Instructions for use
The following coverage policy applies to health benefit plans administered by Cigna. Coverage policies are intended to provide guidance in interpreting certain standard Cigna benefit plans and are used by medical directors and other health care professionals in making medical necessity and other coverage determinations. Please note the terms of a customer’s particular benefit plan document may differ significantly from the standard benefit plans upon which these coverage policies are based. For example, a customer’s benefit plan document may contain a specific exclusion related to a topic addressed in a coverage policy.

In the event of a conflict, a customer’s benefit plan document always supersedes the information in the coverage policy. In the absence of federal or state coverage mandates, benefits are ultimately determined by the terms of the applicable benefit plan document. Coverage determinations in each specific instance require consideration of:

1. The terms of the applicable benefit plan document in effect on the date of service
2. Any applicable laws and regulations
3. Any relevant collateral source materials including coverage policies
4. The specific facts of the particular situation

Coverage policies relate exclusively to the administration of health benefit plans. Coverage policies are not recommendations for treatment and should never be used as treatment guidelines.

This evidence-based medical coverage policy has been developed by eviCore, Inc. Some information in this coverage policy may not apply to all benefit plans administered by Cigna.

These guidelines include procedures eviCore does not review for Cigna. Please refer to the Cigna CPT code list for the current list of high-tech imaging procedures that eviCore reviews for Cigna.

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## PEDHD-1: General Guidelines

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PEDHD-1.1: Pediatric Head Imaging Age Considerations

Many conditions affecting the head 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 head imaging guidelines and individuals who are ≥ 18 years old should be imaged according to the adult head imaging guidelines, except where directed otherwise by a specific guideline section.

PEDHD-1.2: Pediatric Head Imaging Appropriate Clinical Evaluation

- A recent (within 60 days) face to face evaluation including a detailed history, physical examination with a thorough neurologic examination, and appropriate laboratory studies should be performed prior to considering the use of an advanced imaging (CT, MR, Nuclear Medicine) procedure. An exception can be made if the individual is undergoing guideline-supported scheduled follow-up imaging evaluation.

- Unless otherwise stated in a specific guideline section, the use of advanced imaging to screen asymptomatic individuals for disorders involving the head is not supported. Advanced imaging of the head is only indicated in individuals who have documented active clinical signs or symptoms of disease involving the head.
  - Advanced imaging of the head is not indicated for evaluation of recurrent isolated vomiting in individuals without associated headache or focal neurologic findings unless a gastrointestinal workup (labs, imaging, and endoscopy) does not reveal a cause.

- Unless otherwise stated in a specific guideline section, repeat imaging studies of the head 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.

Requests for Studies with Overlapping Fields

- There are many CPT® codes for imaging the head that have significantly overlapping fields. In the majority of cases where multiple head CPT® codes are requested, only one CPT® code should be approved unless there is clear documentation of a need for the additional codes to cover all necessary body areas.

- See HD-1.1: General Guidelines - Anatomic Issues the correct coding of these studies.
PEDHD-1.3: Pediatric Head Imaging Modality General Considerations

- **MRI**
  - MRI is the preferred modality for imaging the pediatric head unless otherwise stated in a specific guideline section.
  - Due to the length of time for image acquisition and the need for the individual to lie still, anesthesia is required for almost all infants except neonates and young children (age < 7 years), as well as older children with delays in development or maturity. In this individual population, MRI imaging sessions should be planned with a goal of minimizing anesthesia exposure adhering to the following considerations:
    - MRI should always be performed without and with contrast unless there is a specific contraindication to gadolinium use since the individual already has intravenous access for anesthesia.
    - 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 requesting clinicians indicate that a non-contrast study is being requested with specific concern for gadolinium retention, the exam can be approved.
    - 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.

- **CT**
  - CT is generally inferior to MRI for imaging the pediatric head, but has specific indications in which it is the preferred modality listed in specific sections of these guidelines.
  - 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.

- **Ultrasound**
  - Cranial ultrasound (CPT® 76506) is a non-invasive means of evaluating for intracranial abnormalities in infants with an open anterior fontanelle.
  - Transcranial Doppler ultrasonography has some utility in select populations of older children with known or suspected intracranial vascular disease.

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.
References

**PEDHD-2: Specialized Imaging Techniques**

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| PEDHD-2.2: Functional Magnetic Resonance Imaging (fMRI, CPT® 70554 and CPT® 70555) | 10 |
| PEDHD-2.3: PET Brain Imaging (CPT® 78608 and CPT® 78609) | 11 |
**PEDHD-2.1: Magnetic Resonance Spectroscopy (MRS, CPT® 76390)**

Magnetic Resonance Spectroscopy involves the analysis of the levels of certain chemicals in pre-selected voxels (small regions) on an MRI scan done at the same time.

Uses in pediatric neuro-oncology: See **PEDONC-4: Pediatric CNS Tumors** for imaging indications.

**Uses in Metabolic Disorders:**
- These cases should be forwarded for medical director review.
- MRS is associated with disease-specific characteristics findings and is indicated for diagnosis and disease monitoring in the following metabolic disorders:
  - Canavan disease.
  - Creatine deficiency.
  - Nonketotic hyperglycinemia.
  - Maple Syrup Urine disease.
- MRS has nonspecific abnormal patterns that can aid in the diagnosis of the following metabolic disorders, but is not routinely indicated for disease monitoring:
  - Metachromatic leukodystrophy.
  - Pelizaeus-Merzbacher disease.
  - Hypomyelination and Congenital Cataract.
  - Globoid Cell Leukodystrophy (Krabbe disease).
  - X-linked adrenoleukodystrophy.
  - Mitochondrial disorders.
  - Alexander disease.
  - Megalencephalic leukoencephalopathy with subcortical cysts.
  - Vanishing White Matter disease.
  - MRS can be approved for disease monitoring of these diagnoses when recent MRI findings are inconclusive and a change in therapy is being considered.
- MRS is considered investigational for all other pediatric indications at this time.

**PEDHD-2.2: Functional Magnetic Resonance Imaging (fMRI, CPT® 70554 and CPT® 70555)**
- These cases should be forwarded for medical director review.
- fMRI is indicated to define eloquent areas of the brain as part of preoperative planning for epilepsy surgery or removal of a mass lesion.
  - The documentation should be clear that brain surgery is planned.
  - Can be approved concurrently with MRI Brain (CPT® 70551 or CPT® 70553) and/or PET Brain Metabolic (CPT® 78608 or CPT® 78609).
- fMRI is considered investigational for all other pediatric indications at this time.
PEDHD-2.3: PET Brain Imaging (CPT® 78608 and CPT® 78609)

- These cases should be forwarded for medical director review.
- Uses in pediatric neuro-oncology: See PEDONC-4: Pediatric CNS Tumors for imaging indications.
- PET Brain is indicated to define active areas of the brain as part of preoperative planning for epilepsy surgery.
  - The documentation should be clear that brain surgery is planned.
  - Can be approved concurrently with MRI Brain (CPT® 70551 or CPT® 70553) and/or fMRI (CPT® 70554 or CPT® 70555).
- PET Brain is considered investigational for all other pediatric indications at this time.

References

   http://pedsinreview.aappublications.org/content/35/3/106.
Pediatric Head Imaging

**PEDHD-3: Pediatric Headache**

Headache is a very common complaint in school aged children and adolescents. Many of these children have a family history of one of the primary headache disorders, such as migraine or tension headache.

- A recent (within 60 days) face to face evaluation including a detailed headache history, physical examination with a thorough neurologic examination, and appropriate laboratory studies should be performed prior to considering advanced imaging.

- Advanced imaging is not indicated for pediatric individuals with headache in the absence of red flag symptoms.

- MRI Brain without contrast (CPT® 70551) or without and with contrast (CPT® 70553) is indicated for children with headaches and at least one of the following red flags:
  - Age ≤ 5 years.
  - Headaches awakening from sleep or always present in the morning.
  - Focal findings on neurologic examination including diplopia.
  - Clumsiness (common description of gait or coordination problems in young children).
  - Headaches associated with morning nausea/vomiting.
  - New onset of seizure activity with focal features.
  - Papilledema on physical exam.
  - Headache precipitated by coughing, sneezing, or Valsalva.
  - Progressive worsening in headache frequency and severity without period of temporary improvement.
  - Systemic symptoms such as persistent fever, weight loss, rash, or joint pain.
  - Immunocompromised individual.
  - Individual with hypercoagulable state or bleeding disorder.
  - Known history of cancer of any type.
  - Known autoimmune or rheumatologic disease.
  - Known genetic disorder with predisposition to intracranial mass lesions.
  - History of stable chronic headaches with recent significant change in frequency or severity.
  - Individuals requiring sedation should generally have MRI studies without and with contrast. See PEDHD-1.3: Pediatric Head Imaging Modality General Considerations.

- CT Head poorly visualizes the posterior fossa in children and is generally insufficient to evaluate pediatric headaches with red flag symptoms. CT should not be approved in lieu of MRI solely to avoid sedation.

- CT Head without contrast is indicated for pediatric headache with one or more of the following:
  - Recent head trauma.
  - Suspected skull or other bony involvement.
  - Ventriculoperitoneal shunt with suspected shunt malfunction. See PEDHD-7: Macrocephaly, Microcephaly, And Hydrocephalus for additional imaging.
  - Sudden onset (thunderclap) headache with suspected intracranial hemorrhage.
  - MRI is contraindicated due to implantable device or rapid clinical deterioration.
MRA Brain or CTA Head are not generally medically necessary in the evaluation of headache in children unless a vascular lesion has been seen or suspected on a prior brain MRI Brain or CT Head.

- Concurrent approval of both MRI and MRA is generally not indicated.

MRV Head (CPT® 70544) is indicated in pediatric individuals with papilledema and headache. See PEDHD-22: Pseudotumor Cerebri for additional imaging guidelines.

References
PEDHD-4: Pediatric Head and Face Trauma

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**PEDHD-4.1: Head Trauma**

In individuals with recent head trauma, a history focused on the incident and careful examination of the head, neck, and neurological function should be performed prior to considering advanced imaging.

- Advanced imaging is not indicated for children with minor head trauma and none of the following red flags:
  - Loss of consciousness.
  - Altered mental status.
  - Known or suspected skull fracture.
  - Glasgow Coma Score ≤ 13.

- CT Head without contrast (CPT® 70450) is the primary advanced imaging study in individuals with acute head trauma.
  - CT Maxillofacial without contrast (CPT® 70486), Orbits/Temporal bone without contrast (CPT® 70480), or CT Cervical spine without contrast (CPT® 72125) is indicated if there has been associated injury to those structures.

- Brain MRI without contrast (CPT® 70551) is indicated for the following:
  - Children with an abnormal neurological exam that is not explained by the CT findings.
  - Children suspected of being the victims of physical abuse. See PEDMS-7: **Suspected Physical Child Abuse** for imaging considerations.

- Following a head injury, a repeat head CT Head without contrast (CPT® 70450) or MRI Brain without contrast (CPT® 70551) is indicated if the child develops fixed or fluctuating diminished mental acuity or alertness, or new abnormalities on neurological examination.

- Follow-up of known or treated subdural or epidural hematoma may require frequent imaging during the initial 8 weeks following injury, and these requests should generally be approved.
  - These cases should be forwarded for medical director review.

- Currently there is no well-validated pediatric version of the Canadian or New Orleans Head CT Rule to aid in deciding which children seen after recent head trauma would benefit from head CT.

**PEDHD-4.2: Facial Trauma**

- CT without contrast is the preferred imaging study in facial trauma.

**Coding of Facial Imaging**

Both orbital/facial bone CT (CPT® 70480) and maxillofacial CT (CPT® 70486) cover the structures of the orbits, sinuses, and face. Unless there is a grounded suspicion of simultaneous involvement of more posterior lesions, especially of the region involving the middle or inner ear, one of these studies only should be sufficient.

Maxillofacial CT (CPT® 70486) is the usual study (except in obvious orbital or temporal bone trauma), but either study is appropriate.
References
# PEDHD-5: Sinusitis and Allergic Rhinitis

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PEDHD-5.1: General Considerations

- Acute sinusitis is a clinical diagnosis, and imaging is not indicated to establish a diagnosis. Acute bacterial sinusitis can be presumptively diagnosed in a child with acute upper respiratory infection (URI) symptoms and any of the following:
  - Persistent symptoms lasting > 10 days without improvement.
  - Worsening symptoms after initial period of improvement.
  - Severe symptoms including purulent nasal discharge and fever > 102.2°F for at least 3 consecutive days.
  - Presumed bacterial infections should be treated empirically with appropriate antibiotics.
  - Imaging of any kind cannot distinguish bacterial from viral sinusitis.

PEDHD-5.2: Imaging Indications in Sinusitis

- Mild mucosal thickening in the paranasal sinuses or mastoids is an extremely common incidental finding noted on head imaging studies done for other indications. If there are no other abnormalities of facial structures noted, this finding is not an indication for advanced imaging of the sinuses or temporal bone.

- CT sinuses without contrast (CPT® 70486) is indicated if any of the following is present:
  - No improvement after 10 days of appropriate antibiotic treatment.
    - Generally this will be amoxicillin/clavulanate, amoxicillin, cefdinir, cefuroxime, cefpodoxime, or ceftriaxone.
  - Recurrence of a treated infection within 8 weeks of effective treatment.
  - Chronic sinusitis (persistent residual URI symptoms for > 90 days).
  - Known or suspected fungal sinusitis.
  - Preoperative evaluation to assess surgical candidacy.

- CT sinuses with contrast (CPT® 70487) can be performed if any of the following is present:
  - Orbital or facial cellulitis.
  - Proptosis.
  - Abnormal visual examination.
  - Ophthalmoplegia.
  - Cystic fibrosis.
  - Immunocompromised individual.
  - Fungal or vascular lesions visualized in nasal cavity.

- CT Head with contrast (CPT® 70460) or MRI Brain without and with contrast (CPT® 70553) is indicated if any of the following are present:
  - Focal neurologic findings.
  - Altered mental status.
  - Seizures.

- Repeat sinus imaging is generally not indicated for individuals who have responded satisfactorily to treatment, but can be approved with clear documentation of the need for updated CT results to direct acute individual care decisions.
  - These cases should be forwarded for medical director review.
**PEDHD-5.3: Stereotactic CT Localization (CPT® 77011)**

Stereotactic CT localization is frequently obtained prior to sinus surgery. The dataset is then loaded into the navigational workstation in the operating room for use during the surgical procedure. The information provides exact positioning of surgical instruments with regard to the individual’s 3D CT images. In most cases, the preoperative CT is a technical-only service that does not require interpretation by a radiologist.

- The imaging facility should report CPT® 77011 when performing a scan not requiring interpretation by a radiologist.
- If a diagnostic scan is performed and interpreted by a radiologist, the appropriate diagnostic CT code (e.g. CPT® 70486) should be used.
- It is not appropriate to report both CPT® 70486 and CPT® 77011 for the same CT stereotactic localization imaging session.
- 3D Rendering (codes CPT® 76376 or CPT® 76377) should not be reported in conjunction with CPT® 77011 (or CPT® 70486 if used). The procedure inherently generates a 3D dataset.
- Such operative studies are indicated when ordered by the operating surgeon for this purpose.

**PEDHD-5.4: Requests for both Head and Sinus Imaging**

- Head CT does not visualize all of the sinuses.
- Head MRI provides excellent visualization of the sinuses sufficient to recognize sinusitis, and addition of sinus CT for this purpose is unnecessary.
- In individuals being evaluated for potential sinus surgery, separate sinus CT is often appropriate even after a head MRI in order to visualize obstructions to spontaneous mucous flow. See **PEDHD-5.3: Stereotactic CT Localization (CPT® 77011)**.
- Separate head imaging is not generally indicated in individuals with a normal neurological examination who have headaches associated with sinus symptoms.
- Sinus CT or MRI is not indicated for the evaluation of headaches or neurological complaints without a more specific indication pointing to a sinus etiology.

**PEDHD-5.5: Allergic Rhinitis**

- Advanced imaging is not indicated for diagnosis or management of individuals with uncomplicated allergic rhinitis.

**PEDHD-5.6: Other Indications for Sinus Imaging**

See **PEDHD-4.2: Facial Trauma** for imaging guidelines in trauma.

- CT without contrast (CPT® 70486) - Congenital anomalies of facial structures.
- 3-D CT reconstructed images (CPT® 76377) in conjunction with routine CT should be an integral part of the examination in evaluating craniofacial abnormalities.
- CT without and with contrast (CPT® 70488) or MRI Orbits/Face/Neck without and with contrast (CPT® 70543) - Tumors or other disorders of facial structures.
- Obstructive sleep apnea—See **PEDHD-24: Pediatric Sleep Disorders** for imaging guidelines.
References
PEDHD-6: Epilepsy and Other Seizure Disorders

| PEDHD-6: Epilepsy and Other Seizure Disorders | 22 |
| PEDHD-6.1: Initial Imaging of Non-Febrile Seizures | 22 |
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| PEDHD-6.4: Febrile Seizures | 23 |
PEDHD-6: Epilepsy and Other Seizure Disorders

A recent (within 60 days) face to face evaluation including a detailed history, physical examination with a thorough neurologic examination, and appropriate laboratory studies should be performed prior to considering the use of an advanced imaging (CT, MR, Nuclear Medicine) procedure. An exception can be made if the individual is undergoing guideline-supported, scheduled follow-up imaging evaluation. This clinical evaluation should also include family history and (whenever possible) the accounts of eyewitnesses to the event(s).

PEDHD-6.1: Initial Imaging of Non-Febrile Seizures

- MRI Brain without contrast (CPT® 70551) or without and with contrast (CPT® 70553) is indicated for the following:
  - First-time seizure in child ≥ 12 months of age that has no known cause and is not associated with fever.
  - Partial seizures.
  - Focal neurologic deficits.
  - Inconclusive findings on recent cranial ultrasound or CT Head.
    - If individual meets criteria for MRI imaging for initial imaging of non-febrile seizure, MRI is approvable even with a recent negative CT.
  - Individuals requiring sedation should generally not have non-contrast MRI studies. See PEDHD-1.3: Pediatric Head Imaging Modality General Considerations.

- CT Head without contrast (CPT® 70450) is indicated for the following:
  - First-time seizure in child associated with recent head trauma.
  - Individual cannot safely undergo MRI (avoidance of sedation is not an indication).

- Cranial ultrasound (CPT® 76506) is indicated for the following:
  - First-time seizure in child < 12 months of age that has no known cause and is not associated with fever if the infant has an open fontanelle.

- The following imaging tests do not generally add valuable information initially and are not indicated for the initial evaluation of seizures in children:
  - CTA Head or Neck.
  - MRA Head or Neck.
  - MRI Cervical, Thoracic, or Lumbar Spine.

PEDHD-6.2: Repeat imaging indications

- Repeat MRI Brain without contrast (CPT® 70551) or without and with contrast (CPT® 70553) is indicated for the following:
  - Need to perform MRI using Epilepsy Protocol (typically 3T magnet with thin section angled slices through hippocampus and temporal lobes, either without or without and with contrast).
  - New or worsening focal neurologic deficits.
  - Increase in severity or frequency of seizures despite documented therapeutic antiepileptic drug levels.
  - Change in seizure type.
  - Preoperative evaluation for epilepsy surgery.
Individuals requiring sedation should generally not have non-contrast MRI studies. See PEDHD-1.3: Pediatric Head Imaging Modality General Considerations.

PEDHD-6.3: Special Imaging Studies in Evaluation for Epilepsy Surgery

For individuals with a previous brain MRI and documentation of intractable epilepsy for which surgical treatment or another interventional modality is under active consideration, ANY of the following are indicated for preoperative planning:

- These cases should be forwarded for medical director review
- PET Brain Metabolic (CPT® 78608 or CPT® 78609).
- Functional MRI Brain (CPT® 70554 or CPT® 70555).
- MR Spectroscopy (CPT® 76390).

PEDHD-6.4: Febrile Seizures

A typical febrile seizure is a generalized seizure occurring in the presence of fever ($T > 100.4^\circ F$) and no central nervous system infection in a child between the age of 6 months and 5 years.

- Neuroimaging should not be performed in the routine evaluation of children with simple febrile seizures.
- MRI Brain without contrast (CPT® 70551) or without and with contrast (CPT® 70553) is indicated for febrile seizures in the presence of one or more of the following:
  - Seizure lasting $> 15$ minutes.
  - Partial seizures.
  - Focal neurologic deficits.
  - Multiple seizures within 24 hours.
  - Macrocephaly.
  - Signs and symptoms of increased intracranial pressure.
References


PEDHD-7: Macrocephaly, Microcephaly, and Hydrocephalus

PEDHD-7.1: Macrocephaly  26
PEDHD-7.2: Microcephaly  26
PEDHD-7.3: Hydrocephalus  26
PEDHD-7.1: Macrocephaly
Macrocephaly is defined as head circumference that is greater than the 95th percentile for age and sex, established by use of measurements and CDC growth charts. An online calculator to determine head circumference percentile is available at: http://www.infantchart.com/cdc0to3headforage.php.

Birth to age 12 months:
- Ultrasound of the head (CPT® 76506) is indicated initially in individuals with an open fontanelle.
- CT Head without contrast (CPT® 70450) is indicated if hydrocephalus or hemorrhage is present on ultrasound.
- MRI Brain without and with contrast (CPT® 70553) is indicated for any abnormality seen on ultrasound.

Age 13 months and older:
- MRI Brain without and with contrast (CPT® 70553) is indicated.
- CT is generally not indicated in this age group since uncomplicated hydrocephalus is less likely after early infancy.

PEDHD-7.2: Microcephaly
- Microcephaly is defined as head circumference that is less than the 5th percentile for age and sex, established by use of measurements and CDC growth charts. An online calculator to determine head circumference percentile is available at: http://www.infantchart.com/cdc0to3headforage.php.
- MRI Brain without and with contrast (CPT® 70553) is indicated for all individuals.
  - CT is generally not recommended as that modality lacks the sensitivity to detect the relevant anatomical abnormalities.

PEDHD-7.3: Hydrocephalus
- This is the most common identifiable cause of macrocephaly. Almost all hydrocephalus is obstructive, except hydrocephalus due to choroid plexus papillomas. See PEDONC-4.13: Choroid Plexus Tumors for imaging guidelines for those lesions.
- Hydrocephalus is traditionally divided into non-communicating (the obstruction lies within the course of the brain’s ventricular system) and communicating (the obstruction is distal to the ventricular system).
- Individuals requiring sedation should generally not have non-contrast MRI studies. See PEDHD-1.3: Pediatric Head Imaging Modality General Considerations.
**Initial Imaging Indications**

**Age 0-6 months:**
- Screening head ultrasound examination
- MRI Brain without and with contrast (CPT® 70553) is indicated if ultrasound shows hydrocephalus.
- Serial US (CPT® 76506) can be used to monitor ventricular size to determine need and timing of placement of a ventricular catheter.

**Greater than 6 months old:**
- MRI Brain without and with contrast (CPT® 70553) is indicated.

**Spine imaging:**
- MRI Spine without and with contrast (CPT® 72156, CPT® 72157, and CPT® 72158) may be indicated in individuals with Chiari malformation (multiple spine segments), Dandy-Walker malformation (cervical spine only), or malignant infiltration of the meninges.

**Repeat Imaging Indications**
- Rapid MRI Brain without contrast (CPT® 70551) or CT Head without contrast (CPT® 70450) is indicated for any new signs or symptoms suggesting shunt malfunction, including (but not limited to) sepsis, decreased level of consciousness, protracted vomiting, visual or neurologic deterioration, decline of mentation after initial improvement, or new or changing pattern of seizures. Rapid MRI Brain without contrast (CPT® 70551) or CT Head without contrast (CPT® 70450) is indicated following shunt placement and then every 12 months for individuals with stable clinical findings.
  - Rapid MRI provides more anatomical detail and does not involve radiation exposure, but many providers use head CT as rapid MRI is not universally available.
  - For routine follow up imaging with CT a low dose protocol should be used.
- Shunting into the peritoneum (VP shunts) can give rise to abdominal complications, but these are generally symptomatic, so surveillance imaging of the abdomen is not indicated.
  - Abdominal ultrasound (CPT® 76700) can be approved for suspicion of CSF pseudocyst formation or distal shunt outlet obstruction.
- Familial screening is not indicated for hydrocephalus except in siblings of individuals with aqueductal stenosis, for whom a one-time CT Head without contrast (CPT® 70450) or Rapid MRI Brain without contrast (CPT® 70551) is indicated.
Additional Rarely Used Studies

- Cisternogram (CPT® 78630) is rarely done in children but can be approved for the following:
  - Known hydrocephalus with worsening symptoms.
  - Suspected obstructive hydrocephalus.
  - Suspected normal pressure hydrocephalus with gait disturbance and either dementia or urinary incontinence.

- Cerebrospinal Ventriculography (CPT® 78635) is rarely done in children but can be approved for the following:
  - Evaluation of internal shunt, porencephalic cyst, or posterior fossa cyst.

- Nuclear Medicine Shunt Evaluation (CPT® 78645) and CSF Flow SPECT (CPT® 78647) are rarely done in children but can be approved for the following:
  - Suspected malfunction of ventriculoperitoneal, ventriculopleural, or ventriculovenous shunts.

References


PEDHD-8.1: Imaging

Craniosynostosis is the premature closure of one or more cranial sutures, usually during infancy. Abnormal head shape is the common clinical feature.

- CT head without contrast (CPT® 70450) is indicated in the diagnosis of craniosynostosis.
- 3D rendering (CPT® 76377) is indicated with the initial diagnostic CT to evaluate the extent of synostosis and determine surgical candidacy or for preoperative planning.
- CT Maxillofacial (CPT® 70486) and CT Orbits (CPT® 70480) without contrast are generally not necessary to evaluate individuals with craniosynostosis but are indicated if the craniosynostosis is part of a larger congenital defect which also involves the bones of the face or orbit.
- Head Ultrasonography (CPT® 76506) is an alternative method of assessing sutural patency in neonates and infants when radiographs are indeterminate.
- CT head without contrast (CPT® 70450) may be performed postoperatively at the discretion of the specialist coordinating the individual’s care.

References
## PEDHD-9: Chiari and Skull Base Malformations

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**PEDHD-9.1: Chiari I Malformations**

- MRI Brain without contrast (CPT® 70551) or without and with contrast (CPT® 70553) and MRI of the entire spine without contrast (CPT® 72141, CPT® 72146, CPT® 72148) or without and with contrast (CPT® 72156, CPT® 72157, CPT® 72158) is indicated for initial evaluation.
  - Individuals requiring sedation should generally not have non-contrast MRI studies. See PEDHD-1.3: Pediatric Head Imaging Modality General Considerations.
- Repeat MRI Brain without contrast (CPT® 70551) or without and with contrast (CPT® 70553) is indicated for individuals with a known Chiari I malformation when any of the following are present:
  - There are new or worsening signs or symptoms documented on a physical examination within 60 days of the imaging request.
  - A surgical procedure is actively being considered.
- Repeat MRI Spine imaging is not indicated for individuals with normal initial spine imaging unless there are new or worsening signs or symptoms that suggest spinal cord pathology documented on a physical examination within 60 days of the imaging request.
  - These cases should be forwarded for medical director review.
- Repeat brain and spine imaging in individuals with Chiari I malformations and known syringomyelia or hydromyelia is highly individualized and is indicated at the discretion of the specialist coordinating the individual’s care for this condition.
  - These cases should be forwarded for medical director review.
- Familial screening is not indicated for Chiari I Malformations.

**Background and Supporting Information**

This is the most common, involving caudal displacement or herniation of the cerebellar tonsils. Chiari I is often associated with syringomyelia, and rarely with hydrocephalus. Most cases are asymptomatic and discovered incidentally on a head scan performed for another indication. When symptoms are present, they are usually nonspecific but can include headache, lower cranial nerve palsies or sleep apnea.

**PEDHD-9.2: Chiari II Malformations**

- Ultrasound is the initial examination in infants to determine ventricular size and associated anomalies and to provide a baseline for follow up evaluation.
- MRI Brain without and with contrast (CPT® 70553) and MRI of the entire spine without and with contrast (CPT® 72156, CPT® 72157, CPT® 72158) is indicated for initial advance imaging evaluation.
- Repeat brain and spine imaging in individuals with Chiari II malformations is highly individualized and is indicated at the discretion of the specialist coordinating the individual’s care for this condition.
  - These cases should be forwarded for medical director review.
- Familial screening is not indicated for Chiari II Malformations.
**Background and Supporting Information**
These malformations are less common and more severe than Chiari I malformations. These individuals usually present at birth. Myelomeningocele is always present, and syringomyelia and hydrocephalus are extremely common.

**PEDHD-9.3: Chiari III and IV Malformations**
- Repeat brain and spine imaging in individuals with Chiari III and IV malformations is highly individualized and is indicated at the discretion of the specialist coordinating the individual's care for this condition.
  - These cases should be forwarded for medical director review.
- Familial screening is not indicated for Chiari III or IV Malformations.

**Background and Supporting Information**
Chiari III malformation includes cerebellar herniation into a high cervical myelomeningocele. Chiari IV malformation refers to complete cerebellar agenesis. Both Chiari III and IV malformations are noted at birth, and are rarely compatible with life.

**PEDHD-9.4: Basilar Impression**
- MRI Brain (CPT® 70551) and cervical spine (CPT® 72141) without contrast are indicated.
- CT Head (CPT® 70450) and cervical spine (CPT® 72125) without contrast are also indicated if surgery is being considered.
- Basilar impression appears to be genetic, and one-time screening of first-degree relatives with MRI Brain without contrast (CPT® 70551) can be approved.

**Background and Supporting Information**
Basilar impression involves malformation of the occipital bone in relation to C1/2 (cervical vertebrae 1 and 2). The top of the spinal cord is inside the posterior fossa and the foramen magnum is undersized. Over time, this can lead to brain stem and upper spinal cord compression. Basilar impression can also be associated with the Chiari malformation, producing very complex anatomical abnormalities.

**PEDHD-9.5: Platybasia**
- MRI Brain without contrast (CPT® 70551) or CT Head without contrast (CPT® 70450) is indicated to establish a positive diagnosis, individuals are usually asymptomatic.

**Background and Supporting Information**
Platybasia is a flattening malformation of the skull base, in which the clivus has a horizontal orientation.
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PEDHD-10.1: Pediatric Intracranial Aneurysms

Unlike adults, the majority of pediatric aneurysms are caused by genetic or developmental defects rather than environmental or lifestyle factors.

Pediatric aneurysms most commonly present with subarachnoid hemorrhage, headache, increased intracranial pressure, seizure activity, or focal neurologic findings.

- A recent (within 60 days) face to face evaluation including a detailed history, physical examination with a thorough neurologic examination, and appropriate laboratory studies should be performed prior to considering advanced imaging, unless the individual is undergoing guideline-supported scheduled follow-up imaging evaluation.

- CT Head without contrast (CPT® 70450) or MRI Brain without contrast (CPT® 70551) is indicated as an initial study for individuals presenting with suspected subarachnoid hemorrhage.
  - CTA Head (CPT® 70496) or MRA Head without contrast (CPT® 70544) is indicated if subarachnoid hemorrhage is present on CT or MRI, or lumbar puncture findings suggest hemorrhage.

- MRI without and with contrast (CPT® 70553) is indicated as an initial study for individuals presenting with headache, increased intracranial pressure, seizures, or focal neurologic findings.
  - CTA Head (CPT® 70496) or MRA Head without contrast (CPT® 70544) is indicated if findings suspicious for intracranial aneurysm are present on MRI.

- MRI without contrast (CPT® 70551) or without and with contrast (CPT® 70553) and MRA Head without contrast (CPT® 70544) are indicated for individuals with known unruptured aneurysm presenting with headache, increased intracranial pressure, seizures, or focal neurologic findings.

- MRI without contrast (CPT® 70551) or without and with contrast (CPT® 70553) and MRA Head without contrast (CPT® 70544) are indicated for individuals with any of the following conditions and headache, increased intracranial pressure, seizures, or focal neurologic findings:
  - Polycystic kidney disease.
  - Fibromuscular dysplasia.
  - Ehlers-Danlos Syndrome.
  - Klippel-Trenaunay-Weber Syndrome.
  - Tuberous Sclerosis.
  - Moyamoya Syndrome.
  - Hereditary Hemorrhagic Telangiectasia (Osler-Weber-Rendu Syndrome).
  - Pseudoxanthoma elasticum.
  - Neurofibromatosis type 1.
  - Individuals requiring sedation should generally not have non-contrast MRI studies. See PEDHD-1.3: Pediatric Head Imaging Modality General Considerations.

- The timing of follow-up imaging for intracranial aneurysms in children is similar to that in adults. See HD-12.1: Intracranial Aneurysms for follow-up imaging guidelines.
Screening MRI Brain or MRA Head for aneurysms is not supported in asymptomatic individuals under age 20 since only 0.6% of ruptured aneurysms occur in the pediatric age range.

Screening MRI Brain or MRA Head for aneurysms is not supported in individuals with coarctation of the aorta repaired before age 3 since there is not an increased risk for intracranial aneurysm in this individual population.

**PEDHD-10.2: Pediatric Intracranial Arteriovenous Malformations (AVM)**

A recent (within 60 days) face to face evaluation including a detailed history, physical examination with a thorough neurologic examination, and appropriate laboratory studies should be performed prior to considering advanced imaging, unless the individual is undergoing guideline-supported scheduled follow-up imaging evaluation.

Head ultrasound (CPT® 76506) is the study of choice for evaluation of a suspected vein of Galen malformation in the neonate. Once confirmed, MRI or conventional angiography are required to precisely identify the feeding arteries and draining vein, especially if embolization is planned.

MRA or CTA are indicated for diagnosis of low flow malformations.

- MRI Brain without and with contrast (CPT® 70553) is the initial study of choice for evaluation of suspected AVM after the neonate period.
  - Individuals requiring sedation should generally not have non-contrast MRI studies. See **PEDHD-1.3: Pediatric Head Imaging Modality General Considerations**.
  - MRA, CTA, or CT are generally not indicated prior to completion of initial MRI.

- MRI Brain without contrast (CPT® 70551) or without and with contrast (CPT® 70553), and MRA Brain (CPT® 70544) or CTA Head (CPT® 70496) are indicated in the following circumstances for individuals with known AVM:
  - New or worsening headaches, seizures, or focal neurologic symptoms.
  - Preoperative planning (including embolization).

Head imaging for AVM screening is indicated for the following conditions:

- Hereditary Hemorrhagic Telangiectasia (Osler-Weber-Rendu Syndrome).
  - MRI Brain without and with contrast (CPT® 70553) is indicated as an initial screening study for infants born to a parent with known HHT.
  - MRI Brain without and with contrast (CPT® 70553) at the time of diagnosis, and a single repeat study after the age of 20.
  - Ongoing surveillance imaging is not indicated for individuals without new or worsening symptoms.
  - Repeat MRI alone or with MRA or CTA (as above) is indicated for clinical signs or symptoms concerning for progression in an individual with a known AVM.

- Capillary Malformation-Arteriovenous Malformation (CM-AVM)
  - Caused by RASA1 mutations.
  - MRI Brain without and with contrast (CPT® 70553) at the time of diagnosis.
- Ongoing surveillance imaging is not indicated for individuals without new or worsening symptoms.
- Repeat MRI alone or with MRA or CTA (as above) is indicated for clinical signs or symptoms concerning for progression in an individual with a known AVM.
- See **PEDPVD-2: Vascular Anomalies**.
  - Sturge-Weber Syndrome:
    - MRI Brain without and with contrast (CPT® 70553) and MRI Face/Neck (CPT® 70543) at the time of diagnosis.
    - Ongoing surveillance imaging is not indicated for individuals without new or worsening symptoms.
    - Repeat MRI alone or with MRA or CTA (as above) is indicated for clinical signs or symptoms concerning for progression in an individual with a known AVM.
  - Cerebral Cavernous Malformations:
    - Also known as cavernomas, cavernous angiomas, or cryptic vascular malformations.
    - MRI Brain without and with contrast (CPT® 70553) and MRI Cervical (CPT® 72156) and Thoracic (CPT® 72157) Spine without and with contrast at the time of diagnosis.
    - Ongoing surveillance imaging is not indicated for individuals without new or worsening symptoms.
    - Repeat MRI alone or with MRA or CTA (as above) is indicated for clinical signs or symptoms concerning for progression in an individual with a known AVM.

**Background and Supporting Information**

Most intracranial AVMs are congenital, vary widely in their location and type, and are discovered at birth due to associated clinical findings or incidentally later in life. Certain hereditary conditions are associated with an increased risk for AVM development.

Vascular malformations include arteriovenous, venous, cavernous, and capillary malformations. The vein of Galen malformation is the most common arteriovenous malformation, presenting in neonates with signs of high output congestive heart failure or later in infancy of childhood with signs of hydrocephalus. Low flow venous, cavernous, and capillary malformations may be asymptomatic and discovered incidentally or they may present in childhood with seizures or neurologic findings secondary to intracranial hemorrhage.


**PEDHD-11: Syncope**

Syncope in children is almost always neurocardiogenic (vasovagal) in nature. Intracranial mass lesions do not cause isolated syncope. Syncope and seizure activity can often be challenging to distinguish for unwitnessed syncope.

- Advanced imaging of the brain is not indicated for individuals with isolated syncope without focal neurologic findings. See PEDCD-5: Syncope and PEDHD-6: Epilepsy and Other Seizure Disorders for additional imaging considerations.

**References**

# PEDHD-12: Pediatric Stroke

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**PEDHD-12.1: General Considerations**
Imaging indications are the same for neonates as for older children.

**PEDHD-12.2: Pediatric Stroke Initial Imaging**

- CT Head without contrast (CPT® 70450) is generally the initial study indicated, as pediatric strokes may be hemorrhagic.
  - MRI Brain without contrast (CPT® 70551) can be performed in lieu of initial CT if emergently available for evaluation of acute stroke symptoms.
- After the initial study, ANY of the following studies are indicated for further evaluation of pediatric stroke:
  - MRI Brain without contrast (CPT® 70551) or without and with contrast (CPT® 70553).
  - MRA Head without contrast (CPT® 70544) and Neck with contrast (CPT® 70548).
  - CTA Head (CPT® 70496) and Neck (CPT® 70498).
  - These cases should be forwarded for medical director review.

**PEDHD-12.3: Pediatric Stroke Subsequent Imaging**

- MRI Brain without contrast (CPT® 70551) or without and with contrast (CPT® 70553) is indicated for any new or worsening neurological findings or seizure activity.
- Most pediatric individuals do not benefit from surveillance imaging after stroke, but specific surveillance imaging indications for specified conditions are listed in the disease-specific section.
  - MRI Brain without contrast (CPT® 70551) or without and with contrast (CPT® 70553).
  - These cases should be forwarded for medical director review.

**PEDHD-12.4: Moyamoya Disease**

**Initial imaging**
- MRI Brain without contrast (CPT® 70551) or without and with contrast (CPT® 70553)
- MRA Head (CPT® 70544) and Neck (CPT® 70548) are indicated for all individuals.
- Head and Neck CTA (CPT® 70496 and CPT® 70498) can be approved if MRI is contraindicated or not readily available.

**Repeat imaging**
- Head MRA (CPT® 70544) every 12 months. Head CTA (CPT® 70496) can be approved if MRI is contraindicated or not readily available.
- MRI Brain without contrast (CPT® 70551) every 12 months.
**PEDHD-12.5: Sickle Cell Disease**

- The following imaging is indicated for all sickle cell individuals with a severe phenotype (Hgb SS or Hgb Sβ0):
  - Transcranial Doppler Ultrasound (CPT® 93886 or CPT® 93888) annually for all individuals age 2 to 16.
    - A short interval repeat study is indicated for individuals with conditional (170-199 cm/sec) flow results.
    - MRI Brain without contrast (CPT® 70551) or without and with contrast (CPT® 70553) is indicated in individuals with persistent abnormal Transcranial Doppler.
  - Transcranial Doppler is not indicated for individuals with other phenotypes (Hgb SC, Hgb Sβ+).
  - Screening of asymptomatic sickle cell individuals with MRI or MRA is no longer recommended.⁶

**Background and Supporting Information**

Individuals with sickle cell disease are at significantly increased risk for stroke and silent infarction, beginning at a very young age. Recent advances allow physicians to identify individuals at high risk for stroke and begin a primary stroke prevention program.

**PEDHD-12.6: CNS Vasculitis and Stroke**

- MRI Brain without and with contrast is the recommended initial study for all individuals with vasculitis and suspected CNS involvement, whether primary or secondary.
  - A normal MRI Brain almost always completely excludes intracranial vasculitis.
  - MRA Head (contrast as requested) is indicated for inconclusive MRI findings suggesting medium or large vessel vasculitis.
  - Individuals with aggressive disease being treated with systemic therapy can have imaging approved for treatment response every 3 months during active treatment.
  - Annual surveillance imaging can be approved to detect progressive vascular damage that may require intervention.
References
## PEDHD-13: Benign Brain Lesions

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**PEDHD-13.1: Arachnoid Cysts**

Arachnoid cysts arise in the middle or posterior fossa, and the majority of lesions are discovered incidentally and do not require surgical intervention.

- MRI Brain without and with contrast (CPT® 70553) is indicated for initial evaluation of arachnoid cysts if not already completed.
- Repeat MRI Brain is not indicated for most individuals with arachnoid cysts, but can be approved for the following:
  - Annual MRI Brain without and with contrast (CPT® 70553) until age 4 if diagnosed at a younger age.
  - New or worsening headache or focal neurologic deficits suggesting progression of cyst.
  - Preoperative planning.

**PEDHD-13.2: Pineal Cysts**

Pineal cysts are generally discovered incidentally and do not require surgical intervention.

- MRI Brain without and with contrast (CPT® 70553) is indicated for initial evaluation of pineal cysts if not already completed.
- Repeat MRI Brain is not indicated for most individuals with pineal cysts, but can be approved for the following:
  - New or worsening headache or focal neurologic deficits suggesting progression of cyst.
  - Preoperative planning.

**PEDHD-13.3: Acoustic Neuromas**

See **PEDPND-2.2: Neurofibromatosis 2** for imaging guidelines in pediatric individuals.

**References**

PEDHD-14: Pediatric Demyelinating Diseases

PEDHD-14.1: General Considerations  48
PEDHD-14.2: Multiple Sclerosis (MS)  48
PEDHD-14.3: Acute Disseminated Encephalomyelitis (ADEM)  48
**PEDHD-14.1: General Considerations**

- MRI Brain without and with contrast (CPT® 70553) is the preferred imaging study for evaluation of pediatric demyelinating disease.
  - MRI of the spinal cord (CPT® 72156 and CPT® 72157) without and with contrast is also indicated for evaluation of pediatric demyelinating disease.
  - MRI of the lumbar spine (CPT® 72158) is not indicated unless the individual has a tethered cord or other anatomic abnormality causing caudal displacement of the filum terminalis.
- CT imaging is generally not indicated in the evaluation of demyelinating disease.
- PET Brain (CPT® 78608 and CPT® 78609) and MR spectroscopy (CPT® 76390) are considered investigational for evaluation of pediatric demyelinating diseases.

**PEDHD-14.2: Multiple Sclerosis (MS)**

- MRI (CPT® 70553) Brain and spinal cord (CPT® 72156 and CPT® 72157) without and with contrast is indicated for initial diagnosis in individuals with clinical signs and/or symptoms suggestive of MS.
  - MRI (CPT® 70551) Brain and spinal cord (CPT® 72141 and CPT® 72146) without contrast can be approved if there is a contraindication to gadolinium administration.
- MRI (CPT® 70553) Brain and spinal cord (CPT® 72156 and CPT® 72157) without and with contrast is indicated every 6 months for disease monitoring.
  - MRI (CPT® 70551) Brain and spinal cord (CPT® 72141 and CPT® 72146) without contrast can be approved if there is a contraindication to gadolinium.

**Background and Supporting Information**

Multiple sclerosis is less common in children. About 4 % of MS cases are diagnosed before age 18, and only ~0.7 % of all MS cases begin before age 10.

Ataxia, optic neuritis, diplopia, and transverse myelitis are common presentations. MS can present as an acute encephalitis-like illness, especially in childhood.

Among children with suspected demyelinating diseases, the principal differential diagnosis is often between MS and acute disseminated encephalomyelitis.

**PEDHD-14.3: Acute Disseminated Encephalomyelitis (ADEM)**

- MRI (CPT® 70553) Brain and spinal cord (CPT® 72156 and CPT® 72157) without and with contrast is indicated for initial diagnosis in individuals with clinical signs and/or symptoms suggestive of ADEM.
  - MRI (CPT® 70551) Brain and spinal cord (CPT® 72141 and CPT® 72146) without contrast can be approved if there is a contraindication to gadolinium.
- MRI (CPT® 70553) Brain and spinal cord (CPT® 72156 and CPT® 72157) without and with contrast is indicated every 3 months for 1 year following diagnosis.
  - MRI (CPT® 70551) Brain and spinal cord (CPT® 72141 and CPT® 72146) without contrast can be approved if there is a contraindication to gadolinium.
Most individuals will have complete clinical recovery by 12 months, while stable MRI abnormalities (gliosis) may persist. These findings do not require additional imaging unless the individual develops new neurologic symptoms.

Background and Supporting Information

ADEM has an acute onset, and is more common among younger children than MS, but the signs and symptoms overlap significantly, and distinguishing between MS and ADEM can be challenging based on clinical examination alone.

References
## PEDHD-15: Pituitary Dysfunction

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PEDHD-15.1: General Considerations

- The initial step in the evaluation of all potential pituitary masses is a detailed history, recent physical examination, and thorough neurological exam, including evaluation of the visual fields.
- Endocrine laboratory studies should be performed prior to considering advanced imaging.
- MRI Brain without and with contrast (CPT® 70553) when pituitary imaging is indicated.
  - One study (either brain MRI [CPT® 70553] or MRI Orbit, Face, Neck [CPT® 70543]) is adequate to image the pituitary. The ordering physician should specify that the study is specifically to evaluate the pituitary gland. The reporting of two CPT® codes, to image the pituitary, is not indicated.

PEDHD-15.2: Panhypopituitarism

Endocrine testing should be performed initially.

- MRI Brain without and with contrast (CPT® 70553) with special attention to the pituitary is indicated for newly diagnosed Panhypopituitarism.
- Individuals with a normal pituitary on initial MRI do not need routine follow up imaging.
- Individuals with mass lesions should have follow up imaging according to the guidelines for the specific diagnosis.

PEDHD-15.3: Isolated Growth Hormone Deficiency

Endocrine testing should be performed initially. For isolated growth hormone deficiency, two measurements of growth hormone with different stimulation agents are performed.

- MRI Brain without and with contrast (CPT® 70553) with special attention to the pituitary is indicated for newly diagnosed isolated growth hormone deficiency.
- Individuals with a normal pituitary on initial MRI do not need routine follow up imaging.
- Individuals with mass lesions should have follow up imaging according to the guidelines for the specific diagnosis.
PEDHD-15.4: Diabetes Insipidus (DI) and Other Disorders of Anti-Diuretic Hormone

Central Diabetes Insipidus (DI)

- MRI Brain without and with contrast (CPT® 70553) is indicated for newly diagnosed central DI.
- Head CT without contrast (CPT® 70450) with attention to the skull base may be approved with history of recent significant head trauma.
- Individuals with a normal pituitary on initial MRI can have repeat MRI without and with contrast (CPT® 70553) every 12 months as germinomas may cause central DI while still too small to detect on imaging.
  - Serial measurement of β-hCG is also indicated for these individuals, and MRI should be repeated if a significant rise in β-hCG is detected on screening. as this may suggest an evolving intracranial germ cell tumor.
- Individuals with mass lesions should have follow up imaging according to the guidelines for the specific diagnosis.

Nephrogenic DI

- Once this diagnosis is firmly established, further advanced imaging is usually not indicated.

Syndrome of Inappropriate Antidiuretic Hormone Secretion (SIADH)

Laboratory studies should be obtained prior to considering advanced imaging—urine osmolality should be high and serum osmolality low.

- MRI Brain without and with contrast (CPT® 70553) is indicated for initial evaluation of unexplained central SIADH.
- Individuals with a normal pituitary on initial MRI do not need routine follow up imaging.
- Individuals with mass lesions should have follow up imaging according to the guidelines for the specific diagnosis.

Background and Supporting Information

The principal evaluation of ADH deficiency is by urine and blood electrolyte and osmolality testing - serum osmolality greater than 300 with urine osmolality less than 300. Deficiencies in ADH can either be central or nephrogenic.
**PEDHD-15.5: Precocious Puberty**

When precocious puberty is documented on physical examination, endocrine lab studies are not necessary prior to advanced imaging.

- MRI Brain without and with contrast (CPT® 70553) is indicated for initial evaluation of any child with documented precocious puberty, following ultrasound of the abdomen (CPT® 76700) in both genders and ultrasound of the pelvis (CPT® 76856) in girls.
- Individuals with a normal pituitary on initial MRI do not need routine follow up imaging.
- Individuals with mass lesions should have follow up imaging according to the guidelines for the specific diagnosis.

**Background and Supporting Information**

Defined as the appearance of secondary sexual characteristics before age 8 in girls and before age 9 in boys.

**PEDHD-15.6: Benign Pituitary Tumors**

- Benign pituitary tumor indications in pediatric individuals are identical to those for adult individuals. See **HD-19: Pituitary** for imaging guidelines.

**PEDHD-15.7: Pituitary Malignancies**

See PEDONC-4.10: Craniopharyngioma and Pituitary Tumors or PEDONC-18: Histiocytic Disorders for imaging guidelines

**References**

## PEDHD-16: Pediatric Ear Disorders

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PEDHD-16.1: Hearing Loss

A recent (within 60 days) face to face evaluation including a detailed history, physical examination (including otoscopic examination), and age-appropriate audiology testing should be performed on any child with known or suspected hearing loss prior to considering advanced imaging. The selection of imaging testing will depend on the age of the child and type of hearing loss.

- Temporal bone CT without contrast (CPT® 70480) is indicated for the following:
  - Conductive hearing loss of any cause.
  - Preoperative planning for resection of mass lesion or cochlear implant placement.
  - Sensorineural hearing loss in individuals who cannot safely undergo MRI.
  - Mixed conductive and sensorineural hearing loss.
  - Congenital hearing loss.
  - Total deafness.

- MRI Brain without and with contrast (CPT® 70553) with attention to internal auditory canals (included in CPT® 70553 and does not require a separate CPT code) is indicated for the following:
  - Conductive hearing loss secondary to known or suspected mass lesion.
  - Preoperative planning for resection of mass lesion or cochlear implant placement.
  - Sensorineural hearing loss of any cause.
  - Mixed conductive and sensorineural hearing loss.
  - Congenital hearing loss.
  - Total deafness.
  - Hearing loss associated with tinnitus.
  - Hearing Loss associated with Vertigo/Dizziness.
  - Individuals requiring sedation should generally not have non-contrast MRI studies. See PEDHD-1.3: Pediatric Head Imaging Modality General Considerations.
**PEDHD-16.2: Ear Pain**

A recent (within 60 days) face to face evaluation including a detailed history, physical examination (including otoscopic examination), should be performed on any child with ear pain prior to considering advanced imaging. Common causes of ear pain include external and middle ear infections, dental problems, sinus infection, mastoid infection, neck problems, tonsillitis, and pharyngitis.

- Advanced imaging is not indicated in the overwhelming majority of pediatric individuals with ear pain.
- CT scan temporal bone without contrast (CPT® 70480) or without and with contrast (CPT® 70482), OR, MRI Brain without and with contrast with attention to internal auditory canals (CPT® 70553), OR MRI Orbits/Face/Neck without and with contrast (CPT® 70543) is indicated for the following:
  - Persistent ear pain without obvious cause.
  - Clinical suspicion for complicated or invasive infection such as mastoiditis.
  - Clinical suspicion of mass lesion causing ear pain.
  - Significant trauma with concern for hematoma formation.
  - Preoperative planning.
  - Individuals requiring sedation should generally not have non-contrast MRI studies. See PEDHD-1.3: Pediatric Head Imaging Modality General Considerations.

**PEDHD-16.3: Cholesteatoma**

- CT Temporal Bone without contrast (CPT® 70480) or without and with contrast (CPT® 70482), OR MRI Brain without and with contrast with attention to internal auditory canals (CPT® 70553), OR MRI Orbits/Face/Neck without and with contrast (CPT® 70543) is indicated for preoperative evaluation in cholesteatoma individuals.
- CT Temporal Bone without contrast (CPT® 70480) or without and with contrast (CPT® 70482), OR MRI Brain without and with contrast with attention to internal auditory canals (CPT® 70553), OR MRI Orbits/Face/Neck without and with contrast (CPT® 70543) is indicated one time post-operatively to exclude residual or regrown cholesteatoma to avoid the need for a second-look surgery.
  - Individuals requiring sedation should generally not have non-contrast MRI studies. See PEDHD-1.3: Pediatric Head Imaging Modality General Considerations.

**Background and Supporting Information**

Cholesteatomas are expansive cysts of the middle ear filled with cellular debris. They can be congenital or arise from recurrent middle ear infections or trauma to the tympanic membrane. Hearing loss is usually conductive, although if the lesion is large enough combined conductive and sensorineural hearing loss may be present. Otoscopic exam findings and symptoms may include painless drainage from the ear or chronic/recurrent ear infections.
**PEDHD-16.4: Vertigo**

A recent (within 60 days) face-to-face evaluation including a detailed history, physical examination (including otoscopic examination), should be performed on any child with vertigo prior to considering advanced imaging.

- If physical examination is otherwise normal and the vertigo responds to treatment, advanced imaging is not indicated.
- MRI Brain without and with contrast with attention to internal auditory canals (CPT® 70553) is indicated for the following:
  - Vertigo with associated headache or ataxia.
  - Vertigo associated with tinnitus and/or hearing loss.
  - Vertigo that does not respond to vestibular treatment.
  - Individuals requiring sedation should generally not have non-contrast MRI studies. See **PEDHD-1.3: Pediatric Head Imaging Modality General Considerations**.

**Background and Supporting Information**

Isolated vertigo is an uncommon complaint during childhood. Middle ear/Eustachian tube problems are the most common cause of isolated vertigo in children.

**PEDHD-16.5: Tinnitus**

Children with hearing loss and tinnitus should be imaged according to **PEDHD-16.1: Hearing Loss**. A recent (within 60 days) face-to-face evaluation including a detailed history, physical examination (including otoscopic examination), and age-appropriate audiology testing should be performed on any child with known or suspected tinnitus prior to considering advanced imaging.

- Advanced imaging is not indicated in the overwhelming majority of pediatric individuals with isolated tinnitus and normal hearing.
- CT scan temporal bone without contrast (CPT® 70480) or without and with contrast (CPT® 70482), OR MRI Brain without and with contrast with attention to internal auditory canals (CPT® 70553), OR MRI Orbits/Face/Neck without and with contrast (CPT® 70543) is indicated for the following:
  - Clinical suspicion of mass lesion causing tinnitus.
  - Persistent tinnitus after recent significant trauma.
  - Persistent unilateral tinnitus.
  - Individuals requiring sedation should generally not have non-contrast MRI studies. See **PEDHD-1.3: Pediatric Head Imaging Modality General Considerations**.

**Background and Supporting Information**

Tinnitus without hearing loss is a less common complaint during childhood.
References
**PEDHD-17: Autism Spectrum Disorders**

The group of diagnoses, including Asperger syndrome, are classified as pervasive development disorders (PDD). These diagnoses are established on clinical criteria, and no imaging study can confirm the diagnosis.

Comprehensive evaluation for autism might include history, physical exam, audiology evaluation, speech, language, and communication assessment, cognitive and behavioral assessments, and academic assessment.

- MRI Brain without and with contrast (CPT® 70553) is indicated for new or worsening focal neurologic findings documented on a physical examination within 60 days of the imaging request.
  - Individuals requiring sedation should generally not have non-contrast MRI studies. See **PEDHD-1.3: Pediatric Head Imaging Modality General Considerations**.
- PET imaging is considered investigational in the evaluation of individuals with autism spectrum disorders.

**References**

PEDHD-18: Behavioral and Psychiatric Disorders

- Behavioral and psychiatric disorders of childhood or adolescence generally require no advanced imaging for diagnosis or management.
  - MRI Brain without and with contrast (CPT® 70553) is indicated for new or worsening focal neurologic findings documented on a physical examination within 60 days of the imaging request.
    - Individuals requiring sedation should generally not have non-contrast MRI studies. See PEDHD-1.3: Pediatric Head Imaging Modality General Considerations.

References
PEDHD-19: Intellectual Disability, Cerebral Palsy, and Developmental Motor Delay

PEDHD-19.1: Intellectual Disability 62
PEDHD-19.2: Cerebral Palsy 62
PEDHD-19.3: Developmental Motor Delay 62
**PEDHD-19.1: Intellectual Disability**

- Brain MRI without and with contrast (CPT® 70553) is indicated for new or worsening focal neurologic findings documented on a physical examination within 60 days of the imaging request.

- Individuals requiring sedation should generally not have non-contrast MRI studies. See **PEDHD-1.3: Pediatric Head Imaging Modality General Considerations**.

*Background and Supporting Information*

Intellectual disability was formerly known as mental retardation, and may be primary or secondary to a variety of heterogeneous disorders.

**PEDHD-19.2: Cerebral Palsy**

Cerebral palsy is a static motor encephalopathy caused by a variety of entities spanning developmental, metabolic, genetic, infectious, ischemic, and other acquired etiologies.

- Brain MRI without and with contrast (CPT® 70553) is indicated for:
  - Initial evaluation of newly diagnosed cerebral palsy.
  - New or worsening focal neurologic findings documented on a physical examination within 60 days of the imaging request, including the presence of developmental delay.
  - Individuals requiring sedation should generally not have non-contrast MRI studies. See **PEDHD-1.3: Pediatric Head Imaging Modality General Considerations**.

*Background and Supporting Information*

Many individuals with intellectual disability also have cerebral palsy, but not all individuals with cerebral palsy have intellectual disability.

**PEDHD-19.3: Developmental Motor Delay**

There are many causes for developmental motor delay. Individuals with motor delay can have decreased, normal, or increased muscular tone. Individuals with low or normal tone do not require imaging unless they have focal neurologic findings.

- Brain MRI without and with contrast (CPT® 70553) is indicated for:
  - Initial evaluation of newly diagnosed developmental motor delay with increased muscle tone.
  - Toe walking, when associated with upper motor neuron signs including hyperreflexia, spasticity, or positive Babinski sign.
  - New or worsening focal neurologic findings documented on a physical examination within 60 days of the imaging request.
  - Individuals requiring sedation should generally not have non-contrast MRI studies. See **PEDHD-1.3: Pediatric Head Imaging Modality General Considerations**.

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References
PEDHD-20: Ataxia

See: PEDHD-19: Intellectual Disability, Cerebral Palsy, and Developmental Motor Delay

- A recent (within 60 days) face-to-face evaluation including a detailed history, physical examination with a thorough neurologic examination, and appropriate laboratory studies should be performed prior to considering advanced imaging, unless the individual is undergoing guideline-supported scheduled follow-up imaging evaluation.

- Brain MRI without and with contrast (CPT® 70553) can be performed to evaluate ataxia, hereditary ataxia, and slowly progressive ataxia.
  - Cervical spine MRI without contrast (CPT® 72141) or without and with contrast (CPT® 72156) is indicated if brain MRI is non-diagnostic.
    - Individuals requiring sedation should generally not have non-contrast MRI studies. See PEDHD-1.3: Pediatric Head Imaging Modality General Considerations.

- CT Head without and with contrast (CPT® 70470) or with contrast (CPT® 70460) is indicated for individuals who have a contraindication to MRI.
  - CT should not be used in place of MRI solely to avoid sedation in young children because MRI is superior for imaging the posterior fossa.

- CT Head without contrast (CPT® 70450) or without and with contrast (CPT® 70470) or MRI Brain without contrast (CPT® 70551) or without and with contrast (CPT® 70553) is indicated for individuals with acute ataxia following significant head trauma.

- Repeat imaging may be appropriate no more frequently than every 12 months when requested by a specialist.

Background and Supporting Information
Ataxia refers to an abnormally ill-coordinated or unsteady gait for age. “Limb ataxia” refers to impaired coordination (for age) of limbs, especially arms. Developmental failure to acquire the ability to walk is a form of developmental delay, not ataxia.

References
PEDHD-21.1: Imaging

Initial evaluation of epistaxis (nosebleed), including recurrent epistaxis that is refractory to medical management is by direct or endoscopic visualization of the relevant portions of the upper airway.

- If a mass lesion is detected on direct visualization, any one of the following imaging studies is indicated:
  - CT Maxillofacial without contrast (CPT® 70486) or without and with contrast (CPT® 70488).
  - MRI Orbits/Face/Neck without and with contrast (CPT® 70543).

Reference
PEDHD-22: Pseudotumor Cerebri

- Pseudotumor cerebri indications in pediatric individuals are identical to those for adult individuals. See HD-17: Papilledema/Pseudotumor Cerebri for imaging guidelines.
**PEDHD-23: Cranial Neuropathies**

- MRI Brain without and with contrast (CPT® 70553) is indicated for all individuals with new or worsening specific cranial nerve abnormalities.
- MRI Neck without and with contrast (CPT® 70543) is also indicated for individuals with abnormalities in cranial nerves IX, X, XI, or XII.

**References**

PEDHD-24: Pediatric Sleep Disorders

- See Pediatric Sleep Guidelines for sleep study indications.
- Advanced imaging is not indicated for the following:
  - Parasomnias.
  - Bed wetting (if child is otherwise neurologically normal).
  - Insomnia.
  - Narcolepsy.
  - Restless Leg Syndrome (polysomnography is useful).
- For Obstructive Sleep Apnea, endoscopic examination of the upper airway and lateral upper airway x-rays should be performed initially.
  - CT Maxillofacial without contrast (CPT® 70486) may be indicated for evaluation of obstructive anatomy if operative intervention is being considered.
- For Obstructive Sleep Apnea, endoscopic examination of the upper airway and lateral upper airway x-rays should be performed initially.
  - CT Maxillofacial without contrast (CPT® 70486) may be indicated.
- For Central Sleep Apnea, MRI Brain without contrast (CPT® 70551) or without and with contrast (CPT® 70553) is indicated if the clinical picture and/or polysomnography study suggests central sleep apnea.

References
PEDHD-25: Temporomandibular Joint (TMJ) Imaging in Children

There is a paucity of clinical symptoms and poor sensitivity of conventional x-rays in diagnosing TMJ arthritis in pediatric individuals with arthritis.

- TMJ MRI (CPT® 70336) is indicated annually for detecting silent TMJ arthritis in children with juvenile idiopathic arthritis (JIA).

References


PEDHD-26: Tourette’s Syndrome

The diagnosis of Tourette’s syndrome is made clinically and advanced neuroimaging is not indicated for either diagnosis or management.

References

PEDHD-27: Tuberous Sclerosis

See PEDONC-2.9: Tuberous Sclerosis Complex (TSC) for imaging guidelines.
PEDHD-28: Von Hippel Lindau Syndrome (VHL)

See PEDONC-2.10: Von Hippel-Lindau Syndrome (VHL) for imaging guidelines.
CNS infection imaging indications in pediatric individuals are similar to those for adult individuals. See HD-14: CNS Infection for imaging guidelines.

Pediatric-specific imaging considerations include suspected congenital brain infection and neonatal meningitis. The common causes of prenatal infections of the central nervous system are cytomegalovirus, Toxoplasma gondii, herpes simplex type 2 virus and most recently zika virus. The findings suggesting prenatal brain infection include microcephaly, microphthalmia, chorioretinitis, cataracts, hypotonia, and seizures. The following are performed for congenital brain infections:

- The following imaging is considered for newborn infants with suspected prenatal brain infection regardless of inciting organism. (For additional information see CDC’s Areas with risk of Zika site: https://wwwnc.cdc.gov/travel/page/zika-information)
  - Head ultrasound (CPT® 76506) can be approved as an initial imaging study.
  - MRI Brain without and with contrast (CPT® 70553) is indicated if the ultrasound is abnormal.
  - Individuals requiring sedation should generally not have only non-contrast MRI studies. See PEDHD-1.3: Pediatric Head Imaging Modality General Consideration.
- Newborn infants with microcephaly should be evaluated as discussed in PEDHD-7: Macrocephaly, Microcephaly, and Hydrocephalus.

Neonatal meningitis is most often caused by bacterial pathogens and usually occurs as a complication of sepsis in the first week of life. In older infants and children, meningeal inoculation occurs secondary to hematogenous spread or penetrating trauma.

The following imaging is considered for newborns or older infants with and open fontanelle and suspected meningitis:

- Head ultrasound (CPT® 76506) can be approved as an initial imaging study.
- MRI Brain without and with contrast (CPT® 70553) is indicated if the ultrasound is abnormal.

References
**PEDHD-30: Scalp and Skull Lesions**

- Scalp and skull lesion imaging indications in pediatric individuals are identical to those for adult individuals with the exception of neonates. See **HD-20: Scalp and Skull Lesions** for imaging guidelines.

- The following imaging is considered for newborns with palpable scalp and skull lesions.
  - Head ultrasound (CPT® 76506) can be approved as an initial imaging study.
  - MRI Brain without and with contrast (CPT® 70553) (preferred) or CT without and with contrast (CPT® 70470) is indicated if the ultrasound is abnormal and associated anomalies are suspected.

**Background and Supporting Information**

- In neonates and young infants, scalp masses include:
  - Congenital lesions (cephalocele-discussed above, dermoid cysts, epidermoid cyst),
  - Vascular lesions (hemangioma, sinus pericranii), and
  - Extracranial hemorrhage related to birth trauma (caput succedaneum, cephalohematoma, subgaleal hematoma).
  - After the first year of life, malignant tumors, such as Langerhans cell histiocytosis metastases from neuroblastoma and rhabdomyosarcoma are an additional cause of a scalp mass

**References**

PEDHD-31: Eye Disorders

- Eye disorder imaging indications in pediatric individuals are identical to those for adult individuals. See HD-32: Eye Disorders for imaging guidelines.