CLINICAL GUIDELINES

Head Imaging Policy

Version 1.0

Effective February 14, 2020

eviCore healthcare Clinical Decision Support Tool Diagnostic Strategies: This tool addresses common symptoms and symptom complexes. Imaging requests for individuals with atypical symptoms or clinical presentations that are not specifically addressed will require physician review. Consultation with the referring physician, specialist and/or individual's Primary Care Physician (PCP) may provide additional insight.

Head Imaging Guidelines

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924

Abbreviations for Head Imaging Guidelines

ACTH	adrenocorticotropic hormone
AD	Alzheimer's Disease
ADH	antidiuretic hormone
AION	arteritic ischemic optic neuritis
AVM	arteriovenous malformation
CBCT	Cone-beam computerized tomography
CMV	cytomegalovirus
CSF	cerebrospinal fluid
CT	computed tomography
CTA	computed tomography angiography
DNA	deoxyribonucleic acid
DWI	diffusion weighted imaging (for MRI)
EEG	electroencephalogram
ENT	Ear, Nose, Throat
ESR	erythrocyte sedimentation rate
FDG	fluorodeoxyglucose
FSH	follicle-stimulating hormone
FTD	Frontotemporal Dementia
GCA	giant cell arteritis
GCS	Glasgow Coma Scale
HIV	human immunodeficiency virus
LH	luteinizing hormone
MMSE	mini mental status examination
MRA	magnetic resonance angiography
MRI	magnetic resonance imaging
MRN	magnetic resonance neurography
MS	multiple sclerosis
MSI	magnetic source imaging
NAION	non-arteritic ischemic optic neuritis
NPH	normal pressure hydrocephalus
PET	positron emission tomography
PML	progressive multifocal leukoencephalopathy
PNET	primitive neuro ectodermal tumor
PWI	perfusion weighted imaging (for MRI)
SAH	subarachnoid hemorrhage
SIADH	Syndrome of Inappropriate Antidiuretic Hormone Secretion
SLE	systemic lupus erythematosus
TIA	transient ischemic attack
TMJ	temporomandibular joint disease
TSH	thyroid-stimulating hormone
VBI	vertebrobasilar insufficiency
VP	ventriculoperitoneal
XRT	radiation therapy

HD-1: General Guidelines

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924

HD-1.0: General Guidelines

- A recent (within 60 days) face to face evaluation including a detailed history, physical examination and appropriate laboratory studies should be performed prior to considering the use of an advanced imaging (CT, MR, Nuclear Medicine) procedure. An exception can be made if the patient is undergoing a guideline-supported, scheduled follow-up imaging evaluation.
  - The clinical evaluation should include a relevant history and physical examination, including a neurological examination (unless the request is for a scheduled follow-up of known problems such as MS, tumors, or hydrocephalus, scheduled surveillance with no new symptoms, screening asymptomatic patient due to family history or otherwise meet criteria for repeat imaging), as well as appropriate laboratory studies and non-advanced imaging modalities
    - A detailed neurological exam is required prior to advanced imaging except in the following scenarios:
      - Tinnitus, TMJ, Sinus or mastoid disease, ear pain, hearing loss, eye disease, and epistaxis. (A relevant physical exam is still required.)
      - The request is from a neurologist or neurosurgeon who has seen the patient since onset of symptoms
  - Other meaningful contact (telephone call, electronic mail or messaging) with an established patient can substitute for a face-to-face clinical evaluation

HD-1.1: General Guidelines – Anatomic Issues

- If two studies using the same modality both cover the anatomic region of clinical interest, only one is generally needed, with the exception of the following scenarios:
  - CT Maxillofacial (CPT® 70486, CPT® 70487, or CPT® 70488) or CT Orbital/Temporal bone (CPT® 70480, CPT® 70481, or CPT® 70482): both cover the structures of the orbits, sinuses, and face. Two separate imaging studies are only supported if there is suspicion of simultaneous involvement of more posterior lesions, especially of the region involving the middle or inner ear.
  - 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. If a previous routine MRI Brain was reported to show a possible pituitary tumor, a repeat MRI with dedicated pituitary protocol may be performed.
  - Internal Auditory Canal: (IAC) MRI can be reported as a limited study with one code from the set (CPT® 70540, CPT® 70542, or CPT® 70543), but should not be used in conjunction with MRI Brain codes (CPT® 70551, CPT® 70552, or CPT® 70553) if IAC views are performed as part of the brain.
  - Mandible (jaw): CT Maxillofacial (CPT® 70486, CPT® 70487, or CPT® 70488) or CT Neck (CPT® 70490, CPT® 70491, or CPT® 70492) can be used to report imaging of the mandible. CT Neck will also image the submandibular space.
    - If MRI is indicated, MRI Orbit, Face, Neck (CPT® 70540, CPT® 70542, or CPT® 70543) can be used to report imaging of the mandible and submandibular space.

- MRI Temporomandibular Joint(s) (TMJ) is reported as CPT® 70336. This code is inherently bilateral and should not be reported twice on the same date of service.

HD-1.2: General Guidelines – Modality

- MRI is preferable to CT for most indications. For exceptions, see **HD-1.4: General Guidelines – CT Head**.
- MRI may be performed for these indications following an initial CT:
  - MRI Brain without and with contrast (CPT® 70553) may be performed to follow-up abnormalities seen on CT Head without contrast (CPT® 70450) when a mass, lesion, or infection is found.
  - MRI Brain without contrast (CPT® 70551) or MRI Brain without and with contrast (CPT® 70553) (preferred) may be performed to follow-up abnormalities seen on CT Head without contrast (CPT® 70450) when there is suspected Multiple Sclerosis or other demyelinating disease.
  - MRI Brain without contrast (CPT® 70551) or MRI Brain without and with contrast (CPT® 70553) may be performed to follow up on stroke or TIA when initial CT Head was done on emergent basis.
  - MRI Brain without and with contrast (CPT® 70553) or MRI Brain without contrast (CPT® 70551) for evaluation of new onset seizures.

HD-1.3: General Guidelines – MRI Brain

- MRI Brain with contrast (CPT® 70552) should not be ordered except to follow-up on a very recent non-contrast study (within two weeks).

The AMA CPT manual does not describe nor assign any minimum or maximum number of sequences for any CT or MRI study. Both MRI and CT imaging protocols are often influenced by the individual clinical situation of the patient 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. Additional sequences, however, are still performed and coded under the routine MRI Brain CPT® 70551, CPT® 70552, or CPT® 70553.

HD-1.4: General Guidelines – CT Head

- Scenarios in which MRI is contraindicated (i.e. pacemakers, ICDs, cochlear implants, aneurysm clips, orbital metallic fragments, etc.)
- CT Head without contrast (CPT® 70450) in nearly all cases, to show:
  - 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
  - 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 may be approved).
  - Prior to lumbar puncture in patients with cranial complaints (without contrast) (CPT® 70450)

HD-1.5: General Guidelines – CT and MR Angiography (CTA and MRA)

- MRA Head may be performed without contrast (CPT® 70544) or without and with contrast (CPT® 70546).
- 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
- MRA Head or CTA Head may be considered with suspected intracranial vascular disease, for example:
  - Pulsatile tinnitus
  - Hemifacial spasm if consideration for surgical decompression
  - Evaluation of stroke or TIA (See **HD-21: Stroke/TIA**)
  - 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
  - Intra-cranial pre-operative planning if there is concern of possible vascular involvement or risk for vascular complication from procedure
  - Suspicion of vasculitis based on supporting clinical evidence
  - NOTE: Evaluation of posterior circulation disease requires both neck and head MRA/CTA to visualize the entire vertebral-basilar system.
  - CTA or MRA Head without or without and with contrast for follow up of aneurysm clipping or coiling procedures (See **HD-12.1: Intracranial Aneurysms**)
- 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

HD-1.6: General Guidelines – PET Coding Notes

- Metabolic Brain PET should be reported as Metabolic Brain PET (CPT® 78608)
- Amyloid Brain PET should be reported as limited PET (CPT® 78811) or limited PET/CT (CPT® 78814)

HD-1.7: General Guidelines – Other Imaging Situations

- Nausea and vomiting, persistent, unexplained and a negative GI evaluation: can undergo MRI Brain without contrast (CPT® 70551). See **AB-1.10: Special Considerations** in the Abdomen Imaging Guidelines
- ECT treatment to screen for intracranial disease: can undergo either MRI Brain without contrast (CPT® 70551) or CT Head without contrast (CPT® 70450)
- 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) can be considered when performed in conjunction with conventional angiography (i.e.: conventional 4 vessel cerebral angiography).

References

1. Grossman RI, Yousem DM. *Neuroradiology*. Philadelphia, PA: Mosby Elsevier; 2010.
2. Latchaw RE, Kucharczyk J, Moseley ME. *Imaging of the nervous system: diagnostic and therapeutic applications*. Philadelphia: Elsevier Mosby; 2005.
3. Rowland LP, Pedley TA, Merritt HH. *Merritt's neurology*. Philadelphia, PA: Lippincott Williams & Wilkins; 2010.
4. Menkes JH, Sarnat HB, Maria BL. *Child neurology*. Philadelphia, PA: Lippincott Williams & Wilkins; 2006.

HD-2: Taste and Smell Disorders

HD-2.1: Taste and Smell Disorders

- MRI Brain without and with contrast (CPT® 70553) or without contrast (CPT® 70551) is considered with unexplained unilateral or bilateral anosmia (inability to perceive odor) or dysgeusia (complete or partial loss of taste)[1,2].
- CT Maxillofacial without contrast (CPT® 70486)[2] consider initially if sinus or facial bone disorders is suspected.

References

1. *ACR Appropriateness Criteria*® Cranial neuropathy. Revised 2017.
2. DeVere R. Disorders of taste and smell. *Continuum*. 2017 Apr;23(2):421-446.

HD-3: Ataxia

HD-3.1: Ataxia

- MRI Brain without and with contrast (CPT® 70553) or MRI Brain without contrast (CPT® 70551) is considered in all patients with ataxia:[1]
  - MRI Cervical, Thoracic and/or Lumbar Spine without contrast (CPT® 72141, CPT® 72146, CPT® 72148)[1] if spinal disease is suspected
  - If these symptoms are acute and stroke is suspected, See **HD-21: Stroke/TIA**
  - If MS is suspected, See **HD-16: Multiple Sclerosis (MS) and Related Conditions**
  - CT Head without contrast (CPT® 70450) and/or CT Temporal Bone without contrast (CPT® 70480) can be added[1] if these symptoms are acute following head trauma

Reference

1. American College of Radiology (ACR) Appropriateness Criteria® Ataxia. Last review date: 2018.

HD-4: Behavioral Disorders

HD-4.0: Behavioral Disorders – General Information

Autism: See **PEDHD-17: Autism Spectrum Disorders** in the Pediatric Head Imaging Guidelines

HD-4.1: Behavioral Disorders

- Neuroses and psychoses do not routinely need advanced imaging
  - MRI Brain without contrast (CPT® 70551) or MRI Brain without and with contrast (CPT® 70553), or CT Head without contrast (CPT® 70450)
    - Bipolar disorder, schizophrenia, and related disorders may require advanced imaging in the following clinical circumstances:
      - Atypical clinical presentation
        - Acute onset
        - Late onset over age 40
        - Presents in setting of general medical illness or intensive care setting
        - Non-auditory hallucinations (e.g., visual, tactile, olfactory)
        - Patients who fail to respond to treatment in the expected manner and who manifest features suggestive of an organic brain disorder (for example, focal deficits, severe headache, or seizures)

References

1. Ropper AH and Brown RH. *Adams and Victors principles of neurology*. 8th Ed. New York: McGraw-Hill Companies, Inc. 2005.1285-1332.
2. Rowland LP, Pedley TA, Merritt HH. *Merritt's neurology*. 12th Ed. Philadelphia, PA: Lippincott Williams & Wilkins. 2010; 1053-1075.
3. Practice Guideline for the Treatment of Patients with Schizophrenia, 2nd Ed. American Psychiatric Association. Feb. 2004.

HD-5: Chiari and Skull-Base Malformation

See **PEDHD-9: Chiari and Skull Base Malformations** in the Pediatric Head Imaging Guidelines

HD-6: Facial Palsy (Bell's Palsy)

HD-6.1: Facial Palsy

Typical features of Bell's palsy include spontaneous onset over 72 hours, otherwise normal neurological and systemic examination, variable initial ipsilateral temporal and auricular pain, and slow improvement over several months. Unless "red flags" are present, imaging is not necessary.

- MRI Brain without and with contrast (CPT® 70553) (with attention to posterior fossa and IACs) is considered with the following "red flags" of unexplained facial paresis/paralysis in clinical scenarios with:[1,2]
  - Trauma to the temporal bone[2]
  - History of tumor[2], systemic cancer, HIV or Lyme disease
  - No improvement in 8 weeks[1]
  - No full recovery in 3 months[2]
  - Gradual onset over weeks to months
  - Vertigo or hearing loss
  - Bilateral involvement
  - Other atypical or inconsistent features[2] including:
    - Second episode of paralysis on the same side[2]
    - Paralysis of isolated branches of the facial nerve[2]
    - Paralysis associated with other cranial nerves[2]
- MRI Brain without and with contrast (CPT® 70553) may be considered for known sarcoidosis with suspected neurosarcoid or CNS involvement

HD-6.2: Hemifacial Spasm

- MRI Brain without and with contrast (CPT® 70553)
- May add CTA Head (CPT® 70496) or MRA Head (CPT® 70544 or CPT® 70546) prior to a vascular decompression surgical procedure to clarify the vascular anatomy in patients who have failed conservative medical management

References

1. Baugh RF, Basura GJ, Ishii LE, et al. Clinical practice guideline. Bell's Palsy Executive Summary. *Otolaryngol. Head Neck Surg. 2013 Nov 4;149(5):656-663.*
2. ACR Appropriateness Criteria® Cranial neuropathy. *American College of Radiology (ACR).* Revised 2017.
3. Iannuzzi MC, Rybicki BA, and Teirstein AS. Sarcoidosis*. N Engl J Med*. 2007 Nov 22;357(21):2153-2165.
4. Joseph FG and Scolding NJ. Sarcoidosis of the nervous system. *Pract Neurol*. 2007 Aug; 7(4):234-244.
5. Ullapalli D and Phillips II LH. Neurosarcoidosis. *Curr Neurol Neurosci Rep.* 2004 Nov;4(6):441-447.
6. Yaltho TC and Jankovic J. The many faces of hemifacial spasm: differential diagnosis of unilateral facial spasms. *Mov Disord*. 2011 Aug 1; 26(9):1582-1592.
7. Reich, Stephen. Bell's Palsy. *Continuum.* 2017 Apr;23(2):447-466.

HD-7: Recurrent Laryngeal Palsy

HD-7.1: Recurrent Laryngeal Palsy

The following can be considered with unilateral vocal cord/fold palsy identified by laryngoscopy:[1]

- MRI Brain without and with contrast (CPT® 70553) or MRI Brain without contrast (CPT® 70551)
- CT Neck with contrast (CPT® 70491) or MRI Neck without and with contrast (CPT® 70543)
- CT Chest with contrast (CPT® 71260) may be added with left vocal cord palsy[1]

Reference

1. ACR Appropriateness Criteria® Cranial neuropathy. *American College of Radiology (ACR).* Revised 2017.

HD-8: Dementia

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924

HD-8.1: Dementia

MRI Brain without contrast (CPT® 70551) or MRI Brain without and with contrast (CPT® 70553) or CT Head without contrast (CPT® 70450) is considered after an initial clinical diagnosis of dementia[3,4] has been established based on a detailed history of memory loss with impairment of day-to-day activities confirmed by family members or others with knowledge of the patient's status and/or abnormal bedside mental status testing such as Mini-Mental Status Exam (MMSE) with score <26, Montreal Cognitive Assessment Survey (MoCA) with score <26, Memory Impairment Screen (MIS) with score <5, or the St. Louis University Mental Status (SLUMS) with score <21. Neuropsychological testing can be performed when history and bedside mental status examination cannot provide a confident diagnosis[1,2].

Practice Notes

- 3D Brain imaging in dementia
  - 3D analysis of the temporal lobes and hippocampus (also known as volumetric analysis or Neuro Quant) (CPT® 76376 and CPT® 76377) lacks sufficient specificity and sensitivity to be clinically useful in the evaluation or follow up of patient with dementia. Its use is limited to research studies and it is otherwise considered to be investigational and experimental in routine clinical practice.

HD-8.2: Dementia - PET

Send these requests for Medical Director Review.

CPT® 78608 is used to report FDG PET metabolic brain studies for dementia, seizure disorders, and dedicated PET tumor imaging studies of the brain.

CPT® 78609 is used to report PET Brain perfusion studies that are not performed with FDG. These scans are nationally noncovered by Medicare.

CPT® 78811 (limited PET) or CPT® 78814 (limited PET/CT) are used to report Amyloid Brain PET (these codes are for static images to measure amyloid, as opposed to the FDG PET which is a metabolic study).

- FDG PET for Dementia and Neurodegenerative Diseases
  - FDG Brain PET (CPT® 78608) may be useful in distinguishing between Alzheimer's disease and Frontotemporal dementia. It is otherwise considered investigational and experimental for the purpose of diagnosis and management of mild cognitive impairment and other forms of dementia including, but not limited to, Lewy Body disease, Parkinson's disease, Normal Pressure Hydrocephalus and Chronic Traumatic Encephalopathy. Appropriate documentation should support concern for one of the variants of Frontotemporal dementia (Behavioral Variant or Primary Progressive Aphasia type FTD) based on a detailed history and exam findings (which may include neuropsychological testing) and meet the following criteria:
    - Meets diagnostic criteria for AD and FTLD; and
    - Has a documented cognitive decline of at least 6 months; and
    - Evaluation has ruled out specific alternative neurodegenerative disease or causative factors; and

- Cause of clinical symptoms is uncertain; and
- The results are expected to help clarify the diagnosis between FTLD and AD and help guide future treatment.

- Medicare covers FDG PET for individuals with a recent diagnosis of dementia and documented cognitive decline of at least six months who meet diagnostic criteria for both Alzheimer's disease (AD) and Frontotemporal Dementia (FTD).
  - The individual must have been evaluated for specific alternate neurodegenerative diseases or other causative factors, but the etiology of the symptoms remains unclear
  - Other conditions must also be met. For the complete coverage policy, See the Medicare National Coverage Determinations (NCD) Manual, Section 220.6.13
  - Medicare also covers FDG PET for individuals with mild cognitive impairment or early dementia when the study is performed in the context of a CMS-approved clinical trial. Requirements are detailed in Section 220.6.13 of the NCD Manual
  - All other uses of FDG PET for patients with a presumptive diagnosis of dementia-causing neurodegenerative disease for which CMS has not specifically indicated coverage continue to be noncovered. Examples of noncovered indications described in the NCD include: possible or probable Alzheimer's disease (AD), clinically typical fronto-temporal dementia (FTD), dementia of Lewy bodies, and Creutzfield-Jacob disease. http://www.cms.gov/Regulations-and-guidance/Guidance/Manuals/downloads/ncd103c1_Part4.pdf

- Amyloid Brain PET
  - Amyloid Brain PET (CPT® 78811 or CPT® 78814) imaging is considered experimental and investigational in the diagnosis of Alzheimer's disease and in differentiating between Alzheimer's disease and other neurodegenerative/neurologic disorders.[3,4,5]
  - Amyloid PET studies may be approved one time for Medicare patients enrolled in approved clinical trials under Coverage with Evidence Development (CED) program. For CMS, approval with CED is available for patients enrolled in studies approved by CMS. See the link below for a list of the CMS approved clinical trials: https://www.cms.gov/Medicare/Coverage/Coverage-with-Evidence-Development/Amyloid-PET.html
    - Medicare will reimburse for Brain PET only through CED
    - Only one study will be paid per beneficiary and the radiopharmaceutical must be FDA-approved. As of September 2, 2016, examples of radiopharmaceuticals which met this qualification include Amyvid™ (florbetapir F18), Neuraceq™ (florbetaben F18) and Vizamyl™ (flutemetamol F18)

Practice Notes

The frontotemporal dementias (FTDs) are a group of neurodegenerative disorders that differ from Alzheimer's disease. The basic pathology involves accumulation of tau proteins in the brain rather than amyloid. Onset tends to be younger (less than 65) and progression usually more rapid than in senile dementia-Alzheimer type (SDAT). There is

no treatment, and the medications used to help memory in Alzheimer's disease are not effective.

There are several subtypes of FTD; most common are the behavioral variant with early loss of executive functions, impaired judgment disinhibition and impulsivity, and the semantic variant with primary and progressive loss of language ability. Other less common subtypes include progressive supranuclear palsy, corticobasal syndrome, and FTD associated with motor neuron disease.

Diagnosis is based on clinical features, neuropsychological testing, and brain imaging (preferably MRI) to rule out other structural disease. Metabolic (FDG) PET Brain may also be helpful by demonstrating patterns of abnormality more consistent with FTD than Alzheimer's disease.

For additional information: http://www.alz.org/dementia/fronto-temporal-dementia-ftd-symptoms.asp.

References

1. McKhann GM, Knopman DS, Chertkow, et al. The diagnosis of dementia due to Alzheimer's disease: recommendations from the National Institute on Aging-Alzheimer's Association workgroups on diagnostic guidelines for Alzheimer's disease. Alzheimers Dement. 2011 May;7(3):263-269.
2. APPENDIX: AAN guideline for clinicians: detection, diagnosis, and management of dementia. CONTINUUM: Lifelong Learning in Neurology. 2008 Apr;14(2), Neurogenetics:149-152.
3. Decision Memo for Positron Emission Tomography (FDG) for Alzheimer's Disease/Dementia (CAG-00088N). CMS.gov. Centers for Medicare & Medicaid Services. https://www.cms.gov/medicare-coverage-database/details/nca-decision-memo.aspx?NCAId=64&fromdb=true.
4. ACR Appropriateness Criteria® Dementia and movement disorders. American College of Radiology (ACR). Last review date: 2015.
5. Knopman DS, DeKosky ST, Cummings JL, et al. Practice parameter: diagnosis of dementia (an evidence-based review): report of the quality standards subcommittee of the American Academy of Neurology. Neurology. 2001 May 8;56(9):1143-1153. (May 2001; reaffirmed February 2004.)
6. Johnson KA, Minoshima S, Bohnen NI, et al. Appropriate use criteria for amyloid PET: a report of the Amyloid Imaging Task Force, the Society of Nuclear Medicine and Molecular Imaging, and the Alzheimer's Association. Alzheimers Dement. 2013 Jan;9(1):e1-16.
7. Decision Memo for Positron Emission Tomography (FDG) and Other Neuroimaging Devices for Suspected Dementia (CAG-00088R). CMS.gov. Centers for Medicare & Medicaid Services. https://www.cms.gov/medicare-coverage-database/details/nca-decision-memo.aspx?NCAId=104&NcaName=Positron+Emission+Tomography+(FDG)+and+Other+Neuroimaging+Devices+for+Suspected+Dementia+(1st+Recon)&bc=AiAAAAAAEAAA&
8. NCD for FDG PET for Dementia and Neurodegenerative Diseases (220.6.13), Effective date 4/3/2009, Implementation date 10/30/2009. http://www.cms.gov/medicare-coverage-database/details/ncd-details.aspx?NCDId=288&ncdver=3&bc=BAABAAAAAAAA&.
9. Albert M, DeCarli D, DeKosky S, et al. The use of MRI and PET for clinical diagnosis of dementia and investigation of cognitive impairment: a consensus report. 2004..
10. Rabinovici GD. Late-onset Alzheimer Disease. CONTINUUM: Lifelong Learning in Neurology. 2019;25(1):14-33. doi:10.1212/con.0000000000000700.
11. Rabinovici GD, Gatsonis C, Apgar C, et al. Association of Amyloid Positron Emission Tomography With Subsequent Change in Clinical Management Among Medicare Beneficiaries With Mild Cognitive Impairment or Dementia. *Jama*. 2019;321(13):1286-1294. doi:10.1001/jama.2019.2000.

HD-9: Epilepsy/Seizures

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924

HD-9.1: Epilepsy/Seizures

- MRI Brain without and with contrast (CPT® 70553) or MRI Brain without contrast (CPT® 70551) may be considered:[1,6]
  - Evaluation of new onset seizures
  - Refractory or drug resistant seizures
  - Change in the type of seizure
  - Preoperative planning
  - If CT Head was performed for an initial evaluation, MRI (as described above) may be approved for additional evaluation
  - Follow-up studies after a previous routine normal study may be considered if performed with special "Epilepsy Protocol" (typically 3T magnet, thin sections with angled slices through hippocampus and temporal lobes)
- FDG PET (CPT® 78608) for surgical planning in patients with refractory seizures who are candidates for epilepsy surgery.[1] (These requests are often accompanied by requests for functional MRI (See **HD-24.2: Functional MRI (f-MRI)**) for surgical planning).
  - Medicare covers FDG PET for pre-surgical evaluation for the purpose of localization of a focus of refractory seizure activity. The complete coverage policy is found in the Medicare National Coverage Determinations (NCD) Manual, Section 220.6.9 https://www.cms.gov/medicare-coverage-database/details/ncd-details.aspx?NCDId=294&ncdver=1&DocID=220.6.9&SearchType=Advanced&bc=IAAAABAAAAAA&

References

1. ACR Appropriateness Criteria® Seizures and epilepsy. *American College of Radiology (ACR).* Last review date: 2014.
2. Krumholz A, Wiebe S, Gronseth G, et al. Practice parameter: evaluating an apparent unprovoked first seizure in adults (an evidence-based review): report of the Quality Standards Subcommittee of the American Academy of Neurology and the American Epilepsy Society. *Neurology*. 2007 Nov 20; 69(21):1996-2007.
3. Harden CL, Huff JS, Schwartz TH, et al. Reassessment: neuroimaging in the emergency patient presenting with seizure (an evidence-based review): report of the Therapeutics and Technology Assessment Subcommittee of the American Academy of Neurology. *Neurology*. 2007 Oct 30;69(18):1772-1780.
4. Hirtz D, Ashwal S, Berg A, et al. Practice parameter: evaluating a first nonfebrile seizure in children, report of the Quality Standards Subcommittee of the American Academy of Neurology, the Child Neurology Society, and the American Epilepsy Society. *Neurology*. 2000 Sep 12;55(5):616-623.
5. St. Louis EK and Cascino GD. Diagnosis of epilepsy and related episodic disorders. *Continuum*. 2016; 22(1 Epilepsy):15-37.
6. Tranvinh E, Lanzman B, Provenzale J, Wintermark M. Imaging Evaluation of the Adult Presenting With New-Onset Seizure. American Journal of Roentgenology. 2019;212(1):15-25. doi:10.2214/ajr.18.20202.

HD-10: Facial Pain/Trigeminal Neuralgia

HD-10.1: Facial Pain/Trigeminal Neuralgia

- MRI Brain without and with contrast (CPT® 70553) (with special attention to the skull base), and/or facial imaging, MRI Orbit without and with contrast (CPT® 70543) may be of value in a given case, including:
  - Suspected tic douloureux or one of its cranial nerve variants such as glossopharyngeal neuralgia (CN IX)
  - Concern about an underlying diagnosis of multiple sclerosis.
  - Trigeminal neuralgia which involves the ophthalmic nerve, (periorbital or forehead pain), once post-herpetic neuralgia (a complication of shingles) has been excluded by history
- MRA Head (CPT® 70544 or CPT® 70546) or CTA Head (CPT® 70496) may be performed for:
  - Failed medical treatment
  - Surgical planning

Practice Notes

The differential diagnosis of facial pain is extensive, complex, and difficult, and there is considerable case-to-case variation in optimal imaging pathway.

References

1. Goh BT, Poon CY, and Peck RH. The importance of routine magnetic resonance imaging in trigeminal neuralgia diagnosis. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2001 Oct; 92(4):424-429.
2. Yaltho TC and Jankovic J. The many faces of hemifacial spasm: differential diagnosis of unilateral facial spasms. *Mov Disord*. 2011 Aug 1;26(9):1582-1592.
3. Cruccu G. Trigeminal Neuralgia*. Continuum.* 2017 Apr;23(2):396-420.

HD-11: Headache

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924

HD-11.1: Headache Non-Indications

Neuroimaging is not usually warranted in patients with migraine and a normal neurologic examination.[4]

- Advanced imaging of the head is NOT indicated for any of the following:
  - Primary headache disorder in the absence of focal neurological deficits or "red flags" (headaches that meet criteria for migraine or tension variety) (See **HD-11.2: Headaches with Red Flags**)
  - Chronic headaches or intermittent recurring headaches with a normal exam, no significant recent changes in pattern or character of headache
  - A new, recent onset headache without "red flags" or findings such as focal deficits, papilledema, age over 50, headache that awakens patient from sleep, or "thunderclap" headache

Practice Notes

Cervicogenic Headache - Defined as headaches caused by a disorder of the cervical spine, usually accompanied by neck pain or other signs and symptoms of cervical disease. Typical findings include reduced cervical range of motion, side-locked pain, and symptoms exacerbated by provocative maneuvers such as head movement or digital pressure. If suspected clinically, MRI Cervical Spine may be considered.

See **SP-3: Neck (Cervical Spine) Pain Without/With Neurological Features (Including Stenosis) and Trauma** in the Spine Imaging Guidelines

HD-11.2: Headaches with Red Flags

- Red Flags
  - Unusual symptoms or history (cancer history, immunosuppression, sudden onset, headache accompanied by seizures, new onset age >50, history of head trauma, headache awakens patient from sleep, headache precipitated by cough or valsalva); OR
  - Abnormal examination findings (altered mental status, papilledema, focal signs or symptoms (unilateral weakness or sensory loss), loss of coordination, seizures, gait disturbance, cranial nerve palsy, vision loss, nystagmus, dysarthria, dysphagia, fever, meningismus)
- If any of the above unusual symptoms or history are present advanced imaging studies may be considered see relevant section below.
- If any of the above abnormal examination findings or chronic headache with significant change in character, severity or frequency of headache (For example: rapidly increasing headache intensity or frequency, transformation of established migraine to chronic daily headaches):
  - MRI Brain without and with contrast (preferred study) (CPT® 70553); or
  - MRI Brain without contrast (CPT® 70551); or
  - CT Head without contrast (preferred study) (CPT® 70450)

- MRA/MRV Head (CPT® 70544 or CPT® 70546) or CTA/CTV Head (CPT® 70496) can be added to evaluate the recent onset of a progressive, severe, daily headache, with or without papilledema and concern for cerebral venous sinus thrombosis.
- For papilledema see **HD-17: Papilledema/Pseudotumor Cerebri**

HD-11.3: Sudden Onset of Headache

- For sudden onset of headache including:
  - Worst, most severe headache ever experienced or thunderclap-type[1,2,6] (example: awakening from sleep)[2,4]
  - Sudden onset unilateral headache, suspected carotid or vertebral dissection or ipsilateral Horner's syndrome[1]
- If any of these onset of headache features are present, the following advanced imaging studies may be considered:
  - CT Head without contrast (preferred study) (CPT® 70450) **or** MRI Brain without contrast (CPT® 70551) **or** MRI Brain without and with contrast (CPT® 70553) **and/or**
  - CTA Head with contrast (CPT® 70496); **or** MRA Head without contrast (CPT® 70544) **or** MRA Head without and with contrast (CPT® 70546)
  - MRA Neck (CPT® 70547, CPT® 70548, or CPT® 70549) or CTA Neck (CPT® 70496) may also be performed if arterial dissection is suspected

See **HD-12.1: Intracranial Aneurysms** and **HD-21.1: Stroke/TIA**

HD-11.4: Trigeminal Autonomic Cephalgias

- Trigeminal autonomic cephalgias includes cluster headache short-lasting, unilateral, neuralgiform headache attacks with conjunctival injection and tearing (SUNCT) syndromes; hemicrania continua.
  - May also include one-time pituitary screening[1,12]
- Cluster Headache (may also include pituitary)
- The following advanced imaging studies may be considered for trigeminal autonomic cephalgias and cluster headache:
  - MRI Brain without and with contrast (preferred study) (CPT® 70553); or
  - MRI Brain without contrast (CPT® 70551)

See **HD-10: Facial Pain/Trigeminal Neuralgia**

HD-11.5: Skull Base, Orbit, Periorbital or Oromaxillary

- Skull base, orbital, periorbital or oromaxillary[1] imaging is appropriate for concern of skull base tumors in patients with head and neck cancers, other skull base abnormalities seen on previous imaging, any invasive sinus infections as well as sinus tumors or orbital tumors with intracranial extension. In these clinical scenarios, any one of the following procedures may be considered:
  - MRI Brain and Orbits without and with contrast (preferred study) (CPT® 70553 and CPT® 70543); **or**
  - MRI Brain and Orbits without contrast (CPT® 70551 and CPT® 70540); **or**
  - CT Head and Orbits without and with contrast (CPT® 70470 and CPT® 70482); **or**
  - CT Head and Orbits with contrast (CPT® 70460 and CPT® 70481)

HD-11.6: Suspected Intracranial Extension of Sinusitis or Mastoiditis

- For suspected intracranial extension of sinusitis or mastoiditis[1], **not** cervicogenic:
  - MRI Brain without and with contrast (CPT® 70553) may be considered (See **PEDHD-16.2: Ear Pain** in the Pediatric Head Imaging Guidelines)

HD-11.7: New Headache Onset Older than Age 50

- For new onset headache in patients older than 50 years of age[2,6] the following may be considered:
  - MRI Brain without and with contrast (preferred study) (CPT® 70553); **or**
  - MRI Brain without contrast (CPT® 70551);
  - If Giant Cell Arteritis is suspected, MRA Head without and with contrast (CPT® 70546) or MRA Head without contrast (CPT® 70544) may be added.

HD-11.8: Cancer or Immunosuppression

- For new headache in patients with cancer or who are immunocompromised, the following may be considered:
  - MRI Brain without and with contrast (preferred study) (CPT® 70553); **or**
  - MRI Brain without contrast (CPT® 70551)

HD-11.9: Abnormal Blood Clotting

- MRI Brain without and with contrast (CPT® 70553); **or** MRI Brain without (CPT® 70551); **or** CT Head without contrast (CPT® 70450)
  - New onset headaches in patient with hypercoagulable states
    - MRA/MRV Head (CPT® 70544 or CPT® 70546) or CTA/CTV Head (CPT® 70496) may be added if there is concern for venous sinus thrombosis
  - Patients with potential for bleeding diathesis
    - Taking anticoagulants or two or more antiaggregants or having a medical condition that predisposes to bleeding (for example, liver failure).
      - Anticoagulants include warfarin, Arixtra, Xarelto, Eliquis, Savaysa, Heparin, Fragmin, Innohep, Lovenox, Orgaran, Angiomax, Pradaxa, Acova, Iprivask and Refludan.
      - Antiaggregants include aspirin, Plavix, Aggrenox, Brilinta, Pravigard, Pletal, Effient, Kengreal, Persantine, and Ticlid.

HD-11.10: Pregnancy

- For new onset headache during pregnancy[1] or immediate post-partum period (within 3 months after delivery) the following may be considered:
  - MRI Brain without contrast (Gadolinium relatively contraindicated in pregnancy) (CPT® 70551)
  - MRA/MRV Head (CPT® 70544 or CPT® 70546) or CTA/CTV Head (CPT® 70496) may be added if there is concern for venous sinus thrombosis.

HD-11.11: Physical Exertion

- For onset of headache with Valsalva maneuver,[2,6] cough, physical exertion **or** sexual (post-coital) activity,[1,6] but not merely a worsening of a pre-existing headache with these activities, the following procedures may be considered:
  - MRI Brain without and with contrast (preferred study) (CPT® 70553); **or**
  - MRI Brain without contrast (CPT® 70551); **or**
  - CT Head without contrast (CPT® 70450); **AND/OR**
  - MRA Head (CPT® 70544 or CPT® 70546) **or**
  - CTA Head without and with contrast (CPT® 70496)

HD-11.12: Post-Trauma

- For post-traumatic headaches within 2 weeks of the injury See **HD-13: Head and Facial Trauma**
- For post-traumatic headaches persisting for longer than 2 weeks following the injury, but within one year of the injury, the following may be considered:
  - CT Head without contrast (CPT® 70450); **or**
  - MRI Brain without contrast (CPT® 70551); **or**
  - MRI Brain without and with contrast (CPT® 70553)

HD-11.13: Acute Systemic Infections

- For acute systemic infections with meningeal neck stiffness[1,6] the following may be considered:
  - MRI Brain without and with contrast (preferred study) (CPT® 70553); or
  - MRI Brain without contrast (CPT® 70551)
- See **HD-14.1: CNS Infection**

HD-11.14: Hydrocephalus Shunts

- For Hydrocephalus Shunts See **PEDHD-7.3: Hydrocephalus**

HD-11.15: Low Pressure Headache and CSF Leak

- Evaluation of suspected low pressure headache and CSF leak may include MRI Brain without and with contrast (CPT® 70553) and MRI Cervical, Thoracic and Lumbar Spine, which according to facility protocols may be completed without contrast (CPT® 72141, CPT® 72146, and CPT® 72148), with and without contrast (CPT® 72156, CPT® 72157, and CPT® 72158) or with contrast only (CPT® 72142, CPT® 72147, and CPT® 72149) or CT myelography (CT Cervical, Thoracic, and Lumbar Spine with contrast [CPT® 72126, CPT® 72129, CPT® 72132])
- CT Maxillofacial without contrast (CPT® 70486) if concern for CSF rhinorrhea

References

1. Hainer BL and Matheson EM. Approach to acute headache in adults. *Am Fam Physician*. 2013 May;87(10):682-687.
2. ACR Appropriateness Criteria® Headache. *American College of Radiology (ACR).* Last review: 2013.
3. Neff MJ. Evidence-based guidelines for neuroimaging in patients with nonacute headaches. *Am Fam Physician.* 2005 Mar 15; 71(6):1219-1222.
4. Silberstein SD. Practice parameter: evidence-based guidelines for migraine headache (an evidence-based review): report of the Quality Standards Subcommittee of the American Academy of Neurology. *Neurology.* 2000 Sep 26;55(6):754–763. Correction: *Neurology*. 2001;56(1):142-142. doi:10.1212/wnl.56.1.142-a.
5. Beithon J, Gallenberg M, Johnson K, et al. Diagnosis and treatment of headache. *Institute for Clinical Systems Improvement.* Eleventh Edition. January 2013.
6. Callaghan BC, Kerber KA, Pace RJ, et al. Headaches and Neuroimaging. *JAMA Intern Med*. 2014 May; 174(5):819-821.
7. Newman LC. Trigeminal autonomic cephalgias. *Continuum*. 2015 Aug;21(4):1041-1057.
8. Headache Classification Committee of the International Headache Society (IHS) The International Classification of Headache Disorders, 3rd edition. *Cephalalgia*. 2018;38(1):1-211**.**
9. Bogduk N, Govind J. Cervicogenic headache: an assessment of the evidence on clinical diagnosis, invasive tests, and treatment. *The Lancet Neurology*. 2009;8(10):959.
10. Mokri B. Spontaneous intracranial hypotension spontaneous CSF Leaks. *Headache Currents*. 2005 Jan; 2(1):11-22.
11. Bley T, Uhl M, Carew J, et al. Diagnostic Value of High-Resolution MR Imaging in Giant Cell Arteritis. *American Journal of Neuroradiology*. 2007;28(9):1722-1727. doi:10.3174/ajnr.a0638.

HD-12: Aneurysm and AVM

HD-12.1: Intracranial Aneurysms

- CTA Head (CPT® 70496) or MRA Head (CPT® 70544 or CPT® 70546) can be performed in any of the following clinical scenarios:
  - Symptoms or signs of cerebral aneurysm, including:
    - "Thunderclap headache" See **HD-11.3: Sudden Onset of Headache**
    - Third nerve palsy with pupillary involvement (pupil-sparing third nerve palsies are not caused by external compression)
    - Suspicion of aneurysm bleed [CT Head or MRI Brain or CSF exam showing evidence of subarachnoid hemorrhage (SAH) or intracerebral hemorrhage]
    - Abnormal CT Head or MRI Brain suggesting possible aneurysm
  - Screening for High Risk Populations as defined by the following criteria (screening usually begins at age 20 unless unusual circumstances as aneurysms are uncommon in children and adolescents):
    - Positive Family History: Two or more first degree relatives (parent, sibling, or child) with history of cerebral aneurysm or SAH: screening every 5 years beginning at age 20
      - One first degree relative (parent, sibling, or child) with history of cerebral aneurysm or SAH may also have one screening study but risks and benefits should be discussed with patient
    - Autosomal dominant polycystic kidney disease (screening begins at age 20 to 65 and is repeated at ten-year intervals)
    - Aortic coarctation or bicuspid aortic valve
    - Type 4 (Vascular) Ehlers-Danlos Syndrome
    - Marfan's Syndrome
    - Loeys-Dietz Syndrome
    - Microcephalic osteodysplastic primordial dwarfism
    - Patients with previous history of SAH or treatment for cerebral aneurysm: continued surveillance and screening every 5 years
    - Presence of an azygos anterior cerebral artery
    - Diagnosis of fibromuscular dysplasia (one screening study after confirmed diagnosis)
  - CTA Head (CPT® 70496) may be performed to confirm questionable or equivocal findings on an initial MRA Head.
  - Follow up of known cerebral aneurysm
    - Known incidentally discovered aneurysms which have never bled. The optimal interval and duration of recommended follow up in the literature are undefined. The risk of aneurysm rupture is related to size, location (posterior circulation is higher risk), and patient factors including age, sex (higher for female), and history of smoking and hypertension.
    - Follow up at 6 months, 12 months and then annually for up to 5 years or until aneurysm is determined to be stable; and then at decreasing frequency, generally every 5 years unless judged to be at higher risk (see above risk factors).

- Follow up of treated aneurysms, clipping or coiling (with or without SAH)
  - Follow up at 3 to 6 month intervals for the first year, then 6 to 12 months for up to 2 years, then annually to ensure that aneurysm is not recanalyzing. If stable and occluded at last imaging then follow up surveillance every 5 years. MRA Head (CPT® 70544 or CPT® 70546) or CTA Head (CPT® 70496)
- MRI Brain without contrast (CPT® 70551) or with and without (CPT® 70553) may be added if there are new signs, symptoms or clinical findings, or to evaluate giant aneurysm (>2.5 cm).

- MRI Spinal (Cervical, Thoracic, Lumbar (without and with contrast) [CPT® 72156, CPT® 72157, CPT® 72158]) is appropriate to evaluate patients with SAH and negative studies for brain aneurysm in whom spinal abnormalities (i.e. AVM) may be suspected as the cause of hemorrhage.

HD-12.2: Arteriovenous Malformations (AVMs) and Related Lesions

- MRI Brain without and with contrast (CPT® 70553) or without contrast (CPT® 70551) may be considered in the following clinical scenarios:
  - AVM is suspected based on a history of SAH.
  - Screening for:
    - Hereditary hemorrhagic telangiectasia syndrome (Osler Weber Rendu) See **PEDHD-10.2: Pediatric Intracranial Arteriovenous Malformations (AVM)** in the Pediatric Head Imaging Guidelines
    - Familial cavernous malformation: Screening should include MRI Brain without or without and with contrast (with gradient echo images).
- CTA Head (CPT® 70496) or MRA Head (CPT® 70544 or CPT® 70546) can be performed if screening MRI Brain is positive.
- CTA Head (CPT® 70496) or MRA Head (CPT® 70544 or CPT® 70546) may be considered when known AVM are being evaluated for embolization or surgery
- Repeat advanced imaging with MRI Brain without and with contrast (CPT® 70553) or without contrast (CPT® 70551), AND/OR MRA Head (CPT® 70544 or CPT® 70546) or CTA Head (CPT® 70496) may be considered depending on the character of the disease and risk factors, or in the following clinical scenarios:
  - New hemorrhage episode is likely
  - Onset or change of seizures
  - Focal neurological signs
  - As follow up after treatment (surgery or embolization) as requested by specialists.

Practice Notes

Trauma is the most common reason for subarachnoid hemorrhage. Ruptured berry aneurysm is the most common reason for non-traumatic subarachnoid hemorrhage in adults.

Small aneurysms are present in about 1% to 2% of adults, but very few ever reach a size for which bleeding is a risk (>5 mm). Small (<3 to 4 mm) unruptured aneurysms in

those with no personal history of SAH have a 0.1% to 0.5% a year rate of bleeding. The risk of cerebral aneurysm with family history ranges from 2% with one first degree relative to 30% to 35% for identical twin or two parents. The risks and benefits of screening these populations need to be considered before advanced imaging.

AVMs most often come to clinical notice either by bleeding or by acting as a seizure focus. They are usually congenital, recognized later in life and have an initial risk of bleeding of 2% per year.

References

1. Bederson JB, Awad IA, Wiebers DO, et al. Recommendations for the management of patients with unruptured intracranial aneurysms: a statement for healthcare professionals from the Stroke Council of the American Heart Association. *Circulation*. 2000 Oct 31;102(18):2300-2308.
2. Bederson JB, Connolly ES Jr, Batjer HH, et al. Guidelines for the management of aneurysmal subarachnoid hemorrhage: a statement for healthcare professionals from a special writing group of the Stroke Council, American Heart Association. *Stroke*. 2009 Mar;40(3):994-1025.
3. Vega C, Kwoon JV, and Lavine SD. Intracranial aneurysms: current evidence and clinical practice. *Am Fam Physician*. 2002 Aug 15;66(4):601-609.
4. Brain Aneurysm Foundation. Early detection and screening..
5. Rozenfeld MN, Ansari SA, Shaibani A, et al. Should patients with autosomal dominant polycystic kidney disease be screened for cerebral aneurysms? *Am J Neuroradiol.* 2014 Jan;35(1):3-9.
6. Bor ASE, Koffijberg H, Wermer MJH, et al. Optimal screening strategy for familial intracranial aneurysms: a cost-effectiveness analysis. *Neurology*. 2010 May 24; 74(21):1671-1679.
7. Schievink WI, Raissi SS, Maya MM, et al. Screening for intracranial aneurysms in patients with bicuspid aortic valve. *Neurology*. 2010 May 4; 74(18):1430-1433.
8. Vlak MHM, Rinkel GJE, Greebe P, et al. Lifetime risks for aneurysmal subarachnoid haemorrhage: multivariable risk stratification. *J Neurol Neurosurg Psych*. 2013 Jun; 84(6):619-623.
9. Kelly AG. Unruptured intracranial aneurysms. *Continuum*. 2014 Apr;20(2):387-398.
10. Thompson BG, Brown RD, Amin-Hanjani S, et al. Guidelines for the management of patients with unruptured intracranial aneurysms. *Stroke*. 2015 Aug; 46(8):2368-2400.
11. Chu LC, Johnson PT, Dietz HC, et al. CT angiographic evaluation of genetic vascular disease: role in detection, staging, and management of complex vascular pathologic conditions. *AJR Am J Roentgenol*. 2014 May; 202(5):1120-1129.
12. Hishikawa T, Date I, Tokunaga K, et al. Risk of rupture of unruptured cerebral aneurysms in elderly patients. *Neurology*. 2015 Nov 24; 85(21):1879-1885.
13. Backes, D, Rinkel GJE, Greving JP, et al. ELAPSS score for prediction of risk of growth of unruptured intracranial aneurysms. *Neurology.* 2017 Apr 25;88(17):1600-1606.
14. Ding D and Ermian N. A model for predicting the growth of unruptured intracranial aneurysms. *Neurology*. 2017 Apr 26;88(17):1594-1595.
15. Kadian-Dodov D, Gornik HL, Gu X, et al. Dissection and Aneurysm in Patients With Fibromuscular Dysplasia. *Journal of the American College of Cardiology*. 2016;68(2):176-185. doi:10.1016/j.jacc.2016.04.044.
16. McDonald J. Hereditary Hemorrhagic Telangiectasia. GeneReviews® [Internet]. https://www.ncbi.nlm.nih.gov/books/NBK1351/. Published February 2, 2017.

HD-13: Head and Facial Trauma

HD-13.1: Head Trauma

Patients with head trauma are at risk for facial and cervical trauma.

See **SP-3: Neck (Cervical Spine) Pain Without/With Neurological Features (Including Stenosis) and Trauma** in the Spine Imaging Guidelines

- CT Head without contrast (CPT® 70450) is the primary imaging modality in patients with acute head trauma and any of the following modified Canadian Criteria:
  - Taking one anticoagulant or two antiaggregants, (e.g., aspirin and Plavix)
  - Known platelet or clotting disorder
  - Renal failure (creatinine >6)
  - Glasgow coma scale (GCS) score of less than 15 at 2 hours following injury
  - >30 minutes of amnesia
  - Any "dangerous mechanism of injury"
    - Fall greater than 5 steps down stairs
    - Fall from height greater than 3 feet
    - Any pedestrian motor vehicle accident
    - Ejection from motor vehicle
  - Suspected open skull fracture
  - Signs of basilar skull fracture (Battle's sign, Raccoon eyes, CSF rhinorrhea, cranial nerve palsy, hemotympanum, acute hearing loss)
  - Two or more episodes of vomiting
  - Patient >64 years old
- MRI Brain without contrast (CPT® 70551) is thereafter used when the clinical findings are not explained by the CT results or to evaluate late effect of brain injury
- Follow-up imaging, MRI or CT, for known subdural hematomas, intracerebral hemorrhage, or contusions can be done at the discretion of ordering specialist

Practice Note

Recent studies have shown that Diffusion tensor MRI tractography may be more sensitive in demonstrating abnormalities such as axonal injury in closed head injury than conventional MRI, but these techniques are best described presently as research tools and their use in routine clinical practice is not determined.

Decisions regarding return to normal activities, including sports, are made based on the clinical status of the patient and repeat imaging is unnecessary.

HD-13.2: Facial Trauma

- CT Maxillofacial without contrast (CPT® 70486) indicated for any concern regarding significant injury to facial structures including but not limited to:
  - Concern for orbital, maxillary, or mandibular fractures
  - Trauma with associated symptoms of anosmia, hearing, vision or speech changes, vertigo, facial numbness
  - Physical exam findings of CSF rhinorrhea, malocclusion, severe focal facial tenderness, focal loss of facial sensation
- CT Orbits/Temporal Bone without contrast (CPT® 70480):
  - Concern for orbital injury or orbital wall fracture
  - Symptoms of diplopia, blurred vision, vision loss
  - Physical exam findings of enophthalmos, entrapment of extraocular muscle(s)
  - Suspicion for temporal bone fracture

  Note: Initial x-rays are not required before advanced imaging for the above indications

Practice Note

Imaging is not necessary in the evaluation of simple nasal fractures if tenderness and swelling is limited to the nasal bridge, the patient can breathe through each naris, and there is no septal hematoma.

References

1. Stiell IG, Wells GA, Vandemheen K, et al. The Canadian CT head rule for patients with minor head injury. *Lancet.* 2001 May 5;357(9266):1391-1396.
2. Giza CC, Kutcher JS, Ashwal S, et al. Summary of evidence-based guideline update: evaluation and management of concussion in sports: report of the Guideline Development Subcommittee of the American Academy of Neurology. *Neurology*. 2013 Jun 11;80(24):2250-2257.
3. Wilde EA, McCauley SR, Hunter JV, et al. Diffusion tensor imaging of acute mild traumatic brain injury in adolescents. *Neurology*. 2008 Mar 18:70(12):948-955.
4. Mayer AR, Ling J, Mannell MV, et al. A prospective diffusion tensor imaging study in mild traumatic brain injury. *Neurology*. 2010 Feb 23; 74(8):643-650.
5. Mondin V, Rinaldo A, Ferlito A. Management of nasal bone fractures. *American Journal of Otolaryngology*. 2005;26(3):181-185. doi:10.1016/j.amjoto.2004.11.006.
6. Sun JK, Lemay DR. Imaging of facial trauma. *Neuroimaging Clinics of North America*. 2002;12(2):295-309. doi:10.1016/s1052-5149(02)00002-3.

HD-14: CNS Infection

HD-14.1: CNS Infection

- Signs of intracranial infection include: 1) headaches, seizures or new focal deficits in a setting of fever or elevated white blood cell count (WBC); 2) known infection elsewhere; 3) or immunosuppression. The following studies may be considered for suspected intracranial infection[1-4] if any of these signs of infection are present:
  - MRI Brain without and with contrast (CPT® 70553) (preferred), **or**
  - CT Head without and with contrast (CPT® 70470)
- FDG Brain PET (CPT® 78608) may be performed to evaluate patients suspected of having encephalitis, including autoimmune encephalitis, if diagnosis remains unclear after evaluation with MRI Brain, CSF analysis, and lab testing including serology, if appropriate.

References

1. Jordan JE, Kieffer SA, Booth TN, et al. ACR-ASNR-SPR Parameter for the performance of computed tomography (CT) of the brain. *American College of Radiology (ACR).* Revised 2015 (Resolution 20).
2. Kastrup O, Wanke I, and Maschke M. Neuroimaging of infections of the central nervous system. *Semin Neurol*. 2008 Sep;28(4):511-522.
3. Britton CB. Acquired Immune Deficiency Syndrome. In: *Merritt's Neurology*. 12th ed. Philadelphia, PA: Lippincott; 2010:186-201.
4. Jubelt J. *Spirochete infections, Lyme disease.* In: *Merritt's Neurology.* 12th Ed. Philadelphia, Lippincott; 2010:225-227.
5. Lee BY, Newberg AB, Liebeskind DS, Kung J, Alavi A. FDG-PET Findings in Patients With Suspected Encephalitis. Clinical Nuclear Medicine. 2004;29(10):620-625. doi:10.1097/00003072-200410000-00004.
6. Probasco JC, Solnes L, Nalluri A, et al. Abnormal brain metabolism on FDG-PET/CT is a common early finding in autoimmune encephalitis. Neurology - Neuroimmunology Neuroinflammation. 2017;4(4). doi:10.1212/nxi.0000000000000352.

HD-15: Movement Disorders

HD-15.1: Movement Disorders

- The majority of movement disorders are diagnosed based on a clinical diagnosis and do not require imaging. These include:
  - Typical Parkinson's Disease[1]
  - Essential Tremor or tremors of anxiety or weakness
  - Restless Leg Syndrome
  - Tics or spasms which can be duplicated at will
- MRI Brain without contrast (CPT® 70551), or without and with contrast (CPT® 70553) is considered in the following clinical scenarios:
  - Atypical Parkinsonism because of unusual clinical features (for example, persistent unilateral signs and symptoms, young onset under age of 50, rapid progression), incomplete or uncertain medication responsiveness, or clinical diagnostic uncertainty.[1] These cases should be forwarded for Medical Director Review.
  - Suspected Huntington Disease[1]
  - Evaluation for surgical treatment of Essential Tremor or Parkinson's disease, including Deep Brain Stimulator (DBS) placement.
  - CT Head without contrast (CPT® 70450) may be performed in follow up after surgery for DBS placement.
- DAT-SPECT Radiopharmaceutical Localization SPECT (ioflupane I-123 SPECT) (CPT® 78803) may be considered:
  - To evaluate patients in whom the diagnosis and differentiation between Parkinson's disease and Essential Tremor remains unclear after evaluation by experts in movement disorders and medication trials.
  - DAT Scans are not useful for differentiation of subtypes of Parkinson's syndromes, to monitor progression of disease or predict risk of development of disease.

Practice Notes

There is little evidence to support the use of MRA/CTA and PET in the evaluation of movement disorders.[2]

References

1. ACR Appropriateness Criteria® Dementia and movement disorders. *American College of Radiology (ACR*). Date of origin: 1996. Last review date: 2015.
2. Suchowersky O, Reich S, Perlmutter J, et al. Practice parameter: diagnosis and prognosis of new onset Parkinson disease (an evidence-based review): report of the Quality Standards Subcommittee of the American Academy of Neurology. *Neurology*. 2006 Apr 11; 66(7):968-975.
3. Gayed I, Joseph U, Fanous M, et al. The impact of DaTscan in the diagnosis of Parkinson's disease. *Clin Nucl Med*. 2015 May;40(5):390-393.
4. Kupsch AR, Bajaj N, Weiland F, et al. Impact of DaTscan SPECT imaging on clinical management, diagnosis, confidence of diagnosis, quality of life, health resource use and safety in patients with clinical uncertain Parkinsonian syndromes: a prospective 1-year follow-up of an open-label controlled study. *J Neurol Neurosurgery Psychiatry*. 2012 Jun; 83(6):620-628.
5. Perlmutter JS and Eidelberg D. To scan or not to scan: DaT is the question. *Neurology*. 2012 Mar 6;78(10):688-689.
6. Bajaj N, Hauser RA, and Grachev ID. Clinical utility of dopamine transporter single photon emission CT (DaT-SPECT) with (123I) ioflupane in diagnosis of parkinsonian syndromes. *J Neurol Neurosurg Psychiatry*. 2013 Nov;84(11):1288-1295.
7. Seifert KD and Wiener JI. The impact of DaT scan on the diagnosis and management of movement disorders: a retrospective study. *Am J Neurodegener Dis.* 2013;2(1) 29-34.
8. de la Fuente-Fernandez R. Role of DaTSCAN and clinical diagnosis in Parkinson disease. *Neurology*. 2012 Mar 6; 78(10):696-701.
9. Hess CW and Okun MS. Diagnosing Parkinson Disease. *Continuum*. 2016 Aug; 22(4):1047-1063.
10. Subramaniam RM, Frey KA, Hunt CH, et al. ACR-ACNM practice parameter for the performance of dopamine transporter (DaT) single photon emission computed tomography (SPECT) imaging for movement disorders. *Clin Nucl Med*. 2017 Nov;42(11):847-852.
11. Bega D, Gonzalez-Latapi P, Zadikoff C, et al. Is there a role for DAT-SPECT imaging in a specialty movement disorders practice? *Neurodegener Dis.* 2015:15(2):81-86.

HD-16: Multiple Sclerosis (MS) and Related Conditions

HD-16.1: Multiple Sclerosis (MS)

- MRI Brain without and with contrast (CPT® 70553) and MRI Cervical and Thoracic Spine without and with contrast (CPT® 72156 and CPT® 72157) use in these clinical scenarios requires[1] clinical suspicion based on recurrent episodes of variable neurological signs and symptoms or clinically isolated syndromes and[2] the baseline exclusion of appropriate alternative conditions that can mimic MS[1-4]
  - MRI Orbit without and with contrast (CPT® 70543) may be considered if optic neuritis is suspected, in addition to the above scenario[4]
  - If a non-contrast study shows incidental evidence of possible demyelinating disease, repeat with MRI Brain with contrast (CPT® 70552) may be approved 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 request for repeat imaging, an MRI Brain with and without contrast (CPT® 70553) is appropriate.
  - If the diagnosis is still equivocal after initial screening repeat studies in 3 to 6 months may be performed
  - Evidence does not support the use of 3T MRI as being more effective than 1.5T units for diagnosis or follow up of MS. Requests for repeat imaging should meet guidelines for timeliness as noted within these guidelines regardless of type of facility requested
- MRI Lumbar Spine usually is not needed since Cervical and Thoracic studies will usually visualize the entire spinal cord
- Repeat Brain and/or Spine imaging in an established patient may be considered in the following scenarios:
  - New episode of neurological deficit[4]
  - Annual surveillance in stable patients
  - To re-establish baseline when instituting or changing immune-modulating agents
  - Symptoms suggestive of Progressive Multifocal Leukoencephalopathy (PML) during Tysabri therapy (or other drugs with similar risk).[5]
    - Screening for patients on natalizumab (Tysabri) or other drugs with risk of PML (Progressive Multifocal Leukoencephalopathy)
      - If Anti-JCV antibody negative: MRI Brain annually
      - If Anti-JCV antibody positive: MRI every 6 months
      - If Anti-JCV antibody positive and titer >1.5, and >two years on treatment: MRI Brain may be performed every 3 months.
  - Repeat imaging requests for MRI without contrast for follow up may be approved when requested by a specialist (as long as request otherwise meets criteria above).
- Family members need not be screened, unless they exhibit suspicious signs or symptoms suggestive of MS.

Practice Notes

Multiple Sclerosis is common and variable with more women affected and at a younger age than men. MS tends to be relapsing-remitting (improves between episodes), relapsing-progressive (worsens with attacks) and chronic progressive (gradual and steady).

MS is a clinical diagnosis, traditionally recognized by "lesions dispersed in time and space," which means involvement of different areas of the neuraxis at different times.

Screening based on family history of MS is not supported by the peer-reviewed evidence.

Sagittal MRI Spinal Cord with phased array detector coil (CPT® 72156 or CPT® 72157) is an alternative spinal imaging.

3D imaging in the evaluation of Multiple Sclerosis has not been shown to improve diagnostic accuracy, or improve clinical outcomes in the management of multiple sclerosis and is considered to be experimental and investigational.

HD-16.2: Neuromyelitis Optica and NMO Spectrum Disorders

- Neuromyelitis optica (NMO, Devic's disease) is an autoimmune disease causing inflammation and demyelination of the optic nerve, spinal cord and brain. Diagnosis is based on the clinical presentation, MRI findings, and presence of auto-antibodies.
- MRI Brain without and with contrast (CPT® 70553), MRI Orbit without and with contrast (CPT® 70543), MRI Cervical and Thoracic Spine without and with contrast (CPT® 72156, CPT® 72157)
  - Suspected Neuromyelitis Optica
  - New symptoms or signs in patient with known Neuromyelitis Optica.

References

1. Gordon JM. The utility of MRI in suspected MS: report of the Therapeutics and Technology Assessment Subcommittee. *Neurology*. 2004 Mar 9; 62(5):838.
2. Scott TF and Frohman EM, De Seze J, et al. Evidence-based guideline: clinical evaluation and treatment of transverse myelitis: report of the Therapeutics and Technology Assessment Subcommittee of the American Academy of Neurology. *Neurology.* 2011 Dec 13; 77(24):2128-2134.
3. Polman CH, Reingold SC, Banwell B, et al. Diagnostic criteria for multiple sclerosis: 2010 revisions to the McDonald criteria. *Ann Neurol*. 2011 Feb; 69(2):292-302.
4. Lövblad K-O, Anzalone N, Dörfler A, et al. MR imaging in multiple sclerosis: review and recommendations for current practice. *Am J Neuroradiol*. 2010 Jun; 31(6):983-989.
5. FDA Drug Safety Communication: New risk factor for Progressive Multifocal Leukoencephalopathy (PML) associated with Tysabri (natalizumab). Originally issued February 5, 2010. Update issued April 22, 2011. U S Food and Drug Administration Home Page. https://www.fda.gov/Drugs/DrugSafety/ucm288186.htm
6. Traboulsee A, Simon JH, Stone L, et al. Revised recommendations of the Consortium of MS Centers Task Force for a standardized MRI protocol and clinical guidelines for the diagnosis and follow-up of multiple sclerosis. *Am J Neuroradiol*. 2016 Mar; 37(3):397-401.
7. Mcguigan C, Craner M, Guadagno J, et al. Stratification and monitoring of natalizumab-associated progressive multifocal leukoencephalopathy risk: recommendations from an expert group. *Journal of Neurology, Neurosurgery & Psychiatry*. 2015.
8. Hagens MH, Burggraaff J, Kilsdonk ID, et al. Three-Tesla MRI does not improve the diagnosis of multiple sclerosis. *Neurology*. 2018;91(3):249-257.
9. Rae-Grant A, Day GS, Marrie RA, et al. Comprehensive systematic review summary: Disease-modifying therapies for adults with multiple sclerosis. *Neurology*. 2018;90(17):789-800. doi:10.1212/wnl.0000000000005345.
10. Barnett Y, Sutton IJ, Ghadiri M, Masters L, Zivadinov R, Barnett MH. Conventional and Advanced Imaging in Neuromyelitis Optica. *American Journal of Neuroradiology*. 2013;35(8):1458-1466. doi:10.3174/ajnr.a3592.
11. Kilsdonk ID, Barkhof F, Wattjes MP. 2010 revisions to mcDonald criteria for diagnosis of multiple sclerosis: Impact of 3-tesla magnetic resonance imaging. *Annals of Neurology*. 2011;70(1):182-183. doi:10.1002/ana.22490.
12. Kaunzner UW, Gauthier SA. MRI in the assessment and monitoring of multiple sclerosis: an update on best practice. *Therapeutic Advances in Neurological Disorders*. 2017;10(6):247-261. doi:10.1177/1756285617708911.
13. 2018 Revised Guidelines of the Consortium of MS Centers MRI Protocol for the Diagnosis and Follow-up of MS. MRI Protocol - Consortium of Multiple Sclerosis Centers (CMSC). http://www.mscare.org/mri.

HD-17: Papilledema/Pseudotumor Cerebri

HD-17.1: Papilledema/Pseudotumor Cerebri

- MRI Brain without and with contrast (CPT® 70553) can be considered when there is suspected elevated intracranial pressure, such as with pseudotumor cerebri (benign intracranial hypertension) and papilledema, to exclude cerebral mass lesions, obstructive hydrocephalus, or occult meningeal disease.
  - MRI Orbit without and with contrast (CPT® 70543) or CT Orbit without and with contrast (CPT® 70482) may be considered if there is concern for orbital pseudotumor or a primary bilateral orbital disorder.
  - Repeat imaging may be considered to evaluate either:
    - Shunt dysfunction in those patients who have had ventriculoperitoneal (VP) or lumboperitoneal (LP) shunts
    - Clinical deterioration
  - MRA Head without contrast (CPT® 70544) or MRA Head without and with contrast (CPT® 70546) or CTA Head without and with contrast (CPT® 70496) can be approved for papilledema with suspected venous sinus thrombosis.
    - CT and MR Venography (CTV and MRV) are reported with the same codes as the CTA/MRA counterpart. 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

Reference

1. Friedman DI. Papilledema and Idiopathic Intracranial Hypertension. *CONTINUUM: Lifelong Learning in Neurology*. 2014;20:857-876. doi:10.1212/01.con.0000453314.75261.66.

HD-18: Paresthesias

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924

HD-18.1: Paresthesias

Requests will be sent for Medical Director Review. Paresthesia(s) (localized numbness and tingling) are symptoms of a local (nerve entrapment for example), regional (Multiple Sclerosis for example) or central (stroke for example) disorder.[1,2] Advanced imaging can be considered initially, based on the highest suspicion disorder, according to these guidelines.[1,2]

References

1. Paresthesia Information Page. National Institute of Neurological Disorders and Stroke. https://www.ninds.nih.gov/Disorders/All-Disorders/Paresthesia-Information-Page.
2. Paresthesia. ReedGroup® MD Guidelines.

HD-19: Pituitary

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.eviCore.com

HD-19.1: Pituitary

- Endocrine laboratory studies should be performed prior to considering advanced imaging, including Prolactin levels; thyroid function levels should also be checked to evaluate for untreated or inadequately treated hypothyroidism as a cause of hyperprolactinemia and pituitary hyperplasia
  - Lab results should be recent, within 6 weeks of the request.
- Pituitary imaging is primarily performed with MRI Brain without and with contrast (CPT® 70553):
  - MRI Orbit, Face, Neck without and with contrast (CPT® 70543) or CT Head without and with contrast (CPT® 70470) are alternatives
  - CT Head without contrast (CPT® 70450) or without and with contrast (CPT® 70470) and/or CT Maxillofacial without contrast (CPT® 70486) may be used in addition to MRI to visualize perisellar bony structures in the preoperative evaluation of certain sellar tumors and for preoperative planning for transphenoidal approaches
- Incidentally found lesions on other studies:
  - If a pituitary abnormality is reported incidentally on a MRI Brain or CT Head performed for other reasons, a follow-up dedicated pituitary study may be obtained (MRI Brain without and with contrast [CPT® 70553] or MRI Orbit/Face/Neck without and with contrast [CPT® 70543]. MRI Brain without and with contrast [CPT® 70553] covers both brain and dedicated pituitary if performed at the same time; no additional CPT® codes are needed); further evaluation and subsequent imaging dependent on specific imaging and biochemical laboratory evaluation findings.
- For Amenorrhea See **PV-3.1: Amenorrhea** in the Pelvic Imaging Guidelines

Pituitary Imaging

Indication	Initial Imaging	Repeat Imaging
Acromegaly[****] **(**Elevated IGF-1 confirmed by lack of suppression of growth hormone on glucose suppression testing, with or without acromegaly)	➢ MRI Brain without and with contrast (CPT® 70553)	➢ MRI Brain without and with contrast (CPT® 70553) ◆ At least 12 weeks after surgery to evaluate for residual tumor ◆ If treated with Pegvisomant, 6 to 12 months after treatment initiated, then annually if stable ◆ If hormone levels increase or neurological findings appear
Microadenoma: Nonfunctioning, unexplained pituitary asymmetries, or incidentally found small tumors (<10 mm)	➢ MRI Brain without contrast and with contrast (CPT® 70553)	➢ MRI Brain without contrast and with contrast (CPT® 70553) at: ◆ 6 and 12 months, then yearly for 3 years if stable. After 3 years, then every other year for the next 6 years, then every 5 years if stable
Macroadenoma (≥10 mm) (if not surgically removed and normal hormonal testing)	➢ MRI Brain without and with contrast (CPT® 70553)	➢ If >10 mm but <20 mm (normal hormone testing/no surgery): ◆ MRI every 6 months for the first year, if stable in size, then annually for 5 years (longer if craniopharyngioma). ➢ If >20 mm (normal hormone testing/no surgery): ◆ MRI every 6 months
Rathke's cleft cyst/Simple cyst	➢ MRI Brain without and with contrast (CPT® 70553)	➢ MRI Brain without and with contrast (CPT® 70553) in one year; if stable and without mass effect or invasion into surrounding structures, no further imaging is required.

Indication	Imaging
Prolactinomas*	➢ MRI Brain without and with contrast (CPT® 70553) with: ◆ Unexplained elevated prolactin level above normal reference range ◆ After initial start of dopamine agonist therapy, repeat MRI in 1 year (or in 3 months if macroprolactinoma), also repeat if prolactin levels continue to rise while on dopaminergic agents, or if new symptoms emerge (e.g., galactorrhea, visual disturbances, headaches, or other hormonal disorders occur) ◆ Image after 2 years of dopamine agonist treatment for those who are being considered for discontinuation of treatment due to remission ◆ After 2 years of dopamine agonist therapy, for those who have achieved normal Prolactin levels and no visible tumor remnant, and for whom dopamine agonists have been discontinued or tapered, image if prolactin level increases above normal range. ◆ If treatment resistant on standard or maximal dopamine agonist therapy (e.g. visible tumor remnant or persistent elevation of Prolactin levels) and will not be treated with surgery/radiation, imaging periodically as per microadenoma or macroadenoma guidelines ◆ If treatment is discontinued at menopause, imaging periodically as per microadenoma or macroadenoma guidelines ◆ Galactorrhea/nipple discharge with normal prolactin and thyroid function levels: See **BR-6: Nipple Discharge/Galactorrhea** in the Breast Imaging Guidelines
TSH, FSH, ACTH or LH producing	➢ MRI Brain without and with contrast (CPT® 70553) when hormone levels are inappropriately elevated.
Male Hypogonadism	➢ MRI Brain without and with contrast (CPT® 70553) if ◆ Severe secondary hypogonadism (morning serum testosterone level <150 ng/dl and low or normal LH and FSH levels) ◆ Serum, free, or bioavailable morning testosterone level below normal range and low or normal LH and FSH levels accompanied by one of the following: ◆ Panhypopituitarism, hyperprolactinemia, symptoms or signs of tumor mass effect (e.g. headache, visual impairment, or visual field deficit), *****suspected alterations in sex hormone binding globulin (SHBG)
Panhypopituitarism	➢ MRI Brain without and with contrast (CPT® 70553)

Indication	Initial Imaging	Repeat Imaging for Non-Operative Care
Diabetes Insipidus (DI)	➢ MRI Brain without and with contrast (CPT® 70553) if: ◆ Laboratory testing consistent with DI (serum osmolality should be high and urine osmolality should be low) and etiology uncertain	NA
Syndrome of Inappropriate ADH (SIADH)	➢ MRI Brain without and with contrast (CPT® 70553) if: ◆ Etiology remains uncertain or is thought to be in the nervous system; ◆ Urine osmolality should be high and serum osmolality low	NA
Other Pituitary Region Tumors**	➢ Evaluation may require CT in addition to MRI to evaluate for hyperostosis. Requests will be sent for Medical Director Review.	

HD-19.2: Additional Imaging

➢ Post-operatively, follow-up pituitary imaging is generally done at the discretion of the neurosurgeon, usually at 4 months and then at one year if stable

Practice Notes

***Prolactinoma Note:** To establish the diagnosis of hyperprolactinemia, a single measurement of serum prolactin is recommended; a level above the upper limit of normal confirms the diagnosis as long as the serum sample was obtained without excessive venipuncture stress. Long-term or inadequately treated primary hypothyroidism can cause pituitary hyperplasia that may mimic a pituitary tumor. Routine imaging surveillance during pregnancy is not recommended due to risk to fetus. Repeat imaging with MRI without gadolinium is performed for new or worsening symptoms, such as headaches or visual symptoms. In women with microprolactinomas, it may be possible to discontinue dopaminergic therapy when menopause occurs. Surveillance for increasing size of the pituitary tumor should continue on a periodic basis.

****Other Pituitary Region Tumor Notes:** Craniopharyngiomas arise in the parasellar area. About 10% of meningiomas arise in this area.

*****Enlarged/Empty Sella Turcica Notes:** An enlarged sella turcica without evident tumor is an incidental finding on MRI Brain or CT Head from a defect in the dural diaphragm of the sella (especially if there is elevated intracranial pressure from another cause), pituitary surgery, or as a result of a pituitary tumor which has expanded the sella and then infarcted (pituitary apoplexy).

****Acromegaly:** Rarely, biochemically confirmed acromegaly with a normal pituitary gland on MRI may occur. Somatostatin receptor scintigraphy (Octreoscan) of thorax and abdomen and growth hormone-releasing hormone (GHRH) level may be considered to evaluate ectopically located disease.

*****Male Hypogonadism**: Alterations in sex hormone-binding globulin (SHBG) can impact testosterone levels. Free or bioavailable testosterone concentrations should be measured when total testosterone concentrations are close to the lower limit of the normal range and when altered SHBG levels are suspected (e.g. moderate obesity, nephrotic syndrome, hypo- and hyperthyroidism, use of glucocorticoids, progestins, estrogens, and androgenic steroids, anticonvulsants, acromegaly, diabetes mellitus, aging, HIV disease, liver cirrhosis, hepatitis). LH and FSH should be obtained to evaluate for secondary (central) hypogonadism, once low testosterone level is confirmed.

HD-19.3: Empty Sella Turcica

- Enlarged/Empty Sella Turcica: An enlarged sella turcica without evident tumor is an incidental finding on MRI Brain or CT Head from a defect in the dural diaphragm of the sella (especially if there is elevated intracranial pressure from another cause), pituitary surgery, or as a result of a pituitary tumor which has expanded the sella and then infarcted (pituitary apoplexy).
- MRI Brain with and without contrast (pituitary protocol) (CPT® 70553) with thin sections of pituitary – (Preferred modality). CT Head with and without contrast (CPT® 70470) – If MRI is contraindicated
  - Primary Empty Sella:
    - Incidentally found on other studies, asymptomatic and no related abnormalities: follow up at 2 years. No further imaging unless clinical symptoms develop (neuro-/ophthalmological symptoms, intracranial hypertension, or endocrine/hormonal abnormalities).
    - Following medical treatment of related endocrine, neurological, or ophthalmological problems: follow up imaging every 6 months.
    - Following surgical treatment: follow up at 4 months and 1 year, (additional imaging only for clinical progression or at request of neurosurgeon).
  - Secondary Empty Sella:
    - Imaging according to the cause or if clinical disease progression (such as adenomas, infiltrative or malignant disorders, hormonal abnormalities, neuro-/ophthalmological symptoms).

References

1. Schlechte JA. Clinical practice. Prolactinoma. *N Engl J Med*. 2003 Nov 20; 349(21):2035-2041.
2. Ciric I. Long-term management and outcome for pituitary tumors. *Neurosurg Clin N Am*. 2003 Jan; 14(1):167-171.
3. American Association of Clinical Endocrinologists medical guidelines for clinical practice for the evaluation and treatment of hypogonadism in adult male patients—2002 update. *Endocr Pract*. 2002; 8(6):439-456.
4. Katznelson L, Laws Jr, ER, Melmed S, et al. Acromegaly: an endocrine society clinical practice guideline. *J Clin Endocrinol Metab*. 2014 Nov;99(11):3933-3951.
5. Melmed S, Casanueva FF, Hoffman AR, et al. Diagnosis and treatment of hyperprolactinemia: an endocrine society clinical practice guideline. *J Clin Endocrinol Metab*. 2011 Feb;96(2):273-288.
6. Freda PU, Beckers AM, Katznelson L, et al. Pituitary incidentaloma: an endocrine society practice guideline. *J Clin Endocrinol Metab*. 2011 Apr;96(4):894-904.
7. Serri O, Chik CL, Ur E, et al. Diagnosis and management of hyperprolactinemia. *CMAJ*. 2003 Sep 16; 169(6):575-581.
8. Dekkers JM, Pereira AM, and Romijn JA. Treatment and follow-up of clinically nonfunctioning pituitary macroadenomas. *J Clin Endocrinol Metabol*. 2008 Oct;93(10):3717–3726..
9. Bhasin S, Cunningham GR, Hayes FJ, et al. Testosterone therapy in men with androgen deficiency syndromes: an endocrine society clinical practice guideline. *J Clin Endocrinol Metabol.* 2010 Jun;95(6): 2536–2559.
10. Hoang JK, Hoffman AR, González RG, et al. Management of Incidental Pituitary Findings on CT, MRI, and 18 F-Fluorodeoxyglucose PET: A White Paper of the ACR Incidental Findings Committee. *Journal of the American College of Radiology*. 2018;15(7):966-972.
11. Ludlam W. Pituitary Incidentaloma: An Endocrine Society Clinical Practice Guideline. *Yearbook of Endocrinology*. 2011;2011:325-326**.**
12. Marinis LD, Bonadonna S, Bianchi A, Maira G, Giustina A. Primary Empty Sella. The Journal of Clinical Endocrinology & Metabolism. 2005;90(9):5471-5477. doi:10.1210/jc.2005-0288.
13. Chiloiro S, Giampietro A, Bianchi A, et al. DIAGNOSIS OF ENDOCRINE DISEASE: Primary empty sella: a comprehensive review. *European Journal of Endocrinology*. 2017;177(6). doi:10.1530/eje-17-0505.
14. Marinis LD, Bonadonna S, Bianchi A, Maira G, Giustina A. Primary Empty Sella. *The Journal of Clinical Endocrinology & Metabolism*. 2005;90(9):5471-5477. doi:10.1210/jc.2005-0288.
15. Freda PU, Beckers AM, Katznelson L, et al. Pituitary Incidentaloma: An Endocrine Society Clinical Practice Guideline. The Journal of Clinical Endocrinology & Metabolism. 2011;96(4):894-904. doi:10.1210/jc.2010-1048.

HD-20: Scalp and Skull Lesions

HD-20.1: Scalp and Skull Lesions

The majority of these are benign soft tissue or bony lesions easily defined by physical examination or with skull x-rays or ultrasound.

- Ultrasound can be performed as initial imaging of scalp or skull lesions
- CT Head without or without and with contrast (CPT® 70450 or CPT® 70470) is appropriate for the following scenarios:
  - Any lesion on physician examination and skull x-ray or ultrasound which is not clearly benign.
  - Langerhans' cell histiocytosis, myeloma, and metastatic cancer, when symptoms suggest bony lesions.
- MRI Brain without contrast (CPT® 70551) or with and without contrast (CPT® 70553) may be considered if there is concern for intracranial extension.
- See **HD-30.2: Dental/Periodontal/Maxillofacial Imaging** for mandibular masses and **PEDHD-5.6: Other Indications for Sinus Imaging** in the Pediatric Head Imaging Guidelines for maxillofacial masses

HD-21: Stroke/TIA

HD-21.1: Stroke/TIA

- CT Head without contrast (CPT® 70450) for acute stroke (within the first 6 hours), TIA or concern for intracerebral or subdural hemorrhage
- MRI Brain without contrast (CPT® 70551) or MRI Brain without and with contrast (CPT® 70553) to evaluate concern for new stroke or TIA. MRI is preferred for evaluation of late presentation and can be performed after an initial CT Head.
- MRA Head without contrast (CPT® 70544) or MRA Head without and with contrast (CPT® 70546) or CTA Head with contrast (CPT® 70496) AND Duplex Ultrasound Carotid Arteries (CPT® 93880) or MRA Neck without contrast (CPT® 70547) or MRA Neck without and with contrast (CPT® 70549) or CTA Neck (CPT® 70498) may be added to CT Head or MRI Brain for evaluation of new stroke or TIA.
  - 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)[1-4] 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)
- MR or CT Venography (MRA Head without contrast [CPT® 70544] or without and with contrast [CPT® 70546] or CTA Head [CPT® 70496]) may be performed to evaluate venous infarcts after diagnosis on MRI Brain or CT Head.
- Transcranial Doppler Studies may also be performed for patients with documented stroke or TIA (See **HD-24.8: Transcranial Doppler (CPT® 93886)**). Requests require Medical Record Review
- Repeat imaging for follow up and resolution of stroke or hemorrhage as determined by a specialist.

References

1. ACR Appropriateness Criteria® Cerebrovascular disease. *American College of Radiology (ACR).* Date of origin: 1996. Last review date: 2016.
2. Latchaw RE, Alberts MJ, Lev MH, et al. Recommendations for imaging of acute ischemic stroke. *Stroke*. 2009; 40(11):3646-3678.
3. Wintermark M, Sanelli PC, Albers GW, et al. Imaging recommendations for acute stroke and transient ischemic attack patients: a joint statement by the American Society of Neuroradiology, the American College of Radiology, and the Society of NeuroInterventional Surgery. *Am J Neuroradiol*. 2013; 34(11):E117-E127.
4. Bernheisel CR, Schlaudecker JD, and Leopold K. Subacute management of ischemic stroke. *Am Fam Physician*. 2011 Dec; 84(12):1383-1388.
5. Zorzon M, Antonutti L, Masè G, et al. Transient global amnesia and transient ischemic attack: natural history, vascular risk factors, and associated conditions. *Stroke*. 1995 Sep; 26(9):1536-1542.
6. Kovacs MJ. Letter by Kovacs regarding article, "Diagnosis and management of cerebral venous thrombosis: a statement for healthcare professionals from the American Heart Association/American Stroke Association". *Stroke*. 2011 July; 42(7):e408.
7. Rowland LP, Pedley TA, and Merritt HH. *Merritt's Neurology*. Philadelphia, PA: Lippincott Williams & Wilkins; 2010.
8. Stam J. Thrombosis of the cerebral veins and sinuses. *N Engl J Med.* 2005 Apr 28; 352(17):1791-1798.
9. Schievink WI. Spontaneous dissection of the carotid and vertebral arteries. *N Engl J Med* 2001 Mar 22; 344(12):898-906.
10. Arnold M and Bousser M-G. Carotid and vertebral artery dissection. *Pract Neurol* 2005 Apr; 5(2):100-109.

HD-22: Cerebral Vasculitis

HD-22.1: Cerebral Vasculitis

- MRI Brain without and with contrast (CPT® 70553) is considered when CNS vasculitis is suspected
  - MRA Head without contrast (CPT® 70544) or MRA Head without and with contrast (CPT® 70546) and MRA Neck without and with contrast (CPT® 70549); OR CTA[3] Head (CPT® 70496) and CTA Neck (CPT® 70498) may be considered in addition to MRI Brain

Practice Notes

Classification of vasculitides based on vessel size adapted from Joseph.[1] MRA and CTA are useful for the evaluation of the large proximal arteries; evaluation of a possible small vessel vasculitis may be beyond the resolution of routine MRA and CTA Head. However, other abnormalities, such as atherosclerotic disease, arterial dissection, Moyamoya disease, or reversible cerebral vasoconstriction may be demonstrated. Conventional angiogram is superior to MRA and CTA in demonstrating abnormalities in smaller vessels and is considered the "gold standard" in the evaluation of primary small vessel CNS vasculitis.

Dominant Vessel Involved	Primary	Secondary
Large arteries	• Giant cell arteritis • Takayasu's arteritis	Aortitis with rheumatoid disease; Infection (e.g. syphilis)
Medium Arteries	• Classical polyarteritis nodosa • Kawasaki disease	Infection (e.g. hepatitis B)
Small vessels and medium arteries	• Wegener's granulomatosis • Churg–Strauss syndrome • Microscopic polyangiitis	Vasculitis with rheumatoid disease, systemic lupus erythematosus, Sjögren's syndrome, drugs, infection (e.g. HIV)
Small vessels	• Henoch-Schönlein purpura • Essential cryoglobulinemia • Cutaneous leukocytoclastic vasculitis	Drugs (e.g. sulphonamides, etc.) Infection (e.g. hepatitis C)

References

1. Joseph FG and Scolding NJ. Cerebral vasculitis: a practical approach. *Pract Neurol*. 2002 Apr;2(2):80-93.
2. Turski PA, Mirsky DM, Booth TN, et al. ACR-ASNR-SNIS-SPR practice guideline for the performance of cervicocerebral magnetic resonance angiography (MRA). *American College of Radiology (ACR).* 2015 (Resolution 10). .

HD-23: Dizziness, Vertigo and Syncope

HD-23.1: Dizziness, Vertigo, and Syncope

- Evaluation of vertigo or dizziness should include a detailed history and neurological exam including orthostatic blood pressure measurements, vestibular testing (tests for nystagmus, head thrust sign, Dix-Hallpike maneuver or other positional testing), gait, and hearing tests.
- MRI Brain without contrast (CPT® 70551) or MRI Brain without and with contrast (CPT® 70553) when history and exam suggest a central cause of vertigo.
  - Abnormal exam findings suggesting a central cause including nystagmus, hearing loss, absent head thrust sign, ataxia, positive Rhomberg test, or focal deficits.
  - Associated asymmetric hearing loss (See **HD-27: Hearing Loss and Tinnitus**) and concern for vestibular schwannoma. (Note: MRI Brain should be performed with thin sections of IACs). 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 **HD-1.1: General Guidelines – Anatomic Issues**).
  - Diagnosis of benign positional vertigo and failure to respond to treatment.
- CTA Head (CPT® 70496) and CTA Neck (CPT® 70498) or MRA Head without (CPT® 70544) or without and with contrast (CPT® 70546) and MRA Neck contrast as requested (CPT® 70547, CPT® 70548, or CPT® 70549) may be added if concern for vertebrobasilar disease (acute onset vertigo and associated symptoms or signs of weakness, gait difficulty, ataxia, drop attacks, visual loss, diplopia, dysarthria).
- CT Temporal bone without contrast (CPT® 70480) may be added if history of head trauma or concern for superior canal dehiscence (see Practice Note below).
- CT Head without contrast (CPT® 70450) or without and with contrast (CPT® 70470) if concern for acute stroke (See **HD-21: Stroke/TIA**) if MRI is contraindicated.

Practice Notes

Advance imaging is not indicated in patients with syncope, transient loss of consciousness or lightheadedness in the absence of symptoms or signs indicating an intracranial disorder.

Superior canal dehiscence is a rare syndrome caused by dehiscence in the boney covering of the superior semicircular canal, and may cause vertigo associated with auditory symptoms including oscillopsia evoked by noise and conductive hearing loss.

References

1. Post RE and Dickerson LM. Dizziness: a diagnostic approach. *Am Fam Physician*. 2010 Aug 15;82(4):361-368.
2. Kerber KA and Baloh RW. The evaluation of a patient with dizziness. *Neurol Clin Pract*. 2011 Dec; 1(1):24-33.
3. Labuguen RH. Initial evaluation of vertigo. *Am Fam Physician.* 2006 Jan 15; 73(2):244-251.
4. Bhattacharrya N, Baugh RF, Orvidas L, et al. Clinical practice guideline: benign paroxysmal positional vertigo. *Otolaryngol Head Neck Surg*. 2008 Nov;139(5 Suppl 4):S47-S81.
5. ACR Appropriateness Criteria® Hearing loss and/or vertigo. *American College of Radiology (ACR).* Date of origin: 1996. Last review date: 2018.
6. Moya A, Sutton R, Ammirati F, et al. Guidelines for the diagnosis and management of syncope (version 2009): the task force for the diagnosis and management of syncope of the European society of cardiology (ESC). *Eur Heart J*. 2009;30(21):2631-2671.
7. Minor LB. Superior canal dehiscence syndrome. *Am J Otol*. 2000 Jan-Feb;21(1):9-19.
8. Brignole M. Diagnosis and treatment of syncope. *Heart*. 2007 Jan;93(1):130-136.
9. Shukla GJ and Zimetbaum PJ. Syncope. *Circulation*. 2006 Apr 25;113(16):e715-e717.
10. Cheshire, W. Syncope. *Continuum*. 2017 Apr;23(2): 335-358.

HD-24: Other Imaging Studies

Some payers may consider these techniques investigational, and their coverage policies may take precedence over eviCore's guidelines.

HD-24.1: Treatment Planning

- Advanced imaging (CT and MRI) performed for the purpose of surgical planning and navigation should be coded as Unlisted CT (CPT® 76497) or Unlisted MRI (CPT® 76498)
  - All requests for imaging to be performed for the purpose of surgical planning and navigation should be forwarded to Medical Director Review
- Requests may refer to proprietary brand systems such as Brainlab or Stealth imaging procedures
- This includes requests for intraoperative studies (inpatient studies do not require preauthorization)
- Some health plans do not require prior authorization for the unlisted codes for treatment planning, and eviCore is not contracted to review them. Please refer to individual health plan policy.
- See **HD-29: Sinusitis** for coding for sinus surgery

HD-24.2: Functional MRI (f-MRI)

- f-MRI is useful in pre-operative scenarios to define the "eloquent" areas of brain
- The ordering physician must be a neurologist, neurosurgeon or radiation oncologist. All other requests should be sent for Medical Director Review. It must be evident that brain surgery is planned, and that f-MRI is being performed to map the language centers, or other "eloquent centers" of the brain
- f-MRI can be approved with PET Brain in epilepsy surgery planning
- Procedure codes for functional MRI:
  - CPT® 70554 MRI Brain, functional MRI, including test selection and administration of repetitive body part movement and/or visual stimulation, not requiring physician or psychologist administration
  - CPT® 70555 MRI Brain, functional MRI; requiring physician or psychologist administration of entire neurofunctional testing

HD-24.3: Magnetic Resonance Spectroscopy (MRS)

- All requests for MRS (CPT® 76390) will be forwarded for Medical Director Review
  - Some Health Plans may consider MRS investigational and experimental.
- MRS involves analysis of the levels of certain chemicals in a pre-selected voxels (small regions) on an MRI scan done at the same time
- MRS is evaluated on a case-by-case basis, and may be considered:
  - Distinguish recurrent brain tumor from radiation necrosis as an alternative to PET (CPT® 78608)
  - Diagnosis of certain rare inborn errors of metabolism affecting the CNS (primarily pediatric patients)
- Evaluation of certain primary brain tumors where diagnostic accuracy has been established in peer-reviewed literature. See **ONC-2.1: Primary Central Nervous System Tumors – General Considerations**, **ONC-2.2: Low Grade Gliomas** and **ONC-2.3: High Grade Gliomas**

HD-24.4: CSF Flow Imaging

- This is generally performed as a part of a MRI Brain study. It is not coded separately for preoperative evaluation of hydrocephalus and Chiari syndrome, with either features of hydrocephalus or syrinx.
- There is no specific or unique procedure code for this study; it is done as a special sequence of a routine MRI Brain without contrast (CPT® 70551).
- If not previously performed as part of recent study, a second study for the purpose of evaluating CSF flow may be performed.

HD-24.5: CT or MRI Perfusion

- Performed as part of a CT Head or MRI Brain examination in the evaluation of patients 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 (<6 hours). Other indications are usually regarded as investigational and experimental. Individual health plan policies should be confirmed.
- 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.

HD-24.6: Magnetic Resonance Neurography (MRN)

- MRN is currently considered investigational by most payers.
- See **PN-7: Magnetic Resonance Neurography (MRN)** in the Peripheral Nerve Disorders (PND) Imaging Guidelines.

HD-24.7: Cone Beam Computed Tomography (CBCT)

- Medical Director Review is required
- CPT® Codes: CPT® 70486, CPT® 70487, CPT® 70488, CPT® 70480, CPT® 70482 (No separate 3-D rendering codes should be reported)

See **HD-30: Temporomandibular Joint Disease (TMJ) and Dental/Periodontal/Maxillofacial Imaging**

HD-24.8: Transcranial Doppler (CPT® 93886)

- Transcranial Doppler (TCD) is a noninvasive ultrasonic technique that measures local blood flow velocity and direction in the proximal portions of large intracranial arteries
- All requests for Transcranial Doppler require Medical Director Review
- It is used principally in the evaluation and management of patients with cerebrovascular disease
  - Annual screening for patients with Sickle Cell Anemia (Hb-SS) and Sickle Beta Thalassemia (Sß) (CPT® 93886)
  - Evaluation of right to left cardiac shunts: Detection of microemboli in patients with stroke or TIA. (CPT® 93892 or CPT® 93893 added to CPT® 93886)
  - Evaluation of intracranial occlusive disease in patients with documented stroke or TIA (CPT® 93890 added to CPT® 93886)
  - Evaluation of hemodynamic effects of known severe extra-cranial occlusive disease (CPT® 93890 added to CPT® 93886)
  - Other indications and uses of TCD generally involve in-patient settings: Evaluation of vasospasm in SAH, determination of brain death, evaluation of acute stroke and need for thrombolytics or other intervention, and intraoperative monitoring
- Screening for moyamoya disease for patient with known disease in other immediate family members.(CPT® 93886)
- Evaluation of Stroke/TIA usually includes CPT® 93886 and CPT® 93890 (Vasoreactivity study) and either CPT® 93892 or CPT® 93893 (Emboli detection).

Note: TCD studies are not indicated for evaluation of brain tumors, degenerative disease, psychiatric disorders, epilepsy, migraine or other headache disorders.

CPT® Codes	
93886	Transcranial Doppler study of the intracranial arteries; complete study
93888	Limited study (follow up)
93890	Vasoreactivity study
93892	Emboli detection without intravenous microbubble injection
93893	Emboli detection with intravenous microbubble injection

Note: CPT® 93890, CPT® 93892, CPT® 93893 represent add on services that require additional expertise, lab time, and equipment not included in the complete and limited codes. These additional codes would be relevant in evaluation of vascular disease, stroke/TIA, anterior or posterior circulation.

CPT® 93890 Vasoreactivity Study: Measures response of cerebral blood flow to increased CO2 levels (following breath holding or administration of acetazolamide); It is used to evaluate risk of stroke and significance of carotid stenosis; patients with loss of normal reactive changes are likely to be at increased risk of stroke.

CPT® 93892/CPT® 93893: Identification of right to left shunts (microembolic signals may be detected during TCD monitoring) and may indicate source of emboli in patients with stroke or TIA. TCD bubble test is very sensitive and may be superior to transthoracic and transesophageal echocardiography in detection of right to left shunts.

References

1. Latchaw RE, Kucharczyk J, Moseley ME. Imaging of the Nervous System. Philadelphia: *Elsevier.* 2005: 101-120, 1089-1100, and 1225-1239.
2. Centers for Medicare & Medicaid Services (CMS).Decision memo for magnetic resonance spectroscopy for brain tumors (CAG-00141N). January 29, 2004. https://www.cms.gov/medicare-coverage-database/details/nca-decision-memo.aspx?NCAId=52&fromdb=true.
3. Jenkinson MD, Smith TS, Joyce K, et al. MRS of oligodendroglial tumors: correlation with histopathology and genetic subtypes. Neurology. 2005 Jun 28; 64(12):2085-2089.
4. Cecil KM. MR spectroscopy of metabolic disorders. *Neuroimaging Clin N Am*. 2006 Feb;16(1):87-116, viii.
5. Öz G, Tkáč I, Charnas LR, et al. Assessment of adrenoleukodystrophy lesions by high field MRSA in non-sedated pediatric patients. *Neurology.* 2005 Feb 8; 64(3):434-441.
6. Moser HW and Barker PB. Magnetic resonance spectroscopy: a new guide for the therapy of adrenoleukodystrophy. *Neurology.* 2005 Feb 8; 64(3):406-407.
7. Albers GW, Thijs VN, Wechsler L, et al. Magnetic resonance imaging profiles predict clinical response to early reperfusion: the diffusion and perfusion imaging evaluation for understanding stroke evolution (DEFUSE) study. *Ann Neurol.* 2006 Nov; 60(5):508-517.
8. Wintermark M, Meuli R, Browaeys P, et al. Comparison of CT perfusion and angiography and MRI in selecting stroke patients for acute treatment. *Neurology.* 2007 Feb 27; 68(9):694-697.
9. Lev MH, Segal AZ, Farkas J, et al. Utility of perfusion-weighted CT imaging in acute middle cerebral artery stroke treated with intra-arterial thrombolysis: prediction of final infarct volume and clinical outcome. *Stroke.* 2001 Sep; 32(9):2021-2036.
10. Parsons MW, Pepper EM, Bateman GA, et al. Identification of the penumbra and infarct core on hyperacute noncontrast and perfusion CT. *Neurology.* 2007 Mar 6; 68:730-736.
11. Haughton VM, et al. Mapping brain function with functional magnetic resonance imaging. In Latchaw RE, Kucharuczyk J, Moseley ME. *Imaging of the Nervous System*. Philadelphia: Elsevier. 2005: 89-100.
12. Håberg A, Kvistad KA, Unsgård G, et al. Preoperative blood oxygen level-dependent functional magnetic resonance imaging in patients with primary brain tumors: clinical application and outcome. *Neurosurgery.* 2004 Apr;54(4):902-915.
13. Medina LS, Bernal B, Dunoyer C, et al. Seizure disorders: functional MR imaging for diagnostic evaluation and surgical treatment—perspective study. *Radiology*. 2005 July; 236(1):247-253.
14. Petrella JR, Shah LM, Harris KM, et al. Preoperative functional MRI imaging localization of language and motor areas: effect on therapeutic decision making in patients with potentially resectable brain tumors. *Radiology*. 2006 Sep;240(3):793-802.
15. Bendszus M and Stoll G. Technology insight: visualizing peripheral nerve injury using MRI. *Nature Clin Pract Neurol*. 2005 Nov; 1(1):45-53.
16. Jarvik JG, Yuen E, Haynor DR, et al. MR nerve imaging in a prospective cohort of patients with suspected carpal tunnel syndrome. *Neurology*. 2002 Jun11; 58(11):1597-1602.

17. Korvenoja A, Kirveskari E, Aronen HJ, et al. Sensiorimotor cortex localization: comparison of magnetoencephalography, functional MR imaging, and intraoperative cortical mapping. *Radiology*. 2006 Oct; 241(1):213-222.
18. De Vos W, Casselman J, Swennen GR. Cone-beam computerized tomography (CBCT) imaging of the oral and maxillofacial region: a systematic review of the literature. *Int J Oral Maxillofac Surg*. 2009 Jun;38(6);609-625.
19. Alexandrov AV, Sloan MA, Tegeler CH, et al. Practice standards for transcranial doppler (TCD) ultrasound. Part II. Clinical indications and expected outcomes. *J Neuroimaging*. 2012 Jul:22(3):215-224.
20. Pediatric Neurosurgery. Pediatric Neurosurgery. 2017;19
21. Tsivgoulis G, Alexandrov AV. Ultrasound in Neurology. *CONTINUUM: Lifelong Learning in Neurology*. 2016;22(5):1655-1677.

HD-25: Epistaxis

HD-25.1: Epistaxis

- All cases should go to Medical Director Review.
- CT Maxillofacial without or with contrast (CPT® 70486 or CPT® 70487) and/or MRI Orbit, Face, and/or Neck without and with contrast (CPT® 70543) is appropriate based on endoscopic findings of mass lesion during ENT examination.

References

1. Kirsch CFE, Bykowski J, Aulino JM, et al. ACR Appropriateness Criteria®. Sinonasal disease. *American College of Radiology (ACR).* Revised 2017.
2. Hoeffner EG, Mukherji SK, Gandhi D, et al. *Temporal bone imaging*. New York: Thieme; 2008.

HD-26: Mastoid Disease or Ear Pain

HD-26.1: Mastoid Disease or Ear Pain

- See **PEDHD-16.2: Ear Pain** in the Pediatric Head Imaging Guidelines

HD-27: Hearing Loss and Tinnitus

HD-27.1: Hearing Loss and Tinnitus

- An initial evaluation including hearing tests, by bedside testing or by formal audiology, is necessary to determine whether a patient's hearing loss is conductive (external or middle ear structures) or sensorineural (inner ear structures, such as cochlea or auditory nerve) hearing loss.[1,2]
- The history in patients with tinnitus should include a description of the tinnitus (episodic or constant, pulsatile or non-pulsatile, rhythmicity, pitch, quality of the sound), as well as inciting or alleviating factors. Continuous and pulsatile tinnitus are more concerning for an underlying and significant disorder.[2] Audiometric assessment can be used as initial diagnostic testing[1,2,3] particularly in patients with tinnitus that is unilateral, persistent (>6 months) or associated with hearing difficulties.
- CT Temporal Bone without (CPT® 70480) or MRI Brain without and with contrast (with IAC views) (CPT® 70553) or without contrast (CPT® 70551):
  - Conductive hearing loss
  - Mixed conductive/sensorineural hearing loss or any sudden sensorineural hearing loss
    - Note: MRI is preferred modality for sensorineural hearing loss.
  - Cholesteatoma
  - Congenital hearing loss
  - Surgical planning, including cochlear implants (both CT Temporal Bone and MRI Brain may be approved for surgical planning if requested by surgeon)
  - Hearing loss with vertigo (See **HD-23.1: Dizziness, Vertigo, and Syncope**)
  - Asymmetric hearing loss
  - Tinnitus localized to a single ear or pulsatile tinnitus
- CT Temporal Bone with contrast (CPT® 70481):
  - Glomus tumors or other vascular tumors of the middle ear, and/or surgical planning
  - Acquired sensorineural hearing loss if MRI unavailable or contraindicated
- MRA Head (CPT® 70544 or CPT® 70546) or CTA Head (CPT® 70496) **AND/OR** MRA Neck (CPT® 70547 or CPT® 70548) or CTA Neck (CPT® 70498)
  - Pulsatile tinnitus or suspicion for vascular lesions
- 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 **HD-1.1: General Guidelines – Anatomic Issues**)
- Both modalities (CT and MRI) may be approved simultaneously for evaluation and surgical planning if ordered by ENT or Neurosurgical specialist.

References

1. ACR Appropriateness Criteria® Hearing loss and/or vertigo. *American College of Radiology (ACR).* Date of origin: 1996. Last review date: 2018. https://acsearch.acr.org/docs/69488/Narrative/.
2. Isaacson JE and Vora NM. Differential diagnosis and treatment of hearing loss. *Am Fam Physician.* 2003 Sep 15; 68(6):1125-1132.

HD-28: Ear Pain (Otalgia)

HD-28.1: Ear Pain (Otalgia)

See **HD-26.1: Mastoid Disease or Ear Pain**

HD-29: Sinusitis

HD-29.1: Sinus Imaging in Adults

- CT Maxillofacial without contrast (CPT® 70486) or limited CT Sinus without contrast (CPT® 76380) is considered for ANY of the following:
  - Acute sinusitis with no improvement in symptoms after a minimum of 4 weeks of treatment; or concern for complicated sinusitis (See Practice Note below)
  - Recurrent sinusitis (4 or more episodes of acute sinusitis within the past 12 months without symptoms or signs between episodes)[1,2,3]
  - Chronic sinusitis (>12 weeks sinusitis) with at least two of the following signs and symptoms:
    - Mucopurulent drainage
    - Nasal obstruction
    - Facial pain – pressure, fullness
    - Decreased sense of smell

    (Note: A trial of antibiotic therapy is not required prior to imaging if patient meets criteria for chronic sinusitis)
- For unexplained cough See **CH-3.1: Cough** in the Chest Imaging Guidelines
- CT Maxillofacial without contrast (CPT® 70486) or CT Maxillofacial with contrast (CPT® 70487):
  - Sinonasal obstruction or suspected mass
- CT Orbit without contrast (CPT® 70480) or CT Orbit without and with contrast (CPT® 70482) may be performed alone or added to CT Maxillofacial for:
  - Suspected orbital complications
- MRI Maxillofacial without contrast (CPT® 70540) or without and with contrast (CPT® 70543) as option instead of CT for:
  - Sinonasal obstruction or suspected mass
  - Suspected orbital complication
  - Suspected invasive fungal sinusitis
- MRI Brain without and with contrast (CPT® 70553) may be performed alone or added to CT Maxillofacial for:
  - Suspected intracranial complication
- Studies requested for the purpose of navigation for sinus surgery should be coded CPT® 77011 (CT guidance for stereotactic localization). It is not appropriate to report both CPT® 70486 and CPT® 77011 for the same CT stereotactic localization imaging session. See **Preface 4.2: CT-, MR-, or Ultrasound-Guided Procedures** in the Preface Imaging Guidelines
- Repeat imaging may be approved for ANY of the following scenarios:
  - An ENT specialist requests the imaging **and**
    - There is no improvement after an additional 3 weeks of conservative treatment after initial imaging was completed; **and**
      - There has been a follow-up visit since the previous imaging; **or**
      - If there is a new abnormality on exam such as obstructing mass
    - Planned sinus surgery (Balloon Sinus Ostial Dilation or Functional Endoscopic Sinus Surgery)

Practice Notes

- Rhinosinusitis is defined as inflammation of the nasal cavity and adjacent paranasal sinuses. Acute sinusitis refers to symptom duration <4 weeks, subacute 4 to 12 weeks, and chronic >12 weeks. Complicated sinusitis refers to symptoms suggesting spread of disease into adjacent structures, including orbital or intracranial complications.[1,2,3]
- There is no evidence to support advanced imaging of acute (<4 weeks) and subacute (4 to 12 weeks) uncomplicated rhinosinusitis[1]
- There is no evidence to support routine follow-up advanced imaging after treatment with clinical improvement of sinusitis[1]

References

1. Rosenfeld RM, Piccirillo JF, Chandrasekhar SS, et al. Clinical practice guideline (update): adult sinusitis. *Otolaryngol Head Neck Surg*. 2015 Apr; 152(2 Suppl):S1-S39.
2. Desrosiers M, Evans GA, Keith PK, et al. Canadian clinical practice guidelines for acute and chronic rhinosinusitis. *Allergy Asthma Clin Immunol*. 2011 Feb 10; 7(1):2.
3. ACR Appropriateness Criteria®. Sinonasal disease. *American College of Radiology (ACR)*. Revised 2017.
4. Huntzinger A. Guidelines for the Diagnosis and Management of Rhinosinusitis in Adults. *Am Fam Physician.* 2007 Dec 1; 76(11):1718-1724.

HD-30: Temporomandibular Joint Disease (TMJ) and Dental/Periodontal/Maxillofacial Imaging

HD-30.1: Temporomandibular Joint Disease (TMJ)

- MRI TMJ (CPT® 70336) is the diagnostic study of choice and should be reserved for those who fail a minimum of 6 weeks of non-surgical treatment and who are actively being considered for TMJ surgery
- CT Maxillofacial without contrast (CPT® 70486) or without and with contrast (CPT® 70488) may be performed when there is suspicion of bony involvement from the MRI and if primary bony pathologies are suspected clinically
- Ultrasound (CPT® 76536) can be used to look for the presence of a joint effusion and to evaluate cartilage and disk displacement with open and closed mouth imaging and to guide injections
- TMJ imaging in children with Juvenile Rheumatoid Arthritis, See **PEDHD-25: Temporomandibular Joint (TMJ) Imaging in Children** in the Pediatric Head Imaging Guidelines

HD-30.2: Dental/Periodontal/Maxillofacial Imaging

- All requests will be forwarded to Medical Director Review
- Cone beam CT may be supported for surgical planning when plain x-rays alone are insufficient. Potential indications include but are not limited to:
  - Impacted teeth
  - Supernumerary teeth
  - Dentoalveolar trauma
  - Root resorption
  - Foreign body
  - Odontogenic cysts, tumors, or other jaw pathology
  - Cleft pathology
  - Orthognathic surgery for dentofacial anomalies
  - Osteomyelitis and odontogenic infections (MRI is the preferred modality after x-ray, See **MS-9.1: Infection – General** in the Musculoskeletal Imaging Guidelines)
  - Bisphosphonate-related osteonecrosis of the jaw
  - Salivary gland stones
  - Maxillofacial bone graft planning
  - Dental implants related to tooth loss from injury, trauma, or jaw pathology such as cysts, tumors, or cancer
- Some payers do not include orthodontic clinical conditions such as replacement of teeth lost due to caries or periodontal disease, non-trauma related dental implantology, or endodontic treatment not related to trauma to the natural tooth in their coverage policies
  - Thus, Cone beam CT scans in these patients would also not be included in the coverage policy
  - These coverage policies will take precedence over eviCore's guidelines

- Cone Beam CT: Report with CPT® Codes: CPT® 70486, CPT® 70487, CPT® 70488, CPT® 70480, CPT® 70482
- 3-D rendering (CPT® 76376 or CPT® 76377) should NOT be reported separately
- Cone beam CT (CBCT) may also be called i-CAT scanner or mini-CAT scanner

References

1. De Vos W, Casselman J, and Swennen GRJ. Cone-beam computerized tomography (CBCT) imaging of the oral and maxillofacial region: a systematic review of the literature. *International Journal of Oral & Maxillofacial Surgery* 2009 Jun; 38(6):609-625.
2. Scrivani SJ, Keith DA, and Kaban LB. Temporomandibular disorders. *N Engl J Med*. 2008 Dec 18; 359(25):2693-2705.
3. Bag AK, Gaddikeri S, Singhal A, et al. Imaging of the temporomandibular joint: an update. *World J Radiol*. 2014 Aug 28;6(8):567-582.
4. Horner K, O'Malley L, Taylor K, et al. Guidelines for clinical use of CBCT: a review. *Dentomaxillofac Radiol*. 2015 Jan;44(1):20140225.

HD-31: Tinnitus

HD-31.1: Tinnitus

See **HD-27.1: Hearing Loss and Tinnitus**

HD-32: Eye Disorders and Visual Loss

HD-32.1: Eye Disorders and Visual Loss

- Examination of ocular complaints and visual loss should include evaluation of pupillary responses, extraocular muscles, visual acuity, and fundoscopic exam of retinae.
- MRI Orbits without contrast (CPT® 70540) or MRI Orbits without and with contrast (CPT® 70543) or CT Orbits with contrast (CPT® 70481):
  - Exophthalmos or enophthalmos
  - Suspected orbital cellulitis
  - Suspected orbital mass
  - Suspected optic neuritis
  - Diplopia
  - Ophthalmoplegia
- MRI Orbits without contrast (CPT® 70540) or MRI Orbits without and with contrast (CPT® 70543):
  - Unexplained visual loss (imaging is not necessary if visual loss is due to known intrinsic eye disease, refractive errors, cataracts, retinal disease etc.)
- MRI Brain without contrast (CPT® 70551) or MRI Brain without and with contrast (CPT® 70553):
  - Ophthalmoplegia
  - Binocular Diplopia
  - Suspected demyelinating disease with optic neuritis (Multiple Sclerosis, Neuromyelitis optica).
  - Unexplained Visual loss (imaging is not necessary if visual loss is due to known intrinsic eye disease, refractive errors, cataracts, retinal disease etc.)
- CT Orbit without contrast (CPT® 70480)
  - Orbital trauma
- MRA Head without contrast (CPT® 70544) or without and with contrast (CPT® 70546)
  - Third nerve oculomotor palsy with pupillary involvement
  - Suspected aneurysm
  - Suspected temporal arteritis
  - Amaurosis with suspected stroke (MRA Neck contrast as requested [CPT® 70547, CPT® 70548, or CPT® 70549] may be added)

Practice Notes

Advanced imaging of the brain and orbit are not routinely paired. Medical necessity for each region is needed to image both regions, based on suspicion of these disorders.

Orbital imaging alone may be sufficient unless other signs or symptoms suggest brain involvement. Signs or symptoms strongly suggestive and localizing to orbital disease include proptosis, conjunctival injection, chemosis, eye pain, enophthalmos, gaze-evoked amaurosis, eyelid retraction, unilateral optic disc swelling, choroidal and retinal folds, optociliary shunt vessels, and numb cheek syndrome.

Non-localizing symptoms and signs, for which both brain and orbit imaging may be indicated, include bilateral optic disc swelling, papilledema, diplopia, headache, relative afferent pupillary defect, visual field defects.

HD-32.2: Horner's Syndrome

- Horner's Syndrome (anisocoria, ptosis, and ipsilateral anhidrosis) is caused by disruption of sympathetic innervation to the eye and face. Definitive diagnosis may be established by pharmacologic testing of the pupillary response with eye drops. Evaluation and imaging depends on determining whether the cause is a central lesion (brainstem or cervical spinal cord), preganglionic lesion (spinal cord or sympathetic chain in the chest), or postganglionic lesion (neck or carotid artery).
- MRI Brain without contrast (CPT® 70551) or MRI Brain without or with contrast (CPT® 70553) for suspected intracranial or brainstem lesions
- MRI Cervical Spine without contrast (CPT® 72141) or MRI Cervical Spine without and with contrast (CPT® 72156) for suspected spinal cord abnormality
- CT Chest with contrast (CPT® 71260) for suspected chest mass
- CT Neck with contrast (CPT® 70491) for suspected neck mass
- CTA Neck without and with contrast (CPT® 70498) or MRA Neck (CPT® 70547, CPT® 70548, or CPT® 70549) for suspected carotid injury or dissection
- MRI Orbits without contrast (CPT® 70540), MRI Orbits without or with contrast (CPT® 70543) or CT Orbit with contrast (CPT® 70481) for suspected orbit lesion or mass

References

1. ACR Appropriateness Criteria® Orbits, vision and visual loss. *American College of Radiology (ACR).* Date of origin: 1999. Last review date: 2017.
2. Quisling SV, Shah VA, Lee HK, et al. Magnetic resonance imaging of third cranial nerve palsy and trigeminal sensory loss caused by herpes zoster. *J Neuroophthalmol*. 2006 Mar; 26(1):47-48.
3. Physiologic anisocoria. *Am Acad Ophthalmol*.
4. Lee JH, Lee HK, Lee DH, et. al., Neuroimaging strategies for three types of horner syndrome with emphasis on anatomic location. *AJR Am J Roentgenol*. 2007 Jan; 188(1):W74-W81.
5. Szatmáry G. Imaging in patients with visual symptoms. *Continuum*. 2016 Oct;22(5):1499-1528.
6. Kawasaki AK. Diagnostic Approach to Pupillary Abnormalities. *CONTINUUM: Lifelong Learning in Neurology*. 2014;20:1008-1022. doi:10.1212/01.con.0000453306.42981.94.
7. Prasad S. Diagnostic Neuroimaging in Neuro-ophthalmic Disorders. CONTINUUM: Lifelong Learning in Neurology. 2014;20:1023-1062. doi:10.1212/01.con.0000453305.65851.1c.

HD-33: Acoustic Neuroma and Other Cerebellopontine Angle Tumors

HD-33.1: Acoustic Neuroma and Other Cerebellopontine Angle Tumors

- Initial diagnosis is usually made during evaluation for asymmetric hearing loss and/or vertigo. See **HD-23: Dizziness, Vertigo and Syncope** and **HD-27: Hearing Loss and Tinnitus** for evaluation of those problems
- Initial diagnosis can be accomplished with MRI Brain without and with contrast (CPT® 70553) which should be done with attention to the internal auditory canals.
- MRI Brain without contrast (CPT® 70551) may be approved if performed with FIESTA protocol
- MRI Orbits, Neck, or Face without and with contrast (CPT® 70543) may be considered with audiologic or clinical features of retrocochlear hearing loss and a negative MRI Brain and in the rare patient in whom a detailed search is indicated for both a lesion of the cerebellopontine angle **and** lesions of the cerebral hemispheres
- After surgical resection, MRI Brain without and with contrast with attention to the internal auditory canals (CPT® 70553) is performed at 6 to 12 months to document the completeness of tumor removal and to serve as a baseline for further follow-up. Assuming complete tumor removal, additional follow up is done at 5 and 10 years. If the findings at 10 years are normal, no further imaging should be performed unless new clinical symptoms occur
- Following stereotactic radiation therapy or continued observation without treatment: MRI Brain without and with contrast with attention to the internal auditory canals (CPT® 70553) is performed at 6 months and then annually

References

1. Hingwala, D, Chatterjee S, Kesavadas C, et al. Applications of 3D CISS sequence for problem solving in neuroimaging. *Indian J Radiol Imaging*. 2011 Apr-Jun;21(2): 90–97.
2. Yousry I, Camelio S, Schmid UD, et al. Visualization of cranial nerves I-XII: value of 3D CISS and T2-weighted FSE sequences. *Eur Radiol*. 2000; 10(7):1061-1067.
3. Olson JJ, Kalkanis SN, Ryken TC. Congress of neurological surgeons systematic review and evidence-based guidelines on the treatment of adults with vestibular schwannomas. *Neurosurgery*, 2018;82(2):129-134.
4. Zou J, Hirvonen T. “Wait and scan” management of patients with vestibular schwannoma and the relevance of non-contrast MRI in the follow-up. J Otol, 2017;12(4):174-184.
5. Lin EP, Crane BT. The management and imaging of vestibular schwannomas. AJRN Am J Neuroradiol, 2017;38(11):2034-2043.

HD-34: Pineal Cysts

See **PEDHD-13.2: Pineal Cysts** in the Pediatric Head Imaging Guidelines

HD-35: Arachnoid Cysts

See **PEDHD-13.1: Arachnoid Cysts** in the Pediatric Head Imaging Guidelines

HD-36: Nuclear Medicine

- Nuclear Medicine
  - Nuclear medicine studies may be used in the evaluation of some head/brain disorders, and other rare indications as well:
    - Brain Scintigraphy with or without vascular flow (any one of CPT® 78600, CPT® 78601, CPT® 78605, or CPT® 78606)
      - Establish brain death (rarely done in outpatient setting)
    - Brain Imaging Radiopharmaceutical Localization SPECT (CPT® 78803)[1]
      - Immunocompromised patients with mass lesion detected on CT or MRI for differentiation between lymphoma and infection
      - In distinguishing recurrent brain tumor from radiation necrosis
      - Can be performed with vasodilating agent acetazolamide (Diamox) to assess functional reserve capacity to predict critically reduced perfusion in patients with chronic cerebrovascular disease (for example, in Moya-Moya disease) and identify patients who might benefit from an extracranial-to-intracranial (EC-IC) bypass to augment Cerebral Blood Flow, and to asses preoperatively the potential for ischemia following carotid artery sacrifice.
    - Brain Imaging Vascular Flow (CPT® 78610)
      - Cerebral ischemia
      - Establish brain death
    - CSF Leakage Detection (CPT® 78650)
      - Evaluation of CSF rhinorrhea, otorrhea, or refractory post-lumbar puncture headache
- Suspected normal pressure hydrocephalus with gait disturbance and either dementia or urinary incontinence
- Radiopharmaceutical Dacryocystography (CPT® 78660)
  - Suspected obstruction of nasolacrimal duct due to excessive tearing
- Cisternogram (CPT® 78630) can be approved for the following:
  - Known hydrocephalus with worsening symptoms
  - Suspected obstructive hydrocephalus
- Cerebrospinal Ventriculography (CPT® 78635) can be approved for the following:
  - Evaluation of internal shunt, porencephalic cyst, or posterior fossa cyst
- Nuclear Medicine Shunt Evaluation (CPT® 78645) and CSF Flow SPECT (CPT® 78803) can be approved for the following:
  - Suspected malfunction of ventriculoperitoneal, ventriculopleural, or ventriculovenous shunts.
- Imaging Radiopharmaceutical Localization SPECT with Ioflupane I-23 (CPT® 78803) can be approved for differentiation of Parkinsonian syndrome (PS) and non-neurodegenerative disorders, such as essential tremor (ET) or drug-induced tremor, due to the overlap of clinical symptoms.[2] DAT-SPECT has significant impact on clinical diagnosis and management of diagnostic uncertainty in cases of PS.[3] See **HD-15: Movement Disorders**

References

1. Bega D, Gonzalez-Latapi P, Zadikoff C, et al. Is there a role for DAT-SPECT Imaging in a Specialty Movement Disorders Practice? *Neurodegener Dis*. 2015 Apr;15(2):81-86.
2. Vagal A, Leach J, Fernandez-Ulloa M, Zuccarello M. The Acetazolamide Challenge: Techniques and Applications in the Evaluation of Chronic Cerebral Ischemia. American Journal of Neuroradiology. 2009;30(5):876-884. doi:10.3174/ajnr.a1538.

HD-37: Sleep-Related Requests

HD-37.1: General Guidelines Sleep-Related Requests

- Oral Appliance: There is a lack of published case-controlled clinical studies in Sleep literature validating the use of advanced imaging with respect to oral appliance therapy (pretreatment assessment). Previous literature has demonstrated support for cephalometric studies (x-ray)[1] in predicting treatment success. Nasoendoscopy (sedated and non-sedated with provocative maneuvers such as Mueller maneuver) has been helpful as well in this regard.[2] Routine use of advanced is not supported at this time
- Hypersomnolence: MRI Brain with and without contrast (CPT® 70553) may be indicated when there are focal neurologic signs or suspicion for an inflammatory neurologic process as the etiology. Recognition and treatment of a comorbid sleep disorders is paramount, and a complete neurologic history and examination should precede any request for advanced imaging[3]
- Central Sleep Apnea: MRI Brain with and without contrast (CPT® 70553) may be indicated for unexplained central sleep apnea syndrome when a primary CNS etiology is suspected; i.e., unassociated with CHF, COPD or other potential etiology. Specific etiologies should be stated for imaging requests, including but not limited to, suspected Chiari malformation, stroke, CNS demyelinating disease, posterior fossa lesion, anoxia or infection[4]

References

1. Guarda-Nardini L, Manfredini D, Mion M, et al. Anatomically based outcome predictors of treatment for obstructive sleep apnea with intraoral splint devices: a systematic review of cephalometric studies. *J Clin Sleep Med*. 2015;11(11):1327-1334.
2. Sutherland, K, Vanderveken OM, Tsuda H, et al. Oral appliance treatment for obstructive sleep apnea: an update. *J Clin Sleep Med*. 2014;10(2):215-227.
3. Chervin RD. Use of clinical tools and tests in sleep medicine. In: *Principles and Practice of Sleep Medicine*. Kryger MH, Roth T, Dement WC. (eds). Elsevier Saunders: St Louis 2011. p.666.
4. Deak MC and Kirsch DB. Sleep-disordered breathing in neurologic conditions; *Clin Chest Med*. 2014 Sep;35(3):547–556.