Evolent Clinical Guideline 2010 ~~003~~ for ~~Brain~~ Magnetic Resonance Spectroscopy (MRS)

Guideline ~~or Policy~~ Number:	Applicable Codes	
Evolent_CG_2010~~003~~		
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Original Date:	**Last Revised Date:**	**Implementation Date:**
April 2007	June ~~May~~ 2025~~4~~	January 2025~~6~~

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STATEMENT

General Information

- *It is an expectation that all patients receive care/services from a licensed clinician. All appropriate supporting documentation, including recent pertinent office visit notes, laboratory data, and results of any special testing must be provided. 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.*

Purpose

Magnetic Resonance Spectroscopy ~~(1)~~

Magnetic resonance spectroscopy (MRS) is a noninvasive imaging technique which can be useful when conventional imaging (CT or MR) provides limited information regarding a specific clinical question. MRS is sensitive but not specific and results should be closely correlated with clinical history, physical examination, laboratory results, and diagnostic imaging studies.~~(2)~~ Magnetic resonance spectroscopy (MRS) should be considered as an adjunct to conventional imaging rather than replacement for histopathological evaluation. (1)

INDICATIONS FOR BRAIN MRS (2)~~(2)~~

- ~~For the evaluation~~ of ~~primary or secondary neoplasms to: (ACR 2024)~~a
- ~~identify of a~~ recurrent or residual brain tumor to differentiate from post-treatment changes, e.g., radiation necrosis. (2–4)~~(2,3,4)~~
-
- ~~differentiate tumor histologies~~
- For further evaluation of a brain lesion to distinguish a brain tumor from other non-tumor diagnoses (e.g., abscess or other infectious or inflammatory process).

- ~~grading primary glioma~~

~~For further evaluation of a brain lesion to distinguish a brain tumor from other non-tumor diagnoses~~Differentiation of cystic lesions

  - ~~Abscess~~
  - ~~Cystic metastasis~~
  - ~~cystic neoplasm~~
  - ~~other inflammatory process~~ (e.g., abscess or other infectious or inflammatory process)~~(1,5)~~
- For s~~S~~uspected inherited metabolic disorders such as Canavan disease and primary mitochondrial disorders. (5)
  - Can be done in combination with Brain MRI if~~when~~ not previously performed. (6,7)

NOTE: MRS remains experimental/investigational for

- Pre-operative grading and differentiation of high grade from low grade gliomas (3,8)
- Most inherited metabolic conditions (5) (excluding Canavan disease and primary mitochondrial disorders, see above)
- N~~n~~eurodegenerative disease, epilepsy, stroke, traumatic brain injury and neonatal hypoxia-ischemia (9,10)
- ~~For evaluation of suspected or evident brain infection~~
- ~~For evaluation of:~~
  - ~~neurodegenerative disease~~
  - ~~demyelinating or dysmyelinating disorder~~
  - ~~spinal cord disorders or trauma~~
  - ~~seizures~~

CODING AND STANDARDS

Cod**es**~~**ing**~~

~~*CPT Codes*~~

76390, +0698T

Applicable Lines of Business

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

BACKGROUND

Magnetic resonance spectroscopy (MRS) determines the concentration of brain metabolites, such as N-acetylaspartate, choline, creatine, and lactate, within the body tissue examined. Radiofrequency waves are translated into biochemical composition of the scanned tissue; the resulting metabolic profile is useful in identifying brain tumors, e.g., differentiating neoplastic and non-neoplastic brain lesions. ~~This modality should be considered as an adjunct to conventional imaging rather than replacement for histopathological evaluation.(9)~~

In terms of brain tumor evaluation and classification, carefully designed multi-center trials complying with criteria of evidence-based medicine have not yet been completed. (11)

Tumor Recurrence vs. Radiation Necrosis (3)

Differentiation between recurrent brain tumors and treatment related injury, e.g., radiation necrosis, is difficult using conventional MRI. MRS is a quantitative approach, measuring various brain metabolic markers, to help in the differentiation of recurrent tumors vs. radiation necrosis. (4) However, no consensus exists regarding the value of this in clinical decision making, and no approach has yet been validated to be sufficiently accurate. (2,3)

~~Glioma (4,11)~~

~~MRS has been proposed for pre-operative grading of gliomas and differentiating high-grade gliomas (HGGs) from low-grade gliomas. It has been found to have moderate diagnostic value and should be combined with other advanced imaging techniques to improve accuracy. Currently, the data is limited; more research is needed for a definite conclusion for the utility of MRS for this indication. Therefore, it remains experimental/investigational.(12,13)~~

Inherited Metabolic Conditions (5)

Although Brain MRS may show abnormalities in many inherited metabolic conditions, primary mitochondrial disease, storage diseases and other neurometabolic disorders (including leukodystrophies), it's role in the diagnosis, prognosis, and management of most of these

conditions is not well established by research and condition-specific guidelines. In a select few conditions MRS does have a more specific role in diagnosis and/or management (primary mitochondrial disorders and Canavan disease). For most of these conditions, Brain MRS is considered Experimental/Investigational. In all cases, basic work-up should first be completed including appropriate family history for inheritance and specific labs related to the suspected condition.

~~MRS in other Diseases~~

~~A role for MRS has been suggested in the management of neurodegenerative disease, epilepsy, and stroke. MRS can also be applied in conjunction with MRI in the evaluation traumatic brain injury and neonatal hypoxia-ischemia.[14,15] However, to better define these roles, it will be necessary to standardize the MRS methodology, as well as the collection, analysis, and interpretation of data so it can be consistently translated to the applicable clinical settings. Currently, these potential applications remain experimental/investigational.[15]~~

Contraindication 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 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 wight limit/dimensions of MRI machine.

SUMMARY OF EVIDENCE

ACR-ASNR-SPR Practice Parameter for the Performance And Interpretation of Magnetic Resonance Spectroscopy of the Central Nervous System [2]

- **Study Design**: This document outlines practice parameters and technical standards for performing and interpreting magnetic resonance spectroscopy (MRS) of the central nervous system. It is a consensus document developed by the American College of Radiology (ACR), the American Society of Neuroradiology (ASNR), and the Society for Pediatric Radiology (SPR).
- **Target Population**: The guidelines apply to both adult and pediatric patients undergoing MRS for various indications.
- **Key Factors**: The document details the indications for MRS, including evidence or suspicion of primary or secondary neoplasm, grading of primary glial neoplasm, differentiation of cystic lesions, evidence or suspicion of brain infection, seizures, neurodegenerative diseases, metabolic disorders, acute brain ischemia, demyelinating

disorders, and neurotoxicity. It also discusses the qualifications and responsibilities of personnel, specifications of the examination, and safety guidelines.

Differentiating Radiation-Induced Necrosis from Recurrent Brain Tumor Using MR Perfusion and Spectroscopy: A Meta-Analysis [4]

- **Study Design**: This meta-analysis examined the roles of several metabolites in differentiating recurrent tumor from necrosis in patients with brain tumors using MR perfusion and spectroscopy. It included two-armed, prospective or retrospective studies.
- **Target Population**: The studies included patients with primary brain tumors or brain metastasis.
- **Key Factors**: The meta-analysis found that MR spectroscopy and MR perfusion using choline/N-acetyl aspartate (Cho/NAA) and choline/creatine (Cho/Cr) ratios and relative cerebral blood volume (rCBV) may increase the accuracy of differentiating necrosis from recurrent tumor. The pooled difference in means indicated that the average rCBV, Cho/Cr ratio, and Cho/NAA ratio were significantly higher in tumor recurrence compared with radiation injury.

Clinical Applications of Magnetic Resonance Spectroscopy in Brain Tumors [3]

- **Study Design**: This document provides an overview of the clinical applications of MRS in brain tumor imaging, including general imaging principles, key imaged metabolites, and practical limitations.
- **Target Population**: The guidelines are intended for patients with brain tumors, including glioblastoma, lymphoma, and metastases.
- **Key Factors**: The document discusses the use of MRS in differentiating primary brain tumors from other potential mimics, estimating tumor grade, and differentiating tumor recurrence from radiation effects. It highlights the importance of interpreting MRS alongside conventional imaging and clinical presentation. The document also addresses the limitations of MRS, such as overlap between spectroscopic appearances of different pathologies and technical challenges.

ANALYSIS OF EVIDENCE

Shared Conclusions [2–4]**:**

- **Importance of MRS**: All three documents highlight the importance of MRS in the diagnosis and management of brain tumors. They emphasize its role in differentiating tumor recurrence from radiation effects, grading gliomas, and identifying various brain pathologies.
- **Indications for Use**: The documents agree on the primary indications for MRS, such as evidence or suspicion of neoplasm, grading of gliomas, and differentiation of cystic lesions.

- **Technical Standards and Safety**: The ACR Practice Parameters and Weinberg et al. both discuss the technical standards and safety guidelines associated with MRS, emphasizing the need for appropriate training and qualifications for personnel.

Differing Conclusions [2–4]**:**

- **Target Population**: While the ACR Practice Parameters apply to both adult and pediatric patients, Chuang et al. and Weinberg et al. focus primarily on adult patients with specific brain tumors and metastases.

Summary [2–4]

- In summary, the three documents provide a comprehensive overview of the evidence for brain MRS, highlighting its importance in the diagnosis and management of brain tumors. They share common conclusions on the indications and technical standards for MRS, while differing in their target populations and specific recommendations for various clinical scenarios.

POLICY HISTORY

Date	Summary
June 2025	• This guideline replaces Evolent Clinical Guideline 003 For Brain Magnetic Resonance Spectroscopy (MRS) • Guideline name changed to Magnetic Resonance Spectroscopy (MRS) • Added third bullet to General Information • Added Summary of Evidence and Analysis of Evidence • Updated references and background.
May 2024	• Update references and background. • Added Contraindications and preferred studies section. • Added pediatric metabolic disorders section.

~~# POLICY HISTORY~~

~~# SUMMARY~~

~~Date~~	~~Summary~~
~~2025~~	~~Updated references and background.~~
~~May 2024~~	~~Update references and background.~~ ~~Added Contraindications and preferred studies section.~~ ~~Added pediatric metabolic disorders section.~~
~~May 2023~~	~~Updated references~~ ~~General Information moved to beginning of guideline with added statement on clinical indications not addressed in this guideline~~

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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