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2024 Computed Tomography (CT) Brain and Head

Diagnostic Imaging

CT-Brain-HH

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Computed Tomography (CT) Brain and Head

NCD 220.1
See also, **NCD 220.1**: Computed Tomography at https://www.cms.gov/medicare-coverage-database/search.aspx *if applicable to individual's healthplan membership*.

CT General Contraindications

Computed tomography (CT) may be contraindicated for **ANY** of the following: [3]

- Allergy to contrast (if contrast is used)
- Pregnancy
- Renal impairment and dialysis unmanageable (if contrast is used)

Preamble: Pediatric Diagnostic Imaging

HealthHelp's clinical guidelines for the Diagnostic Imaging program, are intended to apply to both adults and pediatrics (21 years of age or younger), unless otherwise specified within the criteria.

CT Brain and Head Guideline

Computed tomography (CT) of the brain and head is considered medically appropriate when the documentation demonstrates **ANY** of the following:

1. Cancer of the brain, central nervous system (CNS) or meningioma is known for **ANY** of the following:
    a. Bone tumor or abnormality of the skull is known.
    b. Central nervous system (CNS) cancer is known and received active treatment in the last year, when MRI is **contraindicated or unavailable**.
    c. Extracranial cancer history is known and MRI is **contraindicated or unavailable**.
    d. Histiocytic neoplasms (eg, Erdheim-Chester disease, Langerhans cell histiocytosis, Rosai-Dorfman disease) for treatment response and/or surveillance.
    e. History of CNS cancer, recurrence is suspected based on neurological symptoms or examination **AND** MRI is **contraindicated or unavailable**.
    f. Low-grade tumor (eg, astrocytoma, glioma, meningioma) is known, for follow-up **AND** MRI **is contraindicated or unavailable**.

g. Neurocutaneous tumors are known, for monitoring.

h. Pituitary tumors are known **AND** MRI is **contraindicated or unavailable**.

i. Surveillance per the **National Comprehensive Cancer Network Surveillance guidelines** (*See **Surveillance** section*)

References: [47] [5] [41] [27] [4] [17]

2. Cancer of the brain, central nervous system (CNS) or meningioma is suspected for **ANY** of the following:

a. Cancer history and intracranial involvement is suspected based on symptoms (eg, dizziness, headache) or examination findings **AND** MRI is contraindicated or unavailable.

b. Histiocytic neoplasms (eg, Erdheim-Chester disease, Langerhans cell histiocytosis, Rosai-Dorfman disease) for screening, with or **WITHOUT** neurological symptoms (eg, altered mental status, dizziness, tremors).

c. Mass, tumor or lesion is suspected with new or changing symptoms and MRI is **contraindicated or unavailable**.

d. Non-CNS cancer **OR** hereditary cancer syndromes, for screening. (*__NOTE__: *MRI brain is preferred*.)

e. Pituitary tumors are suspected and MRI is **contraindicated or unavailable**.

f. Recurrence or metastasis is suspected **AND** MRI is **contraindicated or unavailable**.

References: [27] [47] [5] [41] [17]

3. Central sleep apnea is diagnosed on polysomnogram, age is more than 1 year old, there is concern for central neurological cause (eg, Chiari malformation, infectious/inflammatory disease, tumor) **AND** MRI is **contraindicated or unavailable**. (*__NOTE__: *Must be in the absence of chronic opioid use, heart failure, high altitude or treatment of emergent central sleep apnea*).
Reference: [58]

4. Cerebral spinal fluid (CSF) abnormality (eg, cranial arteriovenous malformation [AVM], hydrocephalus, infection, leak, shunt malfunction or spontaneous intracranial hypotension) is suspected or known.
Reference: [61] [24]

5. Congenital abnormalities are suspected or known and **ANY** of the following:

a. Achondroplasia is known for evaluation of cervicomedullary junction and MRI is **contraindicated or unavailable**.

b. Cerebral palsy, if etiology is **NOT** established during neonatal period and there is a change in development, **OR** a progressive neurological disorder is suspected.

c. Macrocephaly evaluation, MRI is **contraindicated or unavailable** and **ANY** of the following situations:

i. Anterior fontanelle is closed.

ii. Increased intracranial pressure is suspected.

iii. Neurodevelopmental exam is abnormal.

iv. Ultrasound is abnormal, non-diagnostic or indeterminate.

d. Microcephaly is known in a pediatric individual and MRI is **contraindicated or unavailable**.

e. Skull deformity is known (eg, craniosynostosis), for evaluation. (*__NOTE__: *CT is preferred imaging to assess bony structures; MRI imaging is preferred to assess intracranial soft tissue*.)

References: [31] [38]

6. Global development delay (GDD) is known or developmental delay **AND** neurological exam is abnormal in a child less than 18 years old **AND** MRI is **contraindicated or unavailable**.

7. Infectious or inflammatory condition, with intracranial pathology, is suspected or known, MRI is **contraindicated or unavailable** and **ANY** of the following: (*__NOTE:__ *MRI is preferred*.)

a. Autoimmune disease or vasculitis is suspected or known, with positive inflammatory markers (eg, c-reactive protein [CRP]) **AND** CNS involvement.

b. Encephalitis is suspected with headache **AND** altered mental status **OR** for follow-up.

c. Endocarditis is known and intracranial septic emboli is suspected.

d. Immunocompromise, with new or worsening symptoms

e. Intracranial abscess or brain infection is suspected and **ANY** of the following: []

1. Laboratory findings are positive (eg, elevated white blood cells).

2. Mental status is acutely altered **OR** neurological symptoms (eg, bowel/ bladder dysfunction, dizziness, headache) are acute

3. Treatment is completed, for follow-up.

f. Meningitis is suspected or known **AND** is symptomatic (eg, fever, headache, stiff neck) **OR** laboratory findings are positive (eg, elevated white blood cells or abnormal lumbar puncture).

References: [11] [37] [19] [10] [1] [18] [45] [6]

8. Movement disorders (eg, Huntington's disease, Parkinson's disease), MRI is **contraindicated or unavailable** and **EITHER** of the following:

   a. Acute onset and cerebral hemorrhage or stroke is suspected.

   b. Parkinson's disease with atypical features or other movement disorder (eg, chorea, hemiballismus, Huntington's disease), for evaluation to exclude an underlying structural lesion

   References: [22] [26]

9. Neurocognitive disorders (eg, Alzheimer's disease, cognitive impairment, dementia, diffuse Lewy body) evaluation and **ALL** of the following:

   a. Basic metabolic workup (such as complete blood count, electrolytes and B12, liver function testing, thyroid function testing) is completed.

   b. Mental status score of **EITHER** the mini-mental state examination (MMSE) or Montreal cognitive assessment (MoCA) of less than 26 **OR** other similar mental status instruments/formal neuropsychological testing showing at least mild cognitive impairment

   c. MRI is **contraindicated or unavailable**.

10. Peri-procedural imaging to guide pre-procedure planning or post-operative complications.

11. Prior CT brain/head is non-diagnostic or indeterminate. (*__NOTE__: *One follow-up is appropriate to evaluate for changes since preceding imaging finding[s]. Further surveillance is appropriate when lesion is specified as "highly suspicious" or there is a change since last exam.*)

12. Seizure disorder/epilepsy is suspected or known and **EITHER** of the following: (*__NOTE:__ *MRI is preferred*.)

    a. Changes in activity/pattern of seizures

    b. New onset of seizures

    Reference: [33]

13. Soft-tissue mass of the head is known, prior imaging is non-diagnostic or indeterminate **AND** MRI is **contraindicated or unavailable**.
    Reference: [13]

14. Stroke, transient ischemic attack (TIA) or vascular disease/event is suspected or known and **ANY** of the following: (*__NOTE:__ *MRI is preferred for chronic or subacute hemorrhage and ischemic stroke; CT is preferred for acute hemorrhagic stroke*.)
    a. Central venous thrombosis is suspected **AND** MRI is **contraindicated or unavailable**.
    b. Coagulopathy is known **OR** anticoagulant use is active.
    c. Hemorrhage, hematoma or vascular anomaly for follow-up evaluation
    d. Neurologic deficits are acute, new or fluctuating.
    e. Sickle cell disease (hemorrhagic or ischemic) , MRI is **contraindicated or unavailable** and **ANY** of the following:
        i. Neurological signs (eg, dizziness, numbness, pain)
        ii. Stroke risk is increased, in an individual aged 2 to 16 years, when transcranial doppler velocity is more than 200.
    f. Subarachnoid hemorrhage, acute, is suspected.
    g. TIA is suspected based on symptoms (eg, episodic neurologic symptoms such as limb weakness, sensory deficits, speech difficulties) **AND** MRI is **contraindicated or unavailable**.

    References: [32] [52] [15] [53] [9] [44] [46] [39]

15. Symptoms include **ANY** of the following:
    a. Headache with **ANY** of the following: (*__NOTE:__ *MRI is preferred*.)
        i. Chronic headaches with change in pattern or intensity (eg, last longer, more frequent or severe).
        ii. Migraine (abdominal or head) and **EITHER** of the following:
            A. Cyclical vomiting syndrome with neurological symptoms (eg, altered mental status, dizziness, tremors) **AND** MRI is **contraindicated or unavailable**.
            B. Migraine is atypical (eg, aura without a headache, nasal congestion, vertigo).
        iii. Persistent headache, in a pediatric individual, and **ANY** of the following:
            A. Age is less than 6 years old.
            B. Increased intracranial pressure is suspected and symptomatic (eg, recurring headache after waking, with or **WITHOUT** nausea/ vomiting).

C. Occipital location

D. Severe and intracranial pathology is suspected (eg, cancer history, coagulopathy, congenital heart disease, hypertension, immune deficiency, neurofibromatosis, sickle cell disease)

E. **NO** family history of headache.

iv. Neurological deficits (eg, altered mental status, dizziness, tremors) are new or worsening.

v. New, acute sudden-onset headache with **ANY** of the following: (*__NOTE__: *MRI is preferred*.)

A. Age is 50 years or older.

B. Cancer history **AND** MRI is **contraindicated or unavailable**.

C. Coagulopathy is known **OR** anticoagulant use is active.

D. Fever

E. Head trauma is subacute.

F. Immunocompromised **AND** MRI is **contraindicated or unavailable**.

G. Intracranial bleeding/stroke history

H. Related to activity or event (exertion, position, sexual activity, valsalva,) **AND** MRI is **contraindicated or unavailable**.

I. Sentinel headache (eg, thunderclap, "worst headache of my life") occurs with rapid intensity and is 48 hours or less in duration.

J. Unilateral, with radiating neck pain **AND** carotid or vertebral artery dissection is suspected. (*__NOTE__: *Combination studies with CTA Brain, CTA Neck may be appropriate.*) (*__NOTE__: *CTA/MRA is preferred*.)

vi. Symptoms persist or worsen despite adherence to physician-directed treatment **AND** MRI is **contraindicated or unavailable**.

vii. Trigeminal autonomic cephalalgia (TAC) (eg, cluster, hemicrania continua, paroxysmal hemicrania, short-lasting unilateral neuralgiform), for initial evaluation **AND** MRI is **contraindicated or unavailable**.

b. Lumbar puncture pre-procedure with either increased intracranial pressure **OR** risk for herniation is suspected.

c. Neurologic symptoms or deficits (eg, abnormal reflexes, limb weakness, mental status change) are acute, new or fluctuating.

d. Psychological changes (eg, abnormal behaviors, emotions or thoughts) with neurological deficits on exam **OR** neurological cause is suspected, based on full neurological assessment **AND** MRI is **contraindicated or unavailable**.

e. Syncope **AND** neurological deficits **OR** suspected seizures **AND** MRI is **contraindicated or unavailable**.

f. Vision or cranial nerve abnormalities (eg, anosmia, Horner's syndrome, nystagmus, ocular nerve palsies) are suspected, MRI is **contraindicated or unavailable** and **ANY** of the following

i. Eye exam findings are abnormal (eg, nystagmus, ocular nerve palsies, papilledema).

ii. Binocular diplopia is known and intracranial pathology is suspected.

iii. Bulbar or pseudobulbar symptoms (eg, difficulty chewing, dysarthria, dysphagia) are present.

iv. Cranial nerve palsy, neuropathy or neuralgia is known **AND** tumor, stroke or bony abnormality of the skull base is suspected.

v. Horner's syndrome when a lesion localized to the central nervous system is suspected.

References: [56] [12] [7] [23] [53] [35] [34] [26] [37] [40] [29] [33] [28]

16. Trauma is suspected or known and **ANY** of the following:

a. Age is over 65 years old.

b. Coagulopathy is known **OR** anticoagulant use is active.

c. Maltreatment, with physical injury, in a pediatric individual is suspected and **ANY** of the following:

i. Apnea

ii. Neurological deficits (altered mental status, bowel/bladder dysfunction, extremity weakness) are present

iii. Skull fracture or other fratures are known.

d. Neurologic sign/symptoms (eg, amnesia, headache, mental status change, seizures, signs of increased intracranial pressure, vomiting) are acute, new or fluctuating.

e. Post concussive syndrome is known, **NO** prior imaging **AND** symptoms are persistent.

f. Skull fracture is suspected or known.

g. Subdural hematoma is suspected **AND** anticoagulation use: repeat scan 24 hours post head trauma.

h. Traumatic brain injury is subacute or chronic **AND** there is a new cognitive and/or neurologic deficit. (*__NOTE__: *MRI is preferred.*)

References: [54] [60]

17. Vertigo or dizziness, MRI is **contraindicated or unavailable**, and **ANY** of the following:

a. CNS lesion is suspected based on symptoms (eg, ataxia, double vision, sensation changes, vision loss).

b. Central vertigo is suspected when neurologic exam and vestibular testing (eg, electronystagmography [ENG], head thrust test, skew deviation, vertical gaze nystagmus, videonystagmography [VNG]) are completed.

c. Cerebrovascular disease (eg, aneurysm, stenosis, stroke, vascular malformations) is suspected.

d. Unilateral hearing loss is new or progressive.

References: [20] [26]

Combination CT and MRI for Metastases Evaluation

Combination CT/MRI studies (5 or less concurrent studies, with a CT or MRI appropriate for cancer location: abdomen, brain, cervical spine, chest, lumbar spine, neck, pelvis and/or thoracic spine) for **ANY** of the following situations:

1. Cancer recurrence or metastasis is suspected.
2. Staging evaluation, for baseline pre-therapy
3. Surveillance following the **NCCN Guidelines** recommended schedule (see *Surveillance* section)

Combination CT Brain and CTA Neck

Computed tomography (CT) of the brain **combined** with computed tomography angiography (CTA) of the neck is considered medically appropriate when the documentation demonstrates **ANY** of the following:

1. Carotid or vertebral artery dissection is suspected, when neurological deficits (eg, abnormal reflexes, limb weakness, mental status change) are known.
   Reference: [8]
2. Stroke, ischemic, or transient ischemic attack (TIA) was recent.
   Reference: [52]

Combination CT Brain and CTA Brain

Computed tomography (CT) of the brain **combined** with computed tomography angiography (CTA) of the brain is considered medically appropriate when the documentation demonstrates **ANY** of the following:

1. Headache and **ANY** of the following:
    a. Acute, with sudden onset, and **ANY** of the following:
        i. Familial first-degree (child, parent, sibling) with history of aneurysm
        ii. History of vascular abnormality
    b. Valsalva maneuver related (eg, coughing, exercising, sexual intercourse), when MRI is **contraindicated or unavailable**.

    Reference: [35]
2. Sickle cell disease is known with neurological symptoms and MRI is **contraindicated or unavailable**.
    References: [9] [52]
3. Stroke, ischemic, or transient ischemic attack (TIA) was recent.
    Reference: [52]
4. Venous thrombosis (dural sinus thrombosis) is suspected and MRI is **contraindicated or unavailable**.

Combination CTA Brain/Head, CTA Neck and CT Brain/Head

Computerized tomography angiography (CTA) of the brain/head, **combined** with CTA of the neck **AND** CT brain/head, is considered medically appropriate when the documentation demonstrates **ANY** of the following:

1. Carotid or vertebral artery dissection is suspected, when neurological deficits (eg, abnormal reflexes, limb weakness, mental status change) are known.
2. Stroke, ischemic or transient ischemic attack (TIA) occurred recently.
    References: [16] [21] [52]

Combination CT Brain and CT Orbit Guideline

Computerized tomography (CT) of the brain **combined** with CT of the orbit(s) is considered medically appropriate when the documentation demonstrates **MRI is contraindicated or unavailable** and **ANY** of the following:

1. Bilateral optic disk swelling (papilledema) with vision loss

2. Optic neuropathy or unilateral optic disk swelling (of unknown cause) is suspected with **ANY** of the following:
    a. Central retinal vein occlusion or optic nerve infiltrative disorders
    b. Compressive lesion of the optic nerve
    c. Ischemic optic neuropathy (arteritic or non-arteritic)
    d. Optic Nerve infiltrative disorders
    e. Optic Neuritis

    Reference: [28]

Combination CT Brain, CT Cervical Spine, Thoracic Spine and Lumbar Spine (Any Combination)

Computed tomography (CT) of the brain, **combined** with CT of the cervical spine, CT of the thoracic spine and/or CT of the lumbar spine is considered medically appropriate, when **MRI is contraindicated or unavailable** and the documentation demonstrates **ANY** of the following:

1. Arnold Chiari malformation is suspected, for initial evaluation.
2. Arnold Chiari malformation is known, for follow-up.
3. Cerebrospinal fluid (CSF) leak is suspected (eg, cerebrospinal-venous fistula, orthostatic headache, otorrhea, post lumbar puncture headache, post spinal surgery headache, rhinorrhea, spontaneous idiopathic intracranial hypotension [SIH]).
    Reference: [25]
4. Drop metastasis from the brain or spine
5. Leptomeningial carcinomatosis is suspected.
    Reference: [50]
6. Neurocutaneous syndrome tumor evaluation and monitoring
    Reference: [57]

LCD 34417
See also, **LCD 34417**: CT of the Head at https://www.cms.gov/medicare-coverage-database/search.aspx *if applicable to individual's healthplan membership*.

LCD 35175
See also, **LCD 35175**: MRI and CT Scans of the Head and Neck at https://www.cms.gov/medicare-coverage-database/search.aspx *if applicable to individual's healthplan membership*.

LCD 35391
See also, **LCD 35391**: Multiple Imaging in Oncology at https://www.cms.gov/medicare-coverage-database/search.aspx *if applicable to individual's healthplan membership*.

LCD 37373
See also, **LCD 37373**: MRI and CT Scans of Head and Neck at https://www.cms.gov/medicare-coverage-database/search.aspx *if applicable to individual's healthplan membership*.

Brain and Head Surveillance

Surveillance imaging (after cancer treatment) of the brain and head is considered medically appropriate when the documentation demonstrates **ANY** of the following:

Bone Cancer Surveillance

NCCN Bone Cancer Version 1.2025

Bone cancer surveillance includes **ANY** of the following:

1. Chondrosarcoma surveillance for **ANY** of the following:
    a. Atypical cartilaginous tumor surveillance with **ALL** of the following:
        i. Chest imaging every 6 to 12 months for 2 years, then annually as clinically indicated
        ii. Primary site X-rays and/or cross-sectional imaging magnetic resonance imaging (MRI) (with and without contrast) or computed tomography (CT) (with contrast) every 6 to 12 months for 2 years, then annually as clinically indicated

b. Low-grade, extracompartmental appendicular tumor, grade I axial tumors or high-grade (grade II or III, clear cell or extracompartmental) tumors surveillance with **ALL** of the following:

i. Chest imaging every 3 to 6 months, may include CT at least every 6 months for 5 years, then annually for at least 10 years, as clinically indicated

ii. Primary site X-rays and/or cross-sectional imaging MRI (with and without contrast) or CT (with contrast) as clinically indicated.

2. Chordoma surveillance with **ALL** of the following:

a. Chest imaging every 6 months, with CT included, annually for 5 years, then annually thereafter as clinically indicated

b. Imaging of primary site, timing and modality (eg, MRI ± CT [both with contrast], X-ray) as clinically indicated up to 10 years

3. Ewing Sarcoma after primary treatment completed and stable/improved disease, surveillance with **ALL** of the following:

a. Chest imaging with X-ray or CT: every 3 months

b. Primary site imaging with MRI ± CT (both with contrast) and X-ray, increase intervals after 24 months and after 5 years, annually as clinically indicated (indefinitely) (*__NOTE__: *Consider PET/CT [head-to-toe] and/or bone scan.*)

4. Giant cell tumor of the bone surveillance with **ALL** of the following:

a. Chest imaging every 6 to 12 months for 4 years, then annually thereafter as clinically indicated

b. Surgical site imaging as clinically indicated (eg, CT and/or MRI, both with contrast, X-ray)

5. Osteosarcoma surveillance with primary site and chest imaging (using same imaging that was done for initial work-up) for **ANY** of the following: (*__NOTE__: *Consider PET/CT [head-to-toe] and/or bone scan*.)

a. Image every 3 months for years 1 and 2

b. Image every 4 months for year 3

c. Image every 6 months for years 4 and 5

d. Image annually for year 6 and thereafter, as clinically indicated

Central Nervous System (CNS) Cancer Surveillance

NCCN Central Nervous System Cancer Version 3.2024

Central nervous system (CNS) cancer surveillance includes **ANY** of the following:

1. Brain metastasis, limited **OR** extensive, image with brain magnetic resonance imaging (MRI) every 2 to 3 months for 1-2 years, then every 4 to 6 months indefinitely
2. Glioma and **ANY** of the following:
    a. Low-grade glioma, image with brain MRI every 3 to 6 months for years 3 through 5, then at least annually as clinically indicated
    b. High grade glioma, image with brain MRI 2 to 8 weeks after radiation therapy, then every 2 to 4 months for 3 years, then every 3 to 6 months indefinitely
3. Medulloblastoma, image with brain MRI every 3 months for 2 years, then every 6 to 12 months for years 5 through 10, then every 1 to 2 years as clinically indicated. (*__NOTE__: *For patients with previous spine disease, concurrent spine imaging as clinically indicated.*)
4. Meningiomas, WHO Grade 1 or 2 **OR** unresectable, image with brain MRI at months 3, 6 and 12, then every 6 to 12 months for 5 years, then every 1 to 3 years as clinically indicated. WHO grade 3 meningiomas: Brain MRI, every 2–4 months for 3 years, then every 3–6 months.
5. Primary CNS lymphoma, image with brain MRI every 3 months for 2 years, then every 6 months until year 5, then annually indefinitely (*__NOTE__: *for individuals with previous spine disease, concurrent spine imaging and cerebrospinal fluid (CSF) sampling as clinically indicated*)
6. Primary spinal cord tumors and **ANY** of the following:
    a. Low-grade tumors, image with spine MRI every 3 to 6 months until year 5, then at least annually indefinitely
    b. High-grade tumors, image with spine MRI every 2 to 6 weeks after treatment, then every 2 to 4 months until year 2-3, then every 3 to 6 months until year 5, then every 6 to 12 months indefinitely
7. Spine metastasis, image with spine MRI or computed tomography (CT) 1 to 3 months after treatment, then every 3 to 4 months for 1 year, then clinically as indicated

Head and Neck Cancers Surveillance

NCCN Head and Neck Cancers Version 4.2024

Head and neck cancers surveillance for locoregionally advanced disease after treatment, includes **ANY** of the following:

1. Short-term surveillance (less then 6 months after treatment), if there is high-risk of early recurrence, symptoms of early recurrence or before starting adjuvant post-operative therapy:
    a. Computed tomography (CT) and/or magnetic resonance imaging (MRI) within 3 to 4 months post-operatively to establish a new baseline for future comparisons
    b. FDG positron emissions tomography/computed tomography (FDG PET/CT) should be performed within 3–6 months of definitive radiation or systemic therapy/RT.
    c. Incomplete response is suspected: CT or MRI scan earlier (eg, 4 to 8 weeks) based on the clinical situation. (*__NOTE__: *Consider an ultrasound [US] of the neck for targeted sampling.*)
2. Long-term surveillance (6 months or more from end-of-treatment, up to 5 years after treatment) with ultrasound, CT, MRI, PET/CT and/or FDG PET/CT (as appropriate) to obtain surveillance for lesions that are recurrent, second primary or at distant sites.[1]

Histiocytic Neoplasms Surveillance

NCCN Histiocytic Neoplasms Version 2.2024

Histiocytic neoplasms surveillance imaging includes **ANY** of the following:

1. Erdheim-Chester disease surveillance imaging includes **ANY** of the following:
    a. FDG-positron emission tomography/computed tomography (PET/CT) every 3 to 6 months after starting therapy until stabilization of the disease, and as clinically indicated after 2 years.
    b. Organ specific imaging with CT (+ contrast) or MRI (± contrast) every 3 to 6 months until disease stabilization and then every 6 to 12 months
2. Langerhans cell histiocytosis surveillance imaging includes FDG-PET/CT (preferred), FDG-PET or CT/magnetic resonance imaging (MRI) every 3 to 6 months for the first 2 years after completion of therapy, then no more than annually (*__NOTE__: *For individuals who are asymptomatic with a single-site bone lesion, imaging surveillance can end after 1 year, with continued tracking of symptoms*)

[1]Per the National comprehensive cancer network (NCCN) Guidelines for Head and Neck Cancers, there are no consensus guidelines for the surveillance imaging type, frequency or duration for locoregionally advanced disease. If an FDG PET/CT at 3 months post-treatment is negative, there are no data to support substantial benefit for further routine imaging when asymptomatic with negative exam. In the absence of multi-institutional prospective data, a tailored approach to surveillance with attention to tumor type, stage, prognostic factors, symptomatology, and physical exam changes or restrictions is recommended.

3. Rosai-Dorfman disease (RDD), surveillance imaging includes **ANY** of the following: (*__NOTE__: *for individuals who are asymptomatic with a single-site bone lesion, imaging surveillance can end after 1 year, with continued tracking of symptoms*)
    a. FDG-PET/CT every 3 to 6 months after starting therapy until stabilization of disease
    b. Organ specific imaging with CT (+ contrast) or MRI (± contrast) every 3 to 6 months until disease stabilization and then every 6 to 12 months

Melanoma: Uveal Surveillance

NCCN Melanoma: Uveal Version 1.2024

Uveal melanoma surveillance imaging includes **ANY** of the following:

1. Low risk disease surveillance imaging every 12 months for 5 years or clinically as indicated, includes **ANY** of the following:
    a. Chest/abdomen/pelvis computed tomography (CT) (+ contrast)
    b. Chest X-ray (dual subtraction)
    c. Magnetic resonance (MR) (+ contrast) or ultrasound of liver
2. Medium risk disease surveillance imaging every 6 to 12 months for 10 years, then as clinically indicated, includes **ANY** of the following:
    a. Chest/abdomen/pelvis CT (+ contrast)
    b. Chest X-ray (dual subtraction)
    c. MR (+ contrast) or ultrasound of liver
3. High risk disease surveillance imaging every 3 to 6 months for 5 years, then every 6 to 12 months for 10 years, then clinically as indicated, includes **ANY** of the following:
    a. Chest/abdomen/pelvis CT (+ contrast)
    b. Chest X-ray (dual subtraction)
    c. MR (+ contrast) or ultrasound of liver

Neuroendocrine and Adrenal Tumors Surveillance

NCCN Neuroendocrine and Adrenal Tumors Version 2.2024

Neuroendocrine and adrenal cancer surveillance includes **ANY** of the following:[2]

1. Adrenal gland tumors surveillance imaging includes **ANY** of the following:

[2]No surveillance is indicated for appendiceal tumors 2 cm or smaller without aggressive features.

a. Localized disease: chest computed tomography (CT) (± contrast) and abdominal CT or magnetic resonance imaging (MRI) (+ contrast) every 12 weeks to 12 months up to 5 years, then clinically as indicated

b. Locoregional unresectable or metastatic disease; chest CT (± contrast) and abdominal/pelvic CT or MRI (+ contrast) or FDG positron emission tomography (PET)/CT every 12 weeks to 12 months up to 5 years, then clinically as indicated

2. Carcinoid syndrome surveillance imaging includes **BOTH** of the following:

a. Abdominal/pelvic multiphasic CT or MRI every 12 weeks to 12 months and chest CT (± contrast) as clinically indicated

b. Echocardiogram every 1 to 3 years or as clinically indicated **without** known carcinoid heart disease (CHD) and at least annually for patients with established CHD.

3. Gastrointestinal (GI) tract (jejunum/ileum/colon, duodenum, rectum), lung and/or thymus neuroendocrine tumor (NET) surveillance includes imaging post-resection with **ANY** of the following:

a. Jejunum/ilium/colon, duodenum, rectum and thymus, surveillance imaging with abdominal ± pelvic multiphasic CT or MRI according to **ONE** of the following levels of frequency:[3]

i. Within 12 weeks to 12 months post-operatively

ii. After 12 months, image every 12 to 24 months for 10 years

iii. After 10 years as clinically indicated

b. Lung/thymus tumors surveillance chest CT (± contrast) for primary tumors, (as clinically indicated for primary GI tumors) according to **ONE** of the following levels of frequency:

i. Within 12 weeks to 12 months post-operatively

ii. After 12 months, image every 12 to 24 months for 10 years

iii. After 10 years as clinically indicated

4. Grade 3, well-differentiated neuroendocrine surveillance includes chest CT (± contrast) as clinically indicated for **ANY** of the following:

a. Locally advanced/metastatic disease with favorable biology (low Ki-67 [eg, less than 55%], positive somastatin receptor [SSTR] based PET imaging) includes abdominal/pelvic MRI (+ contrast) or abdominal/pelvic multiphasic CT for surveillance with **ANY** of the following:

[3]High-grade tumors may be appropriate for more frequent monitoring.

i. Resectable disease surveillance every 12 weeks to 24 weeks for 2 years, then every 6 to 12 months for up to 10 years and chest CT as clinically indicated

ii. Unresectable disease surveillance every 12 weeks to 24 weeks (depending on tumor biology) **AND** chest CT (± contrast); as clinically indicated.

b. Locally advanced/metastatic disease with unfavorable biology (high Ki-67 [eg 55% or higher], rapid growth rate, FDG avid tumors, negative SSTR-based PET imaging), includes surveillance imaging, every 8 weeks to 12 weeks (depending on tumor biology) with **ALL** of the following:

i. Abdominal/pelvic MRI (+ contrast) or abdominal/pelvic multiphasic CT and FDG PET/CT as clinically indicated

ii. Chest CT (± contrast) as clinically indicated

iii. FDG-PET/CT as clinically indicated

c. Locoregional disease (resectable) abdominal/pelvic MRI (+ contrast) or abdominal/pelvic multiphasic CT with frequency of **ONE** of the following:

i. Every 12 weeks to 24 weeks for 2 years (depending on tumor biology, Ki-67) and chest CT as clinically indicated

ii. Every 6 months to 12 months for up to 10 years (depending on tumor biology, Ki-67) and chest CT as clinically indicated

d. Multiple endocrine neoplasia, type 1 (MEN1) screening surveillance for **ANY** of the following tumor types: (*__NOTE__: *For prolonged surveillance, imaging studies without radiation are preferred.*)

i. Lung/thymic NETs: chest CT or MRI (+ contrast) every 1 to 3 years

ii. PanNET: abdominal/pelvic CT or MRI (+ contrast) every 1 to 3 years and consider serial endoscopic ultrasound (EUS)

iii. Parathyroid: if calcium rises, re-image with neck ultrasound and/or parathyroid sestamibi with single-photon emission computed tomography (SPECT) scan (SPECT-CT preferred) or 4D-CT

iv. Pituitary: pituitary or sella MRI (+ contrast) of the pituitary every 3 to 5 years

e. Poorly differentiated large or small cell carcinoma and/or mixed neuroendocrine/non-neuroendocrine neoplasm or unknown primary, imaging surveillance includes **ALL** of the following:

i. Locoregional unresectable or metastatic disease surveillance imaging includes **EITHER** chest CT (± contrast) with abdominal/pelvic MRI (+

contrast) **OR** chest/abdominal/pelvic multiphasic CT; every 6 weeks to 16 weeks

ii. Resectable surveillance imaging includes **EITHER** chest CT (± contrast) with abdominal/pelvic MRI (+ contrast) **OR** chest/abdominal/pelvic multiphasic CT; every 12 weeks for the 1st year, and every 6 months thereafter

f. Post-operative from potentially curative surgery surveillance for at least 10 years (longer if high-risk)

5. Pancreatic neuroendocrine tumor surveillance imaging, post-resection, includes chest CT (± contrast) as clinically indicated and abdominal multiphasic CT or MRI with imaging frequency of **ONE** of the following:[3]

a. Within 3 to 12 months post-operatively

b. After 12 months, image every 6 to 12 months for 10 years

c. After 10 years as clinically indicated

6. Pheochromocytoma/Paraganglioma surveillance imaging and **ANY** of the following:

a. Locally unresectable disease or distant metastases includes **ANY** of the following:

i. Chest/abdominal/pelvic CT with contrast

ii. Chest CT (± contrast) and abdominal/pelvic MRI without contrast (if risk for hypertensive episode)

iii. FDG-PET/CT for bone dominant disease

iv. Meta-iodobenzylguanidine (MIBG) with single-photon emission computerized tomography/CT (SPECT) (if previous MIBG-positive or concern for disease progression) prior to considering radionuclide therapy

v. SSTR-PET/CT or SSTR-PET/MRI (if previous SSTR-positive or concern for disease progression) prior to considering radionuclide therapy

b. Resectable disease, post-resection includes chest CT (± contrast) and abdominal/pelvic CT or MRI (+contrast), if clinically indicated with imaging frequency of **ONE** of the following:

i. 12 weeks to 12 months after resection

ii. Every 6 to 12 months for the 1st 3 years

iii. Annually from year 4 up to 10.

iv. Annually up to 10 years, then as clinically indicated

TIP

NCCN recommends following the surveillance protocols from designated guidelines for the following hereditary endocrine neoplasia syndromes :

- Thyroid cancer guideline, use for: Multiple endocrine neoplasia, type 2 (MEN2) with genetic evaluation of inherited syndromes
- Kidney cancer, use for:
  - Hereditary paraganglioma/pheochromocytoma syndrome
  - Tuberous sclerosis complex (TSC1 and TSC2)
  - von Hippel Lindau syndrome (VHL)
- Genetic/Familial High-Risk Assessment: Breast, Ovarian, and Pancreatic, use for:
  - Neurofibromatosis type 1 (NF1)
  - Li-Fraumeni syndrome (TP53)
  - Lynch syndrome (MLH1, EPCAM/MSH2, MSH6, PMS2)
- Genetic/Familial High-Risk Assessment: Colorectal, use for:
  - Lynch syndrome (MLH1, EPCAM/MSH2, MSH6, PMS2)
  - Familial adenomatous polyposis (APC)

Occult Primary Cancer Surveillance

NCCN Occult Primary Cancer Version 2.2025

Occult primary cancer surveillance imaging for long-term surveillance includes diagnostic tests based on symptomatology.

Soft Tissue Sarcoma Surveillance

NCCN Soft Tissue Sarcoma Version 3.2024

Soft tissue sarcoma surveillance includes **ANY** of the following: ***NOTE**: *Contrasted imaging is preferred; for long term surveillance to minimize radiation exposure, X-rays or MRI may be substituted.*

1. Desmoid tumor (aggressive fibromatosis) imaging surveillance includes **ANY** of the following:
   a. CT or MRI every 3 to 6 months for 2 to 3 years, then every 6 to 12 months thereafter

b. Ultrasound may be considered for select locations (eg, abdominal wall) for long-term follow-up

2. Retroperitoneal/intra-abdominal, after resection imaging surveillance includes CT or MRI (consider PET/CT) every 3 to 6 months for 2 to 3 years, then every 6 months for the next 2 years, then annually.

3. Stage IA/IB tumor surveillance includes **ALL** of the following:

   a. Chest imaging with CT (+contrast) or MRI (± contrast) as clinically indicated

   b. Magnetic resonance imaging (MRI) at baseline and periodically (frequency based on estimated recurrence)

4. Stage II/III resectable with acceptable functional outcomes surveillance includes **ANY** of the following:

   a. Chest imaging with CT (+contrast) or MRI (± contrast) at end of treatment and periodic imaging of primary site (based on estimated risk of locoregional recurrence)

   b. Chest imaging and imaging of primary site with CT (+contrast) or MRI (± contrast) as clinically indicated

5. Stage II, III or select stage IV (any T, N1, M0), resectable with adverse functional outcomes **OR** unresectable primary disease surveillance imaging includes **ANY** of the following:

   a. Baseline and periodic imaging of primary site as clinically indicated

   b. Chest imaging with CT (+contrast) or MRI (± contrast) as clinically indicated

6. Stage IV synchronous disease imaging surveillance includes **ANY** of the following:

   a. Chest and other known metastatic sites imaging with CT (+contrast) or MRI (± contrast) as clinically indicated

   b. MRI (± contrast) (preferred) and/or CT (+ contrast) at baseline and periodically (frequency based on estimated recurrence)

CT Brain and Head Procedure Codes

Table 1. CT Brain/Head Associated Procedure Codes

CODE	DESCRIPTION
70450	Computed tomography, head or brain; without contrast material
70460	Computed tomography, head or brain; with contrast material(s)

CODE	DESCRIPTION
70470	Computed tomography, head or brain; without contrast material, followed by contrast material(s) and further sections

CT Brain and Head Summary of Changes

CT Brain and Head guideline had the following version changes from 2023 to 2024:

- Added the following to keep in alignment with current evidence:
  - "Cancer of the brain is known" split out from "Cancer is suspected or known"
  - "Head trauma is subacute" under "Headache"
  - "Histiocytic neoplasms" under "Cancer"
  - "History of cancer" indication under "Cancer"
  - Indications under "Intracranial abscess"
  - Indications under "Vision or cranial nerve abnormalities"
  - "Lesion with atypical features" under "Cancer"
  - "Mass of the head" indication
  - Pediatric specific indications
  - "Pituitary tumors" under "Cancer"
  - "Syrinx or syringomyelia" indication
  - "TIA is suspected" under "Stroke"
- Removed the following as current evidence does not support indication:
  - "Aneurysm" indication
  - "Anticonvulsant therapy" under "Seizures disorder"
  - "Staging evaluation" under "Cancer"
- Mid-cycle update: added Pediatric Preamble and pediatric indications

CT Brain and Head Definitions

Abscess is a swollen area within body tissue, containing an accumulation of pus.
Achondroplasia is a bone growth disorder that results in dwarfism due to a genetic mutation in the arms and legs. Achondroplasia is the most common form of short stature (adults less than 4-ft. 10-in. in height).

Alzheimer's disease is a degenerative brain disease of unknown cause that is the most common form of dementia, it usually starts in late middle age or in old age and results in progressive memory loss, impaired thinking, disorientation and changes in personality and mood.
Amnesia is a general term that describes memory loss. The loss can be temporary or permanent, but 'amnesia' usually refers to the temporary variety.
Aneurysm refers to weakness in an artery wall, allowing it to abnormally balloon out or widen.
Anosmia is the loss or impairment of the sense of smell.
Anterior fontanelle is the largest of the six fontanelles, and it resembles a diamond-shape ranging in size from 0.6 cm to 3.6 cm with a mean of 2.1 cm. [2] It forms through the juxtaposition of the frontal bones and parietal bones with the superior sagittal sinus coursing beneath it.
Arteriovenous fistula (AVF) is an abnormal connection between an artery and a vein. It happens when one or more arteries are directly connected to one or more veins or venous spaces called sinuses.
Arteriovenous malformation (AVM) is a tangle of abnormal blood vessels connecting arteries and veins.
Astrocytomas are tumors that originate from the star-shaped cells (astrocytes) that support the brain. They are the most common brain tumors in adults.
Ataxia is a degenerative disease of the nervous system that causes people to have difficulty coordinating their muscles. This can lead to clumsy, unwieldy, or awkward movements. People with ataxia may also lose muscle control in their arms and legs, which can lead to a lack of balance.
Aura is a subjective sensation (as of voices or colored lights or crawling and numbness) experienced at the onset of a neurological condition and especially a migraine or epileptic seizure.
Brain herniation occurs when something inside the skull produces pressure that moves brain tissues. This is most often the result of brain swelling or bleeding from a head injury, stroke, or brain tumor.
Brief Resolved Unexplained Event (BRUE) is an event in an infant that is characterised by a marked change in breathing, tone, colour or level of responsiveness, followed by a complete return to a baseline state, and that cannot be explained by a medical cause. A BRUE is a diagnosis of exclusion.
Bulbar palsy involves problems with function of the glossopharyngeal nerve (CN IX), the vagus nerve (CN X), the accessory nerve (CN XI), and the hypoglossal nerve (CN XII). These all emerge from pathways in the medulla oblongata. A lower motor neuron lesion can impair their function. It includes symptoms such as lip trembling, drooling, dysphonia, weak jaw and facial muscles, pharyngeal muscle weakness.
Central sleep apnea (CSA) is a breathing disorder that causes the body to decrease or stop the effort of breathing during sleep. It is usually caused by an issue in the brain or heart. Certain medications (like pain medications) can cause this breathing pattern too. It is different

from obstructive sleep apnea (OSA) because the problem is not caused by a blockage of the airway. Types of central sleep apnea include Cheyne-Stokes breathing, drug-induced apnea, high-altitude periodic breathing, idiopathic central sleep apnea, medical condition-induced central sleep apnea and treatment-emergent central sleep apnea. Symptoms of central sleep apnea include difficulty falling asleep, excessive daytime sleepiness (EDS), frequent nighttime awakening, pause in breathing, and waking up short of breath.

Central vertigo is a clinical condition that causes people to experience hallucinations of motion or a sensation of spinning while remaining still. It's caused by a dysfunction of the vestibular structures in the central nervous system (CNS).

Cerebral Palsy (CP) is a term for a group of neurological disorders that affect a person's ability to move, maintain balance, and posture. CP is the most common motor disability in childhood.

Cerebrospinal fluid (CSF) is a colorless liquid that is comparable to serum, is secreted from the blood into the lateral ventricles of the brain, and serves chiefly to maintain uniform pressure within the brain and spinal cord.

Chiari malformation (Arnold-Chiari syndrome) is a congenital abnormality in which the lower surface of the cerebellum and the lower brain stem protrude into the spinal canal through the foramen magnum.

Chorea is a hyperkinetic movement disorder characterized by involuntary brief, random, and irregular contractions conveying a feeling of restlessness to the observer.

Cluster headache is a type of headache that is characterized by severe pain in the eye or temple and tends to recur in a series of attacks.

Coagulopathy is a condition in which the blood's ability to coagulate (form clots) is impaired.

Compression is reducing in size, quantity or volume, as if by squeezing.

Computed tomography (CT) refers to a computerized X-ray imaging procedure in which a three-dimensional image of a body structure is revealed through a series of cross-sectional images or "slices."

Computed tomography angiography (CTA) is a medical test that combines a computed tomography (CT) scan with an injection of a special dye to produce pictures of blood vessels and tissues in a part of the body.

Congenital is a condition or trait present from birth.

Craniosynostosis is the premature fusion of the sutures of the skull.

C-reactive protein (CRP) is a pentameric protein synthesized by the liver, whose level rises in response to inflammation.

Cyclical vomiting syndrome (CVS) is a rare disorder that usually starts in childhood. It causes repeated episodes of being sick (vomiting) and feeling sick (nausea). The cause of CVS is not fully understood. The vomiting episodes are not caused by an infection or another illness.

Dementia is a usually progressive condition marked by the development of multiple cognitive deficits, such as memory impairment, aphasia and the inability to plan and initiate complex behavior.

Diffuse Lewy body disease is a neurodegenerative disorder characterized by dementia, fluctuations in mental status, hallucinations, and parkinsonism.
Diplopia is a disorder of vision in which two images of a single object are seen (as from unequal action of the eye muscles).
Dissection is the abnormal and usually abrupt formation of a tear or separation of the layers inside the wall of an artery.
Drop metastases are intradural extramedullary spinal metastases that arise from intracranial lesions.
Dural venous sinuses are a group of sinuses or blood channels that drains venous blood circulating from the cranial cavity. It collectively returns deoxygenated blood from the head to the heart to maintain systemic circulation.
Electronystagmography is a test that looks at eye movements to see how well nerves in the brain are working. These nerves are: Vestibular nerve (eighth cranial nerve), which runs from the brain to the ears and oculomotor nerve, which controls eye movement.
Embolism is an obstruction of an artery, typically by a clot of blood or an air bubble.
Encephalitis is inflammation of the brain.
Encephalopathy is a disease, damage, or malfunction of the brain.
Endocarditis is inflammation of the inside lining of the heart chambers and heart valves (endocardium). It is caused by a bacterial or rarely, a fungal infection.
Epilepsy is a brain disorder that causes repeated seizures. A seizure is a sudden change in behavior caused by a temporary change in the brain's electrical activity.
Erdheim-Chester Disease (ECD) is a rare blood disorder that causes the body to produce too many white blood cells. These cells, called histiocytes, are large phagocytic cells that normally respond to injury and infection. ECD is characterized by the accumulation of histiocytes in multiple tissues and organs.
Funduscopic exam, also known as ophthalmoscopy, is an eye exam that examines the back of the eye. The fundus is the medical term for the inner part of the back of the eye. It includes the retina, optic disc, choroids, and blood vessels. This exam is performed by any doctor, not just an opthamologist.
Glioma is a type of tumor that occurs in the brain and spinal cord.
Global developmental delay (GDD) is term used for children under 5 years of age. It is defined as a significant delay in two or more domains of development, including activities of daily living as well as motor, cognitive, speech/language, and personal/social skills.
Head Thrust Test is used to identify individuals with hypofunction of the vestibulo-ocular reflex unilaterally and bilaterally.
Hematoma is a mass of usually clotted blood that forms in a tissue, organ or body space as a result of a broken blood vessel.
Hemiballismus is a rare neurological movement disorder characterized by involuntary, rapid, and forceful movements of the limbs on one side of the body. It is often caused by damage to a

specific area of the brain called the subthalamic nucleus, which can result from various factors such as stroke, tumor, or infection.

Hemicrania continua is a chronic and persistent form of headache marked by continuous pain that varies in severity and always occurs on the same side of the face and head.

Hemorrhage is a copious or heavy discharge of blood from the blood vessels.

Hereditary cancer syndromes are present when a person, because of an inherited mutation, has an increased risk of developing certain tumors which can already develop at a relatively early age. In most known hereditary malignant syndromes the elevated cancer risk is due to a mutation of a single gene (monogenic hereditary diseases).

Histiocytic neoplasms are rare hematologic disorders accounting for less than 1% of cancers of the soft tissue and lymph nodes. Clinical presentation and prognosis of these disorders can be highly variable, leading to challenges for diagnosis and optimal management of these patients.

Horner's syndrome is a syndrome marked by sinking in of the eyeball, constriction of the pupil (miosis), drooping of the upper eyelid (ptosis), face vasodilation and anhidrosis (abnormal deficiency or absence of sweating) caused by paralysis of the cervical sympathetic nerve fibers on the affected side.

Huntington's disease is a hereditary brain disorder that is a progressive, neurodegenerative condition marked especially by impairments in thinking and reasoning, disturbances of emotion and behavior and the involuntary spasmodic movements of chorea that is associated with the loss or atrophy of nerve cells in the basal ganglia especially of the caudate nucleus and putamen.

Hydrocephalus is an abnormal increase in the amount of cerebrospinal fluid within the cranial cavity (as from obstructed flow, excess production, or defective absorption) that is accompanied by expansion of the cerebral ventricles and often increased intracranial pressure, skull enlargement, and cognitive decline.

Hypertension (high blood pressure) is when the force of the blood flowing through blood vessels, is consistently too high. Blood pressure is made up of two numbers: systolic and diastolic. Systolic pressure is the pressure when the ventricles pump blood out of the heart. Diastolic pressure is the pressure between heartbeats when the heart is filling with blood. [4,5]

Blood Pressure Classification[6]

Table 1. Blood Pressure Classification

Blood Pressure Category	Systolic mm Hg (upper number)	and/or	Diastolic mm Hg (lower number)
Normal	Less than 120	and	Less than 80

[4]American Heart Association (AHA), "Health Topics." [Online]. Available: www.heart.org

[5]U.S. Department of Health & Human Services, National Heart, Blood and Lung Institute (NIH), "Health Topics." [Online]. Available: www.nhlbi.nih.gov/lbi.nih.gov

[6]American Heart Association (AHA), "Health Topics." [Online]. Availabile: www.heart.org

Blood Pressure Category	Systolic mm Hg (upper number)	and/or	Diastolic mm Hg (lower number)
Elevated	120-129	and	Less than 80
High blood pressure (Hypertension) Stage 1	120-139	or	80-89
High blood pressure (Hypertension) Stage 2	140 or higher	or	90 or higher
Hypertensive Crisis	Higher than 180	and/or	Higher than 120

Immunosuppression refers to stopping the bodily response to an antigen that occurs when lymphocytes identify the antigenic molecule as foreign, then induce the formation of antibodies and lymphocytes capable of reacting, rendering it harmless.

Increased intracranial pressure (ICP) is a dangerous condition that occurs when pressure inside the skull increases. It can be caused by a brain injury or other medical condition.

Indeterminate findings are inconclusive or insufficient for treatment planning.

Intracranial shunt is a thin plastic tube that helps drain extra cerebrospinal fluid (CSF) from the brain.

Ischemic stroke occurs when the blood supply to part of the brain is interrupted or reduced, preventing brain tissue from getting oxygen and nutrients. Brain cells begin to die in minutes.

Langerhans cell histiocytosis (LCH) is a rare, cancer-like condition that occurs when the body produces too many immature Langerhans cells.

Leptomeningeal carcinomatosis is cancer involving the pia mater and arachnoid mater. It occurs when cancer cells spread to the leptomeninges, which are the thin tissue layers that cover the brain and spinal cord.

Lumbar puncture is a puncture of the subarachnoid space in the lumbar region of the spinal cord to withdraw cerebrospinal fluid or inject medications.

Macrocephaly is the condition in which the head circumference of an infant is above 2 standard deviations, which is above the 97th percentile.

Magnetic resonance imaging (MRI) is a non-invasive diagnostic technique that produces computerized images of internal body tissues and is based on nuclear magnetic resonance of atoms within the body induced by the application of radio waves.

Meningioma is a slow-growing, encapsulated, typically benign tumor arising from the meninges and often causes damage by pressing upon the brain and adjacent parts.

Meningitis is an inflammation (swelling) of the protective membranes covering the brain and spinal cord. A bacterial or viral infection of the fluid surrounding the brain and spinal cord usually causes the swelling.

Metastasis is the spread of a disease-producing agency (such as cancer cells) from the initial or primary site of disease to another part of the body.

Microcephaly is a condition of abnormal smallness of the circumference of the head that is present at birth or develops within the first few years of life and is often associated with developmental delays, impaired cognitive development, poor coordination and balance, deficits in hearing and vision, and seizures.

Mini-Mental State Examination is a set of 11 questions that doctors and other healthcare professionals commonly use to check for cognitive impairment (problems with thinking, communication, understanding and memory).

A **Migraine (typical)** is a headache that can cause severe throbbing pain or a pulsing sensation, usually on one side of the head. It's often accompanied by nausea, vomiting, and extreme sensitivity to light and sound.

Montreal Cognitive Assessment (MoCA) is a brief test of cognitive function, taking 10 minutes to administer. It assesses short-term memory, visuospatial function, executive function, attention, concentration and working memory, language, and orientation.

Neuralgia is acute paroxysmal pain radiating along the course of one or more nerves usually without demonstrable changes in the nerve structure

Neurocutaneous disorders are disorders that affect the brain, spinal cord, organs, skin, and bones. The diseases are lifelong conditions that can cause tumors to grow in these areas.

Neurofibromatosis is a rare genetic disorder that causes benign tumors to grow on nerves and other parts of the body. There are three types of neurofibromatosis: neurofibromatosis 1 (NF1), neurofibromatosis 2 (NF2) and schwannomatosis.

Neuropathy is damage, disease or dysfunction of one or more nerves, especially of the peripheral nervous system, that is typically marked by burning or shooting pain, numbness, tingling, muscle weakness or atrophy It is often degenerative and is usually caused by injury, infection, disease, drugs, toxins or vitamin deficiency.

Neurocutaneous disorders are disorders that affect the brain, spinal cord, organs, skin, and bones. The diseases are lifelong conditions that can cause tumors to grow in these areas.

Non-diagnostic is a result that does not lead to a confirmed diagnosis.

Nystagmus is a visual condition in which the eyes make repetitive, uncontrolled movements. These movements often result in reduced vision and depth perception and can affect balance and coordination; and can occur from side to side, up and down, or in a circular pattern.

Pediatric approximate ages are defined by the US Department of Health (USDH), the Food and Drug Administration (FDA), and the American Academy of Pediatrics (AAP) as the following:

- Infancy, between birth and 2 years of age
- Childhood, from 2 to 12 years of age
- Adolescence, from 12 to 21 years of age, further defined by the AAP into:
    1. Early (ages 11–14 years)
    2. Middle (ages 15–17 years),

3. Late (ages 18–21 years)
4. Older ages may be appropriate for children with special healthcare needs.

Ocular palsy is the decreased strength of a muscle, which produces a reduced rotational movement of the eyeball in the direction corresponding to the paralysed muscle.
Optic nerve infiltrative disorders have an optic disc that is truly swollen, a disc that appears swollen but is acutally infiltrated with underlying lesion or a normal disc.
Optic neuritis is inflammation of the optic nerve.
Orthostatic headache is a headache while upright, that is relieved by lying down.
Otorrhea is drainage of liquid from the ear.
Papilledema is a disease that causes swelling of the optic discs in both eyes. This swelling is caused by increased intracranial pressure (ICP).
Parkinson's disease is a chronic progressive neurological disease chiefly of later life that is linked to decreased dopamine production in the substantia nigra and is marked especially by tremor of resting muscles, rigidity, slowness of movement, impaired balance and a shuffling gait.
Paroxysmal hemicrania is a rare form of headache that brings on severe throbbing and claw-like pain usually on one side of the face near the eye and occasionally around the back of the neck. The pain may be accompanied by red and tearing eyes.
Pediatric approximate ages are defined by the US Department of Health (USDH), the Food and Drug Administration (FDA), and the American Academy of Pediatrics (AAP) as the following:

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    1. Early (ages 11–14 years)
    2. Middle (ages 15–17 years),
    3. Late (ages 18–21 years)
    4. Older ages may be appropriate for children with special healthcare needs.

Polysomnogram (PSG) is a sleep study that records physiological variables while you sleep. The test is used to diagnose sleep disorders.
Post-concussive syndrome (PCS) occurs when symptoms of a mild traumatic brain injury last longer than expected after an injury. These symptoms may include headaches, dizziness, and problems with concentration and memory. They can last weeks to months.
Pseudobulbar affect (PBA) is a condition that's characterized by episodes of sudden uncontrollable and inappropriate laughing or crying. Pseudobulbar affect typically occurs in people with certain neurological conditions or injuries, which might affect the way the brain controls emotion.
Recurrence is a new occurrence of something that happened or appeared before.

Rhinorrhea is excessive mucous drainage from the nose.
Rosai-Dorfman disease is an uncommon histiocytic disorder most frequently presenting as bilateral cervical lymphadenopathy in children and young adults.
Screening does not diagnose the illness. The goal is early detection and lifestyle changes or surveillance, to reduce the risk of disease, or to detect it early enough to treat it most effectively.
Seizure is a sudden, uncontrolled electrical disturbance in the brain. It can cause changes in behavior, movements or feelings, and in levels of consciousness.
Sentinel headache is headache characterized by sudden, severe head pain, often described as "the worst headache of my life." It is sometimes called a "thunderclap" headache. The pain usually peaks within five minutes, persists for at least one hour and may be accompanied by nausea or vomiting.
Short-lasting unilateral neuralgiform headache is a rare primary headache disorder that comes with infrequent attacks that last seconds. The pain can be severe stabbing on one side of the face.
Shunt is a hollow tube surgically placed in the brain (or occasionally in the spine) to help drain cerebrospinal fluid and redirect it to another location in the body where it can be reabsorbed.
Sickle cell disease is a chronic anemia that occurs in individuals who are homozygous for the gene controlling hemoglobin S (eg, African or Mediterranean descent). It is characterized by destruction of red blood cells and by episodic blocking of blood vessels by the adherence of sickle cells to the vascular endothelium. This causes the serious complications of the disease (such as organ failure).
Skew deviation can be clinically assessed at the bedside using the cross-cover or alternating-cover test (aka as test of skew).
Spontaneous intracranial hypotension (SIH) is a condition in which the fluid pressure inside the skull is lower than normal.
Staging in cancer is the process of determining how much cancer is within the body (tumor size) and if it has metastasized (spread).
Strabismus is a disorder in which both eyes do not line up in the same direction, therefore, they do not look at the same object at the same time and is caused by an imbalance of the muscles of the eyeball.
Stroke, sometimes called a brain attack, occurs when something blocks blood supply to part of the brain or when a blood vessel in the brain bursts. In either case, parts of the brain become damaged or die. A stroke can cause lasting brain damage, long-term disability, or even death.
Subdural hematoma occurs when a blood vessel in the space between the skull and the brain (the subdural space) is damaged. Blood escapes from the blood vessel, leading to the formation of a blood clot (hematoma) that places pressure on the brain and damages it.
Surveillance in cancer is the ongoing, timely and systematic collection and analysis of information on new cancer cases, extent of disease, screening tests, treatment, survival and cancer deaths.

Syncope is loss of consciousness resulting from insufficient blood flow to the brain.
Thrombosis is the formation of a blood clot (partial or complete blockage) within blood vessels, whether venous or arterial, limiting the natural flow of blood and resulting in clinical sequela.
Thunderclap headache is an uncommon type of headache that strikes suddenly, the pain peaks within 60 seconds and can warn of potentially life-threatening conditions (usually having to do with bleeding in and around the brain).
Transient ischemic attack (TIA) is a brief interruption of the blood supply to the brain that causes a temporary impairment of vision, speech or movement. The episode usually lasts for just a few moments but may be a warning sign of a full scale stroke.
Trigeminal autonomic cephalalgia (TAC) is a type of primary headache characterized by intense pain on one side of the head in the area where the trigeminal nerve is located, that may cause autonomic symptoms (watering eye, red eye, drooping eyelid, and leaking nose) on the same side of the head where the pain occurs.
Ultrasound is the diagnostic or therapeutic use of ultrasound and especially a noninvasive technique involving the formation of a two-dimensional image used for the examination and measurement of internal body structures and the detection of bodily abnormalities.
Valsalva maneuver is the action of attempting to exhale with the nostrils and mouth or the glottis, closed. This increases pressure in the middle ear and the chest, as when bracing to lift heavy objects and is used as a means of equalizing pressure in the ears.
Vasculitis involves inflammation of the blood vessels. The inflammation can cause the walls of the blood vessels to thicken, which reduces the width of the passageway through the vessel. If blood flow is restricted, it can result in organ and tissue damage.
Vertical Gaze Nystagmus Test looks for jerking as the eyes move up, and are held for about 4 seconds at maximum elevation.
Vertigo is a sensation of motion or spinning that is often described as dizziness. People with vertigo feel as though they are actually spinning or moving, or that the world is spinning around them.
Videonystagmography is a test that measures a type of involuntary eye movement called nystagmus using special goggles with cameras.

CT Brain and Head References

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