UnitedHealthcare® Community Plan: *Radiology Imaging Coverage Determination Guideline*

Pediatric Head Imaging Guidelines (For Ohio Only)

V1.0.2023

Guideline Number: CSRAD018OH.A

Effective Date: June 1, 2023

Application (for Ohio Only)

This Medical Policy only applies to the state of Ohio. Any requests for services that are stated as unproven or services for which there is a coverage or quantity limit will be evaluated for medical necessity using Ohio Administrative Code 5160-1-01.

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- The UnitedHealthcare's evidence-based, proprietary clinical guidelines evaluate a range of advanced imaging and procedures, including NM, US, CT, MRI, PET, Radiation Oncology, Sleep Studies, as well as Cardiac, musculoskeletal and Spine interventions.
- UnitedHealthcare reserves the right to change and update the guidelines. The guidelines undergo a formal review annually. United HealthCare's guidelines are based upon major national and international association and society guidelines and criteria, peer-reviewed literature, major treatises as well as, input from health plans, and practicing academic and community-based physicians.
- These Guidelines are not intended to supersede or replace sound medical judgment, but instead, should facilitate the identification of the most appropriate imaging or other designated procedure given the individual's clinical condition. These guidelines are written to cover medical conditions as experienced by the majority of individuals. However, these guidelines may not be applicable in certain clinical circumstances, and physician judgment can override the guidelines.
- Clinical decisions, including treatment decisions, are the responsibility of the individual and his/her provider. Clinicians are expected to use independent medical judgment, which takes into account the clinical circumstances to determine individual management decisions.
- UnitedHealthcare supports the Choosing Wisely initiative **(https://www.choosingwisely.org/)** by the American Board of Internal Medicine (ABIM) Foundation and many national physician organizations, to reduce the overuse of diagnostic tests that are low value, no value, or whose risks are greater than the benefits.

Benefits, Coverage Policies, and Eligibility Issues (Preface-2)

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Benefits, Coverage Policies, and Eligibility Issues (Preface-2.1)

References (Preface-2)

Benefits, Coverage Policies, and Eligibility Issues (Preface-2.1)

Investigational and Experimental Studies

- Certain advanced imaging studies, or other procedures, may be considered investigational and experimental if there is a paucity of supporting evidence; if the evidence has not matured to exhibit improved health parameters or; the advanced imaging study/procedure lacks a collective opinion of support.

Clinical and Research Trials

- Similar to investigational and experimental studies, clinical trial imaging requests will be considered to determine whether they meet UnitedHealthcare's evidence-based guidelines.
- Imaging studies which are inconsistent with established clinical standards, or are requested for data collection and not used in direct clinical management are not supported.

Legislative Mandate

- State and federal legislations may need to be considered in the review of advanced imaging requests.

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1. Coverage of Clinical Trials under the Patient Protection and Affordable Care Act; 42 U.S.C.A. § 300gg-8

Clinical Information (Preface-3)

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Clinical Documentation and Age Considerations

- UnitedHealthcare's guidelines use an evidence-based approach to determine the most appropriate procedure for each individual, at the most appropriate time in the diagnostic and treatment cycle. UnitedHealthcare's guidelines are framed by:
  - Clinical presentation of the individual, rather than the studies requested
  - Adequate clinical information that must be submitted to UnitedHealthcare in order to establish medical necessity for advanced imaging or other designated procedures includes, but is not limited to the following:
    - Pertinent clinical evaluation should include a recent detailed history, physical examination[20] since the onset or change in symptoms, and/or laboratory and prior imaging studies.
      - Condition-specific guideline sections may describe additional clinical information which is required for a pertinent clinical evaluation.
      - The Spine and Musculoskeletal guidelines require x-ray studies from when the current episode of symptoms has started or changed; x-ray imaging does not have to be within the past 60 days.
      - Advanced imaging or other designated procedures should not be ordered prior to clinical evaluation of an individual by the physician treating the individual. This may include referral to a consultant specialist who will make further treatment decisions.
      - Other meaningful technological contact (telehealth visit, telephone or video call, electronic mail or messaging) since the onset or change in symptoms by an established individual can serve as a pertinent clinical evaluation.
        - Some conditions may require a face-to-face evaluation as discussed in the applicable condition-specific guideline sections.
    - A recent clinical evaluation may be unnecessary if the individual is undergoing a guideline-supported, scheduled follow-up imaging or other designated procedural evaluation. Exceptions due to routine surveillance indications are addressed in the applicable condition-specific guideline sections.
  - UnitedHealthcare's evidence-based approach to determine the most appropriate procedure for each individual requires submission of medical records pertinent to the requested imaging or other designated procedures.
- Many conditions affecting 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 or younger[19] should be imaged according to the Pediatric Imaging Guidelines if discussed in the condition-specific guideline sections. Any conditions not specifically discussed in the Pediatric Imaging Guidelines should be imaged according to the General Imaging Guidelines. Individuals who are >18 years old should be imaged according to the General Imaging Guidelines, except where directed otherwise by a specific guideline section.

- The terms “male” and “female” used in these guidelines refer to anatomic-specific diseases and disease predispositions associated with individuals’ sex assigned at birth rather than their gender identity. It should be noted that gender identity and anatomic-specific diseases as well as disease predispositions are not always linked. As such, these guidelines should be applied to the individual’s corresponding known or suspected anatomic-specific disease or disease predisposition. At UnitedHealthcare, we believe that it is important to understand how all individuals, including those who are gender-diverse, choose to identify themselves. To ensure that gender-diverse individuals are treated with respect and that decisions impacting their healthcare are made correctly and with sensitivity, UnitedHealthcare recognizes all individuals with the following gender marker options: Male, Female, Transgender male, Transgender female, “X,” and “Not specified.”

General Imaging Information

- “Standard” or “conventional” imaging is most often performed in the initial and subsequent evaluations of malignancy. Standard or conventional imaging includes plain film, CT, MRI, or US.
  - Often, further advanced imaging is needed when initial imaging, such as ultrasound, CT, or MRI does not answer the clinical question. Uncertain, indeterminate, inconclusive, or equivocal may describe these situations.
- Appropriate use of contrast is a very important component of evidence-based advanced imaging use.
  - The appropriate levels of contrast for an examination (i.e. without contrast, with contrast, without and with contrast) is determined by the evidence-based guidance reflected in the condition-specific guideline sections.
  - If, during the performance of a non-contrast imaging study, there is the unexpected need to use contrast in order to evaluate a possible abnormality, then that is appropriate.[1]

Ultrasound

- Diagnostic ultrasound uses high frequency sound waves to evaluate soft tissue structures and vascular structures utilizing greyscale and Doppler techniques.
- Ultrasound allows for dynamic real-time imaging at the bedside
  - Ultrasound is limited in areas where there is dense bone or other calcification.
  - Ultrasound also has a relatively limited imaging window so may be of limited value to evaluate very large abnormalities
  - In general, ultrasound is highly operator-dependent, and proper training and experience are required to perform consistent, high-quality evaluations.

- Indications for ultrasound may include, but are not limited to:
  - Obstetric and gynecologic imaging
  - Soft tissue and visceral imaging of the chest, abdomen, pelvis, and extremities
  - Brain and spine imaging when not obscured by dense bony structures
  - Vascular imaging when not obscured by dense bony structures
  - Procedural guidance when not obscured by dense bony structures
  - Initial evaluation of ill-defined soft tissue masses or fullness and differentiating adenopathy from mass or cyst. Prior to advanced imaging, 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.
- More specific guidance for ultrasound usage, including exceptions to this general guidance, can be found throughout the condition-specific guidelines.

Computed Tomography (CT):

- The AMA CPT® manual does not describe nor assign any minimum or maximum number of sequences for any CT study. CT imaging protocols are often influenced by the individual clinical situation of the individual and additional sequences are not uncommon. There are numerous CT protocols that may be performed to evaluate specific clinical questions, and this technology is constantly undergoing development.
- CT utilizes ionizing radiation to create cross-sectional and volumetric images of the body.
  - Advantages over ultrasound include a much larger field of view, and faster completion time in general. Disadvantages compared to ultrasound include lack of portability and exposure to ionizing radiation.
  - Advantages over MRI include faster imaging, and a more spacious scanner area limiting claustrophobia. Disadvantages compared to MRI include decreased soft tissue definition, especially with non-contrast imaging, and exposure to ionizing radiation.
- CT can be performed without, with, or without and with intravenous (IV) contrast depending on the clinical indication and body area.
  - In general, non-contrast imaging is appropriate for evaluating structures with significant tissue density differences such as lung parenchyma and bony structures, or when there is a contraindication to contrast.
  - In general, CT with contrast is the most common level of contrast and can be used when there is need for improved vascular or soft tissue resolution, including better characterization of known or suspected malignancy, as well as, infectious and inflammatory conditions.
  - CT without and with contrast has a limited role as the risks of doubling the ionizing radiation exposure rarely outweigh the benefits of multiphasic imaging, though there are some exceptions which include but are not limited to:
    - Characterization of a mass
    - Characterization of arterial and venous anatomy
    - CT with contrast may be used to better characterize findings on a very recent (within two weeks) inconclusive non-contrast CT where the guidelines would

support CT without and with contrast.
    - More specific guidance for CT contrast usage, including exceptions to this general guidance can be found throughout the condition-specific guidelines.
- Shellfish allergy:
    - It is commonly assumed that an allergy to shellfish indicates iodine allergy, and that this implies an allergy to iodinated contrast media used with CT. However, this is NOT true. Shellfish allergy is due to tropomyosins. Iodine plays no role in these allergic reactions. Allergies to shellfish do not increase the risk of reaction to iodinated contrast media any more than that of other allergens.[1]
- Enteric contrast (oral or rectal) is sometimes used in abdominal imaging. There is no specific CPT® code which refers to enteric contrast.
- The appropriate contrast level and anatomic region in CT imaging is specific to the clinical indication, as listed in the condition-specific guideline sections.
- CT should not be used to replace MRI in an attempt to avoid sedation unless it is listed as a recommended study the appropriate condition-specific guideline.
- There are significant potential adverse effects associated with the use of iodinated contrast media. These include hypersensitivity reactions, thyroid dysfunction, and contrast-induced nephropathy (CIN). Individuals with impaired renal function are at increased risk for CIN.[2]
- Both contrast CT and MRI may be considered to have the same risk profile with renal failure (GFR <30 mL/min).
- The use of CT contrast should proceed with caution in pregnant and breastfeeding individuals. There is a theoretical risk of contrast toxicity to the fetal and infant thyroid. The procedure can be performed if the specific need for that contrast-enhanced procedure outweighs risk to the fetus. Breastfeeding individuals may reduce this risk by choosing to pump and discard breast milk for 12-24 hours after the contrast injection.
- CT without contrast may be appropriate if clinical criteria for CT with contrast are met AND the individual has:
    - Elevated blood urea nitrogen (BUN) and/or creatinine
    - Renal insufficiency
    - Allergies to iodinated contrast
    - Thyroid disease which could be treated with I-131
    - Diabetes
    - Very elderly
    - Urgent or emergent settings due to availability
    - Trauma
- CT is superior to other imaging modalities in certain conditions, including but not limited to the following:
    - Screening following trauma
    - Imaging pulmonary disease
    - Imaging abdominal and pelvic viscera
    - Imaging of complex fractures
    - Evaluation of inconclusive findings on Ultrasound or MRI, or if there is a contraindication to MRI

- More specific guidance for CT usage, including exceptions to this general guidance can be found throughout the condition specific guidelines.

Magnetic Resonance Imaging (MRI):

- The AMA CPT® manual does not describe nor assign any minimum or maximum number of sequences for any MRI study. MRI protocols are often influenced by the individual clinical situation of the individual and additional sequences are not uncommon. There are numerous MRI sequences that may be performed to evaluate specific clinical questions, and this technology is constantly undergoing development.
- Magnetic Resonance Imaging (MRI) utilizes the interaction between the intrinsic radiofrequency of certain Molecules in the body (hydrogen in most cases) and a strong external magnetic field.
  - MRI is often superior for advanced imaging of soft tissues and can also define physiological processes in some instances [e.g. edema, loss of circulation (AVN), and increased vascularity (tumors)].
  - MRI does not use ionizing radiation, and even non-contrast images have much higher soft tissue definition than CT or Ultrasound
  - MRI typically takes much longer than either CT or Ultrasound, and for some individuals may require sedation. It is also much more sensitive to individual motion that can degrade image quality than either CT or Ultrasound.
- MRI Breast and MRI Chest are not interchangeable, as they focus detailed sequences on different adjacent body parts.
- MRI may be utilized either as the primary advanced imaging modality, or when further definition is needed based on CT or ultrasound imaging.
- Most orthopedic and dental implants are not magnetic. These include hip and knee replacements; plates, screws, and rods used to treat fractures; and cavity fillings. Yet, all of these metal implants can distort the MRI image if near the part of the body being scanned.
  - Other implants, however, may have contraindications to MRI. These include:
    - Pacemakers
    - ICD or heart valves
    - Metal implants in the brain
    - Metal implants in the eyes or ears
    - Infusion catheters and bullets or shrapnel.
  - CT can therefore be an alternative study to MRI in these scenarios.
- The contrast level and anatomic region in MRI imaging is specific to the clinical indication, as listed in the specific guideline sections.
- MRI is commonly performed without, without and with contrast.
  - Non-contrast imaging offers excellent tissue definition
  - Imaging without and with contrast is commonly used when needed to better characterize tissue perfusion and vascularization.
    - Most contrast is gadolinium based and causes T2 brightening of the vascular and extracellular spaces.
    - Some specialized gadolinium and non-gadolinium contrast agents are available, and most commonly used for characterizing liver lesions.

  - MRI with contrast only is rarely appropriate and is usually used to better characterize findings on a recent inconclusive non-contrast MRI, commonly called a completion study.
  - MRI contrast is contraindicated in pregnant individuals
  - More specific guidance for MRI contrast usage, including exceptions to this general guidance can be found throughout the condition specific guidelines.
- MRI may be preferred in individuals with renal failure, and in individuals allergic to intravenous CT contrast.
  - Both contrast CT and MRI may be considered to have the same risk profile with renal failure (GFR <30 mL/min).[2]
  - Gadolinium can cause Nephrogenic Systemic Fibrosis (NSF). The greater the exposure to gadolinium in individuals with a low GFR (especially if on dialysis), the greater the chance of individuals developing NSF.
  - Multiple studies have demonstrated potential for gadolinium deposition following the use of gadolinium-based contrast agents (GBCAs) for MRI studies.[3,4,5,6,7] 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.[8]
- A CT may be approved in place of an MRI when clinical criteria are met for MRI AND there is a contraindication to having an MRI (pacemaker, ICD, insulin pump, neurostimulator, etc.)
  - When replacing MRI with CT, contrast level matching should occur as follows:
    - MRI without contrast → CT without contrast
    - MRI without and with contrast → CT with contrast or CT without and with contrast
- The following situations may impact the appropriateness for MRI and or MR contrast
  - Caution should be taken in the use of gadolinium in individuals with renal failure
  - The use of gadolinium contrast agents is contraindicated during pregnancy unless the specific need for that procedure outweighs risk to the fetus.
  - MRI can be performed for non-ferromagnetic body metals (i.e. titanium), although some imaging facilities will consider it contraindicated if recent surgery, regardless of the metal type
- MRI should not be used as a replacement for CT for the sole reason of avoidance of ionizing radiation when MRI is not supported in the condition-based guidelines, since it does not solve the problem of overutilization.
- MRI is superior to other imaging modalities in certain conditions, including but not limited to the following:
  - Imaging the brain and spinal cord
  - Characterizing visceral and musculoskeletal soft tissue masses

- Evaluating musculoskeletal soft tissues including ligaments and tendons
- Evaluating inconclusive findings on ultrasound or CT
- Individuals who are pregnant or have high radiation sensitivity
- Suspicion, diagnosis of or surveillance of infections

- More specific guidance for MRI usage, including exceptions to this general guidance can be found throughout the condition-specific guidelines.

Positron Emission Tomography (PET):

- PET is a nuclear medicine study that uses a positron emitting radiotracer to create cross-sectional and volumetric images based on tissue metabolism.
- Conventional imaging (frequently CT, sometimes MRI or bone scan) of the affected area(s) drives much of initial and restaging and surveillance imaging for malignancy and other chronic conditions. PET is not indicated for surveillance imaging unless specifically stated in the condition-specific guideline sections.
- PET/MRI is generally not supported, See **PET-MRI (Preface-5.3)**
- PET is rarely performed as a single modality, but is typically performed as a combined PET/CT.
  - The unbundling of PET/CT into separate PET and diagnostic CT CPT® codes is not supported, because PET/CT is done as a single study.
- PET/CT lacks the tissue definition of CT or MRI, but is fairly specific for metabolic activity based on the radiotracer used
  - Fluorodeoxyglucose (fluorine-18-2-fluoro-2-deoxy-D-glucose [FDG]) is the most common PET radiotracer and images glucose metabolism
  - Some specialized radiotracers including Gallium-68 DOTATATE, C-11 Choline, F-18 Fluciclovine (AXUMIN®), 68Ga PSMA-11, and 18F Piflufolastat PSMA (Pylarify®) are supported in evaluation for some oncologic conditions, while the use of other radiotracers including but not limited to F-18 Sodium Fluoride is not supported.
- Indications for PET/CT may include
  - Oncologic Imaging for evaluation of tumor metabolic activity
  - Cardiac Imaging for evaluation of myocardial metabolic activity
  - Brain Imaging for evaluation of metabolic activity for procedural planning
- More specific guidance for PET usage, including exceptions to this general guidance can be found throughout the condition-specific guidelines.

Overutilization of Advanced Imaging:

- A number of recent reports describe overutilization in many areas of advanced imaging and other procedures, which may include:
  - High level testing without consideration of less invasive, lower cost options which may adequately address the clinical question at hand
  - Excessive radiation and costs with unnecessary testing
  - Defensive medical practice
  - CT without and with contrast (so called “double contrast studies) requests, which have few current indications.
  - MRI requested in place of CT to avoid radiation without considering the primary indication for imaging
  - Adult CT settings and protocols used for smaller people and children

- Unnecessary imaging procedures when the same or similar studies have already been conducted.

- A review of the imaging or other relevant procedural histories of all individuals presenting for studies has been recognized as one of the more important processes that can be significantly improved. By recognizing that a duplicate or questionably indicated examination has been ordered for individuals, it may be possible to avoid exposing them to unnecessary risks.[9, 10] To avoid these unnecessary risks, the precautions below should be considered.
  - The results of initial diagnostic tests or radiologic studies to narrow the differential diagnosis should be obtained prior to performing further tests or radiologic studies.
  - The clinical history should include a potential indication such as a known or suspected abnormality involving the body part for which the imaging study is being requested. These potential indications are addressed in greater detail within the applicable guidelines.
  - The results of the requested imaging procedures should be expected to have an impact on individual management or treatment decisions.
  - Repeat imaging studies are not generally necessary unless there is evidence of disease progression, recurrence of disease, and/or the repeat imaging will affect an individual's clinical management.
- Preoperative imaging/pre-surgical planning imaging/pre-procedure imaging is not indicated if the surgery/procedure is not indicated. Once the procedure has been approved or if the procedure does not require prior authorization, the appropriate pre-procedural imaging may be approved.

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Coding Issues (Preface-4)

Guideline

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3D Rendering (Preface-4.1)

CPT® 76376 and CPT® 76377:

- Both codes require concurrent supervision of the image post-processing 3D manipulation of the volumetric data set and image rendering.
  - Concurrent supervision is defined as active physician participation in and monitoring of the reconstruction process including design of the anatomic region that is to be reconstructed; determination of the tissue types and actual structures to be displayed (e.g., bone, organs, and vessels); determination of the images or cine loops that are to be archived; and monitoring and adjustment of the 3D work product. The American College of Radiology (ACR) recommends that it is best to document the physician's supervision or participation in the 3D reconstruction of images.
- These two codes differ in the need for and use of an independent workstation for post-processing.
  - CPT® 76376 reports procedures not requiring image post-processing on an independent workstation.
  - CPT® 76377 reports procedures that require image post-processing on an independent workstation.
- These 3D rendering codes should not be used for 2D reformatting.
- Two-dimensional reconstruction (e.g. reformatting an axial scan into the coronal plane) is now included in all cross-sectional imaging base codes and is not separately reimbursable.
- The codes used to report 3D rendering for ultrasound and echocardiography are also used to report the 3D post processing work on CT, MRI, and other tomographic modalities.
- Providers may be required to obtain prior authorization on these 3D codes even if prior authorization is not required for the echocardiography and/or ultrasound procedure codes. It may appear that UnitedHealthcare pre-authorizes echocardiography and/or ultrasound when, in fact, it may only be the 3D code that needs the prior authorization.
- CPT® codes for 3D rendering should not be billed in conjunction with computer-aided detection (CAD), MRA, CTA, nuclear medicine SPECT studies, PET, PET/CT, Mammogram, MRI Breast, US Breast, CT Colonography (virtual colonoscopy), Cardiac MRI, Cardiac CT, or Coronary CTA studies.

- CPT® 76377 (3D rendering requiring image post-processing on an independent workstation) or CPT® 76376 (3D rendering not requiring image post-processing on an independent workstation) can be considered in the following clinical scenarios:
  - Bony conditions:
    - Evaluation of congenital skull abnormalities in newborns, infants, and toddlers (usually for preoperative planning)
    - Complex fractures (comminuted or displaced)/dislocations of any joint (For preoperative planning when conventional imaging is insufficient)
    - Spine fractures, pelvic/acetabulum fractures, intra-articular fractures (For preoperative planning when conventional imaging is insufficient)
    - Preoperative planning for other complex surgical cases
    - Complex facial fractures
  - Preoperative planning for other complex surgical cases
  - Cerebral angiography
  - Pelvis conditions:
    - Uterine intra-cavitary lesion when initial US is equivocal (See **Abnormal Uterine Bleeding (AUB) (PV-2.1)** and **Leiomyoma/Uterine Fibroids (PV-12.1)** in the Pelvis Imaging Guidelines)
    - Hydrosalpinxes or peritoneal cysts when initial US is indeterminate (See
    - **Complex Adnexal Masses (PV-5.3)** in the Pelvis Imaging Guidelines)
    - Lost IUD (inability to feel or see IUD string) with initial US (See **Intrauterine Device (PV-10.1)** in the Pelvis Imaging Guidelines)
    - Uterine anomalies with initial US (See **Uterine Anomalies (PV-14.1)** in the Pelvis Imaging Guidelines)
    - Infertility (See **Initial Infertility Evaluation, Female (PV-9.1)** in the Pelvis Imaging Guidelines)
  - Abdomen conditions:
    - CT Urogram (See **Hematuria and Hydronephrosis (AB-39)** in the Abdomen Imaging Guidelines)
    - MRCP (See **MR Cholangiopancreatography (MRCP) (AB-27)** in the Abdomen Imaging Guidelines)

CT-, MR-, or Ultrasound-Guided Procedures (Preface-4.2)

PRF.CD.0004.2.UOH
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- CT, MR, and Ultrasound guidance procedure codes contain all the imaging necessary to guide a needle or catheter. It is inappropriate to routinely bill a diagnostic procedure code in conjunction with a guidance procedure code.
- Imaging studies performed as part of a CT-, MR-, or Ultrasound-guided procedure should be reported using the CPT® codes in the following table.

TABLE: Imaging Guidance Procedure Codes

CPT®	Description
76942	Ultrasonic guidance for needle placement
77022	MR guidance for, and monitoring of parenchymal tissue ablation
77021	MR guidance for needle placement
77013	CT guidance for, and monitoring of parenchymal tissue ablation
77012	CT guidance for needle placement
77011	CT guidance for stereotactic localization
75989	Imaging guidance for percutaneous drainage with placement of catheter (all modalities)
19086	Biopsy, breast, with placement of breast localization device(s), when performed, and imaging of the biopsy specimen, when performed, percutaneous; each additional lesion, including MR guidance
19085	Biopsy, breast, with placement of breast localization device(s), when performed, and imaging of the biopsy specimen, when performed, percutaneous; first lesion, including MR guidance

CPT® 19085 and CPT® 19086:

- The proper way to bill an MRI guided breast biopsy is CPT® 19085 (Biopsy, breast, with placement of breast localization device(s), when performed, and imaging of the biopsy specimen, when performed, percutaneous; first lesion, including MR guidance). Additional lesions should be billed using CPT® 19086.
  - **CPT® 77021 (**MR guidance for needle placement) is not an appropriate code for a breast biopsy.

CPT® 75989:

- This code is used to report imaging guidance for a percutaneous drainage procedure in which a catheter is left in place.
- This code can be used to report whether the drainage catheter is placed under fluoroscopy, ultrasound, CT, or MR guidance modality.

CPT® 77011:

- A stereotactic CT localization scan 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.[3]
- 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 (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.

CPT® 77012 (CT) and CPT® 77021 (MR):

- These codes are used to report imaging guidance for needle placement during biopsy, aspiration, and other percutaneous procedures.
- They represent the radiological supervision and interpretation of the procedure and are often billed in conjunction with surgical procedure codes.
  - For example, CPT® 77012 is reported when CT guidance is used to place the needle for a conventional arthrogram.
  - Only codes representing percutaneous surgical procedures should be billed with CPT® 77012 and CPT® 77021. It is inappropriate to use with surgical codes for open, excisional, or incisional procedures.
  - **CPT® 77021** (MR guidance for needle placement) is not an appropriate code for breast biopsy.
    - CPT® 19085 would be appropriate for the first breast biopsy site, and CPT® 19086 would be appropriate for additional concurrent biopsies.

CPT® 77013 (CT) and CPT® 77022 (MR):

- These codes include the initial guidance to direct a needle electrode to the tumor(s), monitoring for needle electrode repositioning within the lesion, and as necessary for multiple ablations to coagulate the lesion and confirmation of satisfactory coagulative necrosis of the lesion(s) and comparison to pre-ablation images.
  - **NOTE**: CPT® 77013 should only be used for non-bone ablation procedures.
    - CPT® 20982 includes CT guidance for bone tumor ablations.
  - Only codes representing percutaneous surgical procedures should be billed with CPT® 77013 and CPT® 77022. It is inappropriate to use with surgical codes for open, excisional, or incisional procedures.
- CPT® 77012 and CPT® 77021 (as well as guidance codes CPT® 76942 [US], and CPT® 77002 - CPT® 77003 [fluoroscopy]) describe radiologic guidance by different modalities.
  - Only one unit of any of these codes should be reported per individual encounter (date of service). The unit of service is considered to be the individual encounter, not the number of lesions, aspirations, biopsies, injections, or localizations.

Unlisted Procedures/Therapy Treatment Planning (Preface-4.3)

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CPT®	Description
78999	Unlisted procedure, diagnostic nuclear medicine
76498	Unlisted MR procedure (e.g., diagnostic or interventional)
76497	Unlisted CT procedure (e.g., diagnostic or interventional)

- These unlisted codes should be reported whenever a diagnostic or interventional CT or MR study is performed in which an appropriate anatomic site-specific code is not available.
  - A Category III code that describes the procedure performed must be reported rather than an unlisted code if one is available.
- CPT® 76497 or CPT® 76498 (Unlisted CT or MRI procedure) can be considered in the following clinical scenarios:
  - Studies done for navigation and planning for neurosurgical procedures (i.e. Stealth or Brain Lab Imaging)[1,2]
  - Custom joint Arthroplasty planning (not as Alternative Recommendation) (See **Osteoarthritis (MS-12.1)** in the Musculoskeletal Imaging Guidelines)
  - Any procedure/surgical planning if thinner cuts or different positional acquisition (than those on the completed diagnostic study) are needed. These could include navigational bronchoscopy. See **Navigational Bronchoscopy (CH-1.7)** in the Chest Imaging Guidelines

Therapy Treatment Planning

- Radiation Therapy Treatment Planning: See **Unlisted Procedure Codes in Oncology (ONC-1.5)** In the Oncology Imaging Guidelines

CPT® 76380 Limited or Follow-up CT (Preface-4.5)

PRF.CD.0004.5.UOH
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- CPT® 76380 describes a limited or follow-up CT scan. The code is used to report any CT scan, for any given area of the body, in which the work of a full diagnostic code is not performed.
- Common examples include (but are not limited to):
  - Limited sinus CT imaging protocol
  - Limited or follow-up slices through a known pulmonary nodule
  - Limited slices to assess a non-healing fracture (such as the clavicle)
- Limited CT (CPT® 76380) is not indicated for treatment planning purposes. Please See **Unlisted Procedure Codes in Oncology (ONC-1.5)** in the Oncology Imaging Guidelines.
- It is inappropriate to report CPT® 76380, in conjunction with other diagnostic CT codes, to cover 'extra slices' in certain imaging protocols.
  - There is no specific number of sequences or slices defined in any CT CPT® code definition.
  - The AMA, in *CPT® 2019*, does not describe nor assign any minimum or maximum number of sequences or slices for any CT study.
    - A few additional slices or sequences are not uncommon.
    - CT imaging protocols are often influenced by the individual clinical situation of the individual. Sometimes the protocols require more time and sometimes less.

SPECT/CT Imaging (Preface-4.6)

- SPECT/CT involves SPECT (Single Photon Emission Computed Tomography) nuclear medicine imaging and CT for optimizing location, accuracy, and attenuation correction and combines functional and anatomic information.
  - Common studies using this modality include ^{123}I- or ^{131}I-Metaiodobenzylguanidine (MIBG) and octreotide scintigraphy for neuroendocrine tumors.
- Hybrid Nuclear/CT scan can be CPT® 78830 - single area and single day, CPT® 78831 - 2 or more days, or CPT® 78832 - 2 areas with one day and 2-day study.
- A procedure code for SPECT/CT parathyroid nuclear imaging, (CPT® 78072), became effective January 1, 2013.

CPT® 76140 Interpretation of an Outside Study (Preface-4.7)

PRF.CD.0004.7.UOH
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- It is inappropriate to use diagnostic imaging codes for interpretation of a previously performed exam that was completed at another facility.
  - If the outside exam is being used for comparison with a current exam, the diagnostic code for the current examination includes comparison to the prior study[4]
  - CPT® 76140 is the appropriate code to use for an exam which was completed elsewhere, and a secondary interpretation of the images is requested.[5]

Quantitative MR Analysis of Tissue Composition (Preface-4.8)

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- Category III CPT® codes for quantitative analysis of multiparametric MR (mp-MRI) data with and without an associated diagnostic MRI have been established. Quantitative mp-MRI uses software to analyze tissue physiology of visceral organs and other anatomic structures non-invasively. At present, these procedures are primarily being used in clinical trials and there is no widely recommended indications in clinical practice. As such, these procedures are considered to be investigational and experimental for coverage purposes.
  - CPT® 0648T (without diagnostic MRI) and CPT® 0649T (with diagnostic MRI) refer to data analysis with and without associate imaging of a single organ, with its most common use being LiverMultiScan (LMS)
    - See **Fatty Liver (AB-29.2)** in the Abdomen Imaging Guidelines
  - CPT® 0697T (without diagnostic MRI) and CPT® 0698T (with diagnostic MRI) refer to data analysis with and without associate imaging of a multiple organs, with its most common use being CoverScan.

HCPCS Codes (Preface-4.9)

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- Healthcare Common Procedure Coding System (HCPCS) codes are utilized by some hospitals in favor of the typical Level 3 CPT® Codes. These codes are typically 4 digits preceded by a C, or S[6]
  - Many of these codes have similar code descriptions to level 3 CPT® codes (i.e. C8931 – MRA with dye, Spinal Canal, and 72159-MRA Spinal canal)
  - If cases are submitted with HCPCS codes with similar code descriptions to the typical level 3 CPT® codes, those procedures should be managed in the same manner as the typical CPT® codes
  - HCPCS code management is discussed further in the applicable guideline sections
- Requests for many Healthcare Common Procedure Coding System (HCPCS) codes, including nonspecific codes such as S8042 [Magnetic resonance imaging (MRI), low-field], should be redirected to a more appropriate and specific CPT® code. Exceptions are noted in the applicable guideline sections.

References (Preface-4)

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1. Society of Nuclear Medicine and Molecular Imaging Coding Corner http://www.snmmi.org/ClinicalPractice/CodingCornerPT.aspx?ItemNumber=1786
2. Intraoperative MR. Brainlab. https://www.brainlab.com/surgery-products/overview-neurosurgery-products/intraoperative-mr/
3. Experience the Advanced 3D Sinus Surgery Planning with Scopis Building Blocks planning software. Scopis Planning. http://planning.scopis.com/
4. ACR Radiology Coding SourceTM March-April 2007 Q and A. www.acr.org. https://www.acr.org/Advocacy-and-Economics/Coding-Source/ACR-Radiology-Coding-Source-March-April-2007-Q-and-A
5. Chung CY, Alson MD, Duszak R, Degnan AJ. From imaging to reimbursement: what the pediatric radiologist needs to know about health care payers, documentation, coding and billing. *Pediatric Radiology*. 2018;48(7):904-914. doi:10.1007/s00247-018-4104-1
6. HCPCS - General Information from CMS.gov at https://www.cms.gov/medicare/coding/medhcpcsgeninfo

Whole Body Imaging (Preface-5)

Guideline

Whole Body CT Imaging (Preface-5.1)

Whole Body MR Imaging (Preface-5.2)

PET-MRI (Preface-5.3)

References (Preface-5)

Whole Body CT Imaging (Preface-5.1)

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- Whole-body CT or LifeScan (CT Brain, Chest, Abdomen, and Pelvis) for screening of asymptomatic individuals is not indicated. The performance of whole-body screening CT examinations in healthy individuals does not meet any of the current validity criteria for screening studies and there is no clear documentation of benefit versus radiation risk.
- Whole-body low dose CT is supported for oncologic staging in Multiple Myeloma (See **Multiple Myeloma and Plasmacytomas (ONC-25)** in the Oncology Imaging Guidelines)

Whole Body MR Imaging (Preface-5.2)

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- Whole-body MRI (WBMRI) is, with the exception of select cancer predisposition syndromes and autoimmune conditions discussed below, generally not supported at this time due to lack of standardization in imaging technique and lack of evidence that WBMRI improves individual outcome for any individual disease state.
  - While WBMRI has the benefit of whole-body imaging and lack of radiation exposure, substantial variation still exists in the number of images, type of sequences (STIR vs. diffusion weighting, for example), and contrast agent(s) used.
- Coding considerations:
  - There are no established CPT® or HCPCS codes for reporting WBMRI.
  - WBMRI is at present only reportable using CPT® 76498. All other methods of reporting whole-body MRI are inappropriate, including:
    - Separate diagnostic MRI codes for multiple individual body parts
    - MRI Bone Marrow Supply (CPT® 77084)
- Disease-specific considerations:
  - Cancer screening:
    - Interval WBMRI is recommended for cancer screening in individuals with select cancer predisposition syndromes. Otherwise, WBMRI has not been shown to improve outcomes for cancer screening. See **Li-Fraumeni Syndrome (LFS) (PEDONC-2.2)**, **Hereditary Paraganglioma-Pheochromocytoma (HPP) Syndromes (PEDONC-2.13)**, **Constitutional Mismatch Repair Deficiency (CMMRD or Turcot Syndrome) (PEDONC-2.15)** in the Pediatric Oncology Imaging Guidelines for additional information
  - Cancer staging and restaging
    - While the feasibility of WBMRI has been established, data remain conflicting on whether WBMRI is of equivalent diagnostic accuracy compared with standard imaging modalities such as CT, scintigraphy, and PET imaging.
    - Evidence has not been published establishing WBMRI as a standard evaluation for any type of cancer.
  - Autoimmune disease
    - WBMRI can be approved in some situations for individuals with chronic recurrent multifocal osteomyelitis. See **Chronic Recurrent Multifocal Osteomyelitis (PEDMS-10.2)** in the Pediatric Musculoskeletal Imaging Guidelines for additional information.

PET-MRI (Preface-5.3)

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- PET-MRI is generally not supported for a vast majority of oncologic and neurologic conditions due to lack of standardization in imaging technique and interpretation. However, it may be appropriate in select circumstances when the following criteria are met:
  - The individual meets guideline criteria for PET-CT **AND** PET-CT is not available at the treating institution **AND**
  - The provider requests PET-MRI in lieu of PET-CT
- When the above criteria are met, PET-MRI may be reported using the code combination of PET Whole-Body (CPT® 78813) and MRI Unlisted (CPT® 76498). All other methods of reporting PET-MRI are inappropriate.
  - When clinically appropriate, diagnostic MRI codes may be indicated at the same time as the PET-MRI code combination.
- See **PET Imaging in Pediatric Oncology (PEDONC-1.4)** in the Pediatric Oncology Imaging Guidelines, **PET Brain Imaging (PEDHD-2.3)**, and **Special Imaging Studies in Evaluation for Epilepsy Surgery (PEDHD-6.3)** in the Pediatric Head Imaging Guidelines for more information

References (Preface-5)

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2. Siegel MJ, Acharyya S, Hoffer FA, et al. Whole-Body MR Imaging for Staging of Malignant Tumors in Pediatric Patients: Results of the American College of Radiology Imaging Network 6660 Trial. *Radiology*. 2013;266(2):599-609. doi:10.1148/radiol.12112531
3. Antoch G. Whole-Body Dual-Modality PET/CT and Whole-Body MRI for Tumor Staging in Oncology. *JAMA*. 2003;290(24):3199. doi:10.1001/jama.290.24.3199
4. Lauenstein TC, Semelka RC. Emerging techniques: Whole-body screening and staging with MRI. *Journal of Magnetic Resonance Imaging*. 2006;24(3):489-498. doi:10.1002/jmri.20666
5. Khanna G, Sato TSP, Ferguson P. Imaging of Chronic Recurrent Multifocal Osteomyelitis. *RadioGraphics*. 2009;29(4):1159-1177. doi:10.1148/rg.294085244
6. Ferguson PJ, Sandu M. Current Understanding of the Pathogenesis and Management of Chronic Recurrent Multifocal Osteomyelitis. *Current Rheumatology Reports*. 2012;14(2):130-141. doi:10.1007/s11926-012-0239-5
7. National Comprehensive Cancer Network (NCCN) Guidelines Version 2 2022. – March 19, 2022, Genetic/Familial High Risk Assessment: Breast and Ovarian, available at: https://www.nccn.org/professionals/physician_gls/pdf/genetics_bop.pdf Referenced with permission from the NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines™) for Genetic/Familial High-Risk Assessment: Breast, Ovarian, and Pancreatic V2.2022. – March 19, 2022 ©. 2022 National Comprehensive Cancer Network, Inc. All rights reserved. The NCCN Guidelines™ and illustrations herein may not be reproduced in any form for any purpose without the express written permission of the NCCN. To view the most recent and complete version of the NCCN Guidelines™, go online to NCCN.org

References (Preface-6)

Guideline

References (Preface-6.1)

References (Preface-6.1)

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- Complete reference citations for the journal articles are embedded within the body of the guidelines and/or may be found on the Reference pages at the end of some guideline sections.
- The website addresses for certain references are included in the body of the guidelines but are not hyperlinked to the actual website.
- The website address for the American College of Radiology (ACR) Appropriateness Criteria® is **http://www.acr.org**.

Copyright Information (Preface-7)

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Copyright Information (Preface-7.1)

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Pediatric Head Imaging Guidelines

Procedure Codes Associated with Head Imaging	
MRI	**CPT®**
MRI Brain without contrast	70551
MRI Brain with contrast (rarely used)	70552
MRI Brain without and with contrast	70553
MRI Orbit, Face, Neck without contrast	70540
MRI Orbit, Face, Neck with contrast (rarely used)	70542
MRI Orbit, Face, Neck without and with contrast	70543
MRI Temporomandibular Joint (TMJ)	70336
Functional MRI Brain not requiring physician or psychologist	70554
Functional MRI Brain requiring physician or psychologist	70555
MR Spectroscopy	76390
Unlisted MRI procedure (for radiation planning or surgical software)	76498
MRA	**CPT®**
MRA Head without contrast	70544
MRA Head with contrast	70545
MRA Head without and with contrast	70546
MRA Neck without contrast	70547
MRA Neck with contrast	70548
MRA Neck without and with contrast	70549
CT	**CPT®**
CT Head without contrast	70450
CT Head with contrast	70460
CT Head without and with contrast	70470
CT Orbits without contrast (includes temporal bone and mastoid)	70480
CT Orbits with contrast (includes temporal bone and mastoid)	70481
CT Orbits without and with contrast (includes temporal bone and mastoid)	70482
CT Maxillofacial without contrast (includes sinuses, jaw, and mandible)	70486
CT Maxillofacial with contrast (includes sinuses, jaw, and mandible)	70487
CT Maxillofacial without and with contrast (includes sinuses, jaw, and mandible)	70488
CT Neck without contrast (includes jaw, and mandible)	70490
CT Neck with contrast (includes jaw, and mandible)	70491
CT Neck without and with contrast (includes jaw, and mandible)	70492
CT Guidance for Stereotactic Localization (used for sinus surgery planning)	77011
CT Guidance for Placement of Radiation Therapy Fields	77014
Unlisted CT procedure (for radiation planning or surgical software)	76497
CTA	**CPT®**
CTA Head	70496
CTA Neck	70498

Nuclear Medicine	CPT®
PET Brain Metabolic Evaluation	78608
PET Brain Perfusion Evaluation	78609
PET with concurrently acquired CT; limited area (this code rarely used in pediatrics)	78814
PET with concurrently acquired CT; whole body	78816
Brain Scintigraphy Static Limited	78600
Brain Scintigraphy Limited with Vascular Flow	78601
Brain Scintigraphy Complete Static	78605
Brain Scintigraphy Complete with Vascular Flow	78606
Brain Imaging Vascular Flow	78610
Cisternogram	78630
Cerebrospinal Ventriculography	78635
Shunt Evaluation	78645
CSF Leakage Detection	78650
Radiopharmaceutical Dacryocystography	78660
Ultrasound	**CPT®**
Echoencephalography (Head or Cranial Ultrasound)	76506
Ophthalmic ultrasound, diagnostic; B-scan & quantitative A-scan performed same encounter	76510
Ophthalmic ultrasound, diagnostic; quantitative A-scan only	76511
Ophthalmic ultrasound, diagnostic; B-scan	76512
Ophthalmic ultrasound, diagnostic; anterior segment ultrasound, immersion (water bath) B-scan	76513
Ophthalmic ultrasound, diagnostic; corneal pachymetry, unilateral or bilateral	76514
Ophthalmic biometry by ultrasound, A-scan	76516
Ophthalmic biometry by ultrasound, A-scan, with lens power calculation	76519
Ophthalmic ultrasonic foreign body localization	76529
Soft tissues of head and neck Ultrasound (thyroid, parathyroid, parotid, etc.)	76536
Transcranial Doppler study of the intracranial arteries; complete study	93886
Transcranial Doppler study of the intracranial arteries; limited study	93888
Transcranial Doppler study of the intracranial arteries; vasoreactive study	93890
Transcranial Doppler study of the intracranial arteries; emboli detection without intravenous microbubble injection	93892
Transcranial Doppler study of the intracranial arteries; emboli detection with intravenous microbubble injection	93893
Duplex scan of extracranial arteries; complete bilateral study	93880
Duplex scan of extracranial arteries; unilateral or limited study	93882
Non-invasive physiologic studies of extracranial arteries, complete bilateral study	93875

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General Guidelines (PEDHD-1.0)

- A pertinent clinical evaluation including a detailed history, physical examination with a thorough neurologic examination since the onset or change in signs and/or symptoms[29], appropriate laboratory studies and basic imaging such as plain radiography or ultrasound should be performed prior to considering advanced imaging (CT, MR, Nuclear Medicine), unless the individual is undergoing guideline-supported scheduled imaging evaluation. A meaningful technological contact (telehealth visit, telephone call, electronic mail or messaging) since the onset or change in signs and/or symptoms[29], can serve as a pertinent clinical evaluation.
  - A detailed neurological exam is required prior to advanced imaging except in the following scenarios:
    - Individual is undergoing a guideline-supported scheduled follow-up imaging evaluation
    - Tinnitus, TMJ, Sinus or mastoid disease, ear pain, hearing loss, eye disease, papilledema[30], dental requests and epistaxis. (A relevant physical exam is still required.)
    - The request is from a neurologist, neurosurgeon, endocrinologist, otolaryngologist, or ophthalmologist who has evaluated the individual since onset of symptoms.
- 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.
- 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.

Pediatric Head Imaging Age Considerations (PEDHD-1.1)

- 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 or younger[31] and any conditions not specifically discussed in the General Head Imaging Guidelines should be imaged according to the Pediatric Head Imaging Guidelines. Any conditions not specifically discussed in the Pediatric Head Imaging Guidelines should be imaged according to the General Head Imaging Guidelines. Individuals who are >18 years old should be imaged according to the General Head Imaging Guidelines, except where directed otherwise by a specific guideline section.

Pediatric Head Imaging Appropriate Clinical Evaluation (PEDHD-1.2)

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 is appropriate unless there is clear documentation of a need for the additional codes to cover all necessary body areas.
- See **General Guidelines - Anatomic Issues (HD-1.1)** in the Head Imaging Guidelines for the correct coding of these studies.

Pediatric Head Imaging Modality General Considerations (PEDHD-1.3)

- 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 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 be appropriate if requested. By doing so, the requesting provider 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 UnitedHealthcare guidelines for the clinical condition being evaluated, MRI/MRA 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.
  - CT Head without contrast (CPT® 70450) may be indicated for:
    - Mass effect
    - Blood/blood products
    - Urgent/emergent settings due to availability and speed of CT
    - Trauma
    - Recent hemorrhage, whether traumatic or spontaneous
    - Bony structures of the head evaluations including dystrophic calcifications
    - Hydrocephalus evaluation and follow-up
      - Some centers use limited non-contrast "fast or rapid MRI" (CPT® 70551) to minimize radiation exposure in children - these requests are appropriate.
    - Prior to lumbar puncture in individuals with cranial complaints
    - Scenarios in which MRI is contraindicated (i.e. pacemakers, ICDs, cochlear implants, aneurysm clips, orbital metallic fragments, etc.)
- CT and MR Angiography (CTA and MRA) Head and Neck
  - MRA Head may be performed without contrast (CPT® 70544), with contrast (CPT® 70545), or without and with contrast (CPT® 70546).
  - CTA Head is performed without and with contrast (CPT® 70496).
  - MRA Neck may be done either without contrast (CPT® 70547), with contrast (CPT® 70548), or without and with contrast (CPT® 70549), depending on facility preference and protocols and type of scanner.
  - CTA Neck is done with and without contrast (CPT® 70496)
- Indications for CTA and MRA Head and Neck vessels include, but are not limited to the following:
  - MRA is the preferred study in children unless contraindicated:
    - Pulsatile tinnitus
    - Hemifacial spasm if consideration for surgical decompression
    - Evaluation of stroke or TIA (See **Pediatric Stroke Initial Imaging** (**PEDHD-12.2)**, **Pediatric Stroke Subsequent Imaging** (**PEDHD-12.3)**, **Moyamoya Disease** (**PEDHD-12.4)**, **Sickle Cell Disease** (**PEDHD-12.5)** and **CNS Vasculitis and Stroke (PEDHD-12.6)** including collateral assessment)
    - Follow up of known cerebral artery stenosis
    - Trigeminal neuralgia failed medical therapy
    - Cerebral sinus thrombosis suspected with increased intracranial pressure (refractory headaches, papilledema, diagnosis of pseudotumor cerebri)
    - Aneurysm suspected with acute "thunderclap" headache syndrome and appropriate screening or evaluation of known subarachnoid hemorrhage and pseudoaneurysms (may be appropriate to limit CTA to include only the head to avoid unnecessary radiation to the individual) (See **Pediatric Intracranial Aneurysms** (**PEDHD-10.1)**)

- Noninflammatory vasculopathy, including radiation vasculopathy (See **Long Term Pediatric Cancer Survivors** (**PEDONC-19)** in the Pediatric Oncology Imaging Guidelines)
- Traumatic vascular injuries
- Vascular malformations, vascular anatomic variants and fistulas (See **Pediatric Intracranial Arteriovenous Malformations (AVM)**) **(PEDHD-10.2)**
- Arterial, including carotid dissections
- Tumors of vascular origin or involving vascular structures
- Surgical and radiation therapy localization, planning and neuronavigation
- Evaluation for vascular intervention and follow-up including postsurgical/posttreatment vascular complications
- Intra-cranial pre-operative planning if there is concern of possible vascular involvement or risk for vascular complication from procedure
- Vasculitis and collagen vascular disease (See **CNS Vasculitis and Stroke** (**PEDHD-12.6)**)
- Sickle cell disease (See **Sickle Cell Disease** (**PEDHD-12.5)**)
- Moyamoya disease (See **Moyamoya Disease** (**PEDHD-12.4)**)

- MRA Head without, with, or without and with contrast or CTA Head for follow up of aneurysm clipping or coiling procedures (See **Intracranial Aneurysms (HD-12.1)** in the Head Imaging Guidelines)
- CT and MR Venography (CTV and MRV) are reported with the same codes as the CTA/MRA counterpart (there is no specific code for CT/MR venography):
  - If arterial and venous CT or MR studies are both performed in the same session, only one CPT® code should be used to report both procedures
- MRA without and with contrast with venous sinus thrombosis to differentiate total from subtotal occlusion

➤ NOTE: Evaluation of posterior circulation disease requires both neck and head MRA/CTA to visualize the entire vertebral-basilar system

➤ 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.

➤ Nuclear Medicine
- Nuclear medicine studies other than metabolic PET imaging on the pediatric brain or head are rarely performed in an elective outpatient setting but the following studies are supported for the following indications:
  - Brain Scintigraphy with or without vascular flow (any one of CPT® codes: CPT® 78600, CPT® 78601, CPT® 78605, or CPT® 78606)
  - Radiopharmaceutical Localization Imaging SPECT (CPT® 78803)
    - Immunocompromised individuals with mass lesion detected on CT or MRI for differentiation between lymphoma and infection.
    - Radiopharmaceutical Localization Imaging SPECT (CPT® 78803) with vasodilating agent acetazolamide (Diamox) challenge when surgery or other vascular intervention is being considered (i.e. Moyamoya).

- Brain Imaging Vascular Flow (CPT® 78610)
  - Cerebral ischemia.
  - Establish brain death (rarely done in outpatient setting).
- CSF Leakage Detection (CPT® 78650)
  - Evaluation of CSF rhinorrhea or otorrhea, or refractory post-lumbar puncture headache.
- Radiopharmaceutical Dacryocystography (CPT® 78660)
  - Suspected obstruction of nasolacrimal duct due to excessive tearing.

- 3D Rendering
  - CPT® 76377 (3D rendering requiring image post-processing on an independent workstation) or CPT® 76376 (3D rendering not requiring image post-processing on an independent workstation) can be considered in the following clinical scenarios:
    - Bony conditions:
      - Evaluation of congenital skull abnormalities in newborns, infants, and toddler (usually for preoperative planning)
      - Complex joint fractures or pelvis fractures
      - Spine fractures (usually for preoperative planning)
      - Complex facial fractures
    - Preoperative planning for other complex surgical cases
    - Cerebral angiography
  - 3D Rendering (CPT® 76377 or CPT® 76376) may be used for surgical planning and surgical follow up after craniotomy when ordered by surgical specialist
  - 3D Rendering indications in pediatric head imaging are identical to those in the general imaging guidelines. See **3D Rendering** (**Preface-4.1)** 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.

Background and Supporting Information

- "The U.S. Food and Drug Administration (FDA) is warning that repeated or lengthy use of general anesthetic and sedation drugs during surgeries or procedures in children younger than 3 years or in pregnant women during their third trimester may affect the development of children's brains. … Published studies in pregnant animals and young animals have shown the use of general anesthetic and sedation drugs for more than 3 hours caused widespread loss of nerve cells in the brain. … All the studies in children had limitations, and it is unclear whether any negative effects seen in children's learning or behavior were due to the drugs or to other factors, such as the underlying medical condition that led to the need for the surgery or procedure."[28]

General Guidelines-Other Imaging Situations (PEDHD-1.4)

- MRI Brain without contrast (CPT® 70551) or MRI Brain with and without contrast (CPT® 70553) can be performed for nausea and vomiting, persistent, unexplained and a negative GI evaluation
- MRI Brain without contrast (CPT® 70551) or MRI Brain without and with contrast (CPT® 70553) is approvable in the presence of neurological signs and/or symptoms, including headache, after COVID-19 infection
- Screening for metallic fragments before MRI should be done initially with Plain x-ray.
  - The use of CT Orbital to rule out orbital metallic fragments prior to MRI is rarely necessary
  - Plain x-rays are generally sufficient; x-ray detects fragments of 0.12 mm or more, and CT detects those of 0.07 mm or more
  - Plain x-ray is generally sufficient to screen for aneurysm clips
- CPT® 76377 (3D rendering requiring image post-processing on an independent workstation) or CPT® 76376 (3D) can be considered when performed in conjunction with conventional angiography (i.e.: conventional 4 vessel cerebral angiography).
- MRI Brain with and without contrast (CPT® 70553) is appropriate in consideration of neurosarcoidosis
- CT or MRI Perfusion (See **CT or MRI Perfusion (HD-24.5)** in the Head Imaging Guidelines)
  - Performed as part of a CT Head or MRI Brain examination in the evaluation of individuals with very new strokes or brain tumors.
  - Category III 0042T - “cerebral perfusion analysis using CT.” The study is generally limited to evaluation of acute stroke (<24 hours), to help identify individuals with stroke-like symptoms most likely to benefit from thrombolysis or thrombectomy, to assist in planning and evaluating the effectiveness of therapy for cervical or intracranial arterial occlusive disease and/or chronic cerebral ischemia, identifying cerebral hyperperfusion syndrome following revascularization and following aneurysmal subarachnoid hemorrhage. Other indications are usually regarded as investigational and experimental. (See **Moyamoya Disease** (**PEDHD-12.4**))
  - There is no specific CPT® code for MRI Perfusion. Perfusion weighted images are obtained with contrast and are not coded separately from a contrasted MRI Brain examination. If MRI Brain without and with contrast is approved, no additional CPT® codes are necessary or appropriate to perform MRI perfusion

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Specialized Imaging Techniques (PEDHD-2)
Magnetic Resonance Spectroscopy (MRS, CPT® 76390) (PEDHD-2.1)
Functional Magnetic Resonance Imaging (fMRI, CPT® 70554 and CPT® 70555) (PEDHD-2.2)
PET Brain Imaging (CPT® 78608) (PEDHD-2.3)

Magnetic Resonance Spectroscopy (MRS, CPT® 76390) (PEDHD-2.1)

- 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 **Pediatric CNS Tumors (PEDONC-4)** in the Pediatric Oncology Imaging Guidelines.

Uses in Metabolic Disorders:

- MRS is indicated in individuals with neonatal hypoxic ischemic encephalopathy to help estimate the age of the injury.
- 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 (MCL)
  - Pelizaeus-Merzbacher disease (PMD)
  - Hypomyelination and Congenital Cataract
  - Globoid Cell Leukodystrophy (Krabbe disease)
  - X-linked adrenoleukodystrophy (X-ALD, CALD)
  - Mitochondrial disorders (e.g. Leigh's syndrome, Kearns-Sayre syndrome, MELAS, etc)
  - Alexander disease (ALX, AXD, demyelonigenic leukodystrophy)
  - Megalencephalic leukoencephalopathy with subcortical cysts
  - Vanishing White Matter disease (Leukoencephalopathy with vanishing white matter, CACH syndrome, CACH/VWM)
  - MRS can be appropriate 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.

Functional Magnetic Resonance Imaging (fMRI, CPT® 70554 and CPT® 70555) (PEDHD-2.2)

- MRI 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 performed 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.

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PET Brain Imaging (CPT® 78608) (PEDHD-2.3)

- Uses in pediatric neuro-oncology: See **Pediatric CNS Tumors (PEDONC-4)** in the Pediatric Oncology Imaging Guidelines.
- Metabolic (FDG) 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 appropriate concurrently with MRI Brain (CPT® 70551 or CPT® 70553) and/or fMRI (CPT® 70554 or CPT® 70555).
- Metabolic (FDG) PET Brain/MRI is generally not supported for neurologic conditions due to lack of standardization in imaging technique and interpretation. However, it can be appropriate in certain pediatric individuals when ALL of the following criteria are met:
  - The individual meets guideline criteria for Metabolic (FDG) PET/CT Brain AND
  - Metabolic (FDG) PET/CT Brain is not available at the treating institution AND
  - The provider requests Metabolic (FDG) PET Brain/MRI in lieu of Metabolic (FDG) PET/CT Brain
- Metabolic (FDG) PET Brain/MRI, when the above criteria are met, are reported using the code combination of Metabolic (FDG) PET Brain (CPT® 78608) and MRI Brain (CPT® 70551 or CPT® 70553). All other methods of reporting Metabolic (FDG) PET Brain/MRI are inappropriate
  - When clinically appropriate, diagnostic MRI codes can be appropriate at the same time as the Metaboic (FDG) PET Brain/MRI code combination.
- Metabolic (FDG) PET Brain is considered investigational for all other pediatric indications at this time.

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Pediatric Headache (PEDHD-3)

Pediatric Headache (PEDHD-3.1)

- 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 pertinent clinical evaluation including a detailed history, physical examination with a thorough neurologic examination, since the onset or change in signs and/or symptoms, 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.
- Sensitivity and specificity of MRI are greater than that of CT for intracranial lesions.
- 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, and/or symptoms 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, physical exertion[12], or Valsalva.
  - Thunderclap headache.
  - 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.
- MRI Brain without contrast (CPT® 70551) or MRI Brain without and with contrast (CPT® 70553) is appropriate in the presence of neurological signs and/or symptoms, including headache, after COVID-19 infection
- If concern for CNS infection – See **CNS Infection (PEDHD-29)**
- CT Head poorly visualizes the posterior fossa in children and is generally insufficient to evaluate pediatric headaches with red flag symptoms. CT is not supported in lieu of MRI solely to avoid sedation.

- CT Head without contrast (CPT® 70450) is indicated for pediatric headache with one or more of the following:
  - Sudden severe headache including thunderclap headache
  - Acute setting of suspected intracranial infection prior to lumbar puncture (CT Head with contrast CPT® 70460 if intracranial spread of disease is suspected to detect suppurative fluid collections) (See **General Guidelines-Other Imaging Situations** (**PEDHD-1.4)**)
  - To exclude new hemorrhage, significant mass effect, or hydrocephalus in cases including rapid clinical deterioration
  - Recent head trauma.
  - Suspected skull or other bony involvement.
  - If MRI is contraindicated
  - Ventriculoperitoneal shunt with suspected shunt malfunction. See **Macrocephaly, Microcephaly, and Hydrocephalus (PEDHD-7)** for additional imaging.
- MRI Brain without contrast (CPT® 70551) or without and with contrast (CPT® 70553) is appropriate if a recent CT is inconclusive.
- MRI Brain without and with contrast (CPT® 70553) is appropriate if an abnormality is identified on a non-contrasted MRI performed greater than 2 weeks, otherwise a MRI Brain with contrast (CPT® 70552) is appropriate.
- MRA Head or CTA Head are not generally indicated in the evaluation of headache in children unless a vascular lesion has been seen or suspected on a prior MRI Brain or CT Head.
  - Concurrent MRI and MRA is generally not indicated.
- MRV Head (CPT® 70544, CPT® 70545, or CPT® 70546) is indicated in pediatric individuals with papilledema and headache. See **Papilledema/Pseudotumor Cerebri (HD-17)** in the Head Imaging Guidelines.

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Pediatric Head and Face Trauma (PEDHD-4)

Head Trauma (PEDHD-4.1)
Facial Trauma (PEDHD-4.2)

Head Trauma (PEDHD-4.1)

- 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 since the onset or change in signs and/or symptoms prior to considering advanced imaging.
- Advanced imaging is indicated for children with head trauma with ANY of the following red flags:
  - Loss of consciousness
  - Altered mental status or abnormal behavior
  - Known or suspected skull fracture
  - Glasgow Coma Score <15
  - Age younger than 2 years
  - Vomiting
  - Severe mechanism of injury
  - Severe or worsening headache
  - Amnesia
  - Nonfrontal scalp hematoma
- CT Head without contrast (CPT® 70450) is the primary advanced imaging study in individuals with acute head trauma.
  - CT Maxillofacial without contrast (CPT® 70486), CT 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.
- MRI Brain without contrast (CPT® 70551) is indicated for the following:
  - Children with an abnormal neurological exam that is not explained by the CT findings.
  - Subacute (8 days to one month after initial traumatic event) or chronic blunt head trauma with new or worsening neurological signs or cognitive symptoms
  - Children suspected of being the victims of physical abuse. See **Suspected Physical Child Abuse (PEDMS-7)** in the Pediatric Musculoskeletal Imaging Guidelines.
- Following a head injury, a repeat 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 parenchymal subdural or epidural hematoma may require frequent imaging during the initial 8 weeks following injury, and these requests should generally appropriate.

Facial Trauma (PEDHD-4.2)

- CT Maxillofacial without contrast (CPT® 70486) is the preferred imaging study in facial trauma.

Coding of Facial Imaging

- Both CT Orbital/Facial Bone (CPT® 70480) and CT Maxillofacial (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.
- CT Maxillofacial (CPT® 70486) is the usual study (except in obvious orbital or temporal bone trauma), but either study is appropriate.

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Sinus and Facial Imaging (PEDHD-5)

General Considerations (PEDHD-5.1)

- 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.

Imaging Indications in Sinusitis (PEDHD-5.2)

- 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 Maxillofacial 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 (MRI Orbit, Face, and/or Neck without and with contrast (CPT® 70543) is appropriate if requested instead of CT Maxillofacial)
  - Preoperative evaluation to assess surgical candidacy
- CT Maxillofacial 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) or MRI Orbit, Face and/or Neck with and without contrast (CPT® 70543) is indicated if ANY of the following are present:
  - Focal neurologic findings
  - Altered mental status
  - Seizures
  - Concern for orbital complications

- Concern for invasive fungal sinusitis
- MRA Head (CPT® 70544, CPT® 70545, or CPT® 70546) or CTA Head (CPT® 70496) is appropriate with these findings as well if there is clinical concern for associated vascular complications including but not limited to mycotic aneurysm or venous sinus thrombosis.

- Repeat sinus imaging is generally not indicated for individuals who have responded satisfactorily to treatment but is appropriate with clear documentation of the need for updated CT results to direct acute patient care decisions.

Stereotactic CT Localization (CPT® 77011) (PEDHD-5.3)

- 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.
- For treatment planning for sinus surgery CPT® 77011: A stereotactic CT localization scan 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 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 (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.

Requests for both Head and Sinus Imaging (PEDHD-5.4)

- CT Head does not visualize all of the sinuses.
- MRI Brain 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 CT Sinus is often appropriate even after a MRI Brain in order to visualize obstructions to spontaneous mucus flow. See **Stereotactic CT Localization (CPT® 77011) (PEDHD-5.3)**.
- Separate head imaging is not generally indicated in individuals with a normal neurological examination who have headaches associated with sinus symptoms.
- CT or MRI Sinus is not indicated for the evaluation of headaches or neurological

complaints without a more specific indication pointing to a sinus etiology.

Allergic Rhinitis (PEDHD-5.5)

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

Other Indications for Sinus Imaging (PEDHD-5.6)

- See **Facial Trauma (PEDHD-4.2)** for imaging guidelines in trauma.
- CT Maxillofacial without contrast (CPT® 70486) - Congenital anomalies of facial structures.
- Cleft lip and palate can be associated with brain malformations and abnormal brain development. MRI Brain (CPT® 70551) is appropriate in cases of cleft lip and/or palate. See **Cleft Palate (PEDHD-8.2)**
- 3D CT reconstructed images (CPT® 76377) in conjunction with routine CT should be an integral part of the examination in evaluating craniofacial abnormalities.
- CT Maxillofacial 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 **Pediatric Sleep Disorders (PEDHD-24.1)** for imaging guidelines.
- See **Sinus and Facial Imaging (HD-29)** for conditions not addressed in Sinus and Facial Imaging (PEDHD-5)

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Epilepsy and Other Seizure Disorders (PEDHD-6)

Epilepsy and Other Seizure Disorders (PEDHD-6.0)

- A pertinent evaluation including a detailed history, physical examination with a thorough neurologic examination, since the onset or change in signs and/or symptoms, and appropriate laboratory studies should be performed prior to considering the use of an advanced imaging (CT, MRI, Nuclear Medicine) procedure. An exception can be made if the individual is undergoing guideline-supported, scheduled follow-up imaging evaluation or request is from or in consultation with a neurologist or neurosurgeon who has seen the individual since onset of symptoms. This clinical evaluation should also include family history and (whenever possible) the accounts of eyewitnesses to the event(s).

Initial Imaging of Non-Febrile Seizures (PEDHD-6.1)

- MRI Brain without contrast (CPT® 70551) or without and with contrast (CPT® 70553) is indicated for the following:
  - First-time seizure in child that has no known cause and is not associated with fever
  - Partial seizures
  - New onset primary generalized epilepsy (e.g., absence epilepsy or juvenile myoclonic epilepsy)[1] in those who are neurologically abnormal, (e.g. developmental delay)
  - 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 appropriate even with a recent negative CT.
  - MRI Brain with and without contrast (CPT® 70553) is appropriate if there are history or examination findings concerning for a mass lesion or demyelinating disease.
- CT Head without contrast (CPT® 70450) is indicated for the following:
  - First-time seizure in child associated with recent head trauma, barrier to obtaining a neuroimaging study in a timely manner and should not preclude MRI imaging when requested. (Late post traumatic seizures may be better evaluated by MRI Brain without contrast (CPT® 70551) See **Head Trauma (PEDHD-4.1)**).
  - Individual cannot safely undergo MRI (avoidance of sedation is not an indication) or in urgent situations.
  - Identification of blood and calcifications
- Cranial ultrasound (CPT® 76506) for the following:
  - First-time seizure in child <30 days of age that has no known cause and is not associated with fever if the infant has an open fontanelle.
  - Cranial ultrasound is not required before MRI Brain without (CPT® 70551) for hypoxic ischemic encephalopathy (HIE) and congenital malformations.
- 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

Repeat imaging indications (PEDHD-6.2)

- 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
  - Refractory or drug resistant seizures (See Background and Supporting Information below)
  - Change in seizure type
  - Repeat imaging for persistent seizures as per specialist request or any provider in consultation with a specialist
  - MRI Brain with contrast (CPT® 70552) or without or with contrast (CPT® 70553) to clarify an abnormality on noncontrast MRI or if considering infection or inflammation

Background and Supporting Information

Drug Resistant synonyms may include “Refractory,” “Intractable,” or “Pharmacoresistant”
Drug Resistant requires only 2 trials of antiepileptic medications

Special Imaging Studies in Evaluation for Epilepsy Surgery (PEDHD-6.3)

- Individuals with a previous MRI Brain and documentation of intractable epilepsy for which surgical treatment or another interventional modality is under active consideration, below are examples of, but not all inclusive, include:
  - Focal Resection
  - Temporal Lobe Resection
  - Extratemporal Resection
  - Lesionectomy
  - Multiple Subpial Transections
  - Laser Interstitial Thermal Therapy
  - Anatomical or Functional Hemispherectomy and Hemispherotomy
  - Corpus Callosotomy
  - Stereotactic Radiosurgery
  - Neurostimulation Device Implantations including,
    - Vagus Nerve Stimulation (VNS)
    - Responsive Neurostimulation
    - Deep Brain Stimulation

- The following requests are appropriate for pre-surgical evaluation:
  - MRI Brain without contrast or with and without contrast 3T/7T (CPT® 70551 or CPT® 70553)
  - Ictal SPECT (CPT® 78803)
  - Functional MRI (f-MRI) (CPT® 70555 or CPT® 70554) See **Functional MRI (fMRI) (HD-24.2)** in the Head Imaging Guidelines
  - Metabolic (FDG) PET Brain (CPT® 78608)
    - Metabolic (FDG) PET Brain/MRI is generally not supported for neurologic conditions due to lack of standardization in imaging technique and interpretation. However, it may be appropriate in certain pediatric individuals when ALL of the following criteria are met:
      - The individual meets guideline criteria for Metabolic (FDG) PET/CT Brain AND
      - Metabolic (FDG) PET/CT Brain is not available at the treating institution AND
      - The provider requests Metabolic (FDG) PET Brain/MRI in lieu of Metabolic (FDG) PET/CT Brain
    - Metabolic (FDG) PET Brain/MRI, when the above criteria are met, are reported using the code combination of Metabolic (FDG) PET Brain (CPT® 78608) and MRI Brain (CPT® 70551 or CPT® 70553). All other methods of reporting Metabolic (FDG) PET Brain/MRI are inappropriate.
      - When clinically appropriate, diagnostic MRI codes may be appropriate at the same time as the Metabolic (FDG) PET Brain/MRI code combination.
  - MR Spectroscopy (CPT® 76390).
  - See **Primary Central Nervous System Tumors-General Considerations (ONC-2.1)** in the Oncology Imaging Guidelines for additional imaging requests for surgery and/or **Neurosurgical Imaging (HD-28)** in the Head Imaging Guidelines
- When noninvasive EEG monitoring is insufficient, intracranial monitoring with stereo-EEG or grids/strips and electrodes may be required with appropriate additional imaging for neuronavigation with one of each of the following after consulting the health plan direction for unlisted codes:
  - MRI Brain with and without or without contrast (CPT® 70553 or CPT® 70551)
  - CT Head without or with contrast (CPT® 70450 or CPT® 70460)
  - If previous head imaging is considered inadequate or additional sequences/protocols are required OR is greater than 6 months old, diagnostic head imaging may be appropriate.
- Due to variances with techniques currently available for neuronavigation, the following are appropriate:
  - CTA Head without and with contrast (CPT® 70496) or MRA Head (CPT® 70544, CPT® 70545 or CPT® 70546)
  - Post-operative imaging including after intracranial (EEG) monitoring is appropriate per neurosurgeon's request

Febrile Seizures (PEDHD-6.4)

- A typical febrile seizure is a generalized seizure occurring in the presence of fever (T >100.4°F/38°C) 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 (Head circumference that is greater than the 95th percentile for age and sex, established by use of measurements and CDC growth charts. See **Macrocephaly (PEDHD-7.1)**)
  - Signs and symptoms of increased intracranial pressure
  - Developmental delay

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Macrocephaly, Microcephaly, and Hydrocephalus (PEDHD-7)

Macrocephaly (PEDHD-7.1)
Microcephaly (PEDHD-7.2)
Hydrocephalus (PEDHD-7.3)

Macrocephaly (PEDHD-7.1)

- Macrocephaly is defined as head circumference that is greater than the 95th percentile for age and sex, or head circumference increasing in percentiles over two visits 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 6 months:
  - Ultrasound 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 contrast (CPT® 70551) or without and with contrast (CPT® 70553) is indicated for any abnormality seen on ultrasound.
- Age 7 months and older, or with closed fontanelle:
  - MRI Brain without contrast (CPT® 70551) or 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.

Microcephaly (PEDHD-7.2)

- Microcephaly is defined as head circumference that is less than the 5th percentile for age and sex, or head circumference decreasing in percentiles over two visits 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.

Hydrocephalus (PEDHD-7.3)

- This is the most common identifiable cause of macrocephaly. Almost all hydrocephalus is obstructive, except hydrocephalus due to choroid plexus papillomas. See **Choroid Plexus Tumors (PEDONC-4.13)** in the Pediatric Oncology 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).
- Ventriculomegaly refers to enlarged ventricular spaces. It is often initially found on fetal ultrasound. It can be from an obstructive cause or can be relative secondary to small brain volume. It can remain stable and may be monitored with serial ultrasound (CPT® 76506) to assess stability or MRI Brain with and without contrast (CPT® 70553) if over age 6 months. If ventriculomegaly progresses to hydrocephalus, follow imaging timelines listed below for hydrocephalus.

- Benign external hydrocephalus (aka benign extra-axial fluid collection among other names) is defined as a rapid increase in head circumference in an infant with enlarged frontal subarachnoid spaces. It is a common cause of macrocephalus and is commonly secondary to a familial large head size. See **Macrocephaly (PEDHD 7.1)** for initial imaging guidelines. It typically requires no intervention. Once diagnosed and confirmed with MRI Brain with and without contrast (CPT® 70553) no additional imaging is required unless new neurological symptoms appear, worsen or persist beyond age 4 years. If developmental motor delay See **Developmental Motor Delay (PEDHD 19.3)**
- For CSF flow imaging See **CSF Flow Imaging (HD-24.4)** in the Head Imaging Guidelines

Initial Imaging Indications

- **Age 0-6 months**:
  - Screening head ultrasound examination (CPT® 76506)
  - 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, or performance of an endoscopic third venticulostomy (ETV)
- **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 including CSF flow shunting and Ventriculostomy

- 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 or ETV 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 after shunt setting adjustments, or as ordered by a specialist (neurologist or neurosurgeon) or any provider in consultation with a specialist
- Rapid MRI Brain without contrast (CPT® 70551) or CT Head without contrast (CPT® 70450) is indicated in the postoperative period following shunt placement or ETV, with further follow-up imaging 6-12 months after the procedure 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 CT Head 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) is appropriate 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 appropriate 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 appropriate for the following:
  - Evaluation of internal shunt, porencephalic cyst, or posterior fossa cyst.
- Nuclear Medicine Shunt Evaluation (CPT® 78645) and CSF Flow SPECT (CPT® 78803) are rarely done in children but can be appropriate for the following:
  - Suspected malfunction of ventriculoperitoneal, ventriculopleural, or ventriculovenous shunts.

Background and Supporting Information

- Head ultrasound can be performed while the fontanelles are still open and has excellent spatial and anatomic resolution, particularly within the first 2 months of life. After 6 months, smaller acoustic windows due to closing sutures limit the sensitivity of the examination

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Craniosynostosis/Cleft Palate (PEDHD-8)

Craniosynostosis Imaging (PEDHD-8.1)

Cleft Palate (PEDHD-8.2)

Craniosynostosis Imaging (PEDHD-8.1)

- Craniosynostosis is the premature closure of one or more cranial sutures, usually during infancy. Craniosynostosis may be caused by a genetic condition, such as Apert, Pfeiffer or Crouzon syndrome to name a few.[18] Abnormal head shape **is the common clinical feature**.
- Skull x-rays and/or ultrasound should be obtained prior to considering advanced imaging. In cases of very strong consideration of craniosynostosis with surgical planning in progress, x-rays and/or ultrasound are not required.
- CT Head without contrast (CPT® 70450) is indicated in the diagnosis of craniosynostosis, with reported sensitivity near 100%. CT also detects associated intracranial pathology.
- 3D rendering (CPT® 76376 or 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.
- CT Maxillofacial (CPT® 70486) and/or CT Orbits (CPT® 70480) may be indicated in certain types of craniosynostosis and may be approved when ordered by surgical specialties or in consultation with surgical specialties during surgical evaluation and planning.
- Ultrasound Head (CPT® 76506) can be approved as an alternative method of assessing sutural patency in neonates and infants when radiographs are indeterminate. If inconclusive or for pre-operative planning, CT with 3D rendering can be approved as discussed previously in this section.
- CT Head without contrast (CPT® 70450) may be performed postoperatively at the discretion of or in consultation with the specialist coordinating the individual's care.
- Positional plagiocephaly typically does NOT require advanced imaging.[13,15,16]

Cleft Palate (PEDHD-8.2)

- Congenital anomalies of facial structures - CT Maxillofacial without contrast (CPT® 70486) or MRI Face, Orbits and/or Neck without contrast or with and without contrast (CPT® 70540 or CPT® 70543)[19].
- Cleft lip and palate can be associated with brain malformations and abnormal brain development. MRI Brain (CPT® 70551) is appropriate in individuals with cleft lip and/or palate. MRI Face, Orbits and/or Neck without contrast or with and without contrast (CPT® 70540 or CPT® 70543)[19] is appropriate if requested by surgeon or any provider in consultation with the surgeon.

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Chiari and Skull Base Malformations (PEDHD-9)
Chiari I Malformations (PEDHD-9.1)
Chiari II Malformations (Arnold Chiari Malformation) (PEDHD-9.2)
Chiari III and IV Malformations (PEDHD-9.3)
Basilar Impression (PEDHD-9.4)
Platybasia (PEDHD-9.5)

Chiari I Malformations (PEDHD-9.1)

- This involves caudal displacement or herniation of the cerebellar tonsils. Chiari I may be 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.
- 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.
- For CSF flow imaging See **CSF Flow Imaging (HD-24.4)** in the Head Imaging Guidelines
- Repeat imaging may be approved at the discretion of or in consultation with the specialist coordinating the individual's care for this condition.
- 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
  - 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 from baseline that suggest spinal cord pathology.
- Repeat brain and spine imaging in individuals with Chiari I malformations and known syringomyelia or hydromyelia is highly individualized
- Familial screening is not indicated for Chiari I Malformations.

Chiari II Malformations (Arnold Chiari Malformation) (PEDHD-9.2)

- These malformations are more severe than Chiari I malformations. These individuals usually present at birth. Myelomeningocele is always present, and syringomyelia and hydrocephalus are extremely common.
- 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 advanced imaging evaluation.
- Repeat brain and spine imaging in individuals with Chiari II malformations is highly individualized and is indicated at the discretion of or in consultation with the specialist coordinating the individual's care for this condition.
- Familial screening is not indicated for Chiari II Malformations.

Chiari III and IV Malformations (PEDHD-9.3)

- 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.
- Repeat brain and spine imaging in individuals with Chiari III and IV malformations is highly individualized and is indicated at the discretion of or in consultation with the specialist coordinating the individual's care for this condition.
- Familial screening is not indicated for Chiari III or IV Malformations.

Basilar Impression (PEDHD-9.4)

- 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.
- 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 appropriate.

Platybasia (PEDHD-9.5)

- Platybasia is a flattening malformation of the skull base, in which the clivus has a horizontal orientation.
- MRI Brain without contrast (CPT® 70551) or CT Head without contrast (CPT® 70450) is indicated to establish a diagnosis when clinically suspected, individuals are usually asymptomatic.

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Intracranial Aneurysms and AVM (PEDHD-10)

Pediatric Intracranial Aneurysms (PEDHD-10.1)

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

Pediatric Intracranial Aneurysms (PEDHD-10.1)

- 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 pertinent 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 or request is from a neurologist or neurosurgeon who has seen the individual since onset of symptoms.
- 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 (CPT® 70544, CPT® 70545, or CPT® 70546) is indicated if subarachnoid hemorrhage is present on CT or MRI, or lumbar puncture findings suggest hemorrhage.
  - CT or MRI Perfusion See **General Guidelines-Other Imaging Situations (PEDHD-1.4)**
- MRI Brain 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 (CPT® 70544, CPT® 70545, or CPT® 70546) is indicated if findings suspicious for intracranial aneurysm are present on MRI.
- MRI Brain without contrast (CPT® 70551) or without and with contrast (CPT® 70553) and MRA Head (CPT® 70544, CPT® 70545, or CPT® 70546) are indicated for individuals with known unruptured aneurysm presenting with headache, increased intracranial pressure, seizures, or focal neurologic findings.
- CTA Head (CPT® 70496) for individuals with treated aneurysms is preferred.
- MRI Brain without contrast (CPT® 70551) or without and with contrast (CPT® 70553) and MRA Head (CPT® 70544, CPT® 70545, or CPT® 70546) 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
- Kawasaki disease
- Coarctation of the aorta
- Patent ductus arteriosus
- Hyper-IgE syndrome
- 4 forms of Loeys-Dietz syndrome
- Klinefelter syndrome
- Alpha-glucosidase deficiency
- Noonan syndrome
- Pheochromocytoma
- Alpha-1-antitrypsin deficiency
- Presence of an azygos anterior cerebral artery
- Marfan Syndrome
- Bicuspid aortic valve
- Microcephalic osteodysplastic primordial dwarfism Type II

- The timing of follow-up imaging for intracranial aneurysms in children is similar to that in adults. See **Intracranial Aneurysms (HD-12.1)** in the Head Imaging Guidelines.
- Screening MRI Brain or MRA Head for aneurysms is generally 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.

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

- A pertinent 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 or request is from or in consultation with a neurologist or neurosurgeon who has seen the individual since onset of symptoms.
- 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.

- Ultrasound Head (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.
  - 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 Head (CPT® 70544, CPT® 70545, or CPT® 70546) or CTA Head (CPT® 70496) are indicated in the following circumstances for individuals with known AVM:
  - Repeat advanced imaging with MRI Brain without and with contrast (CPT® 70553) or without contrast (CPT® 70551), AND/OR MRA Head (CPT® 70544, CPT® 70545, or CPT® 70546) or CTA Head (CPT® 70496) when requested by a specialist or any provider in consultation with a specialist
- 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.
    - CTA (as above) is indicated for clinical signs or symptoms concerning for progression in an individual with a clipped 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 **Vascular Anomalies (PEDPVD-2)** in the Pediatric Peripheral Vascular Disease Imaging Guidelines.
  - 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.

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Syncope (PEDHD-11)

Syncope (PEDHD-11.1)

- 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 **Syncope (PEDCD-5)** in the Pediatric Cardiac Imaging Guidelines and **Epilepsy and Other Seizure Disorders (PEDHD-6)** for additional imaging considerations.
- There is no role for advanced neuroimaging for Postural Tachycardia Syndrome (POTS).

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Pediatric Stroke (PEDHD-12)
General Considerations (PEDHD-12.1)
Pediatric Stroke Initial Imaging (PEDHD-12.2)
Pediatric Stroke Subsequent Imaging (PEDHD-12.3)
Moyamoya Disease (PEDHD-12.4)
Sickle Cell Disease (PEDHD-12.5)
CNS Vasculitis and Stroke (PEDHD-12.6)

General Considerations (PEDHD-12.1)

- Imaging indications are the same for neonates as for older children.

Pediatric Stroke Initial Imaging (PEDHD-12.2)

- Individuals may not present with typical stroke findings. MRI Brain without contrast (CPT® 70551) or MRI Brain without and with contrast (CPT® 70553) is appropriate in the presence of neurological signs and/or symptoms with concern for stroke.[4]
- ANY of the following studies are indicated for evaluation:
  - CT Head without contrast (CPT® 70450) or MRI Brain without contrast (CPT® 70551)
  - MRA Head (CPT® 70544) or CTA Head (CPT® 70496)
  - For suspected carotid dissection CTA Neck (CPT® 70498) or or MRA Neck (CPT® 70547, CPT® 70548 or CPT® 70549)
  - Note: Both MRA or CTA Head and Neck are needed to visualize the posterior vertebrobasilar circulation for evaluation of the vertebrobasilar stroke/TIA (vertigo associated with diplopia, dysarthria, bifacial numbness or ataxia) or concern for arterial dissection (risks may include premature stroke [under age 50], head or neck trauma, fibromuscular dysplasia, Ehlers-Danlos syndrome, and chiropractic neck manipulation)
- In individuals with COVID-19, See **COVID-19 and Multisystem Inflammatory Syndrome in Children (MIS-C) (PEDHD-12.7)**

Pediatric Stroke Subsequent Imaging (PEDHD-12.3)

- 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.
- Repeat imaging for follow up and resolution of stroke or hemorrhage as determined by a neurology specialist or any provider in consultation with a neurology specialist.
  - MRI Brain without contrast (CPT® 70551) or without and with contrast (CPT® 70553)
  - MRA Head/MRV Head (CPT® 70544, CPT® 70545 or CPT® 70546) or CTA Head/CTV Head (CPT® 70496) for follow-up of known cerebral artery stenosis or thrombosis[4,7]
  - Other surveillance imaging indications after stroke are listed in the disease-specific sections.

Background and Supporting Information

- CT and MR Venography (CTV and MRV) are reported with the same codes as the CTA/MRA counterpart (there is no specific code for CT/MR venography):
  - If arterial and venous CT or MR studies are both performed in the same session, only **one** CPT® code is used to report both procedures
  - If an arterial CTA or MRA study has been performed and subsequently a repeat study is needed to evaluate the venous anatomy, then this study is supported
  - If a venous CTV or MRV study has been performed and subsequently a repeat study is needed to evaluate the arterial anatomy, then this study is supported
  - MRA without and with contrast with venous sinus thrombosis to differentiate total

from subtotal occlusion

Moyamoya Disease (PEDHD-12.4)

Initial imaging

- MRI Brain without contrast (CPT® 70551) or without and with contrast (CPT® 70553), MRA Head (CPT® 70544, CPT® 70545, or CPT® 70546) and MRA Neck (CPT® 70547, CPT® 70548, or CPT® 70549) are indicated for all individuals. CTA Head and Neck (CPT® 70496 and CPT® 70498) can be appropriate if MRI is contraindicated or not readily available.

Repeat imaging

- MRA Head (CPT® 70544, CPT® 70545, or CPT® 70546) every 12 months. CTA Head (CPT® 70496) can be appropriate if MRI is contraindicated or not readily available
- MRI Brain without contrast (CPT® 70551) every 12 months
- Radiopharmaceutical Localization Imaging SPECT (CPT® 78803) with vasodilating agent acetazolamide (Diamox) challenge can be appropriate when surgery or other vascular intervention is being considered.
- CT or MRI Perfusion See **General Guidelines-Other Imaging Situations (PEDHD-1.4)**

Sickle Cell Disease (PEDHD-12.5)

- 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.
- Identification of silent cerebral infarction is important because treatment with prophylactic red cell transfusions to maintain hemoglobin S levels at <30% of total hemoglobin may reduce recurrent stroke and extent of neurologic damage.
- The following imaging is indicated for all sickle cell individuals with a severe phenotype (Hgb SS or Hgb $S\beta^0$):
  - Transcranial Doppler (TCD) Ultrasound (CPT® 93886 or CPT® 93888) annually for all individuals age 2 to 16. TCD is used to screen for overt and silent infarctions and monitor response to transfusion therapy.
    - A short interval repeat study is indicated for individuals with conditional (170-199 cm/sec) flow results, or with individuals undergoing transfusion therapy.
    - MRA Head (CPT® 70544, CPT® 70545, or CPT® 70546) or CTA Head (CPT® 70496) is appropriate with 2 non-imaging TCD measurements of ≥200 cm/sec or a single measurement of >220 cm/sec or 2 assessment TCD measurements ≥185 cm/sec or a single measurement >205 cm/sec
    - MRI Brain without contrast (CPT® 70551) or without and with contrast (CPT® 70553) and/or MRA Head (CPT® 70544, CPT® 70545, or CPT® 70546) is/are indicated in individuals with persistent abnormal TCD velocities

- TCD for children aged 17 years old may be appropriate on a case by case basis. See **Transcranial Doppler** (CPT®93886) **(HD-24.8)** in the Head Imaging Guidelines for other indications for this modality and **Stroke/TIA (HD-21.1)** in the Head Imaging Guidelines
- After 17 years old, for individuals with a history of abnormal TCDs, TCDs may be repeated every 3 months.
- TCD is not indicated for individuals with other phenotypes (Hgb SC, Hgb Sβ+).
- A 1-time MRI Brain (CPT® 70551 or CPT® 70553) screening without sedation to detect silent cerebral infarcts in early-school-age children, when MRI can commonly be performed without sedation. A second screening MRI can be considered if new symptoms or cognitive impairment occurs or a change in academic performance is noted.
- After an infarct-like lesion is identified, MRI Brain (CPT® 70551 or CPT® 70553) surveillance every 12-24 months to assess for cerebral infarct progression
- MRA Head (CPT® 70544, CPT® 70545, or CPT® 70546) for any new findings of MRI Brain abnormalities.[19]
- Otherwise screening of asymptomatic sickle cell individuals with MRI or MRA is no longer recommended.
- MRI Brain without contrast or MRI Brain without and with contrast (CPT® 70551 or CPT® 70553) and MRA Head (CPT® 70544, CPT® 70545, or CPT® 70546) is appropriate prior to any change in therapy.[20-25]

CNS Vasculitis and Stroke (PEDHD-12.6)

- 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 (CPT® 70544, CPT® 70545, or CPT® 70546) is indicated for inconclusive MRI findings suggesting medium or large vessel vasculitis.
  - Individuals with aggressive disease being treated with systemic therapy can have imaging for treatment response every 3 months during active treatment.
  - Annual surveillance imaging is appropriate to detect progressive vascular damage that may require intervention.

COVID-19 and Multisystem Inflammatory Syndrome in Children (MIS-C) (PEDHD-12.7)

- MRI Brain without contrast (CPT® 70551) or MRI Brain without and with contrast (CPT® 70553) is appropriate in the presence of neurological signs and/or symptoms, including headache, after COVID -19 infection.

- COVID-19 infections in children are generally mild in comparison to that of adults, however a post viral syndrome in children has become increasingly noted. Multisystem Inflammatory Syndrome in Children (MIS-C) can cause an inflammatory vasculopathy, prothombotic state and/or post viral myocarditis in children who have had a COVID-19 infection caused by SARS-CoV-2. The child may have had minor symptoms or been asymptomatic at the time of COVID-19 infection but the virus can trigger endothelial injury and activation of the IL-1 pathway similar to that in Kawasaki disease and acute rheumatic fever.
  - Symptoms of MIS-C may include some or all of the following;
    - Headache, irritability
    - Mucocutaneous changes similar to Kawasaki disease (i.e. strawberry tongue, red cracked lips, rash of hands and/or feet)
    - Polymorphus or vasculitic rash
    - Non-exudative conjunctivitis
    - Tachycardia, hypotension
    - Cough, shortness of breath
    - Abdominal pain, vomiting, diarrhea
    - Lymphadenopathy, joint pain, sore throat

- MRI Brain (CPT® 70553 or CPT® 70551), MRA Head (CPT® 70544, CPT®70545 or CPT® 70546) and MRA Neck (CPT® 70547 or CPT® 70548 or CPT® 70549) is appropriate in children presenting with any of these symptoms after known or presumed COVID-19 infection. MRA is the preferred study in children however, CTA Head (CPT® 70496) and/or Neck (CPT® 70498) is appropriate if MRA is contraindicated.
- If concern for CNS infection – See **CNS Infection (PEDHD-29.1)**
- See **Multisystem inflammatory syndrome in children (MIS-C) (PEDCD-12)** in the Pediatric Cardiac Imaging Guidelines

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Benign Brain Lesions (PEDHD-13)

Arachnoid Cysts (PEDHD-13.1)
Pineal/Colloid Cysts (PEDHD-13.2)
Acoustic Neuromas (PEDHD-13.3)

Arachnoid Cysts (PEDHD-13.1)

- 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 contrast (CPT® 70551) or 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 is appropriate for the following:
  - Annual MRI Brain without contrast (CPT® 70551) or 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.
  - When requested by a specialist or any provider in consultation with a specialist

Pineal/Colloid Cysts (PEDHD-13.2)

- Pineal cysts are generally discovered incidentally and do not require surgical intervention.
- MRI Brain without contrast (CPT® 70551) or 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 MRI Brain without contrast (CPT® 70551) or without and with contrast (CPT® 70553) is appropriate for the following:
  - New or worsening headache or focal neurologic deficits suggesting progression of cyst.
  - Preoperative planning.
- Repeat MRI Brain without contrast (CPT® 70551) or without and with contrast (CPT® 70553) is appropriate for colloid cysts for the following:
  - In the presence of symptoms including syncope
  - Evaluation of CSF flow (CPT® 70551)
  - When requested by a specialist or any provider in consultation with a specialist

Acoustic Neuromas (PEDHD-13.3)

- See **Neurofibromatosis 2 (PEDPND-2.2)** in the Pediatric Peripheral Nerve Disorders Imaging Guidelines

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Pediatric Demyelinating Diseases (PEDHD-14)

General Considerations (PEDHD-14.1)

- MRI Brain without and with contrast (CPT® 70553) is the preferred imaging study for evaluation of pediatric demyelinating disease.
  - MRI Spinal Cord without and with contrast (CPT® 72156 and CPT® 72157) is also indicated for evaluation of pediatric demyelinating disease.
  - MRI Lumbar Spine without and with contrast (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.
- Metabolic (FDG) PET Brain (CPT® 78608) and MR Spectroscopy (CPT® 76390) are considered investigational for evaluation of pediatric demyelinating diseases.

Multiple Sclerosis (MS) (PEDHD-14.2)

- 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.
- MRI Brain (CPT® 70553) 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 Brain (CPT® 70551) and Spinal Cord (CPT® 72141 and CPT® 72146) without contrast is appropriate if there is a contraindication to gadolinium administration.
- MRI Brain without contrast (CPT® 70551), which is preferred, OR MRI Brain without and with contrast (CPT® 70553) is indicated every 6 months for disease monitoring whether or not receiving treatment.[19]
  - MRI Spinal Cord (CPT® 72156 and CPT® 72157) without and with contrast OR Spinal Cord (CPT® 72141 and CPT® 72146) without contrast is (are) indicated every 12 months or for new signs or symptoms.[19]
  - MRI Orbit without and with contrast (CPT® 70543) may be considered if opticneuritis is suspected, in addition to the above scenario.
  - Symptoms suggestive of Progressive Multifocal Leukoencephalopathy (PML) during Tysabri therapy (or other medications with similar risk).
    - Screening for individuals on natalizumab (Tysabri) or other drugs with risk of PML (Progressive Multifocal Leukoencephalopathy)
      - MRI Brain every 6 months while on treatment
      - MRI Brain every 3-6 months for high-risk individuals positive for serum JC virus antibody and >18 months natalizumab exposure

- If a non-contrast study shows incidental evidence of possible demyelinating disease, repeat with MRI Brain with contrast (CPT® 70552) is appropriate within 2 weeks of previous non-contrast study as the presence of enhancing lesions may be helpful in confirming the diagnosis. If non-contrast study was performed more than 2 weeks prior to the performance of the repeat imaging, an MRI Brain with and without contrast (CPT® 70553) is appropriate.

Background and Supporting Information

- Medications with similar risks of PML as Tysabri include: Dimethyl fumarate (Tecfidera), Fingolimod (Gilenya), Ocrelizumab (Ocrevus), Mavenclad (cladribine), Vumerity (diroximel fumarate), Soliris (eculizaumab), Zeposia (ozanimod), Lemtrada (alemtuzumab), Bafiertam (monomethyl fumarate), Rituxan (rituximab).
- 3D imaging in the evaluation of Multiple Sclerosis is not approvable as a separate code as most scanners are capable of 3D acquisitions or other imaging sequences may be done.

Acute Disseminated Encephalomyelitis (ADEM) and Other Pediatric Demyelinating Disorders (PEDHD-14.3)

- 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.
- MRI Brain (CPT® 70553) 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 Brain (CPT® 70551) and Spinal Cord (CPT® 72141 and CPT® 72146) without contrast can be approved if there is a contraindication to gadolinium.
- MRI Brain (CPT® 70553) and Spinal Cord (CPT® 72156 and CPT® 72157) without and with contrast is indicated every 3 months for 1 year following diagnosis or if ordered out of sequence or beyond one year by a specialist or any provider in consultation with a specialist.
  - MRI Brain (CPT® 70551) 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. Prolonged symptoms or return of symptoms may represent a different demyelinating disorder
- There are other pediatric demyelinating disorders that are less common but have clinical overlap with multiple sclerosis and ADEM such as (but not limited to):
  - Neuromyelitis optica (NMO) spectrum disorders (See **Neuromyelitis Optica and NMO Spectrum Disorders (HD 16.2)**)
  - Anti-MOG syndromes (anti-myelin oligodendrocyte glycoprotein) (See **Anti-MOG Syndromes (HD 16.3)**)
  - Demyelination secondary to infectious or inflammatory disorders (e.g. transverse myelitis) (See **General Guideines – Other Imaging Sitnuations (HD 1.7)**)
- These conditions may require a different treatment regimen than multiple sclerosis and may require repeat imaging to monitor treatment response as the diagnosis becomes more clear. Repeat imaging with MRI Brain and/or MRI Cervical Spine and MRI Thoracic Spine as requested by neurology or infectious disease may be approved.

Transverse Myelitis (PEDHD-14.4)

- Transverse myelitis is an inflammatory disorder of the spine and can be:
  - Idiopathic
    - Associated with autoimmune central nervous system inflammatory disease
    - First event of multiple sclerosis (MS)
    - Neuromyelitis optica (NMO)
    - MOG (Myelin Oligodendrocyte Glycoprotein) antibody disorder
  - Associated with connective tissue autoimmune diseases
    - Systemic Lupus Erythematous (SLE)
    - Systemic Sclerosis
    - Rheumatoid Arthritis (RA)
    - Sjogren's Syndrome (SS)
    - Neuro-Sarcoidosis (NS)
  - Post-infectious or post-vaccine neurological syndrome

See **Multiple Sclerosis (MS) and Related Conditions (HD-16)**

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Pituitary Dysfunction (PEDHD-15)
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General Considerations (PEDHD-15.1)

- 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 initial advanced imaging.
- MRI Brain without and with contrast (CPT® 70553) or MRI Brain without contrast (CPT® 70551) when pituitary imaging is indicated.
  - Pituitary Gland: one study (either MRI Brain [CPT® 70553] or MRI Orbit, Face, Neck [CPT® 70543]) is adequate to report the imaging of the pituitary. The reporting of two CPT® codes, to image the pituitary, is not indicated
- If a previous MRI Brain was reported to show a possible pituitary tumor with supporting evidence of pituitary disease or is inconclusive, a repeat MRI with dedicated pituitary protocol may be performed. If a prior MRI Brain was without contrast a follow up scan either with contrast (CPT® 70552) or with and without contrast (CPT® 70553) is appropriate
- For association between pituitary dysfunction and optic nerve issues See **Eye Disorders and Visual Loss (HD- 32.1)** in the Head Imaging Guidelines
- For repeat imaging, See **Pituitary (HD-19.1)** in the Head Imaging Guidelines

Panhypopituitarism (PEDHD-15.2)

- Endocrine testing should be performed initially.
- MRI Brain without and with contrast (CPT® 70553) or MRI Brain without contrast (CPT® 70551) 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.

Isolated Growth Hormone Deficiency (PEDHD-15.3)

- Clinical features include: height below the normal range (<3rd percentile), subnormal growth velocity or the child's height is below the range expected based on parental height.
- Risk factors include: a history of brain tumor, cranial irradiation or other congenital/organic hypothalamic-pituitary abnormality as well as an incidental finding of a hypothalamic-pituitary abnormality on MRI.
- Endocrine testing should be performed initially.

- MRI Brain without and with contrast (CPT® 70553) or MRI Brain without contrast (CPT® 70551) with special attention to the pituitary is indicated for any of the following:
  - Both IGF1 and IGFBP3 are below the laboratory reference range for age/sex or Tanner stage.
  - 2 measurements of growth hormone stimulation with different stimulation agents (glucagon, clonidine, arginine, insulin, levodopa) performed on the same day or separate days produce maximal GH levels <10ng/mL See Background and Supporting Information
- 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

- Growth hormone stimulation testing is limited by poor specificity and requires failure on 2 tests to diagnose growth hormone deficiency.
- Controversy exists as to the cutoff level which differentiates a normal response from a deficient response on provocative testing. Some experts support GH <7 ng/mL however many pediatric endocrinologists consider a peak GH level <10 ng/mL to be indicative of growth hormone deficiency and may identify children with partial GHD.

Diabetes Insipidus (DI) and Other Disorders of Anti-Diuretic Hormone (PEDHD-15.4)

- Laboratory testing should be performed initially. Diabetes insipidus is characterized by serum osmolality >300mOsm/kg and urine osmolality <300 mOsm/kg.
- Central diabetes insipidus (CDI) is caused by diminished synthesis or secretion of vasopressin in the hypothalamus and nephrogenic diabetes insipidus (NDI) is caused by renal resistance to vasopressin.

Central Diabetes Insipidus (DI)

- MRI Brain without and with contrast (CPT® 70553) or MRI Brain without contrast (CPT® 70551) is indicated for newly diagnosed central DI.
- Individuals with a normal pituitary on initial MRI can have repeat MRI Brain without and with contrast (CPT® 70553) every 3-6 months for the first 2 years 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.
- 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) or MRI Brain without contrast (CPT® 70551) is approvable for initial evaluation of unexplained central (hypothalamic pituitary) 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

- See **Small Cell Lung Cancer-Suspected/Diagnosis (ONC-7.1)** and **Paraneoplastic Syndromes (ONC-30.3)** in the Oncology Imaging Guidelines.
- Pulmonary diseases including infection (tuberculosis, viral/bacterial pneumonia), acute respiratory infections, mechanical ventilation and others can cause SIADH although the mechanism is unclear. Individuals with lung disease should have chest imaging according to the guidelines for the specific diagnosis

Precocious Puberty (PEDHD-15.5)

- Defined as the appearance of secondary sexual characteristics before age 8 in females and before age 9 in males. The diagnosis is made clinically using Tanner staging and often will include a bone age assessment (hand/wrist radiographs) and/or abdominal and/or pelvic ultrasound (See Peripheral Precocious Puberty below).
- Endocrine laboratory studies (baseline LH, FSH and either estradiol or testosterone) are used to determine if the etiology of precocious puberty is central (gonadotropin dependent) or peripheral (gonadotropin independent). Estradiol and testosterone levels will often be elevated to a pubertal range

Central Precocious Puberty (CPP)

- An LH >0.3 U/L on a random blood sample is the most reliable screening test for central precocious puberty. If LH <0.3 U/L and CPP is suspected, a stimulation test with a GnRH analog is the gold standard.
- Neuroimaging should always follow hormonal studies that suggest a central origin of precocious puberty.
- MRI Brain without and with contrast (CPT® 70553, preferred study) or MRI Brain without contrast (CPT® 70551) is indicated for evaluation of any child with documented central precocious puberty.
- MRI is appropriate irrespective of age and gender in individuals with precocious puberty and concurrent CNS symptoms of severe headache, visual changes or seizures.
- 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. (**Benign Pituitary Tumors** (**PEDHD-15.6)** and **Pituitary Malignancies (PEDHD-15.7)**)

Peripheral Precocious Puberty

- The differential diagnosis of peripheral precocious puberty (LH suppressed or in the pre-pubertal range with elevated estradiol, testosterone and/or adrenal androgens) is broad and may include ovarian, testicular, adrenal and other sources of excessive hormonal production
- Ultrasound Abdomen (CPT® 76700) in both genders and Ultrasound Pelvis (CPT® 76856) in females and Scrotal ultrasound (CPT 76870) in males depending on the suspected source of hormonal excess for initial imaging
- See **CNS Germinomas and Non-Germinomatous Germ Cell Tumors (PEDONC-4.7)** in the Pediatric Oncology Imaging Guidelines for evaluation of HCG secreting CNS tumors.
- See **Hepatoblastoma (PEDONC-11.2)** in the Pediatric Oncology Imaging Guidelines for evaluation of HCG secreting hepatic tumors.
- See **Pediatric Germ Cell Tumors (PEDONC-10)** in the Pediatric Oncology Imaging Guidelines and **Testicular, Ovarian and Extragonadal Germ Cell Tumors (ONC-20)** in the Oncology Imaging Guidelines for evaluation of Leydig Cell tumors.
- See **Adrenal Cortical Lesions (AB-16.1)** in the Abdomen Imaging Guidelines for evaluation of adrenal virilizing tumors

Benign Pituitary Tumors (PEDHD-15.6)

- Benign pituitary tumor indications in pediatric individuals are identical to those for adult individuals. See **Pituitary (HD-19)** in the Head Imaging Guidelines.

Pituitary Malignancies (PEDHD-15.7)

- See **Craniopharyngioma and Other Hypothalamic/Pituitary Region Tumors (PEDONC-4.10)** or **Histiocytic Disorders (PEDONC-18)** in the Pediatric Oncology Imaging Guidelines

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Pediatric Ear Disorders (PEDHD-16)
Hearing Loss (PEDHD-16.1)
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Tinnitus (PEDHD-16.5)

Hearing Loss (PEDHD-16.1)

- A pertinent 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.
- CT Temporal Bone 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 See **Tinnitus (PEDHD-16.5)**
- Both modalities (CT and MRI) may be approved simultaneously for evaluation and surgical planning if ordered by or in consultation with an ENT or Neurosurgical specialist
- Limited MRI Brain with attention to internal auditory canals (CPT® 70540, CPT® 70542, or CPT® 70543) can be approved when requested by the provider in place of a complete MRI Brain. Note: Limited MRI codes should not be used in addition to MRI Brain codes; IAC views are performed as additional sequences as part of the brain study. (See **General Guidelines – Anatomic Issues (HD-1.1)** in the Head Imaging Guidelines)

Ear Pain (PEDHD-16.2)

- A pertinent 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, neck problems, tonsillitis, and pharyngitis.
- Advanced imaging is not indicated in the overwhelming majority of pediatric individuals with ear pain.
- 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 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.

Cholesteatoma (PEDHD-16.3)

- 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.
- 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.

Vertigo (PEDHD-16.4)

- Isolated vertigo is an uncommon complaint during childhood. Middle ear/Eustachian tube problems are the most common cause of isolated vertigo in children.
- A pertinent 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.
  - Vertigo that does not respond to vestibular treatment.

Tinnitus (PEDHD-16.5)

- Tinnitus without hearing loss is a less common complaint during childhood.
- Children with hearing loss and tinnitus should be imaged according to **Hearing Loss (PEDHD-16.1).** A pertinent 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 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.
- MRA Head (CPT® 70544, CPT® 70545 or CPT® 70546) or CTA Head (CPT® 70496) AND/OR MRA Neck (CPT® 70547, CPT® 70548 or CPT® 70549) or CTA Neck (CPT® 70498) for Pulsatile tinnitus or suspicion for vascular lesions

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Autism Spectrum Disorders (PEDHD-17)

Autism Spectrum Disorders (PEDHD-17.1)

- 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 pertinent physical. Consider advanced imaging if there is loss of developmental milestones and/or regression in two or more areas of development.
- PET imaging is considered investigational in the evaluation of individuals with autism spectrum disorders.

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Behavioral and Psychiatric Disorders (PEDHD-18)

Behavioral and Psychiatric Disorders (PEDHD-18.1)

- Behavioral and psychiatric disorders of childhood or adolescence, to include Attention Deficit Hyperactivity Disorder (ADHD), generally require no advanced imaging for diagnosis or management.[2]
  - MRI Brain without and with contrast (CPT® 70553) is indicated for new or worsening focal neurologic findings.
- For concerns of PANS (Pediatric acute-onset neuropsychiatric syndrome) and PANDAS (Pediatric autoimmune neuropsychiatric disorder associated with streptococcal infection) See **Movement Disorders including Tourette's Syndrome (PEDHD-26)**

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Intellectual Disability, Cerebral Palsy, and Developmental Motor Delay (PEDHD-19)

Intellectual Disability (PEDHD-19.1)
Cerebral Palsy (PEDHD-19.2)
Developmental Motor Delay (PEDHD-19.3)

Intellectual Disability (PEDHD-19.1)

- Intellectual disability may be primary or secondary to a variety of heterogeneous disorders. See Background and Supporting Information.
- MRI Brain without and with contrast (CPT® 70553) is indicated for new or worsening focal neurologic findings and/or new or worsening cognitive decline.[9]

Background and Supporting Information

- Intellectual disability is a condition characterized by significant limitations in both intellectual functioning and adaptive behavior that originates before the age of 22.[10] One way to measure intellectual functioning is an IQ test. Generally, an IQ test score of around 70 or as high as 75 indicates a significant limitation in intellectual functioning.[10]

Cerebral Palsy (PEDHD-19.2)

- Many individuals with intellectual disability also have cerebral palsy, but not all individuals with cerebral palsy have intellectual disability.
- Cerebral palsy is a static motor encephalopathy caused by a variety of entities spanning developmental, metabolic, genetic, infectious, ischemic, and other acquired etiologies.
- MRI Brain 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, including the presence of developmental delay.
  - Re-evaluation after 24 months of age due to rapid myelination during the first 2 years of life.
- For spinal imaging requests See **Myelopathy (SP-7.1)** in the Spine Imaging Guidelines

Developmental Motor Delay (PEDHD-19.3)

- There are many causes for developmental motor delay. Individuals with motor delay can have decreased, normal, or increased muscular tone. Individuals with normal tone do not require imaging unless they have focal neurologic findings.
- MRI Brain without and with contrast (CPT® 70553) is indicated for:
  - Initial evaluation of newly diagnosed developmental motor delay with abnormal muscle tone.
  - Toe walking, when associated with upper motor neuron signs including hyperreflexia, abnormal tone (spasticity/hypotonia), or positive Babinski sign.
  - New or worsening focal neurologic findings.
  - Re-evaluation after 24 months of age due to rapid myelination during the first 2 years of life.
- For spinal imaging requests See **Myelopathy (SP-7.1)** in the Spine Imaging Guidelines and **Tethered Cord (PEDSP-5)** in the Pediatric Spine Imaging Guidelines

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Ataxia (PEDHD-20)

Ataxia (PEDHD-20.1)

- 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.
- See **Intellectual Disability, Cerebral Palsy, and Developmental Motor Delay (PEDHD-19)**
- A pertinent 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 or request is from or in consultation with a neurologist or neurosurgeon who has seen the individual since onset of symptoms.
- MRI Brain without and with contrast (CPT® 70553) can be performed to evaluate ataxia, hereditary ataxia, and slowly progressive ataxia.
  - If spinal etiology is suspected the following may be indicated:
    - MRI Cervical Spine (CPT® 72141 or CPT® 72156) and/or
    - MRI Thoracic Spine (CPT® 72146 or CPT® 72157) and/or
    - MRI Lumbar Spine (CPT® 72148 or CPT® 72158)
- 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.
  - If there is a contraindication to contrast and a spinal etiology is suspected the following may be indicated:
    - CT Cervical Spine (CPT® 72125 or CPT® 72127) and/or
    - CT Thoracic Spine (CPT® 72128 or CPT® 72130) and/or
    - CT Lumbar Spine (CPT® 72131 or CPT® 72133
- 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 or any provider in consultation with a specialist unless there are new signs or symptoms.

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Epistaxis (PEDHD-21)

Imaging (PEDHD-21.1)

- 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).

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Pseudotumor Cerebri (PEDHD-22)

Pseudotumor Cerebri (PEDHD-22.1)

- Pseudotumor cerebri indications in pediatric individuals are identical to those for adult individuals. See **Papilledema/Pseudotumor Cerebri (HD-17.1)** in the Head Imaging Guidelines.

Cranial Neuropathies (PEDHD-23)

Cranial Neuropathies (PEDHD-23.1)

- 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.

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Pediatric Sleep Disorders (PEDHD-24)

Pediatric Sleep Disorders (PEDHD-24.1)

- See **Pediatric Sleep Guidelines (SL-3)** in the Sleep Apnea and Treatment Clinical Guidelines
- 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 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.
- There is no indication for imaging prior to tonsillectomy for obstructive sleep apnea

References

1. Owens JA. Sleep medicine. *Nelson Textbook of Pediatrics, Chapter 31.* eds Kliegman RM, St. Geme JW III, Blum NJ, Shah SS, Tasker RC, Wilson KM. 21st edition. 2020, pp 172-184.
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Temporomandibular Joint (TMJ) Imaging/Dental/Maxillofacial in Children (PEDHD-25)

Temporomandibular Joint Imaging (PEDHD-25.1)
Dental/Periodontal/Maxillofacial Imaging (PEDHD 25.2)

Temporomandibular Joint Imaging (PEDHD-25.1)

- Temporomandibular Joint (TMJ) Imaging in Children indications in pediatric individuals are very similar to those for adult individuals. See **Temporomandibular Joint Disease (TMJ) (HD-30.1)** in the Head Imaging Guidelines.
- Pediatric-specific imaging considerations include the following:
  - There is a paucity of clinical symptoms and poor sensitivity of conventional x-rays in diagnosing TMJ arthritis in pediatric individuals with arthritis
    - MRI TMJ (CPT® 70336) is indicated annually for detecting silent TMJ arthritis in children with juvenile idiopathic arthritis (JIA).
    - Bone Scintigraphy/Bone Scan 3 Phase Study (CPT® 78315) in individuals over 12 years of age[7] is appropriate in anticipation or consideration of surgery[7]
    - Unilateral condylar hyperplasia is manifested by slow growth in areas of the mandible causing facial asymmetry. It is usually a self-limiting condition seen predominantly in 12–30 year olds.

Dental/Periodontal/Maxillofacial Imaging (PEDHD 25.2)

See **Dental/Periodontal/Maxillofacial Imaging (HD 30.2)**

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Movement Disorders including Tourette's Syndrome (PEDHD-26)

Tourette's Syndrome (PEDHD-26.1)
Movement Disorders (PEDHD-26.2)

Tourette's Syndrome (PEDHD-26.1)

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

Movement Disorders (PEDHD-26.2)

- Movement disorders are hyperkinetic and hypokinetic movements that are involuntary. The majority are diagnosed based on a clinical diagnosis and do not require imaging.
- Typically Benign Movement disorders include:
  - Stereotypies, repetitive rhythmic movements
  - Tics that are vocal or motor with typical onset and course
  - Tourette Syndrome
  - Essential Tremor or tremors of anxiety or weakness
  - Restless Leg Syndrome
- MRI Brain without contrast (CPT® 70551), or without and with contrast (CPT® 70553) is considered in the following clinical scenarios:
  - Atypical clinical features for example, movements that persist in sleep, onset outside of typical age at onset (4-6 years for tics) , rapid progression, incomplete or uncertain medication responsiveness, or clinical diagnostic uncertainty, limbic encephalitis
  - Dystonia, intermittent involuntary muscle contractions
  - Chorea, continual irregular movements
  - Ballism, involuntary high amplitude movements
  - Athetosis, slow writhing continuous movements
  - Myoclonus, involuntary muscle jerks (not sleep myoclonus)
- For concerns of PANS (Pediatric acute-onset neuropsychiatric syndrome) and PANDAS (Pediatric autoimmune neuropsychiatric disorder associated with streptococcal infection), MRI Brain without contrast (CPT® 70551), or without and with contrast (CPT® 70553) may be considered only after a complete medical workup including labs, acute infection, and other comorbid psychiatric disorders (e.g. OCD, ADHD and ASD) have been investigated as routine brain imaging is not routinely recommended.
- See **Movement Disorders (HD-15.1)** in the Head Imaging Guidelines for the following
  - Suspected Huntington Disease
  - Evaluation for surgical treatment of Essential Tremor or Parkinson's disease, including Deep Brain Stimulator (DBS) placement
- Post-op imaging is approvable when ordered by a specialist or any provider in consultation with a specialist for either procedure.

Background and Supporting Information

- There is little evidence to support the use of MRA/CTA and PET in the evaluation of movement disorders.
- Tourette syndrome (TS) is a neurological disorder characterized by repetitive, stereotyped, involuntary movements and vocalizations called tics. The first symptoms of TS are almost always noticed in childhood. Some of the more common tics include eye blinking and other vision irregularities, facial grimacing, shoulder shrugging, and head or shoulder jerking. Perhaps the most dramatic and disabling tics are those that result in self-harm such as punching oneself in the face, or vocal tics including coprolalia (uttering swear words) or echolalia (repeating the words or phrases of others). Many with TS experience additional neurobehavioral problems including inattention, hyperactivity and impulsivity, and obsessive-compulsive symptoms such as intrusive thoughts/worries and repetitive behaviors.

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Tuberous Sclerosis (PEDHD-27)

Tuberous Sclerosis (PEDHD-27.1)

- See **Tuberous Sclerosis Complex (TSC) (PEDONC-2.9)** in the Pediatric Oncology Imaging Guidelines.

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Von Hippel-Lindau Syndrome (VHL) (PEDHD-28)

Von Hippel-Lindau Syndrome (VHL) (PEDHD-28.1)

- See **Von Hippel-Lindau Syndrome (VHL) (PEDONC-2.10)** in the Pediatric Oncology Imaging Guidelines.

CNS Infection (PEDHD-29)

CNS Infection (PEDHD-29.1)

- CNS infection imaging indications in pediatric individuals are similar to those for adult individuals. See **CNS and Head Infection/ Neuro-COVID-19 (HD-14)** in the Head Imaging Guidelines.
- CT Head (as per **General Guidelines – CT Head (HD-1.4)** in the Head Imaging Guidelines) may be considered in Pediatric CNS Infection.
- The following studies may be considered for suspected intracranial infection if any signs of CNS infection are present:
  - MRI Brain without and with contrast (CPT® 70553) (preferred) or MRI Brain without contrast (CPT® 70551)
  - CT Head (CPT® 70450, CPT® 70460, or CPT® 70470) in cases where MRI is contraindicated or urgently prior to lumbar puncture to rule out meningitis.
- 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)
    - Ultrasound Head (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.
  - Newborn infants with microcephaly should be evaluated as discussed in **Macrocephaly, Microcephaly, and Hydrocephalus (PEDHD-7).**
- 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 an open fontanelle and suspected meningitis.
  - Ultrasound Head (CPT© 76506) as an initial imaging study but is not required.
  - MRI Brain without and with contrast (CPT® 70553) is indicated if the ultrasound is abnormal
- A wide spectrum of neurological diseases have been observed in children with COVID-19 infection in children including, but not limited to, Multisystem Inflammatory Syndrome.and Acute Necrotising Myelitis.[10,11]
  - MRI Brain with and without contrast (CPT® 70553) and/or MRI Cervical Spine without and with contrast (CPT® 72156) and/or MRI Thoracic Spine with

and without contrast (CPT® 72157) and/or MRI Lumbar Spine without and with contrast (CPT® 72158)

- Metabolic (FDG) Brain PET (CPT® 78608) is appropriate to evaluate individuals suspected of having encephalitis, including autoimmune encephalitis, if diagnosis remains unclear after evaluation with MRI Brain, CSF analysis, and lab testing including serology.[12]

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Scalp and Skull Lesions (PEDHD-30)

Scalp and Skull Lesions (PEDHD-30.1)

- Scalp and skull lesion imaging indications in pediatric individuals are identical to those for adult individuals with the exception of neonates. See **Scalp and Skull Lesions (HD-20.1)** in the Head Imaging Guidelines.
  - In neonates and young infants, scalp masses include:
    - Congenital lesions (cephalocele-discussed above, dermoid cysts, epidermoid cyst)
    - Vascular lesions (hemangioma, sinus pericranii)
    - 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.
- The following imaging is considered for newborns with palpable scalp and skull lesions.
  - Ultrasound Head (CPT® 76506) can be approved as an initial imaging study.
  - MRI Brain without and with contrast (CPT® 70553) (preferred) or CT Head without and with contrast (CPT® 70470) is indicated if the ultrasound is abnormal and associated anomalies are suspected.

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Eye Disorders (PEDHD-31)

Eye Disorders (PEDHD-31.1)

- Eye disorder imaging indications in pediatric individuals are close to identical to those for adult individuals. See **Eye Disorders and Visual Loss (HD-32.1)** in the Head Imaging Guidelines.
- For specific pediatric conditions: MRI Orbits without contrast (CPT® 70540) or MRI Orbits without and with contrast (CPT® 70543) or CT Orbits with contrast (CPT® 70481) or CT Orbits without contrast (CPT® 70480) and/or MRI Brain without contrast (CPT® 70551) or MRI with and without contrast (CPT® 70553)[2] can be performed for Optic Nerve Hypoplasia, Septo-Optic Dysplasia and/or Infantile Nystagmus Syndrome.
- For traumatic retinal hemorrhages as seen in suspected shaken baby syndrome (See **Head Trauma (PEDHD-4.1)**)

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Policy History and Instructions for Use

Guideline

Policy History and Instructions for Use

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Policy History and Instructions for Use

Instructions for Use

This Medical Policy provides assistance in interpreting United HealthCare Services, Inc. standard benefit plans. When deciding coverage, the federal, state (Ohio Administrative Code [OAC]) or contractual requirements for benefit plan coverage must be referenced as the terms of the federal, state (OAC) or contractual requirements for benefit plan coverage may differ from the standard benefit plan. In the event of a conflict, the federal, state (OAC) or contractual requirements for benefit plan coverage govern.

Before using this policy, please check the federal, state (OAC) or contractual requirements for benefit plan coverage. United HealthCare Services, Inc. reserves the right to modify its Policies and Guidelines as necessary. This Medical Policy is provided for informational purposes. It does not constitute medical advice.

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Policy History/Revision Information

Date	Summary of Changes
XX/XX/202X	
XX/XX/202X	