Evolent Clinical Guideline ~~002~~2008 for Brain Computed Tomography (CT)

Guideline ~~or Policy~~ Number:	Applicable Codes
Evolent_CG_~~002~~2008	

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STATEMENT

General Information

- *It is an expectation that all patients receive care/services from a licensed clinician. ~~All~~ All appropriate supporting documentation, including recent pertinent office visit notes, laboratory data, and results of any special testing must be provided. ~~If~~ If applicable: All prior relevant imaging results and the reason that alternative imaging cannot be performed must be included in the documentation submitted.*
- *Where a specific clinical indication is not directly addressed in this guideline, medical necessity determination will be made based on widely accepted standard of care criteria. These criteria are supported by evidence-based or peer-reviewed sources such as medical literature, societal guidelines and state/national recommendations.*
- *The guideline criteria in the following sections were developed utilizing evidence-based and peer-reviewed resources from medical publications and societal organization guidelines as well as from widely accepted standard of care, best practice recommendations.*

Special Note

Brain Computed Tomography (CT) ~~/~~and Computed Tomography Angiography (CTA) are not approvable simultaneously unless they meet the criteria described below in the Indications for **Brain CT/Brain CTA** combination studies section. If there is a combination request~~*~~ for an overlapping body part, either requested at the same time or sequentially (within the past 3 months) the results of the prior study should ~~be~~show one or more of the following:

- Inconclusive or show a need for additional or follow up imaging evaluation ~~OR~~
- The office notes should clearly document an indication why overlapping imaging is needed and how it will change management for the patient.
- ~~(*Unless approvable in the **combination section** as noted in the guidelines)~~

(See **Combination Studies** section for indicated combinations below)

Purpose

~~***Brain CT***~~

Computed tomography (CT) is an imaging technique used to view the structures of the brain and is useful in evaluating pathologies in the brain. It provides more detailed information on head trauma, brain tumors, stroke, and other pathologies in the brain than regular radiographs.

Important Note: Brain MRI is preferred to Brain CT in most circumstances where the patient can tolerate MRI and sufficient time is available to schedule the MRI examination. Assessment of subarachnoid hemorrhage, acute trauma, or bone abnormalities of the calvarium (fracture, etc.) may be better imaged with CT. CT is also appropriate in an urgent situation where MRI is not readily available (stroke, increased ICP, CNS infection).

~~***# — Designates CT is indicated only when MRI is contraindicated or cannot be performed***~~

INDICATIONS

Headache

Evaluation of Headache [1,2]

- ~~Chronic headache with a change in character/pattern (e.g., more frequent, increased severity, or duration)~~ [1] ~~#~~

~~Cluster headaches or other trigeminal-autonomic cephalgias, i.e., paroxysmal hemicrania, hemicrania continua, short-lasting unilateral neuralgiform headache attacks (SUNCT/SUNA) imaging is indicated once to eliminate secondary causes #~~

- Acute ~~headache~~, sudden onset~~:~~ headache (< 4 weeks), with any ONE of the following (no contraindication to MRI is needed):
  - ~~With~~ A personal or family history (brother, sister, parent, or child) of brain aneurysm or AVM (arteriovenous malformation) ~~**OR**~~
  - < 48 hours of "worst headache in my life" or "thunderclap" headache (Sudden onset new headache reaching maximum intensity within 2-3 minutes, lasting more than 5 minutes)~~.~~
  - Prior history of stroke or intracranial bleed
  - Known coagulopathy or on anticoagulation
- New onset ~~of~~ headache (< 3 months with no prior history of headache) with any ONE of the following ([1,3,4]no contraindication to MRI is needed):
  - Fever
  - Subacute head trauma
  - Acute, new, or fluctuating neurologic deficits, such as sensory deficits, limb weakness, abnormal reflexes (pathological, asymmetric, hyperreflexia), speech difficulties, visual loss, lack of coordination, or mental status changes or with signs of increased intracranial pressure (papilledema). ~~(See background) #~~
  - Migraine with atypical/complex aura (such as motor, brainstem or retinal auras which may be characterized by motor weakness, balance issues, vertigo, slurred speech, visional loss and/or double vision)
    - **NOTE**: Imaging is not indicated for typical migraine symptoms characterized by visual and/or sensory and/or speech/language symptoms AND the absence of motor, brainstem or retinal symptoms. Typical migraines develop gradually, last one hour or less and are completely reversible
  - ~~History of cancer or significantly immunocompromised #~~

- ~~Fever~~
- ~~Subacute head trauma~~
- ~~Age > 50 [1,3] #~~
- Severe unilateral headache with radiation to or from the neck, associated with suspicion of carotid or vertebral artery dissection ~~#~~

- New onset headache with any ONE of the following when MRI is **contraindicated** or cannot be performed:
  - History of cancer or significantly immunocompromised
  - Age > 50
  - Related to activity or event (sexual activity, exertion, Valsalva, position), new or progressively worsening [1,5,6,7] #[3]
  - Persistent or progressively worsening during a course of physician-directed treatment [1] #

~~**Note**: Neuroimaging warranted for atypical/complex migraine aura, but not for a typical migraine aura [1] (see background)~~

- ~~Special Considerations~~Chronic headache (>3 months) and any ONE of the following when MRI is **contraindicated** or cannot be performed:
  - Change in character or pattern (e.g. increased severity, frequency or duration)
- Cluster headaches or other trigeminal-autonomic cephalalgias (paroxysmal hemicrania, hemicrania continua, short-lasting unilateral neuralgiform headache attacks (SUNCT/SUNA)) once to eliminate secondary causes

Additional Indications in the Pediatric Population ~~with~~ (<18) When None of the Above Apply *(4,5)*

- Persistent headache [8,9] and any ONE of the following (no contraindication to MRI is needed)
  - Immune deficiency
  - History of neoplasm
  - History of congenital heart disease
  - Coagulopathy
  - See **Imaging in Known Genetic Conditions** for additional indications
- Persistent headache and any ONE of the following when MRI is **contraindicated** or cannot be performed:
  - Age < 6 years old
  - Occipital location ~~#~~
- ~~Age < 6 years #~~

- Symptoms indicative of Documentation of absence of family history of headache
  - Concern for increased intracranial pressure, with symptoms such as recurring headaches after waking with or without associated nausea/vomiting #
- Documented absence of family history of headache #
- Severe headache in a child with an underlying disease that predisposes to intracranial pathology (e.g., Immune deficiency, sickle cell disease, neurofibromatosis, History of neoplasm, coagulopathy, hypertension, congenital heart disease)

Neurological Symptoms or Deficits (6–10)

- Acute, new, or fluctuating, or persistent neurologic symptoms or deficits such as, sensory deficits, limb weakness, abnormal reflexes (pathological, asymmetric, hyperreflexia), speech difficulties, visual loss, lack of coordination, or mental status changes (see background).

Stroke and Vascular Disease

Evaluation of Known or Suspected Stroke (15,16)(11,12)

- Known or Suspected stroke with any acute, new, or fluctuating symptoms or deficits such as sensory deficits, limb weakness, speech difficulties, visual loss, lack of coordination, or mental status changes (see background)**Background**)
- History of stroke and ONE of the following:
  - No prior workup when MRI is **contraindicated** or cannot be performed
  - New neurologic signs or symptoms
- Suspected stroke with:
  - aA personal or first-degree family history (brother, sister, parent, or child) of aneurysm ORor
  - Kknown coagulopathy or on anticoagulation
- Symptoms of transient ischemic attack (TIA) (episodic neurologic symptoms such as sensory deficits, limb weakness, speech difficulties, visual loss, lack of coordination, or mental status changes) #when MRI is **contraindicated** or cannot be performed
- Evaluation of neurological signs or symptoms in sickle cell disease (17,18) #
- High stroke risk in sickle cell patients (2 - 16 years of age) with a transcranial doppler velocity >200 (19) #
- See **Imaging in Known Genetic Conditions** section for additional indications (including for HbSS sickle cell disease or HbSβ0 thalassemia)

Evaluation of Known or Suspected Vascular Disease (13)

- Evaluation of suspected acute subarachnoid hemorrhage (SAH)

- Follow-up for known hemorrhage, hematoma, or vascular abnormalities [11]
- Suspected central venous thrombosis ~~- see background [20,21]~~ #and ANY ONE of the following when MRI is **contraindicated** or cannot be performed:
  - Patient has a hypercoagulable state such as pregnancy, post-partum, prothrombotic conditions (acquired or genetic), malignancy, oral contraceptive use, recent infection, recent trauma or covid-19
  - Documentation of concern for central venous thrombosis is specified
  - Papilledema or signs/symptoms of increased intracranial pressure
- Known Moyamoya disease or reversible cerebral vasoconstriction with any new or changing neurological signs or symptoms #when MRI is **contraindicated** or cannot be performed
- ~~Follow-up for known hemorrhage, hematoma, or vascular abnormalities~~

Head Trauma

Evaluation of Known or Suspected Trauma ~~*(22,23,24)*~~*(14,15)*

- Known or suspected trauma or injury to the head with documentation of one or more of the following acute, new, or fluctuating:
  - Focal neurologic findings
  - Motor changes
  - Mental status changes
  - Amnesia
  - Vomiting
  - Seizures
  - Headache
  - Signs of increased intracranial pressure
- Known coagulopathy or on anticoagulation
- Known or suspected skull fracture by physical exam and/or prior imaging
- Repeat scan 24 hours post head trauma for anticoagulated patients with suspected diagnosis of delayed subdural hematoma
- Post concussive syndrome if persistent or disabling symptoms and imaging has not been performed
- Subacute or chronic traumatic brain injury with new cognitive and/or neurologic deficit #when MRI is **contraindicated** or cannot be performed

~~Brain Tumor, Mass, or Metastasis~~

~~Evaluation of~~ Suspected ~~Tumor/Mass/Cyst~~ ~~(1,25)~~Malignancy (16,17)

- Bone tumor or abnormality of the skull on prior imaging (CT or x-ray) (18)
- Suspected brain tumor with any acute, new, or fluctuating neurologic symptoms or deficits such as sensory deficits, limb weakness, abnormal reflexes (pathological, asymmetric, hyperreflexia), speech difficulties, visual loss, lack of coordination, or mental status changes ~~(see **background**)~~ #when MRI is **contraindicated** or cannot be performed
- ~~•~~ Lesion on prior imaging with atypical features ~~for further evaluation or follow up~~
- ~~• Histiocytic Neoplasms for screening and/or with neurological signs or symptoms~~
  - ~~o Erdheim-Chester Disease~~
  - ~~o Langerhans Cell Histiocytosis~~
  - ~~o Rosai-Dorfman Disease~~
- ~~**Note**: Suspected Pituitary Tumors (Brain MRI is the study of choice if indicated) or Sella CT if~~when MRI is **contraindicated** or cannot be performed

~~**Note**: Screening for hereditary cancers syndromes (Brain MRI is the study of choice if indicated)~~

~~*Evaluation of Known Brain Lesion/Cyst*~~

- ~~• Bone tumor or abnormality of the skull (26)~~
- ~~• Histiocytic Neoplasms to assess treatment response and surveillance of known brain/skull lesions (27,28)~~
  - ~~o Erdheim-Chester Disease~~
  - ~~o Langerhans Cell Histiocytosis~~
  - ~~o Rosai-Dorfman Disease~~

~~**Note**: Known~~**Note**: For pituitary ~~tumors (Brain MRI is the study of choice if indicated) or Sella CT~~ disorders, if MRI is contraindicated or cannot be performed

~~CT~~ (see Evolent CG 2054 for Temporal Bone, Mastoid, Orbits, Sella, Internal Auditory Canal CT for Sella CT or Evolent CG 2012 for Brain MRI for ~~Known Cancer~~indications)

Known Malignancy

MRI is the ideal modality to follow-up meningioma, pituitary tumors, low grade tumors, neurocutaneous syndromes, and screening/restaging/surveillance for non-CNS cancers. CT should only be used when MRI is **contraindicated** or ~~is unable to be obtained.~~ cannot be performed (see ECG 2012 for Brain MRI for indications)

~~MRI is appropriate for **any malignancy when there are signs or symptoms of brain metastases** (e.g., headache, sensory deficits, memory problems). There does not need to be a neuro deficit on exam or other workup done first for a patient with cancer.~~

~~***Combination Studies for Initial Staging, Active Monitoring, or Evaluation of Suspected Metastases #*** ***(25)***~~

~~≤ 5 concurrent studies to include CT or MRI of any of the following areas as appropriate depending on the cancer: Neck, Abdomen, Pelvis, Chest, Brain, Cervical Spine, Thoracic Spine or Lumbar Spine~~

Seizure Disorders

~~*For*~~ *Evaluation of Known or Suspected Seizure Disorder*

~~(29,30,31)~~**W~~w~~hen MRI is contraindicated or cannot be performed** (19)

- New onset of ~~seizures~~ unprovoked seizure ~~or newly identified change in seizure activity/pattern # (Brain MRI is the study of choice if indicated)~~(20)

~~Infectious or Inflammatory Disease~~

- Newly identified change in seizure activity/pattern

Infection and Inflammation

Evaluation of Known or Suspected Infection or Inflammatory Disease

W~~#~~**~~w~~hen MRI is contraindicated or cannot be performed** (21)

- Suspected intracranial abscess or brain infection with acute altered mental status or with positive lab findings (such as elevated WBCs) **OR** follow-up assessment during or after treatment completed.
- Meningitis with positive signs and symptoms (such as fever, headache, mental status changes, stiff neck) **OR** with positive lab findings (such as elevated white blood cells or abnormal lumbar puncture fluid exam) ~~(32)~~
- Suspected encephalitis with headache and altered mental status or follow-up as clinically warranted
- Endocarditis with suspected septic emboli
- Vasculitis
  - Central Nervous System (CNS) involvement in patients with known or suspected vasculitis or autoimmune disease with abnormal inflammatory markers or autoimmune antibodies
  - Suspected primary CNS vasculitis based on neurological signs and symptoms with completed infectious/inflammatory lab work-up ~~(33)~~when MRI is contraindicated or cannot be performed (22)
- Immunocompromised patient (e.g., transplant recipients, HIV with CD4<200, primary immunodeficiency syndromes, hematologic malignancies) with focal neurologic symptoms, headaches, behavioral, cognitive or personality changes

~~Cognitive Impairment~~

Evaluation of Cognitive Impairment ~~(34,35)~~

~~Mental status score~~**When MRI is contraindicated or cannot be performed** (23,24)

- Evaluation for mild cognitive impairment or dementia with all of ~~either~~ the following:
  - Objective measures demonstrate ~~objective~~ impairment (MMSE ~~or~~ /MoCA ~~of less than~~< 26 or other ~~similar~~ mental status instruments~~*/formal~~ (see **Background**) or mild cognitive impairment on neuropsychological testing ~~showing at least mild cognitive impairment **AND** a completed basic metabolic workup (such as~~)
  - Full lab evaluation (thyroid function ~~testing, liver function testing, complete blood count, electrolytes, and B12) #~~tests, CBC, CMP, ~~including LFTs~~ and B12) has been completed and if abnormal, has been treated and the cognitive difficulty persists
- ~~*Other examples include Mini-Cog, Memory Impairment Screen, Saint Louis University Mental Status Examination (SLUMS), Brief Alzheimer's Screen (BAS), Blessed Dementia Scale (BDS), Clinical Dementia Rating (CDR)~~ ~~(36,37)~~

Movement Disorders (7,25)

~~*Evaluation of Movement Disorders #* (11,38)~~

- For evaluation of acute onset of a movement disorder with concern for stroke or hemorrhage
- For evaluation of suspected Parkinson's with atypical features or unresponsive to levodopa when MRI is **contraindicated** or cannot be performed

Note: Atypical parkinsonian syndromes include progressive supranuclear palsy (PSP), multiple system atrophy (MSA), corticobasal degeneration (CBD), and dementia with Lewy bodies.

- For the evaluation of other movement disorders to exclude a structural lesion (i.e., suspected Huntington disease, chorea, hemiballismus, atypical dystonia)

~~**Note**: CT has limited utility in the chronic phases of disease. Brain MRI is the study of choice if indicated.~~**Note:** Imaging is not indicated in essential tremor, Tourette' syndrome or isolated focal dystonia (e.g., blepharospasm, cervical dystonia, laryngeal dystonia, oromandibular dystonia, writer's dystonia) ~~(38,39)~~ .(25,26)

Cranial Nerve and Vision Abnormalities

Vision Abnormalities #

When MRI is contraindicated or cannot be performed

- Abnormal eye findings on physical or neurologic examination ~~(~~that suggest CNS pathology (such as papilledema, pathologic nystagmus, optic atrophy, ocular nerve palsies, new onset anisocoria, visual field deficits~~, etc.)~~ ~~**Note**: See background~~) (8)

- Binocular diplopia with concern for ~~intracranial~~CNS pathology after comprehensive eye evaluation ~~(40)~~(8)
- ~~Childhood strabismus with development delay or abnormal fundoscopic exam to rule out intracranial abnormalities (41)~~
- Horner's syndrome with signs/symptoms localizing the lesion to the ~~central nervous system (42)~~brain (vertigo, altered facial sensation, contralateral CN IV palsy, crossed motor/sensory signs) (27,28)

Other Cranial Nerve Disorders~~uropathies~~ (1,29)

~~Evaluation of cranial nerve palsy/neuropathy/neuralgia when thought to be due to tumor, stroke, or bony abnormalities of the skull base or~~ **When MRI is contraindicated or cannot be performed**

- Trigeminal (CN V) neuralgia or neuropathy
- Occipital Neuralgia with atypical features (such as burning versus stabbing pain, referred pain to the face/ear, tinnitus, visual disturbances) to exclude a structural lesion (30)
- Hemifacial spasm (CN VII)
- Facial Nerve Paresis / Bell's Palsy (CN VII) with atypical features (such as bilateral involvement, multiple episodes, slow resolution beyond three weeks, incomplete/no improvement at three months, or facial twitching/spasms prior to onset) (29,31–33)
- Clinical evidence of cranial nerve (CN IX, X, XI, and/or XII) deficits or dysfunction (such as dysphagia, shoulder/neck movement abnormalities, tongue movement abnormalities, vocal fold movement or sensation abnormalities)
- Bulbar symptoms~~, i.e.,~~ (such as difficulty in chewing, ~~weakness of the facial muscles,~~ dysarthria, ~~palatal weakness,~~ dysphagia, and dysphonia) and/or bulbar signs~~, i.e.,~~ (such as atrophy and fasciculations of the tongue~~ and~~, weakness of the facial muscles, palatal weakness, absent gag reflex~~ (43) #~~) (29)
- Pseudobulbar symptoms~~, i.e.,~~ (such as dysphagia, dysarthria, ~~facial weakness,~~ sudden~~,~~ stereotyped emotional outbursts that are not reflective of mood) and/or pseudobulbar signs~~, i.e.,~~ (such as spastic tongue~~ and~~, facial weakness, exaggerated gag/jaw jerk~~ (44) #~~) (34)

Congenital Abnormalities

- Evaluation of Known or Suspected Congenital Abnormalities
  - Known or suspected congenital abnormality with any acute, new, or fluctuating neurologic, motor, or mental status changes
  - Craniosynostosis and other skull deformities (35)
  - Prior treatment **OR** treatment planned for congenital abnormality
- Evaluation of Known or Suspected Congenital Abnormalities **when MRI is contraindicated or cannot be performed**

- Evaluation of macrocephaly in an infant/child <18 with previously abnormal US, abnormal neurodevelopmental examination, signs of increased ICP or closed anterior fontanelle ~~(45) #~~(36)
- Evaluation of microcephaly ~~in an infant/child~~and age < 18 ~~(46) #~~years old (37)
- ~~Evaluation of craniosynostosis and other skull deformities. (47,48)~~
- ~~Evaluation of the corticomedullary junction in Achondroplasia (49) #~~
- Cerebral palsy ~~if~~ and ONE of the following (38):
  - Etiology has not been established in the neonatal period
  - ~~,~~There is change in the expected clinical or developmental profile ~~or~~ and concern for progressive neurological disorder ~~(50)~~
- ~~Prior treatment **OR** treatment planned for congenital abnormality~~
- See **Imaging in Known Genetic Conditions** section for additional indications

Note: For evaluation of known or suspected hydrocephalus ~~please~~ see section on CSF abnormalities, below.

Cerebrospinal Fluid Abnormalities

- Evaluation of Known or Suspected CSF Abnormalities
  - Evaluation of suspected hydrocephalus with any acute, new, or fluctuating neurologic, motor, or mental status changes
  - Follow up of known hydrocephalus~~*~~
  - ~~For initial evaluation of a suspected Arnold Chiari malformation (51) *#~~
  - ~~Follow-up imaging of a known type II or type III Arnold Chiari malformation. For Arnold Chiari type I, follow-up imaging only if~~ with new ~~or changing signs/~~symptoms ~~(52) #~~or to plan/monitor treatment
  - ~~Initial evaluation for a known syrinx or syringomyelia*#~~
  - Known or suspected normal pressure hydrocephalus (NPH) ~~(53)~~(39)
    - With symptoms of gait difficulty, cognitive disturbance, and/or urinary incontinence
  - Follow-up shunt evaluation ~~(54,55,56)~~ and ONE of the following (40)
    - ~~Post operativity if indicated based on underlying disease or pre-operative radiographic findings and/or~~
    - Baseline imaging following placement or revision
    - 6-12 months after placement ~~and/~~or revision
    - ~~With neurologic symptoms that suggest~~ Clinical concern for shunt malfunction
  - Evaluation of known or suspected cerebrospinal fluid (CSF) leakage ~~(57)~~(41)
  - Cisternography for intermittent and complex CSF rhinorrhea/otorrhea~~.~~ (CSF fluid

should always be confirmed with laboratory testing (Beta-2 transferrin assay) ~~(57,58)~~first) (41,42)

- Evaluation of Known or Suspected CSF Abnormalities **when MRI is contraindicated or cannot be performed**
  - For initial evaluation of a suspected Arnold Chiari malformation (43,44)
  - Follow-up imaging of a known type II or type III Arnold Chiari malformation. For Arnold Chiari type I, follow-up imaging only if new or changing signs/symptoms (43–45)
  - ~~Initial evaluation for a k~~Known syrinx or syringomyelia
  - Suspected spontaneous intra-cranial hypotension with distinct postural headache (other symptoms include nausea, vomiting, dizziness, tinnitus, diplopia, neck pain or imbalance) (1,46)~~59)~~ #

~~*Often congenital, but can present later in life; or less commonly acquired secondary to tumor, stroke, trauma, infection, etc.~~

~~Procedural Evaluations~~

~~*Preoperative/Procedural Evaluation*~~

- ~~Pre-operative evaluation for a planned surgery or procedure~~

~~*Postoperative/Procedural Evaluation*~~

- ~~A follow-up study may be needed to help evaluate a patient's progress after treatment, procedure, intervention, or surgery. Documentation requires a medical reason that clearly indicates why additional imaging is needed for the type and area(s) requested.~~

~~Prior Imaging~~

~~FURTHER EVALUATION OF INDETERMINATE FINDINGS ON PRIOR IMAGING~~

~~Unless follow-up is otherwise specified within the guideline:~~

- ~~For initial evaluation of an inconclusive finding on a prior imaging report that requires further clarification.~~
- ~~One follow-up exam of a prior indeterminate MR/CT finding to ensure no suspicious interval change has occurred. (No further surveillance unless specified as highly suspicious or change was found on last follow-up exam)~~

Other Indications

- Prior to lumbar puncture in patients with suspected increased intracranial pressure or at risk for herniation

Other Indications when MRI is contraindicated or cannot be performed

- Vertigo associated with any ONE of the following [10] #[6]
  - Signs or symptoms suggestive of a possible CNS lesion (Ssuch as a positive HINTS test, ataxia, dysarthria, visual loss, double vision, weakness, mental status change, hearing loss, tinnitus or a change in sensation)
  - Progressive unilateral/asymmetric hearing loss and/or tinnitus
  - Concern for stroke with known risk factors for cerebrovascular disease with concern for stroke(sSuch as hypertension, smoking, obesity, hypercholesterolemia)
  - After fullConcern for central vertigo (source within the CNS) based on findings on neurologic examination and/or vestibular testing with concern for central vertigo (i.e.,(Ssuch as skew deviation, vertical nystagmus, head thrust test, and/or videonystagmography (VNG)) / electronystagmography (ENG))) testing results suggesting a likely CNS etiology)

NOTE: "Vertigo" is the sensation that a person and/or their surroundings are moving. There are many vague, nonspecific terms that are often used instead including "dizzy", "light-headed", "woozy", "groggy", or "giddy". The reviewer should examine the record to determine if the patient is experiencing vertigo or another condition (such as presyncope, ataxia, anxiety, arrhythmia). If it is not clear what condition is being described, clarification should be requested.

- Diagnosis of central sleep apnea on polysomnogram #
  - Children > 1 year [60]
  - [47]
  - Adults in the absence of heart failure, chronic opioid use, high altitude, or treatment emergent central sleep apnea **AND** concern for a central neurological cause (Chiari malformation, tumor, infectious/inflammatory disease) **OR** with an abnormal neurological exam
- Syncope with documented clinical concern for seizure or associated neurological signs or symptoms , when MRI is contraindicated [61,62] #cannot be performed [48]
- Cyclical vomiting syndrome or abdominal migraine with any localizing neurological symptoms [63,64] #[49,50]
- Soft tissue mass of the head with nondiagnostic initial evaluation (ultrasound and/or radiograph) [65,66,67] #
- Psychological changes with neurological deficits on exam or after completion of a full neurological assessment that suggests a possible neurologic cause [68] #[51]
- Child < 18 years with global developmental delay **OR** a developmental delay with abnormal neurological examination in a child < 18 years [69,70] #or abnormal EEG [52]
- Unexplained event (BRUE) formerly apparent life-threatening event (ALTE) in infants < 1 year with concern for neurological cause based on history and exam [71] #[53]

Note: Imaging is not indicated in low-risk patients

PREOPERATIVE OR POSTOPERATIVE ASSESSMENT

When not otherwise specified in the guideline:

Preoperative Evaluation:

- Imaging of the area requested is needed to develop a surgical plan

Postoperative Evaluation:

- Known or suspected complications
- A clinical reason is provided how imaging may change management

NOTE: This section applies only within the first few months following surgery

FURTHER EVALUATION OF INDETERMINATE FINDINGS ON PRIOR IMAGING

Unless follow up is otherwise specified within the guideline:

- For initial evaluation of an inconclusive finding on a prior imaging report that requires further clarification.
- One follow-up exam of a prior indeterminate MR/CT finding to ensure no suspicious interval change has occurred. (No further surveillance unless specified as highly suspicious or change was found on last follow-up exam)
- ~~Prior to lumbar puncture in patients with suspected increased intracranial pressure or at risk for herniation~~

IMAGING IN KNOWN GENETIC CONDITIONS

- Achondroplasia [54]:
  - Once (to evaluate the corticomedullary junction; typically done in infancy)
- Sickle Cell Disease [55,56]:
  - When needed to screen for silent stroke
  - Abnormal Transcranial Doppler Velocity > 200 cm/s

Combination Studies for Imaging in Known Genetic Conditions

NOTE: When medical necessity is met for an individual study **AND** conscious sedation is

required (such as for young pediatric patients or patients with significant developmental delay), the entire combination is indicated~~)~~

Brain CT and Brain CTA

- Sickle Cell Disease [55,56]:
  - When needed to screen for silent stroke
  - Abnormal Transcranial Doppler Velocity > 200 cm/s
  - New neurologic or cognitive concerns (including TIA, no formal testing required)
  - When cessation or changing frequency of transfusions is under consideration

OTHER COMBINATION STUDIES WITH BRAIN CT

Note: When medical necessity is met for an individual study **AND** conscious sedation is required (such as for young pediatric patients or patients with significant developmental delay), the entire combination is indicated~~)~~

Note: These body regions might be evaluated separately or in combination as documented in the clinical notes by physical examination findings (e.g., localization to a particular segment of the neuroaxis), patient history, and other available information, including prior imaging.

~~Exception: Approved indications as noted above and being performed in a child under 8 years of age who will need anesthesia for the procedure and there is a suspicion of concurrent intracranial pathology~~

~~**Note:** MRA and CTA are generally comparable noninvasive imaging alternatives each with their own advantages and disadvantages. Accordingly, Brain CT can be combined with Brain MRA/Neck MRA with appropriate medical reasoning.~~

Brain CT and Brain CTA

- Recent ischemic stroke ~~or~~
- Recent transient ischemic attack (TIA) when MRI is contraindicated or cannot be performed ~~[72,73]~~(11,57)
- Acute, sudden onset of headache with personal history of a vascular abnormality or first-degree family history of aneurysm ~~[74,75]~~(1,13)
- Thunderclap headache >6 hours after onset in an acute setting with high suspicion of SAH ~~[75]~~(1)
- Headache associated with exercise, exertion, ~~Valsalva~~ or sexual activity when MRI is contraindicated or cannot be performed ~~[76]~~(2)
- ~~•~~ Suspected central venous thrombosis ~~(dural sinus thrombosis)~~ and MRI is contraindicated or cannot be performed ~~[73]~~ ~~– CT/CTV**~~

- ~~Neurological signs or symptoms in sickle cell patients when MRI is contraindicated or cannot be performed~~ [(17)]
- ~~High stroke risk in sickle cell patients (2 - 16 years~~and ANY ONE of ~~age) with a transcranial doppler velocity > 200 when MRI is contraindicated or cannot be performed~~ [(17)]the following [(11)]:
  - Patient has a hypercoagulable state such as pregnancy, post-partum, prothrombotic conditions (acquired or genetic), malignancy, oral contraceptive use, recent infection, recent trauma or Covid-19
  - Documentation of concern for central venous thrombosis is specified
  - Papilledema or signs/symptoms of increased intracranial pressure
- Known Moyamoya disease [(77,78)](12,58) or reversible cerebral vasoconstriction with any new or changing neurological signs or symptoms [(75,79)](1,59)
  - **NOTE**: For this indication, when Brain CT is ordered in combination with Brain CTA, a contraindication to MRI is not needed
- Suspected secondary CNS vasculitis based on neurological signs or symptoms in the setting of an underlying systemic disease with abnormal inflammatory markers or autoimmune antibodies when MRI is contraindicated or cannot be performed [(74)](13)
- Suspected primary CNS vasculitis based on neurological signs and symptoms with completed infectious/inflammatory lab work-up when MRI is contraindicated or cannot be performed [(74,80,81)](13,22,60)

Brain CT and~~/or~~ Brain ~~CTA and/or~~ /Neck CTA (11,12)

- Recent ischemic stroke ~~or~~
- Recent transient ischemic attack (TIA) when MRI is contraindicated or cannot be performed (11,57)
- History of stroke and ONE of the following:
  - No prior workup when MRI is contraindicated or cannot be performed
  - New neurologic signs or symptoms
- Suspected or known carotid or vertebral artery dissection with focal or lateralizing neurological deficits

*__Note__: MRA and CTA are generally comparable noninvasive imaging alternatives, each with their own advantages and disadvantages. Brain MRI can alternatively be combined with Brain CTA/Neck CTA.

Brain ~~CT~~/Cervical Spine ~~CT~~/Thoracic Spine ~~CT~~/Lumbar Spine CT ~~(any combination) #~~

When MRI is contraindicated or CANNOT be performed or surgeon preference

- For initial evaluation of a suspected Arnold Chiari malformation

- Follow-up imaging of a known type II or type III Arnold Chiari malformation. For Arnold Chiari type I, follow-up imaging only if new or changing signs/symptoms ~~(82,83,84,85)~~(43)
- Oncological ~~Applications~~Applications (e.g., primary nervous system, metastatic) (16)
  - Drop metastasis from brain or spine (CT spine imaging in this scenario is usually CT myelogram) ~~see background~~
  - Suspected leptomeningeal carcinomatosis ~~(see background)~~ ~~(86)~~
  - Tumor evaluation and monitoring in neurocutaneous syndromes
- CSF leak highly suspected and supported by patient history and/or physical exam findings (e.g., known or suspected spontaneous ~~(idiopathic)~~ intracranial hypotension (SIH), post lumbar puncture headache, post spinal surgery headache, orthostatic headache, rhinorrhea or otorrhea, or cerebrospinal-venous fistula ~~- CT spine imaging in this scenario is usually (~~CT myelogram~~))~~ (61)

Brain ~~CT and /~~Orbit CT (8,62)

- If MRI is contraindicated or cannot be performed~~:~~;
  - Optic neuropathy or unilateral optic disk swelling of unclear etiology to distinguish between a compressive lesion of the optic nerve, optic neuritis, ischemic optic neuropathy (arteritic or non-arteritic), central retinal vein occlusion, or optic nerve infiltrative disorders~~(87)~~
  - Bilateral optic disk swelling (papilledema) with vision loss~~(88)~~
  - ~~Approved indications as noted above and being performed in high-risk populations and will need anesthesia for the procedure and there is a suspicion of concurrent intracranial pathology(88)~~

Combination Studies for Malignancy for Initial Staging or Restaging

Unless otherwise specified in this guideline, indication for combination studies for malignancy for initial staging or restaging:

- Concurrent studies to include CT or MRI of any of the following areas as appropriate depending on the cancer: Abdomen, Brain, Chest, Neck, Pelvis, Cervical Spine, Thoracic Spine or Lumbar Spine

CODING AND STANDARDS

~~Coding~~

~~CPT~~ Codes

70450, 70460, 70470, +0722T

Applicable Lines of Business

☒	CHIP (Children's Health Insurance Program)
☒	Commercial
☒	Exchange/Marketplace
☒	Medicaid
☒	Medicare Advantage

BACKGROUND

Contraindications and Preferred Studies

- Contraindications and reasons why a CT/CTA cannot be performed may include: impaired renal function, significant allergy to IV contrast, pregnancy (depending on trimester).
- Contraindications and reasons why an~~d~~ MRI/MRA cannot be performed may include: impaired renal function, claustrophobia, non-MRI compatible devices (such as non-compatible defibrillator or pacemaker), metallic fragments in a high-risk location, patient exceeds weight limit/dimensions of MRI machine.

~~Headache and Migraine~~

~~**Headache timeframes and other characteristics** – Headaches can be classified as acute, subacute or chronic. Acute headaches are present from hours to days, subacute from days to weeks and chronic headaches for more than 3 months. Acute severe headaches are more likely to be pathological (e.g., SAH, cerebral venous thrombosis) than non-acute (e.g., migraine, tension-type). Headaches can also be categorized as new onset or chronic/recurrent. Non-acute new onset headaches do not require imaging unless there is a red flag as delineated above. Incidental findings lead to additional medical procedures and expense that do not improve patient well-being. Primary headache syndromes, such as migraine and tension headaches, are often episodic with persistent or progressive headache not responding to treatment requiring further investigation (e.g., new daily persistent headache). Imaging is indicated in chronic headaches if there is a change in the headache frequency (number of headaches episodes/month), duration of each episode, severity of the headaches or new characteristics, such as changing aura or associated symptoms.~~ [1,2,89,90,91,92,93,94,95]

~~**Migraine with aura** [2,3,96] – The headache phase of a migraine is preceded and/or accompanied by transient neurological symptoms referred to as aura in at least a third of migraine attacks. Migraine with typical aura consists of visual and/or sensory and/or speech/language symptoms, but no motor, brainstem or retinal symptoms and is characterized~~

by gradual development, duration of each symptom no longer than one hour, a mix of positive and negative features and complete reversibility. Atypical or complex aura includes motor, brainstem, monocular visual disturbances, or ocular cranial nerve involvement (hemiplegic migraine, basilar migraine/brainstem aura, retinal migraine, ophthalmoplegic migraine) and secondary causes need to be excluded. Additional features of an aura that raise concern for an underlying vascular etiology include late age of onset, short duration, evolution of the focal symptoms, negative rather than positive visual phenomenon, and history of vascular risk factors.

Individuals presenting with a new migraine with aura (especially an atypical or complex aura) can mimic a transient ischemic attack or an acute stroke. If there is a new neurologic deficit, imaging should be guided by concern for cerebrovascular disease, not that the individual has a headache. [97,98]

Definitions

MoCA – The Montreal Cognitive Assessment (MoCA) was designed as a rapid screening instrument for mild cognitive dysfunction. It assesses different cognitive domains: attention and concentration, executive functions, memory, language, visuoconstructional skills, conceptual thinking, calculations, and orientation. MoCA differs from the MMSE mainly by including tests of executive function and abstraction, and by putting less weight on orientation to time and place. Ten of the MMSE's 30 points are scored solely on the time-place orientation test, whereas the MoCA assigns it a maximum of six points. The MoCA also puts more weight on recall and attention-calculation performance, while de-emphasizing language skill. Time to administer the MoCA is approximately 10 minutes. The total possible score is 30 points; a score of 26 or above is considered normal.

CT and developmental delay – Significant developmental delay is defined as significant delay (more than two standard deviations below the mean) in one or more developmental domains: gross/fine motor, speech/language, cognition, social/personal, and activities of daily living. Isolated delay in social/language development is characteristic of autism spectrum disorders or hearing loss. Isolated delay in motor development is characteristic of cerebral palsy (a static encephalopathy) or myopathy. Global developmental delay (GDD) is a subset of developmental delay defined as significant delay (by at least 2 SD's) in two or more developmental categories. Note that the term "GDD" is usually reserved for children < 5 years old, whereas in older children > 5 years, disability is quantifiable with IQ testing.

Leptomeningeal Carcinomatosis

Leptomeningeal Carcinomatosis [86,99,100,101] – Leptomeningeal metastasis is an uncommon and typically late complication of cancer with poor prognosis and limited treatment options. Diagnosis is often challenging with nonspecific presenting symptoms ranging from headache and confusion to focal neurologic deficits such as cranial nerve palsies. Standard diagnostic evaluation involves a neurologic examination, MRI of the brain and spine with gadolinium, and cytologic evaluation of the cerebral spinal fluid (CSF). Hematologic malignancies (leukemia and lymphoma), primary brain tumors as well as solid malignancies can spread to the leptomeninges. The most common solid tumors giving rise to LM are breast cancer (12 - 35%), small and non-small cell lung cancer (10-26%), melanoma (5 -25%), gastrointestinal malignancies (4-14 %), and cancers of unknown primary (1-7%).

Drop Metastases

Drop Metastases – Drop metastases are intradural extramedullary spinal metastases that arise from intracranial lesions. Common examples of intracranial neoplasms that result in drop metastases include pineal tumors, ependymomas, medulloblastomas, germinomas, primitive neuroectodermal tumors (PNET), glioblastomas multiform, anaplastic astrocytomas, oligodendrogliomas and less commonly choroid plexus neoplasms and teratomas. [102]

Meningitis

CT scan and Meningitis – In suspected bacterial meningitis, CT with contrast may be performed before lumbar puncture (LP) to show preliminary meningeal enhancement. It is important to evaluate for a mass lesion or cause of elevated ICP that would contraindicate an LP. CT may be used to define the pathology of the base of the skull and that may require therapeutic intervention and surgical consultation. Some causes of an intracranial infection include fractures of the paranasal sinus and inner ear infection.

Normal Pressure Hydrocephalus

CT and Normal Pressure Hydrocephalus (NPH) – Although diagnosis can be made based on CT findings alone, MRI is more accurate for disclosing associated pathologies (such as cerebrovascular disease), excluding other potential etiologies, and for detecting NPH typical signs of prognostic value. A CT scan can exclude NPH and is appropriate for screening purposes and in individuals who cannot undergo MRI.

Macrocephaly

CT for Macrocephaly – Consider ultrasound in infants with macrocephaly and a normal neurological examination, no evidence of increased ICP and an open anterior fontanelle. If head US is normal, the infant should be monitored closely. [103] The anterior fontanelle generally closes between 10 and 24 months of age, with 3% closing between 5-9 months and 11% after 24 months. [104]

Congenital Abnormalities

CT scan for congenital abnormalities – While MRI is preferred to CT for evaluation of most congenital CNS abnormalities, in some clinical situations CT is preferred (craniosynostosis) or equivalent to MRI. CT is appropriate in the follow-up of hydrocephalus or VP shunt function where the etiology of hydrocephalus has been previously determined or in individuals for which MRI evaluation would require general anesthesia.

Anosmia

Anosmia – There is no relevant literature to support the use of CT head in the evaluation of the olfactory nerve.

Cranial Nerves

CT for evaluation of the cranial nerves – Magnetic resonance imaging (MRI) is considered the gold standard in the study and evaluation of the cranial nerves. Computed tomography (CT) allows, usually, an indirect view of the nerve and is useful to demonstrate the intraosseous segments of cranial nerves, the foramina through which they exit skull base, and their pathologic changes. In optic neuritis, CT has limited utility. Contrast-enhanced CT scanning of the orbits may help exclude other orbital pathology. CT scanning of the brain, regardless of whether intravenous contrast material is administered or not, does not yield prognostic and treatment-altering information. In Bell's Palsy temporal bone CT is useful in the evaluation of the caliber and the course of the IAC and bony facial nerve canal in the temporal bone. When using CT to evaluate the facial nerve, pathology often can only be inferred by visualization of erosion or destruction of the adjacent bony facial nerve canal. In contrast, MRI visualizes soft tissues well and so is better suited for evaluating soft tissue facial nerve abnormalities.

Tumors

CT and tumors – MRI is the ideal modality to follow-up meningioma, pituitary tumors, low grade tumors, neurocutaneous syndromes, and staging/surveillance for non-CNS cancers. CT should only be used when MRI is contraindicated or is unable to be obtained. Surveillance timelines should follow NCCN guidelines. Imaging is also warranted if the individual is symptomatic or there are new/changing signs or symptoms or complicating factors.

Head Trauma

CT scan for Head Trauma – Most types of head injury are minor injuries; clinical signs and symptoms help predict the need for brain CT following injury. CT has advantages in evaluating head injury due to its sensitivity for demonstrating mass effect, ventricular size and configuration, bone injuries, and acute hemorrhage. An individual who presents with certain clinical risk factors may be more likely to benefit from CT imaging. Some of the clinical risk factors that may be used as a guide to predict the probability of abnormal CT following minor head injury are vomiting, skull fracture, and age greater than 60 years. Individuals with a Glasgow Coma Scale of 15 or less who also have been vomiting or have a suspected skull fracture are likely to show abnormal results on CT scan. CT is also useful in detecting delayed hematoma, hypoxic-ischemic lesions, or cerebral edema in the first 72 hours after head injury.

Central Venous Thrombosis

CT and Central Venous Thrombosis – A CTV or MRV is indicated for the definite evaluation of a central venous thrombosis/dural sinus thrombosis. The most frequent presentations are isolated headache, intracranial hypertension syndrome (headache, nausea/vomiting, transient visual obscurations, pulsatile tinnitus, CN VI palsy, papilledema), [105] seizures, focal neurological deficits, and encephalopathy. Risk factors are hypercoagulable states inducing genetic prothrombotic conditions, antiphospholipid syndrome and other acquired prothrombotic diseases (such as cancer), oral contraceptives, pregnancy, puerperium (6-weeks postpartum), infections, and trauma. COVID-19 infection is associated with hypercoagulability, a thromboinflammatory response, and an increased incidence of venous thromboembolic events (VTE) [106,107]. Since venous thrombosis can cause SAH, infarctions, and hemorrhage, parenchymal imaging with MRI/CT is also appropriate [21,108,109].

Computed Tomography (CT) versus Magnetic Resonance

Imaging (MRI)

Generally, magnetic resonance imaging is the preferred imaging technique for evaluating the brain parenchyma, and CT is preferable for evaluating subarachnoid hemorrhage. CT is faster and more readily available than MRI and is often used in urgent clinical situations.

Stroke/TIA

Imaging for Stroke – Individuals presenting with symptoms of acute stroke should receive prompt imaging to determine whether they are candidates for treatment with tissue plasminogen activator. Non-contrast CT can evaluate for hemorrhage that would exclude the individual from reperfusion therapy. ~~Functional imaging can be used to select individuals for thrombolytic therapy by measuring the mismatch between "infarct core" and "ischemic penumbra" and may define ischemic areas of the brain with the potential to respond positively to reperfusion therapy. Contrast-enhanced CT angiography (CTA) may follow the non-contrast CT imaging to identify areas of large vessel stenosis or occlusion which may be a target for therapy.~~

Memory Status Instruments

Cut off values for cognitive impairment

Mini-Cog < 3

Memory Impairment Screen < 5

Saint Louis University Mental Status Examination (SLUMS)

- High school education <27
- Less than high school education <25

Brief Alzheimer's Screen (BAS) <24

Blessed Dementia Scale (BDS) >3

Clinical Dementia Rating~~**Recent stroke or transient ischemic attack** – When revascularization therapy is not indicated or available in patients with an ischemic stroke or TIA, the focus of the work-up is on secondary prevention. Both stroke and TIA should have an evaluation for high-risk modifiable factors such as carotid stenosis atrial fibrillation as the cause of ischemic symptoms [110]. Diagnostic recommendations include neuroimaging evaluation as soon as possible, preferably with magnetic resonance imaging, including DWI; noninvasive imaging of the extracranial vessels should be performed, and noninvasive imaging of intracranial vessels is reasonable. [111]~~

~~Patients with a history of stroke and recent work-up with new signs or symptoms indicating progression or complications of the initial CVA should have repeat brain imaging as an initial study. Patients with remote or silent strokes discovered on imaging should be evaluated for high-risk modifiable risk factors based on the location and type of the presumed etiology of the brain injury.~~

~~Neurological Deficits~~

~~**Neurological Deficits** – Examples of abnormal reflexes related to upper motor neuron lesion/central pathology include hyperreflexia, clonus, Hoffman sign and Babinski, snout, palmar grasp, and rooting reflexes.~~

~~Visual loss has many possible etiologies, and MRI or CT is only indicated in suspected neurological causes of visual loss based on history and exam. Visual field defects, such as bitemporal hemianopsia, homonymous hemianopsia, or quadranopsia, require imaging as well as does suspected optic nerve pathology. Subjective symptoms such as blurred vision or double vision with no clear correlate on neurological examination requires a comprehensive eye evaluation to exclude more common causes, such as cataracts, refractive errors, retinopathy, glaucoma, or macular degeneration. Transient visual loss with history consistent with TIA but normal exam at time of examination also should be imaged. Positive visual phenomena, such as photopsias or scintillations that march across the visual field, suggest migraine whereas negative phenomenon, such as shaded or blurred, is more characteristic of ischemia.~~

- Sum of boxes score > or equal to 4.5 or
- Global score greater than or equal to 1 Mo

Montreal Cognitive Assessment (MoCA) < 26

Mini-Mental Status Exam (MMSE) < 26

SUMMARY OF EVIDENCE

ACR Appropriateness Criteria® Cerebrovascular Diseases-Aneurysm, Vascular Malformation, and Subarachnoid Hemorrhage [13]

Study Design: The study design involves a detailed literature review and expert panel recommendations to establish imaging guidelines for various cerebrovascular conditions. The criteria are based on the latest evidence and expert consensus to ensure appropriate imaging procedures are selected for different clinical scenarios.

Target Population: The target population includes patients with cerebrovascular diseases such as aneurysms, vascular malformations, and SAH. Specific variants address different clinical presentations, including known acute SAH, suspected cerebral vasospasm, untreated cerebral aneurysms, previously treated cerebral aneurysms, high-risk cerebral aneurysm screening, known high-flow vascular malformations, and suspected CNS vasculitis.

Key Factors:

Imaging Recommendations: The document outlines the appropriateness of various imaging modalities, including arteriography, CTA, MRA, MRI, and ultrasound, for different clinical scenarios. Each variant provides specific recommendations based on the clinical presentation and the relative radiation level associated with each imaging procedure.

Clinical Presentations: The criteria cover a wide range of clinical presentations, from acute SAH to surveillance monitoring of untreated and treated aneurysms, as well as screening for high-risk populations and evaluation of suspected CNS vasculitis.

Expert Panel: The recommendations are developed by an expert panel on neurological imaging, including specialists from various institutions and organizations. The panel's collaboration ensures a comprehensive and well-rounded approach to imaging guidelines.

Headache Classification Committee of the International Headache Society (IHS) The International Classification of Headache Disorders, 3rd edition [2]

Study Design: The ICHD-3 is a systematic classification of headache disorders based on extensive research and clinical studies. The classification is hierarchical, allowing for detailed diagnosis from the first-digit level to the fifth. The criteria for each headache type are based on clinical features, diagnostic criteria, and evidence from field-testing studies.

Target Population: The target population includes individuals experiencing various types of headaches, ranging from primary headaches like migraines and tension-type headaches to secondary headaches attributed to other disorders. The classification is intended for use by healthcare professionals, including neurologists, general practitioners, and researchers, to diagnose and manage headache disorders.

Key Factors:

Primary Headaches: The document classifies primary headaches into categories such as migraines, tension-type headaches, and trigeminal autonomic cephalalgias. Each category includes specific diagnostic criteria, clinical features, and comments on pathophysiology and treatment.

Secondary Headaches: These are headaches attributed to other disorders, such as trauma, vascular disorders, infections, and psychiatric disorders. The classification provides criteria for diagnosing secondary headaches based on the temporal relationship between the headache and the underlying disorder.

Diagnostic Criteria: The criteria for each headache type include the number of attacks, duration, pain characteristics, associated symptoms, and exclusion of other diagnoses. For example, migraine without aura requires at least five attacks lasting 4-72 hours with specific pain characteristics and associated symptoms like nausea and photophobia.

Field Testing: The classification includes results from field-testing studies that validate the diagnostic criteria. These studies involve large populations and use advanced diagnostic methods like neuroimaging and genetic testing.

Clinical and Research Applications: The ICHD-3 is designed for both clinical practice and research. It helps clinicians diagnose and manage headache disorders and provides a standardized framework for researchers to study headache epidemiology, pathophysiology, and treatment.

ACR Appropriateness Criteria® Cerebrovascular Diseases-Stroke and Stroke-Related Conditions [11]

Study Design: The document is a guideline developed by the American College of Radiology (ACR) Appropriateness Criteria Expert Panel on Neurological Imaging. It is based on a systematic analysis of medical literature from peer-reviewed journals and follows established methodology principles such as the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) and the RAND/UCLA Appropriateness Method.

Target Population: The guidelines are intended for use by radiologists, radiation oncologists, and referring physicians in making decisions regarding radiologic imaging and treatment for patients with cerebrovascular diseases, including stroke and stroke-related conditions.

Key Factors:

Conditions Covered: The guidelines encompass a wide range of cerebrovascular diseases, including carotid stenosis, carotid dissection, intracranial large vessel occlusion, and cerebral venous sinus thrombosis. They also address complications such as intraparenchymal hemorrhage and completed ischemic strokes.

Imaging Recommendations: The document provides evidence-based guidelines for appropriate imaging examinations for diagnosis and treatment of specified medical conditions. It includes recommendations for various imaging modalities such as CT, MRI, MRA, and ultrasound.

Clinical Scenarios: The guidelines cover different clinical scenarios, including transient ischemic attack (TIA), acute ischemic stroke, recent ischemic infarct, and known intraparenchymal hemorrhage, among others.

Methodology: The guideline development and revision process involves a multidisciplinary expert panel and supports the systematic analysis of medical literature. In instances where peer-reviewed literature is lacking or equivocal, expert opinions are used to formulate recommendations.

ANALYSIS OF EVIDENCE

Shared Conclusions [2,11,13]**:**

1. **Diagnostic Imaging**: All three articles emphasize the importance of diagnostic imaging in identifying and managing cerebrovascular conditions. They discuss various imaging modalities such as CT, MRI, MRA, and CTA, highlighting their roles in diagnosing conditions like stroke, aneurysms, and vascular malformations.
2. **Clinical Guidelines**: The articles provide clinical guidelines for the management of cerebrovascular diseases. They stress the need for evidence-based approaches and the use of standardized criteria to ensure accurate diagnosis and effective treatment.
3. **Risk Factors**: Each article discusses the risk factors associated with cerebrovascular diseases, including hypertension, smoking, and genetic predispositions. They highlight the importance of identifying these risk factors to prevent and manage conditions effectively.

POLICY HISTORY

~~Summary~~

Date	Summary
July 2025	• Fixed a typo in the Neurological Symptoms or Deficits section • Edited the policy history for June 2025 to better reflect the changes that were presented at committee. No clinical changes
June 2025	• Guideline name changed from Brain CT to Brain Computed Tomography (CT) • Guideline number changed from 002 to 2008 • Added new bullet-point to the General Statement section • Updated Imaging in Known Genetic Conditions section • Checked the Medicare Advantage box in the Applicable Lines of Business table • Added a Summary of Evidence and Analysis of Evidence • Updated refences • Updated background • Updated combination section • Reorganized tumor section Clarified: • Acute and chronic HA timeframes • Migraine aura • CVT • Cognitive impairment labs • Horner's syndrome • Follow-up shunt evaluation • Vertigo Added: • Genetic section • History of stroke • Other cranial nerve disorders to mirror Brain MRI guideline Removed: • Childhood strabismus

Date	Summary
June 2024	• Updated references • Updated background section • Updated combination section Added • Updated Cancer sections • Vertigo with progressive unilateral hearing loss or **tinnitus** • Known Moyamoya disease or reversible cerebral vasoconstriction with any new or changing neurological signs or symptoms (also to (Bran CT /CTA combo) • Thunderclap headache >6 hours after onset in an acute setting with high suspicion of SAH (Brain CT/CTA combo) Deleted • Tumor monitoring in neurocutaneous syndromes • Pulsatile tinnitus combo section
~~May 2023~~	~~Updated and reformatted references~~ ~~Updated background section~~ ~~Reorganized indications~~ ~~General Information moved to beginning of guideline with added statement on clinical indications not addressed in this guideline~~ ~~Added:~~ ~~• Indeterminate imaging section~~ ~~• Lesion with atypical features for further evaluation or follow up~~ ~~• Initial evaluation for a known syrinx or syringomyelia~~ ~~o Bulbar and Pseudobulbar symptoms to match Brain MRI~~ ~~Clarified:~~ ~~• Abnormal reflexes (pathological, asymmetric, hyperreflexia)~~ ~~• New onset headache - Related to activity or event (sexual activity,~~ ~~• exertion, Valsalva, position), new or progressively worsening~~ ~~• Tumor surveillance as per professional society recommendations~~ ~~• Brain CT/Brain CTA - Headache associated with exercise, exertion,~~ ~~• Valsalva or sexual activity~~ ~~Deleted:~~ ~~• Anosmia (loss of smell) or dysosmia documented by objective testing that is persistent and of unknown origin~~

LEGAL AND COMPLIANCE

Guideline Approval

Committee

Reviewed / Approved by Evolent Specialty Services Clinical Guideline Review Committee

Disclaimer

Evolent Clinical Guidelines do not constitute medical advice. Treating health care professionals are solely responsible for diagnosis, treatment, and medical advice. Evolent uses Clinical Guidelines in accordance with its contractual obligations to provide utilization management. Coverage for services varies for individual members according to the terms of their health care coverage or government program. Individual members' health care coverage may not utilize some Evolent Clinical Guidelines. Evolent clinical guidelines contain guidance that requires prior authorization and service limitations. A list of procedure codes, services or drugs may not be all inclusive and does not imply that a service or drug is a covered or non-covered service or drug. Evolent reserves the right to review and update this Clinical Guideline in its sole discretion. Notice of any changes shall be provided as required by applicable provider agreements and laws or regulations. Members should contact their Plan customer service representative for specific coverage information.

Evolent Clinical Guidelines are comprehensive and inclusive of various procedural applications for each service type. Our guidelines may be used to supplement Medicare criteria when such criteria is not fully established. When Medicare criteria is determined to not be fully established, we only reference the relevant portion of the corresponding Evolent Clinical Guideline that is applicable to the specific service or item requested in order to determine medical necessity.

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