



CLINICAL GUIDELINES

Pediatric Neck Imaging Guidelines

Version 2.0

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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.

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Pediatric Neck Imaging Guidelines	
Procedure Codes Associated with Neck Imaging	3
PEDNECK-1: General Guidelines	5
PEDNECK-2: Neck Masses (Pediatric)	10
PEDNECK-3: Cervical Lymphadenopathy	14
PEDNECK-4: Dystonia/Torticollis	16
PEDNECK-5: Dysphagia	18
PEDNECK-6: Thyroid and Parathyroid	19
PEDNECK-7: Esophagus	23
PEDNECK-8: Trachea	24

Procedure Codes Associated with Neck Imaging	
MRI	CPT®
MRI Orbit, Face, Neck without contrast	70540
MRI Orbit, Face, Neck with contrast (rarely used)	70542
MRI Orbit, Face, Neck without and with contrast	70543
MRI Temporomandibular Joint (TMJ)	70336
Unlisted MRI procedure (for radiation planning or surgical software)	76498
MRA	CPT®
MRA Neck without contrast	70547
MRA Neck with contrast	70548
MRA Neck without and with contrast	70549
CT	CPT®
CT Maxillofacial without contrast (includes sinuses, jaw, and mandible)	70486
CT Maxillofacial with contrast (includes sinuses, jaw, and mandible)	70487
CT Maxillofacial without and with contrast (includes sinuses, jaw, and mandible)	70488
CT Neck without contrast (includes jaw, and mandible)	70490
CT Neck with contrast (includes jaw, and mandible)	70491
CT Neck without and with contrast (includes jaw, and mandible)	70492
CT Guidance for Placement of Radiation Therapy Fields	77014
Unlisted CT procedure (for radiation planning or surgical software)	76497
CTA	CPT®
CTA Neck	70498
Nuclear Medicine	CPT®
PET Imaging; limited area (this code not used in pediatrics)	78811
PET Imaging; skull base to mid-thigh (this code not used in pediatrics)	78812
PET Imaging; whole body (this code not used in pediatrics)	78813
PET with concurrently acquired CT; limited area (this code rarely used in pediatrics)	78814
PET with concurrently acquired CT; skull base to mid-thigh	78815
PET with concurrently acquired CT; whole body	78816
Thyroid Uptake, Single or Multiple Quantitative Measurement(s) (Including Stimulation, Suppression, or Discharge, When Performed)	78012
Thyroid Imaging (Including Vascular Flow, When Performed)	78013
Thyroid Imaging (Including Vascular Flow, When Performed); with Single or Multiple Uptake(s) Quantitative Measurement(s) (Including Stimulation, Suppression, or Discharge, When Performed)	78014
Thyroid Carcinoma Metastases Imaging Limited Area	78015
Thyroid Carcinoma Metastases Imaging with Additional Studies	78016
Thyroid Carcinoma Metastases Imaging Whole Body	78018
Thyroid Carcinoma Metastases Uptake (Add-on Code)	78020
Parathyroid Planar Imaging (Including Subtraction, When Performed)	78070
Parathyroid Planar Imaging (Including Subtraction, When Performed); with Tomographic (SPECT)	78071
Parathyroid Planar Imaging (Including Subtraction, When Performed); with Tomographic (SPECT), and Concurrently Acquired Computed Tomography (CT) for Anatomical Localization	78072
Salivary Gland Nuclear Imaging	78230
Salivary Gland Nuclear Imaging with Serial Imaging	78231

Salivary Gland Function Study	78232
Esophageal Motility Study	78258
Radiopharmaceutical Localization Imaging Limited area	78800
Radiopharmaceutical Localization Imaging Whole Body	78802
Radiopharmaceutical Localization Imaging SPECT	78803
Ultrasound	CPT®
Soft tissues of head and neck Ultrasound (thyroid, parathyroid, parotid, etc.)	76536
Duplex scan of extracranial arteries; complete bilateral study	93880
Duplex scan of extracranial arteries; unilateral or limited study	93882
Non-invasive physiologic studies of extracranial arteries, complete bilateral study	93875
Ultrasound guidance for needle placement	76942

PEDNECK-1: General Guidelines

PEDNECK-1.0: General Guidelines	6
PEDNECK-1.1: Age Considerations	6
PEDNECK-1.2: Appropriate Clinical Evaluation	6
PEDNECK-1.3: Modality General Considerations	6

PEDNECK-1.0: General Guidelines

- A pertinent clinical evaluation including a detailed history, physical examination, and appropriate laboratory studies should be performed prior to considering advanced imaging (CT, MRI, Nuclear Medicine), unless the patient is undergoing guideline-supported scheduled follow-up imaging evaluation. A meaningful technological contact (telehealth visit, telephone call, electronic mail or messaging) can serve as a pertinent clinical evaluation.
- Unless otherwise stated in a specific guideline section, the use of advanced imaging to screen asymptomatic patients for disorders involving the neck is not supported. Advanced imaging of the neck should only be approved in patients who have documented active clinical signs or symptoms of disease involving the neck.
- Unless otherwise stated in a specific guideline section, repeat imaging studies of the neck are not necessary unless there is evidence for progression of disease, new onset of disease, and/or documentation of how repeat imaging will affect patient management or treatment decisions

PEDNECK-1.1: Age Considerations

- Many conditions affecting the neck in the pediatric population are different diagnoses than those occurring in the adult population. For those diseases which occur in both pediatric and adult populations, minor differences may exist in management due to patient age, comorbidities, and differences in disease natural history between children and adults.
- Patients who are <18 years old should be imaged according to the Pediatric Neck Imaging Guidelines if discussed. Any conditions not specifically discussed in the Pediatric Neck Imaging Guidelines should be imaged according to the General Neck Imaging Guidelines. Patients who are ≥18 years old should be imaged according to the General Neck Imaging Guidelines, except where directed otherwise by a specific guideline section.

PEDNECK-1.2: Appropriate Clinical Evaluation

- See **PEDNECK-1.0: General Guidelines**

PEDNECK-1.3: Modality General Considerations

- MRI
 - ◆ MRI Neck is generally performed without and with contrast (CPT® 70543) unless the patient has a documented contraindication to gadolinium or otherwise stated in a specific guideline section.
 - ◆ Due to the length of time required for MRI acquisition and the need to minimize patient movement, anesthesia is usually required for almost all infants (except neonates) and young children (age <7 years) as well as older children with delays in development or maturity. This anesthesia may be administered via oral or intravenous routes. In this patient population, MRI sessions should be planned

with a goal of minimizing anesthesia exposure by adhering to the following considerations:

- MRI procedures can be performed without and/or with contrast use as supported by these condition based guidelines. If intravenous access will already be present for anesthesia administration and there is no contraindication for using contrast, imaging without and with contrast may avoid repetitive anesthesia administration to perform an MRI with contrast if the initial study without contrast is inconclusive.
 - Recent evidence based literature demonstrates the potential for gadolinium deposition in various organs including the brain, after the use of MRI contrast.
 - The U.S. Food and Drug Administration (FDA) has noted that there is currently no evidence to suggest that gadolinium retention in the brain is harmful and restricting gadolinium-based contrast agents (GBCAs) use is not warranted at this time. It has been recommended that GBCA use should be limited to circumstances in which additional information provided by the contrast agent is necessary and the necessity of repetitive MRIs with GBCAs should be assessed.
- If multiple body areas are supported by eviCore guidelines for the clinical condition being evaluated, MRI of all necessary body areas should be obtained concurrently in the same anesthesia session.
- ◆ The presence of surgical hardware or implanted devices may preclude MRI.
- ◆ The selection of best examination may require coordination between the provider and the imaging service.

➤ CT

- ◆ CT Neck typically extends from the base of the skull to the upper thorax.
 - A separate CPT® code for head imaging in order to visualize the skull base is not necessary.
 - In some cases, especially in follow-up of a known finding, it may be appropriate to limit the exam to the region of concern to reduce radiation exposure.
- ◆ CT Neck is generally performed with contrast (CPT® 70491) unless the patient has a documented contraindication to CT contrast or otherwise stated in a specific guideline section.
- ◆ CT Neck may be indicated for further evaluation of abnormalities suggested on prior US or MRI Procedures.
- ◆ In general, CT Neck is appropriate when evaluating trauma, malignancy, and for preoperative planning.
- ◆ CTA Neck (CPT® 70498) is indicated for evaluation of the vessels of the neck, especially with concern for dissection.
- ◆ CT should not be used to replace MRI in an attempt to avoid sedation unless listed as a recommended study in a specific guideline section.
- ◆ The selection of best examination may require coordination between the provider and the imaging service.

➤ Ultrasound

- ◆ Ultrasound soft tissues of the neck (CPT® 76536) is indicated as an initial study for evaluating adenopathy, other palpable mass or swelling, thyroid, parathyroid, parotid and other salivary glands, and cysts.
- ◆ For those patients who do require additional advanced imaging after ultrasound, ultrasound can be very beneficial in selecting the proper modality, body area, image sequences, and contrast level that will provide the most definitive information for the patient.

➤ Nuclear Medicine

- ◆ Nuclear medicine studies of the neck in pediatric patients are most commonly used to evaluate neck masses, or thyroid and parathyroid disease following initial studies with anatomic imaging, such as ultrasound, CT, or MRI. See **PEDNECK-2: Neck Masses (Pediatric)** and **PEDNECK-6: Thyroid and Parathyroid** for imaging guidelines.
- ◆ Salivary Gland Nuclear Imaging (one of CPT® 78230, CPT® 78231, or CPT® 78232) is indicated for the following:
 - Evaluation of salivary gland function in patients with dry mouth (xerostomia) and ONE of the following:
 - Sjögren syndrome
 - Sialadenitis
 - History of head or neck radiation therapy

➤ 3D Rendering

- ◆ 3D Rendering indications in pediatric neck imaging are identical to those in the general imaging guidelines. See **Preface-4.1: 3D Rendering** in the **Preface Imaging Guidelines**.

The guidelines listed in this section for certain specific indications are not intended to be all-inclusive; clinical judgment remains paramount and variance from these guidelines may be appropriate and warranted for specific clinical situations.

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PEDNECK-2: Neck Masses (Pediatric)

Evaluation of neck masses in pediatric patients involves careful consideration of clinical history and accurate physical examination. The patient's age and knowledge of the anatomy and common lesions of the neck are very important in narrowing the differential diagnosis.

- Ultrasound Neck (CPT® 76536) is indicated as the initial imaging study of choice. Ultrasound helps define the size and extent of localized superficial masses and helps confirm whether they are cystic or solid. Color Doppler ultrasound (CPT® 93880 bilateral study or carotid arteries or CPT® 93882 unilateral study) can evaluate the vasculature.
- MRI Neck without contrast (CPT® 70540) or without and with contrast (CPT® 70543), or CT Neck with contrast (CPT® 70491) can be approved if ultrasound is inconclusive or to further characterize abnormalities seen on ultrasound.
- Cervical lymphadenitis is common in children and follows most viral or bacterial infections of the ears, nose, and throat. No advanced imaging is necessary with uncomplicated lymph node enlargement. When lymphadenopathy persists for more than 4 weeks of treatment or there is suspicion of complications, such as abscess formation, ultrasound is indicated, See **PEDNECK-3: Cervical Lymphadenopathy**.
- Congenital cervical cysts frequently present in children and include thyroglossal duct cyst (55% of cases), cystic hygroma (25%), branchial cleft cysts (16%), bronchogenic cyst (0.91%), and thymic cyst (0.3%).
 - ◆ Barium swallow and MRI Neck without and with contrast (CPT® 70543) or CT Neck with contrast (CPT® 70491) are indicated for diagnosis of fourth branchial cleft cysts.
 - ◆ Ultrasound is indicated for initial evaluation of a suspected cystic neck mass.
 - ◆ MRI Neck without and with contrast (CPT® 70543) or CT Neck with contrast (CPT® 70491) may be indicated for preoperative planning.
- Salivary gland nuclear imaging (one of CPT® 78230, CPT® 78231, or CPT® 78232) is indicated for evaluation of parotid masses to allow preoperative diagnosis of Warthin's tumor.

Practice Notes

- The most common malignant ENT tumors in children are lymphoma and rhabdomyosarcoma.

Differential Diagnosis of Neck Lesions by Anatomic Region:

- Subcutaneous tissues:
 - ◆ Teratoma (includes dermoid cysts)
 - Cervical teratomas are typically large bulky masses discovered at birth or in the first year of life.
 - Large lesions may cause stridor, dyspnea, or dysphagia.
 - Most teratomas arise in the anterior suprahyoid neck and may be midline or off midline in location and adjacent to or within a thyroid lobe.
 - ◆ Vascular malformations
 - ◆ Lipoma
 - ◆ Cellulitis
 - ◆ Plexiform neurofibromas
 - ◆ Keloid
 - ◆ Scar
 - ◆ Pilomatrixoma
 - ◆ Subcutaneous fat fibrosis (in neonates)
- Retropharyngeal space:
 - ◆ Abscess, cellulitis, adenitis
 - Usually involves children under age 6.
 - Patients have history of upper respiratory tract infection followed by high fever, dysphagia, and neck pain.
 - ◆ Lymphadenopathy
 - ◆ Extension of goiter
 - ◆ Extension of pharyngeal tumor
- Retrovisceral space (posterior to the cervical esophagus):
 - ◆ Gastrointestinal duplication cysts (usually are diagnosed in first year of life).
- Pretracheal space (contains trachea, larynx, cervical esophagus, recurrent laryngeal nerves, and thyroid and parathyroid glands):
 - ◆ Thyroglossal duct cyst
 - Thyroglossal duct cyst is most common before the age of 20, 75% present as a midline mass and 43% of patients present with an infected mass.
 - Usually presents as an enlarging, painless midline mass.
 - Thyroid carcinoma occurs in 1% of thyroglossal duct cysts.
 - ◆ Goiter
 - ◆ Laryngocele
 - ◆ Lymphadenopathy
 - ◆ Teratoma
 - ◆ Abscess
 - ◆ Ectopic thymus or cervical extension of normal thymus
- Danger space (closed space lying between the skull base and the posterior mediastinum and between the alar and prevertebral fasciae in a sagittal plane):
 - ◆ Cellulitis
 - ◆ Abscess

- Prevertebral space:
 - ◆ Neurenteric cyst
 - ◆ Cellulitis
 - ◆ Abscess
 - ◆ Spondylodiskitis
 - ◆ Lymphadenopathy
 - ◆ Cellulitis
 - ◆ Paraganglioma
- Carotid sheath space:
 - ◆ Jugular vein thrombosis or phlebitis
 - ◆ Lymphadenopathy
 - ◆ Cellulitis
 - ◆ Abscess
 - ◆ Paraganglioma
- Parotid gland space:
 - ◆ Parotid lymphadenopathy
 - ◆ Retromandibular vein thrombosis
 - ◆ Parotiditis
 - ◆ Sialodochitis (inflammation of the salivary gland duct)
 - ◆ Salivary duct stone
- Submandibular and sublingual spaces:
 - ◆ Thyroglossal duct cyst
 - ◆ Branchial cleft cyst
 - 90% of branchial abnormalities arise from the second branchial apparatus.
 - Second branchial cleft cysts are the most common branchial cleft cyst and usually present in patients between 10 and 40 years as painless fluctuant masses.
 - They typically present as slowly growing, nontender masses in the upper neck
 - Most second branchial cleft cysts are located in the submandibular space, at the anteromedial border of the sternocleidomastoid muscle, lateral to the carotid space, or posterior to the submandibular gland.
 - Ranula – typically cystic masses in the floor of the mouth.
- Masticator space (includes masseter and pterygoid muscles):
 - ◆ Venous or lymphatic malformation
 - ◆ Cellulitis
 - ◆ Abscess
 - ◆ Rhabdomyosarcoma
- Parapharyngeal space:
 - ◆ Cellulitis
 - ◆ Abscess
 - ◆ Rhabdomyosarcoma
 - ◆ Extension of lymphoma

- Paravertebral space:
 - ◆ Cervical dermal sinus (epithelium-lined dural tubes that connect the skin with the central nervous system or its covering)
 - ◆ Meningocele
 - ◆ Rhabdomyosarcoma
 - ◆ Lymphoma
 - ◆ Neuroblastoma
 - ◆ Neurofibroma
- Posterior cervical space:
 - ◆ Lymphadenopathy
 - ◆ Lymphatic malformation

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PEDNECK-3: Cervical Lymphadenopathy

PEDNECK-3.1: Imaging

15

PEDNECK-3.1: Imaging

- Painful acute lymphadenopathy and other painful neck masses (including neck “swelling”) should be treated with a trial of conservative therapy for at least 4 weeks, including antibiotics if appropriate.
 - ◆ If there is improvement with conservative treatment, advanced imaging is not indicated.
 - ◆ If there is unexplained fever with a temperature $\geq 100.4^{\circ}\text{F}$ and there is clinical concern for suppurative lymphadenopathy or a neck abscess, ultrasound (CPT® 76536) is indicated without 4 weeks of treatment and observation.
- Ultrasound Neck (CPT® 76536) is indicated as an initial evaluation if lymphadenopathy persists following 4 weeks of treatment and/or observation.
- MRI Neck without contrast (CPT® 70540) or without and with contrast (CPT® 70543) or CT Neck with contrast (CPT® 70491) can be approved if ultrasound is inconclusive or to further characterize abnormalities seen on ultrasound. Both are superior to ultrasound for defining the relationship of an abscess to adjacent structures, particularly the airway; and detecting posterior cervical, mediastinal and intracranial extension.
- If systemic symptoms or other clinical findings suggest malignancy, See **PEDONC-5: Pediatric Lymphomas** in the **Pediatric Oncology Imaging Guidelines**.

Practice Notes

Inflammatory lymph nodes from acute lymphadenitis are usually painful, tender and mobile, frequently associated with upper respiratory infection, pharyngitis or dental infection.

Occasionally, sarcoidosis or toxoplasmosis and Human immunodeficiency virus (HIV) can cause inflammatory lymphadenopathy as well.

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PEDNECK-4: Dystonia/Torticollis

Infants under 12 Months of Age (Congenital Muscular Torticollis)

- Ultrasound Neck (CPT® 76536) is indicated as the initial study to evaluate suspected congenital muscular torticollis, also called fibromatosis coli.
 - ◆ Patients usually present by 2 weeks of life with an anterior neck mass, which is commonly right sided (75% of cases). A history of a traumatic breech or forceps delivery is common.
 - ◆ If Ultrasound is Positive→ No further imaging is needed since diagnosis is defined.
 - ◆ If Ultrasound is Negative→ CT Neck with contrast (CPT® 70491) or MRI Neck without contrast (CPT® 70540) or without and with contrast (CPT® 70543) can be approved to evaluate for other structural causes.

Children and Adults (Acquired Torticollis)

- Injury or inflammation involving the sternocleidomastoid or trapezius muscles is the most common cause of acquired torticollis in children.
- If there has been recent trauma, plain radiographs of the cervical spine should be obtained as an initial evaluation when the suspicion of injury is low. CT Neck with contrast (CPT® 70491) and/or CT Cervical Spine without contrast (CPT® 72125) is indicated as the initial study to identify fracture or malalignment if plain radiographs are inconclusive or in patients with a high risk mechanism of cervical spine injury within the last 3 months (See below**). MRI Cervical Spine without contrast (CPT® 72141) is also appropriate in the clinical setting of cervical spine trauma with an associated neurologic deficit.
- In the absence of trauma, CT Neck with contrast (CPT® 70491), CT Cervical Spine without contrast (CPT® 72125), MRI Cervical Spine without contrast (CPT® 72141), MRI Neck without and with contrast (CPT® 70543), or MRA Neck without and with contrast (CPT® 70549) can be approved to identify underlying abscess, bony, muscular, vascular, or neurologic causes.
 - ◆ Positive→ Further advanced imaging is not required if a local cause has been identified.
 - ◆ Negative→ MRI Brain without and with contrast (CPT® 70553) to exclude CNS cause.

**High risk mechanisms of cervical spine injury may include:

- ◆ Head trauma and/or maxillofacial trauma
- ◆ Pedestrian in a motor vehicle accident
- ◆ Fall from above standing height
- ◆ Diving accident
- ◆ Head-on motor vehicle collision without/with airbag deployment
- ◆ Rollover motor vehicle collision
- ◆ Ejection from the vehicle in a motor vehicle collision
- ◆ High speed of the vehicle at the time of collision

- ◆ Not wearing a seatbelt/shoulder harness in a motor vehicle collision
- ◆ Patients with ankylosing spondylitis are at high risk of cervical spine fractures even with minor direct/indirect trauma to the cervical spine which can result in quadriparesis/quadriplegia

Practice Note

Torticollis or cervical dystonia is an abnormal twisting of the neck in which the head is rotated or twisted. Acute causes are most common. Other causes are variable and may be congenital, acquired (caused by trauma, juvenile idiopathic arthritis, or neoplasm), or idiopathic. Imaging approach is same as that for acute torticollis in children.

References

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PEDNECK-5: Dysphagia

- Dysphagia imaging indications in pediatric patients are very similar to those for adult patients. See **Neck-3: Dysphagia and Esophageal Disorders** in the **Neck Imaging Guidelines**.
- Pediatric-specific imaging considerations include the following:
 - ◆ X-rays neck and chest may be appropriate as the initial imaging study when concerned for foreign body ingestion as cause of dysphagia.
 - ◆ Esophageal motility study (CPT® 78258) is indicated for ANY of the following:
 - Dysphagia associated with chest pain and difficulty swallowing both solids and liquids.
 - Gastroesophageal reflux.
- CTA Chest (CPT® 71275) or MRA Chest (CPT® 71555) is indicated for a suspected vascular ring, which can be associated with dysphagia:
 - ◆ A right aortic arch or double arch noted on chest radiography is an indication for CTA or MRA.

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PEDNECK-6: Thyroid and Parathyroid

PEDNECK-6.1: Thyroid Masses or Nodules	20
PEDNECK-6.2: Hyperthyroidism	20
PEDNECK-6.3: Hypothyroidism	21
PEDNECK-6.4: Parathyroid Imaging	21

PEDNECK-6.1: Thyroid Masses or Nodules

- Ultrasound Neck (CPT® 76536) is the recommended initial study for evaluation of thyroid masses or nodules in pediatric patients.
 - ◆ If TSH normal or elevated, fine needle aspiration (FNA) under ultrasound guidance (CPT® 76942) is indicated.
 - ◆ If TSH is low, nuclear thyroid scintigraphy (either CPT® 78013 or CPT® 78014), is indicated.
 - Hyperfunctioning nodules should be resected surgically.
 - Hypofunctioning nodules should undergo FNA under ultrasound guidance (CPT® 76942).
- CT Neck without contrast (CPT® 70490) or with contrast (CPT® 70491), or MRI Neck without contrast (CPT® 70540) or without and with contrast (CPT® 70543) is indicated for preoperative planning in patients with large or fixed masses, vocal cord paralysis, or bulky cervical or supraclavicular adenopathy.
 - ◆ CT Chest without contrast (CPT® 71250) or with contrast (CPT® 71260) is also indicated for patients with substernal extension of the thyroid, pulmonary symptoms, or abnormalities on recent chest x-ray.
- If any biopsy reveals thyroid carcinoma, See **ONC-6: Thyroid Cancer** in the **Oncology Imaging Guidelines**.
- If the biopsy shows indeterminate findings, repeat ultrasound (CPT® 76536) and/or FNA (CPT® 76942) is indicated 3 months following initial biopsy.
 - ◆ If the nodule is stable and/or FNA is benign, repeat ultrasound (CPT® 76536) is indicated in 6 months.
 - ◆ If the nodule is growing or the FNA is not benign, the nodule should be resected surgically.
- If the initial biopsy shows benign findings, repeat ultrasound (CPT® 76536) is indicated 6 months following initial biopsy.
 - ◆ If the nodule is stable, repeat ultrasound (CPT® 76536) is indicated annually.
 - ◆ If the nodule is growing or concerning new findings are present, the nodule should undergo repeat FNA (CPT® 76942) or be resected surgically.
 - ◆ Benign nodules that have been surgically resected do not require routine imaging follow up in the absence of clinical or laboratory changes suggesting recurrence.

PEDNECK-6.2: Hyperthyroidism

- Ultrasound Neck (CPT® 76536) is the recommended initial study for evaluation of hyperthyroidism. Common causes are Graves' disease and autoimmune disorders (lupus, rheumatoid arthritis and Sjögren syndrome).
 - ◆ If a nodule or mass is discovered on ultrasound, the patient should be imaged according to **PEDNECK-6.1: Thyroid Masses or Nodules**.
- For all other patients with documented hyperthyroidism, thyroid uptake nuclear imaging (either CPT® 78012 or CPT® 78014) is indicated.

PEDNECK-6.3: Hypothyroidism

- Causes include thyroid congenital dysgenesis, dysmorphogenesis autoimmune thyroiditis, Hashimoto thyroiditis, subacute thyroiditis, and abnormality in the pituitary gland or hypothalamus. Congenital hypothyroidism is usually diagnosed in the neonate on a routine perinatal screening examination.
- Ultrasound (CPT® 76536) is the recommended initial study for evaluation of hypothyroidism.
 - ◆ If a nodule or mass is discovered on ultrasound, the patient should be imaged according to **PEDNECK-6.1: Thyroid Masses or Nodules**.
- For patients with documented congenital hypothyroidism, thyroid uptake nuclear imaging (either CPT® 78012 or CPT® 78014) is indicated.

PEDNECK-6.4: Parathyroid Imaging

- Either ultrasound (CPT® 76536) or sestamibi parathyroid nuclear imaging (one of CPT® 78070, CPT® 78071, or CPT® 78072) is indicated for initial evaluation of primary or recurrent hyperparathyroidism, generally indicated by one of the following:
 - ◆ Serum calcium (>1 mg/dL over upper limit of normal).
 - ◆ Elevated serum calcium and elevated serum parathyroid hormone (PTH).
- CT Neck without and with contrast (CPT® 70492) or MRI Neck without contrast (CPT® 70540) or without and with contrast (CPT® 70543) is indicated for any of the following:
 - ◆ Preoperative planning for localization.
 - ◆ Serum calcium (>1 mg/dL over upper limit of normal).
 - ◆ Recurrent or persistent hyperparathyroidism following neck exploration (MRI preferred unless contraindicated).

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PEDNECK-7: Esophagus

- Esophagus imaging indications in pediatric patients are very similar to those for adult patients. See **Neck-3: Dysphagia and Esophageal Disorders** in the **Neck Imaging Guidelines**.
- Pediatric-specific imaging considerations include the following:
 - ◆ Esophagram is the study of choice for evaluating congenital atresia with associated tracheoesophageal fistula.
 - ◆ Plain radiographs alone usually suffice for the diagnosis of other types of esophageal atresia and a contrast examination of the esophagus is not warranted but may be indicated for post-operative evaluation.
 - ◆ CT Neck with contrast (CPT® 70491) and CT Chest with contrast (CPT® 71260) are indicated for evaluation of suspected congenital malformations if x-rays or esophagram are inconclusive.
 - 3D rendering may be approvable for preoperative planning in complex cases.
 - ◆ Ultrasound (CPT® 76536) can be approved for evaluation of upper esophageal foreign bodies.

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PEDNECK-8: Trachea

- Trachea imaging indications in pediatric patients are very similar to those for adult patients. See **Neck-9: Trachea and Bronchus** in the **Neck Imaging Guidelines**.
- Pediatric-specific imaging considerations include the following:
 - ◆ CT Neck with contrast (CPT® 70491) and CT Chest with contrast (CPT® 71260) are indicated for evaluation of suspected congenital malformations if x-rays are inconclusive.
 - 3D rendering may be approvable for preoperative planning in complex cases.
 - CT is not routinely performed to evaluate foreign body aspiration, but it may be considered in complicated cases.

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