Hypercalcemia may be determined by elevated serum calcium, elevated serum ionized calcium, or elevated serum calcium level corrected for albumin. A comparison of serial measurements of calcium may also be helpful in determining the presence of true hypercalcemia as calcium levels may be variable over time in primary hyperparathyroidism.

- Parathyroidectomy candidacy should be determined by the provider, however national guidelines recognize the following criteria for Surgery^{1,4}
 - ◆ All individuals <50 years of age, regardless of whether objective features are present or absent.
 - ◆ All symptomatic individuals, including those with kidney stones, hypercalcemic crises, pathologic fractures or other associated symptoms.
 - ◆ Individuals with findings concerning for parathyroid cancer (very high calcium >13).
 - ◆ All asymptomatic individuals with the following:
 - Serum calcium >1.0 mg/dl (0.25 mmol/l) above the normal range
 - BMD by DEXA: T-score ≤2.5 at the lumbar spine, total hip femoral neck or distal 1/3 radius
 - Vertebral fracture by x-ray, CT, MRI and vertebral fracture assessment
 - Estimated glomerular filtration rate of less than 60 ml/min
 - Urinary calcium excretion >400 mg in 24 hours
 - Nephrolithiasis or nephrocalcinosis by x-ray, ultrasound or CT
 - ◆ Asymptomatic individuals who cannot participate in appropriate medical surveillance
 - ◆ Asymptomatic individuals desiring definitive surgical management
- For cases of “normocalcemic hyperparathyroidism” in which primary hyperparathyroidism is not confirmed, additional investigation for secondary causes of hyperparathyroidism (renal insufficiency, hypercalciuria as a primary renal abnormality, vitamin D deficiency and gastrointestinal malabsorption problems such as short gut syndrome, celiac disease, Crohn's disease or a prior Roux-en-Y bypass surgery) is indicated^{1,18}.
- For cases of hypercalcemia in which primary hyperparathyroidism is not confirmed, additional consideration for other causes of hypercalcemia (malignancy including PTH-RP mediated and myeloma, granulomatous disease, FHH, medications including thiazide diuretics, excessive calcium/vitamin D supplementation and the history of or present lithium use) is indicated¹.

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Neck-9: Trachea and Bronchus

Neck-9.1: Trachea and Bronchus – Imaging

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Neck-9.1: Trachea and Bronchus – Imaging

- Plain x-rays neck and chest and bronchoscopy are the initial imaging studies for evaluating patients with suspected tracheal and visualized bronchial pathology. Bronchoscopy can further evaluate the distal (endo) bronchial tree.
 - ◆ Suspected tracheal disease can be identified by inspiratory stridor and a characteristic flow-volume loop of PFTs.¹
- CT Neck with contrast (CPT® 70491) or without contrast (CPT® 70490) and/or CT Chest with contrast (CPT® 71260) or without contrast (CPT® 71250) can be performed to further evaluate abnormalities, which include tracheal or bronchial tumor, foreign bodies, or persistent segmental or lobar lung collapse seen on other imaging studies.^{1,2}
- Expiratory HRCT (CPT® 71250) is indicated in patients with obstructive physiology tracheomalacia.¹
- Trachea or bronchial “inspissation” without an abnormality described above, is not a risk for malignancy.³

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Neck-10: Neck Pain

Neck-10.1: Neck Pain (Cervical)	31
Neck-10.2: Torticollis and Dystonia	31

Neck-10.1: Neck Pain (Cervical)

- Neck pain is usually related to a specific process including pharyngitis, radiculopathy, adenopathy, mass, carotid dissection and torticollis, and therefore found elsewhere in these guidelines.¹
- For the evaluation of neck pain or other symptoms which may involve the cervical spine, including myelopathy and cervical radiculopathy¹ See **Spine Imaging Guidelines**

Neck-10.2: Torticollis and Dystonia **Older Child (beyond infancy) or Adult¹**

- For trauma, CT Neck with contrast (CPT® 70491) and/or CT Cervical Spine without contrast (CPT® 72125) is the initial study to identify fracture or malalignment
- For no trauma, CT Neck with contrast (CPT® 70491), and/or MRI Cervical Spine without contrast (CPT® 72141), or CT Cervical Spine without contrast (CPT® 72125) is the initial study to locate a soft tissue or neurological cause
 - ◆ Positive→Further advanced imaging is not required if CT Neck or CT Cervical Spine has identified local cause
 - ◆ Negative→MRI Brain without and with contrast (CPT® 70553) to exclude CNS cause

Practice Notes

- Torticollis or cervical dystonia is an abnormal twisting of the neck with head rotated or twisted. Its causes are many and may be congenital or acquired and caused by trauma, infection/inflammation, neoplasm and those less defined and idiopathic. It occurs more frequently in children and on the right side (75%).
- Retropharyngeal space abscess could be associated with torticollis because child would not move neck freely.

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Neck-11: Salivary Gland Disorders

- Xerostomia (Dry Mouth)
 - ◆ Salivary Gland Nuclear Imaging (one of CPT® 78230, CPT® 78231, or CPT® 78232) can be considered for any one of the following:
 - Dry mouth and either:
 - Sjögren's syndrome
 - Sialadenitis
 - History of head or neck radiation therapy
 - History of cerebral palsy
 - Parotid mass to allow preoperative diagnosis of Warthin's tumor
- Salivary Gland Stones, Sialadenitis or Stenosis:¹
 - ◆ CT Neck with contrast (CPT® 70491) and/or CT Maxillofacial area with contrast (CPT® 70487) or MRI Neck without and with contrast (CPT® 70543) may be approved.
 - ◆ Sialography (contrast dye injection) under fluoroscopy, may be performed to rule out a stone, with post sialography CT (CPT® 70486), **or** post sialography MRI (CPT® 70540).
- Parotid or Salivary Gland Mass
 - ◆ The following can be approved:²
 - MRI Orbits/Face/Neck without and with contrast preferred (CPT® 70543), or MRI Orbits/Face/Neck without contrast (CPT® 70540) or
 - CT Neck with contrast (CPT® 70491) preferred, or CT Neck without contrast (CPT® 70490) and/or CT Maxillofacial area with contrast (CPT® 70487)
 - Ultrasound (CPT® 76536) may be approved as initial or additional imaging, and does not need to be completed prior to the approval of advanced imaging.

Practice Note

- CT Neck
 - ◆ CT should be performed with IV contrast. Dual-phase CT imaging (without and with IV contrast) is not usually necessary. CT performed only without IV contrast may be helpful in a small minority of cases. Contrast is useful for distinguishing vessels from lymph nodes and confirming whether a mass is hypervascular as many pulsatile neck masses (especially those in level II or III) are lymph nodes overlying the carotid artery rather than true vascular masses. There is no current literature comparing the efficacy of contrast-enhanced CT to CTA or MRI and MRA for the evaluation of a pulsatile neck mass.

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Neck-12: Sore Throat, Odynophagia, and Hoarseness

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Neck-12.1: Sore Throat/Throat Pain/Odynophagia	34
Neck-12.2: Hoarseness	34

Neck-12.0: Definitions

- Hoarseness – A symptoms of altered voice quality reported by the individual
- Dysphagia – Disordered or impaired swallowing (See **Neck-3: Dysphagia and Esophageal Disorders**)
- Odynophagia – Pain upon swallowing

Neck-12.1: Sore Throat/Throat Pain/Odynophagia

- See **Neck-3.1: Dysphagia and Esophageal Disorders** for dysphagia
- Sore Throat/Throat Pain/Odynophagia
 - ◆ Imaging studies are not indicated for uncomplicated viral or streptococcal pharyngitis with sore throat³
 - See **Neck-5: Neck Masses** for suspected complicated pharyngitis/deep neck abscesses
 - ◆ Persistent sore throat/throat pain/odynophagia:
 - Initial evaluation is barium esophogram and laryngoscopy
 - CT Neck with contrast (CPT® 70491) or MRI Neck without and with contrast (CPT® 70543) if initial barium esophogram and laryngoscopy are negative and there is a suspicion of submucosal tumor/lesion^{2,4}
 - ◆ Alarm symptoms of persistent unilateral throat pain or odynophagia with ipsilateral referred otalgia is especially suspicious for a submucosal tumor
 - Initial evaluation is laryngoscopy
 - CT Neck with contrast (CPT® 70491) or MRI Neck without and with contrast (CPT® 70543) if initial laryngoscopy negative
 - ◆ CT Neck with contrast (CPT® 70491) for postoperative throat pain or odynophagia after head and neck procedure with suspected complication of procedure.⁴

Practice Notes

- Persistent unilateral throat pain or odynophagia with ipsilateral referred otalgia is especially suspicious for a submucosal tumor and advanced imaging is appropriate when initial evaluation is negative.

Neck-12.2: Hoarseness

- Laryngoscopy is the primary diagnostic modality for evaluating patients with hoarseness. Imaging studies, including CT and MRI, are unnecessary in most patients with hoarseness because most hoarseness is self-limited or caused by pathology that can be identified by laryngoscopy alone. The need for advanced imaging is based upon abnormal findings upon laryngoscopy.¹

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