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2025 Magnetic Resonance (MR) Spectroscopy

Diagnostic Imaging

MRI-Spectroscopy-HH

Last Review Date: 05/08/2025
Previous Review Date: 10/28/2024
Guideline Initiated: 09/06/2023

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Magnetic Resonance (MR) Spectroscopy

NCD 220.2
NO clinical criteria for MRI as of 12/15/2025
See also, **NCD 220.2**: Magnetic Resonance Imaging at https://www.cms.gov/medicare-coverage-database/search.aspx *if applicable to individual's healthplan membership*.

Clinical Judgment

These medical policies are designed to provide clinical guidance and do not supplant a provider's independent professional judgment. Physicians retain full and independent authority to determine appropriate care based on each patient's individual clinical circumstances. Although services may be subject to documentation requirements, medical necessity review, or coverage limitations, nothing in this policy is intended to restrict or interfere with a physician's independent medical judgment.

MRI General Contraindications

MRI is contraindicated for **ANY** of the following:

- Safety, related to clinical status (body mass index exceeds MRI capability, intravascular stents within recent 6 weeks)
- Safety, related to implanted devices (aneurysm clips, cochlear implant, implantable cardio-defibrillators, insulin pump, permanent pace maker, spinal cord stimulator)[1]
  References: [8] [2] [5]

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.

MR Spectroscopy Guideline

Magnetic resonance spectroscopy (MRS) of the brain is considered medically appropriate when the documentation demonstrates **ANY** of the following:

[1]Some implanted devices that were once absolute contraindications to a MRI may now be accepted, including if the specific MRI is able to accommodate the device or the device itself is deemed safe for MRI.

1. Brain tumors are known and **ANY** of the following:
    a. Biopsy localization guidance
    b. Brain tumor is recurrent, to distinguish from radiation-induced tumor necrosis.
    c. Gliomas, to differentiate from **ANY** of the following:
        i. Demyelination
        ii. Edema
        iii. Infection
        iv. Low grade from high grade
        v. Lymphoma
        vi. Metastasis
        vii. Necrosis
    d. Treatment planning and response

    References: [11] [9] [3]
2. Epilepsy for pre-surgical evaluation
    References: [9] [12]
3. Encephalopathy (eg, hepatic, hypoxic ischemic encephalopathy [HIE], metabolic, toxic), for prognosis evaluation
    References: [4]
4. Magnetic resonance imaging (MRI) is non-diagnostic or indeterminate, and therapy evaluation/planning is needed with **ANY** of the following conditions:
    a. Alexander disease (ALX, AXD) (eg, ALX, AXD, demyelinogenic leukodystrophy)
    b. Globoid cell leukodystrophy (Krabbe disease)
    c. Hypomyelination and congenital cataract
    d. Megalencephalic leukoencephalopathy with subcortical cysts
    e. Metachromatic leukodystrophy (MCL)
    f. Mitochondrial disorders (eg, mitochondrial myopathy, encephalopathy, lactic acidosis, stroke-like episode [MELAS], Leigh's syndrome, Kearns-Sayre syndrome)
    g. Pelizaeus-Merzbacher disease (PMD)
    h. Vanishing White Matter disease (VWM) (eg, leukoencephalopathy with vanishing white matter [VWM], childhood ataxia with CNS hypomyelination [CACH syndrome], CACH/VWM)

i. X-linked adrenoleukodystrophy (X-ALD), (eg, X-ALD, cerebro adrenoleukodystrophy [CALD])

References: [1]

5. Metabolic disorders (eg, Canavan disease, creatine deficiency, Maple Syrup Urine disease, nonketotic hyperglycemia) for diagnosing and monitoring
   References: [9] [6] [10]
6. Mitochondrial disorder (eg, Leber hereditary optic neuropathy, Leigh syndrome, myoclonic epilepsy with ragged red fibers [MERRF])
   References: [9] [12]
7. Multiple sclerosis
   References: [9] [12]
8. Traumatic brain injury
   References: [9] [7]

MR Spectroscopy Summary of Changes

MR Spectroscopy guideline had the following version changes from 2024 to 2025:

Table 1. 2025 MR Spectroscopy Summary of Changes

Date	Type of Change	Summary
05/08/2025	Annual	• Citations updated per the evidence. • Evidence reviewed and indications remain the same.

MR Spectroscopy Procedure Codes

Table 1. Magnetic Resonance Spectroscopy Associated Procedure Codes

CODE	DESCRIPTION
76390	Magnetic resonance spectroscopy

MR Spectroscopy Definitions

Alexander disease is one of a group of neurological conditions known as the leukodystrophies. Leukodystrophies are disorders that result from abnormalities in myelin, the "white matter" that protects nerve fibers in the brain.

Ataxia is a pathological abnormality of organization or modulation of movement, typically caused by cerebellar dysfunction, but can also result from lesions in the corticospinal tract or dorsal columns of the spinal cord.

Biopsy is a medical procedure in which a sample of tissue or cells is removed from the body for examination under a microscope. This is done to diagnose or monitor various medical conditions, including cancer, infections and other diseases.

Canavan disease is a fatal, progressive leukodystrophy with autosomal recessive inheritance, caused by mutations in the gene for aspartoacylase, leading to elevated levels of N-acetylaspartate, brain edema, and dysmyelination.[

Cerebral adrenoleukodystrophy (CALD) a severe form of adrenoleukodystrophy (ALD), is a rare, X-linked genetic disorder causing progressive damage to the brain's white matter, leading to rapid neurological decline and, if untreated, death.

Demyelination is any condition that causes damage to the protective covering (myelin sheath) that surrounds nerve fibers.

Demyelinogenic leukodystrophy a group of rare, progressive, genetic disorders, primarily affects the white matter of the brain, causing damage to the myelin sheath that insulates nerve fibers.

Edema an abnormal infiltration and excess accumulation of serous fluid in connective tissue or in a serous cavity.

Encephalopathy is a disease, damage or malfunction of the brain.

Epilepsy is a chronic neurological disorder characterized by recurrent unprovoked seizures due to abnormal excessive or synchronous neuronal activity in the brain.

Glioma are primary central nervous system (CNS) tumors that originate from glial cells or neural stem/progenitor cells and are classified into various types and grades based on histological and molecular characteristics.

Globoid Cell Leukodystrophy (Krabbe disease) is a severe neurodegenerative disorder caused by a deficiency in the enzyme galactosylceramidase (GALC), leading to the accumulation of toxic substances that damage myelin in the nervous system

Hepatic encephalopathy (HE) is a brain dysfunction caused by liver disease, specifically when the liver fails to remove toxins from the blood, leading to their accumulation in the brain and causing neurological and psychiatric symptoms.

Hypomyelination is a permanent deficiency in the formation of myelin, the fatty substance that insulates nerve fibers and promotes rapid transmission of nerve impulses, typically identified by MRI findings of reduced or absent myelin development in the white matter of the brain.

Indeterminate findings are inconclusive or insufficient for treatment planning.

Ischemia is a deficient supply of blood to a body part (such as the heart or brain) due to obstruction of the inflow of arterial blood.

Kearns-Sayre syndrome is a rare neuromuscular disorder with onset usually before the age of 20 years. It is the result of abnormalities in the DNA of mitochondria (small rod-like structures found in every cell of the body that produce the energy that drives cellular functions).

Krabbe disease is a severe neurodegenerative disorder caused by a deficiency in the enzyme galactosylceramidase (GALC), leading to the accumulation of toxic substances that damage myelin in the nervous system

Leber hereditary optic neuropathy (LHON) is a maternally inherited mitochondrial disease characterized by acute or subacute painless loss of central vision, primarily affecting young males.

Leigh's syndrome is a severe, progressive neurodegenerative disorder that typically presents in infancy or early childhood and often leads to death within a few years due to respiratory failure.

Leukodystrophy is a group of genetically determined disorders characterized by progressive degeneration of the central nervous system white matter due to abnormalities in myelin production or maintenance.

Lymphoma is a type of blood cancer that affects the immune system. Lymphoma occurs when abnormal white blood cells, called lymphocytes, grow in the lymphatic system.

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.

Magnetic Resonance Spectroscopy (MRS) is an analytical tool that detects radio frequency electromagnetic signals that are produced by the atomic nuclei within molecules. It can be used to obtain in situ concentration measures for certain chemicals in complex samples, such as the living brain.

Maple Syrup Urine disease (MSUD) is a rare autosomal recessive disorder characterized by the inability to properly metabolize branched-chain amino acids, leading to toxic accumulation of these substances in the body.

Megalencephalic leukoencephalopathy with subcortical cysts (MLC) is a rare genetic disorder characterized by an enlarged brain, abnormal white matter, and subcortical cysts, leading to motor dysfunction, epilepsy, and mild to moderate intellectual disability.

Metachromatic leukodystrophy is a rare, inherited lysosomal storage disorder characterized by the accumulation of sulfatides due to a deficiency of the enzyme arylsulfatase A (ARSA), leading to progressive demyelination in the central and peripheral nervous systems.

Metastases 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.

Mitochondria are an organelle found in large numbers in most cells, in which the biochemical processes of respiration and energy production occur. It has a double membrane, the inner layer being folded inward to form layers (cristae).

Myoclonic epilepsy with ragged red fibers (MERRF) is a rare mitochondrial disorder characterized by progressive myoclonus, generalized epilepsy, ataxia and the presence of ragged red fibers in muscle biopsy.

Myopathy is a general term referring to any disease that affects the muscles that control voluntary movement in the body.

Multiple sclerosis (MS) is a demyelinating disease marked by patches of hardened tissue in the brain or the spinal cord and associated especially with partial or complete paralysis and jerking muscle tremor.
Necrosis is localized death of living tissue.
Non-diagnostic is a result that does not lead to a confirmed diagnosis.
Nonketotic hyperglycinemia is a disorder characterized by abnormally high levels of a molecule called glycine in the body (hyperglycinemia). The excess glycine builds up in tissues and organs, particularly the brain. Affected individuals have serious neurological problems.
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:

1. Infancy, between birth and 2 years of age
2. Childhood, from 2 to 12 years of age
3. Adolescence, from 12 to 21 years of age, further defined by the AAP into:
    a. Early (ages 11–14 years)
    b. Middle (ages 15–17 years),
    c. Late (ages 18–21 years)
    d. Older ages may be appropriate for children with special healthcare needs.

Pelizaeus-Merzbacher disease is a disorder that affects the brain and spinal cord. It is a type of leukodystrophy and is characterized by problems with coordination, motor skills and learning. It is caused by an inability to form myelin due to genetic changes in the PLP1 gene.
Radiation necrosis refers to the death of healthy tissue caused by radiation therapy, occurring as a complication of radiotherapy or radiosurgery, where the tissue at the original tumor site or within the irradiated area undergoes cell death due to damage from radiation, often developing months to years after treatment is completed; it is considered a severe side effect of radiation therapy.
Recurrence is a new occurrence of something that happened or appeared before.
Vanishing white matter (VWM) disease is an inherited condition caused by a faulty gene. Children with VWM disease have a defective protein that prevents the body from making enough myelin, a white, fatty substance that insulates nerve fibers, protecting them from damage.
X-linked adrenoleukodystrophy (X-ALD) is a genetic disease that affects the nervous system and the adrenal glands (small glands located on top of each kidney). People with this disease often have progressive loss of the fatty covering (myelin) that surrounds the nerves in the brain and spinal cord.

MR Spectroscopy References

[1] Abbaspour, F., Mohammadi, N., . . . Hormozi-Moghaddam. Z. (2024). Applications of magnetic resonance spectroscopy in diagnosis of neurodegenerative diseases: A systematic review. *Heliyon, 10*(9), e30521.

[2] Carpenter, J.P., Litt, H. & Gowda, M. (2023). Magnetic Resonance Imaging and Arteriography. A.N. Sidawy (Eds.). *Rutherford's Vascular Surgery and Endovascular Therapy* (30). (pp. 336-394.e4). Philadelphia, PA: Elsevier.

[3] Galijasevic, M., Steiger, R., . . . Grams, A.E. (2022) . Magnetic Resonance Spectroscopy in Diagnosis and Follow-Up of Gliomas: State-of-the-Art. *Cancers, 14*(13), 3197.

[4] Groenendaal, F. & De Vries, L.S. (2025). Hypoxic-Ischemic Encephalopathy. R.J. Martin & A.A. Fanaroff (Eds.) *Fanaroff and Martin's Neonatal-Perinatal Medicine* (12), (pp. 1059-1084). Philadelphia: Elsevier.

[5] Gupta, S.K., Ya'qoub, L., . . . Saeed, I.M. (2020). Safety and Clinical Impact of MRI in Patients with Non–MRI-conditional Cardiac Devices. *Radiology: Cardiothoracic Imaging, 2*(5), e200086.

[6] Hongel, G., Niess, E., . . . Strasser. B. (2022). Emerging methods and applications of ultra-high field MR spectroscopic imaging in the human brain. *Analytical Biochemistry, 638*, 11479.

[7] Joyce, J.M., La, P.L., . . . Harris, A.D. (2022). Magnetic Resonance Spectroscopy of Traumatic Brain Injury and Subconcussive Hits: A Systematic Review and Meta–Analysis. *Journal of Neurotrauma, 39*(20), 1455-1476.

[8] Maralani, P.J., Schieda, N., . . . Weinreb, J. (2020). MRI safety and devices: An update and expert consensus. *Journal of Magnetic Resonance Imaging, 51*(3), 657-674.

[9] Maudsley, A.A., Andronesi, O.C., . . . Soher, B.J. (2021). Advanced magnetic resonance spectroscopic neuroimaging: Experts' consensus recommendations. *NMR in Biomedicine, 34*(5), e4309.

[10] Radhakrishnan, R., Shea, L.A.G., . . . Rigsby, C.K. (2022). ACR Appropriateness Criteria Ataxia-Child. *Journal of the American College of Radiology, 19*(11), S240-S255.

[11] Weinberg, B.D., Kuruva, M., . . . Mullins, M.E. (2021). Clinical Applications of Magnetic Resonance Spectroscopy in Brain Tumors: From Diagnosis to Treatment. *Radiologic Clinics of North America, 59*(3), 349-362.

[12] Whitehead, M.T. & Blumi, S. (2021). Proton and Multinuclear Spectroscopy of the Pediatric Brain. *Magnetic Resonance Imaging Clinics of North America, 29*(4), 543-555.

Disclaimer section

Purpose

The purpose of the HealthHelp's clinical guidelines is to assist healthcare professionals in selecting the medical service that may be appropriate and supported by evidence to safely improve

outcomes. Medical information is constantly evolving, and HealthHelp reserves the right to review and update these clinical guidelines periodically. HealthHelp reserves the right to include in these guidelines the clinical indications as appropriate for the organization's program objectives. Therefore the guidelines are not a list of all the clinical indications for a stated procedure, and associated Procedure Code Tables may not represent all codes available for that state procedure or that are managed by a specific client-organization.

Clinician Review

These clinical guidelines neither preempt clinical judgment of trained professionals nor advise anyone on how to practice medicine. Healthcare professionals using these clinical guidelines are responsible for all clinical decisions based on their assessment. All Clinical Reviewers are instructed to apply clinical indications based on individual patient assessment and documentation, within the scope of their clinical license.

Payment

The use of these clinical guidelines does not provide authorization, certification, explanation of benefits, or guarantee of payment; nor do the guidelines substitute for, or constitute, medical advice. Federal and State law, as well as member benefit contract language (including definitions and specific contract provisions/exclusions) take precedence over clinical guidelines and must be considered first when determining eligibility for coverage. All final determinations on coverage and payment are the responsibility of the health plan. Nothing contained within this document can be interpreted to mean otherwise.

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National and Local Coverage Determination (NCD and LCD)

NOTICE
To ensure appropriate review occurs to the most current NCD and/or LCD, always defer to https://www.cms.gov/medicare-coverage-database/search.aspx.

Background

National Coverage Determinations (NCD) and Local Coverage Determinations (LCD) are payment policy documents outlined by the Centers for Medicare and Medicaid Services (CMS) and the government's delegated Medicare Audit Contractors (MACs) that operate regionally in jurisdictions.

CMS introduced variation between different jurisdictions/Medicare Audit Contractors (MACs) and their associated covered code lists with the transition to ICD 10. The variation resulted in jurisdictions independently defining how codes are applied for exclusions, limitations, groupings, ranges, etc. for the medical necessity indications outlined in the NCD and LCD. Due to this variation, there is an inconsistent use/application of codes and coverage determinations across the United States between the different MACs.

In addition, **WITHOUT** notice, CMS can change the codes that indicate medical necessity and the format of the coverage determinations/associated documents (eg, Articles). This is an additional challenge for organizations to keep up with ongoing, unplanned changes in covered codes and medical necessity indications.

Medical Necessity Codes

Due to the variation in code application between jurisdictions/MACs and that updates can happen without notification, HealthHelp is not able to guarantee full accuracy of the codes listed for any Coverage Determination, and advises that prior to use, the associated Coverage Determination Articles are reviewed to ensure applicability to HealthHelp's programs and any associated NCDs and LCDs.

For Internal Use Only:

11248 11249 11253 11282 11325 11328 11333 11349 11350 11351 11352 11354 11355 11356 11358 11359 11360 11361 11362 11365 11366 11367 11368 11369 11370 11374 11375 11394 11395 11396 11565