



CLINICAL GUIDELINES

Pediatric 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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MRI Orbit, Face, Neck without and with contrast	70543
MRI Temporomandibular Joint (TMJ)	70336
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MRA	CPT®
MRA Neck without contrast	70547
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CT Maxillofacial without contrast (includes sinuses, jaw, and mandible)	70486
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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 individual 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 individuals for disorders involving the neck is not supported. Advanced imaging of the neck should only be approved in individuals 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 individual 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 individual age, comorbidities, and differences in disease natural history between children and adults.
- Individuals 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. Individuals 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 individual 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 individual 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 individual 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 individual 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 individuals 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 individual.

➤ Nuclear Medicine

- ◆ Nuclear medicine studies of the neck in pediatric individuals 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 individuals 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 individuals involves careful consideration of clinical history and accurate physical examination. The individual'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.
 - Individuals 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 individuals 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 individuals 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-lines 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

- 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.
 - ◆ Ultrasound (CPT® 76536) is indicated without 4 weeks of treatment and observation 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 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) 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.
 - ◆ Individuals 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.
 - ◆ CT Neck with contrast (CPT® 70491) or MRI Neck without contrast (CPT® 70540) or without and with contrast (CPT® 70543) to evaluate for other structural causes if ultrasound is negative.

Children and Adults (Acquired Torticollis)

- Injury or inflammation involving the sternocleidomastoid or trapezius muscles is the most common cause of acquired torticollis in children.
- Plain radiographs of the cervical spine should be obtained as an initial evaluation if there has been recent trauma, 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 individuals 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.
- 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) in the absence of trauma 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

- ◆ Individuals 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.

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PEDNECK-5: Dysphagia

- Dysphagia imaging indications in pediatric individuals are very similar to those for adult individuals. 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	19
PEDNECK-6.2: Hyperthyroidism	20
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PEDNECK-6.4: Parathyroid Imaging	20

PEDNECK-6.1: Thyroid Masses or Nodules

- Ultrasound Neck (CPT® 76536) is the recommended initial study for evaluation of thyroid masses, diffuse thyroid enlargement, or nodules in pediatric individuals.
 - ◆ Fine needle aspiration (FNA) under ultrasound guidance (CPT® 76942) is indicated if TSH normal or elevated for any solitary or suspicious thyroid nodule(s) detected by imaging or physical exam.
 - ◆ Nuclear thyroid scintigraphy (either CPT® 78013 or CPT® 78014) is indicated if TSH is low.
 - Hyperfunctioning nodules should be treated surgically but may also undergo FNA under ultrasound guidance (CPT® 76942) if suspicious in appearance and not being treated surgically.
 - Hypofunctioning nodules should undergo FNA under ultrasound guidance (CPT® 76942).
 - ◆ Repeat imaging with Ultrasound Neck (CPT® 76536) for lymph node assessment may be approved if cervical lymph node imaging was not performed at the time of the initial diagnostic thyroid ultrasound.
- 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 individuals 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 individuals 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.
- Repeat ultrasound (CPT® 76536) and/or FNA under ultrasound guidance (CPT® 76942) is indicated 3-6 months following initial biopsy if the initial biopsy shows inadequate, or non-diagnostic findings.
 - ◆ Repeat ultrasound (CPT® 76536) is indicated in 6-12 months if the nodule is stable and/or FNA is benign.
 - ◆ Nodule should be treated surgically if the nodule is growing or the FNA is not benign.
- Repeat ultrasound (CPT® 76536) is indicated 6-12 months following initial biopsy if the initial biopsy shows benign findings.
 - ◆ Repeat ultrasound (CPT® 76536) is indicated every 1-2 years if the nodule is stable.
 - ◆ Repeat FNA under ultrasound guidance (CPT® 76942) or be treated surgically if the nodule is growing or concerning new findings are present.
 - ◆ Benign nodules that have been surgically resected do not require routine imaging follow up in the absence of clinical or laboratory changes suggesting recurrence.
- If the initial biopsy shows indeterminate or suspicious findings, surgery is recommended.

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 individual should be imaged according to **PEDNECK-6.1: Thyroid Masses or Nodules**.
- Thyroid uptake nuclear imaging (either CPT® 78012 or CPT® 78014) may be approved for all other individuals with documented hyperthyroidism.

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 individual should be imaged according to **PEDNECK-6.1: Thyroid Masses or Nodules**.
- For individuals with documented congenital hypothyroidism, thyroid uptake nuclear imaging (either CPT® 78012 or CPT® 78014) may be approved.

PEDNECK-6.4: Parathyroid Imaging

- Parathyroid imaging indications in pediatric individuals are the same as those for adult individuals. See **Neck-8.3: Parathyroid Imaging** in the Neck Imaging Guidelines

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PEDNECK-7: Esophagus

- Esophagus imaging indications in pediatric individuals are very similar to those for adult individuals. 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 individuals are very similar to those for adult individuals. 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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