CLINICAL GUIDELINES

Neck Imaging Guidelines

Version 1.0

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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.

Neck Imaging Guidelines

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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

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Neck-1: General

NECK-1.0: General Guidelines

- A current clinical evaluation (within 60 days), which includes a relevant history and physical examination and appropriate laboratory studies and non-advanced imaging modalities, such as plain x-ray or ultrasound, are required prior to considering advanced imaging. Other meaningful contact (telephone call, electronic mail or messaging) by an established patient can substitute for a face-to-face 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

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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

1. Haugen BR, Alexander EK, Bible KC, et al. 2015 American Thyroid Association Management Guidelines for adult patients with thyroid nodules and differentiated thyroid cancer: The American Thyroid Association Guidelines Task Force on Thyroid Nodules and Differentiated Thyroid Cancer. *Thyroid*. 2016 Jan;26(1):1-133.

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

- Gastroesophageal Reflux Disease (GERD)[5]
  - 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, 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[4,6,12,13]
  - Oropharyngeal (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 Sensation[7-9]
  - 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 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[10,11,14,15]
  - CTA Chest with contrast (CPT® 71275) 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 alone[10])

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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10. ACR Appropriateness Criteria Dysphagia. Rev. 2018.
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Neck-4: Cervical Lymphadenopathy

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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

- 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 masses[2]
  - 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 asymmetry[2]
  - 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 masses[4]
    - Size ≥1.5cm[4]
    - Firm texture or fixation of the mass[4]
    - Absence of infectious etiology[4]
    - 2 or more weeks duration[4]
    - 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 mass[4]
    - Associated onset of persistent hoarseness, tonsil asymmetry, oral or oropharyngeal ulceration, or ulceration of skin overlying the neck mass[4]
    - History of malignancy that would be primary or metastatic to the neck[4]
    - Prior ultrasound results are suspicious or indeterminate for malignancy[2]
  - Carcinoma found in a lymph node or other neck mass[2]
  - Suspected peritonsillar, retropharyngeal or other deep neck space abscess[2]
  - Suspected or known sarcoidosis[5]
  - Preoperative evaluation of any neck mass[2]
- MRI Neck without and with contrast (CPT® 70543) is supported if:[2]
  - CT suggests the need for further imaging[2]
  - 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 FNA or Ultrasound guided FNA of the mass.[5]
- 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 following in the Oncology Imaging Guidelines:
  - **ONC-3: Squamous Cell Carcinomas of the Head and Neck**
  - **ONC-4: Salivary Gland Cancers**
  - **ONC-6: Thyroid Cancer**
  - **ONC-9: Esophageal Cancer**
  - **ONC-27: Non-Hodgkin Lymphomas**
  - **ONC-28: Hodgkin Lymphoma**

Neck-7: Recurrent Laryngeal Palsy

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

Neck-8: Thyroid and Parathyroid

Neck-8.1: Thyroid Nodule

- Serum thyrotropin (TSH) should be measured in the initial evaluation of thyroid nodule/mass/asymmetry/goiter.
- 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[3,6]
  - Suspicion of ectopic thyroid tissue[3]
  - Presence of thyroid nodule in the setting of Grave's disease (to rule out cold nodule).[3]
  - 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.
- 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] (See **Neck-5.1: Neck Masses – Imaging** regarding nonthyroidal anterior neck masses):
  - Normal or High serum thyrotropin (TSH)[1,3,6]
  - Thyroid nodule(s) being monitored with imaging: US is the indicated imaging modality rather than CT or MRI
  - Incidentally found on CT, MRI, or PET (focal activity)[2,3,6]
  - Nodules ≤1 cm with very low suspicion US pattern including spongiform pattern and pure cysts do not require repeat US.[6]
  - For more suspicious or larger nodules, if Fine Needle Aspiration (FNA) is not performed or was not diagnostic for malignancy, US can be repeated:
    - If US features are highly suspicious: repeat US every 6 months for up to 24 months.
    - If US features are of low to intermediate suspicion: repeat US at 12 and 24 months.
    - If nodule is stable after 24 months, follow-up ultrasound exams (CPT® 76536) can be performed every 3 to 5 years for interval surveillance.[12]
- Fine-Needle Aspiration (FNA) is indicated for suspicious and/or large thyroid nodules prior to CT or MRI imaging [6]

Sonographic Pattern	US features	Estimated risk % of Malignancy	FNA size cutoff (largest dimension)
High Suspicion	Solid hypoechoic nodule or solid hypoechoic component of a partially cystic nodule with one or more of the following features: Irregular margins (infiltrative, microlobulated), microcalcifications, taller than wide shape, rim calcifications with small extrusive soft tissue component, evidence of ETE (extrathyroidal extension)	>70-90	Recommend FNA at ≥1cm
Intermediate Suspicion	Hypoechoic solid nodule with smooth margins without microcalcifications, ETE, or taller than wide shape	10-20	Recommend FNA at ≥1cm
Low Suspicion	Isoechoic or hypoechoic solid nodule, or partially cystic nodule with eccentric solid areas, without microcalcifications, irregular margin or ETE, or taller than wide shape	5-10	Recommend FNA at ≥1.5cm
Very Low Suspicion	Spongiform or partially cystic nodule without any of the sonographic features described in low, intermediate, or high suspicion patterns	<3	Consider FNA at ≥2cm Observation without FNA is also a reasonable option
Benign	Purely cystic nodules (no solid component)	<1	No biopsy

(Source: 2015 American Thyroid Management Guideline for Adult Patients with Thyroid Nodules and Differentiated Thyroid Cancer)

- Nuclear medicine thyroid scan (CPT® 78013 or CPT® 78014) is considered for ANY of the following:
  - Evaluate eligibility for radioiodine therapy[3]
  - Select nodules to biopsy in multinodular goiter even if TSH not low[1,6]
  - Substernal goiter with compressive symptoms (e.g. dyspnea, stridor, cough, dysphonia, dysphagia)
- 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 respiratory motion artifact, unless contraindicated. 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]

- Airway compression[3]
- Presence of pathologic lymph nodes in cervical regions not visualized on ultrasound[3]
- Clinically suspected advanced disease confirmed by FNA, including invasive primary tumor[3,6]
- Preoperative planning for any thyroid disease

- 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 purposes[3]

Practice Notes

- 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.
- 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 propylthiouricil/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] are approvable as initial imaging if ALL of the following conditions are met[1,2,3]:
    - Both PTH and Calcium levels are elevated above the reference range for lab testing facility (See Practice Notes).
    - Individual is a surgical candidate (See Practice Note).
    - 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**
  - Additional imaging may be ordered by an Endocrinologist, Parathyroid surgeon or Radiologist or any provider in consultation with one of these specialists[1,3].
    - 4D CT Neck without and with contrast (CPT® 70492)[8-13]
    - 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 adenomas[14].

- 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 parathyroidectomy[1].
- Choline PET/CT (CPT® 78815 or CPT® 78816) is considered experimental and investigational for preoperative localization in cases of primary hyperparathyroidism. Send these requests to Medical Director Review[15-17].

- Primary hyperparathyroidism variants
  - Primary hyperparathyroidism with non-elevated serum calcium. (Serum Calcium level within and PTH elevated above the reference range for the lab testing facility).
    - 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 above and PTH within the reference range for the lab testing facility).
    - No current consensus exists on the degree of PTH non-suppression for confirmation of primary hyperparathyroidism however PTH level ≥25 pg/mL is a reasonable cutoff[1,7].
    - See Practice notes for more information.
  - Intention of parathyroid imaging should also be for pre-operative localization rather than diagnostic[1].
  - Proceed with the same imaging pathway as in “classic” primary hyperparathyroidism.

  For the following Primary Hyperparathyroidism variants, follow the standard imaging pathway:

	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 above the reference range for the lab testing facility.
  - 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, follow the standard imaging pathway[18].

- In the event of clinical progression (decline in bone mineral density or new fracture/renal stone/nephrocalcinosis), any of the imaging studies listed in the imaging pathway for classic primary hyperparathyroidism may be approved if imaging is being requested by or after consultation with a parathyroid surgeon[18].

- Secondary renal hyperparathyroidism
  - Serum calcium levels are below or within the reference range for the lab testing facility (but may also be elevated in more advanced disease).
  - Any of the imaging studies listed in the imaging pathway for classic primary hyperparathyroidism may be approved 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].
    - Imaging is being requested by or after consultation with a parathyroid surgeon for preoperative localization.

- Tertiary hyperparathyroidism
  - Serum calcium and PTH levels are above the reference range for the lab testing facility as a result of long standing secondary hyperparathyroidism in patients on renal replacement therapy or after renal transplant.
  - Any of the imaging studies listed in the imaging pathway for classic primary hyperparathyroidism may be approved if imaging is being requested by or after consultation with a parathyroid surgeon for preoperative localization.

For the following Hyperparathyroidism subtypes, imaging is being requested by or after consultation with a Parathyroid Surgeon:

	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/D supplementation and the history of or present lithium use) is indicated[1].

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Neck-9: Trachea and Bronchus

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)

- 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 radiculopathy[1] See **Spine Imaging Guidelines**

Neck-10.2: Torticollis and Dystonia

Older Child (beyond infancy) or Adult[1]

- 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 mal-alignment
- 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:[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) for suspected salivary duct or gland stone.
  - 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 (CPT® 70543) or
    - CT Neck with contrast (CPT® 70491) and/or CT Maxillofacial area with contrast (CPT® 70487)

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Neck-12: Sore Throat, Odynophagia, and Hoarseness

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 throat[3]
    - 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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