



Evolut Clinical Guideline 2028013 for Functional Magnetic Resonance Imaging (MRI) Brain-MRI~~Brain~~

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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

fMRI

Functional MRI (fMRI) of the brain is a non-invasive imaging technique, to image the brain activity of a patient prior to undergoing brain surgery for tumors or epilepsy. fMRI images capture blood oxygen levels in parts of the brain that are responsible for perception, cognition, and movement allowing neurosurgeons to operate with less possibility of harming areas that are critical to the patient's quality of life. fMRI is primarily used for presurgical planning, operative risk assessment and therapeutic follow-up.

See Legislative Language section for legislation for the State of Washington.

INDICATIONS FOR FUNCTIONAL BRAIN MRI ^(1,2)

Pre-Operative/Procedural Evaluation ⁽¹⁾

fMRI may have a significant role in the mapping of a lesion in relation to eloquent cortex (i.e., language, motor, sensory and visual centers) to determine the appropriateness of surgical intervention in the following:

- Focal brain lesion (i.e., tumor or vascular malformation) for presurgical planning ⁽³⁻⁶⁾
- Pre-operative evaluation for epilepsy surgery ^(7,8)
- Brain tumor for radiation treatment planning ^(9,10)



Post-Operative/Procedural Evaluation

Therapeutic follow-up: A documented medical reason must clearly explain the medical necessity for follow up (i.e., evaluation of post-treatment eloquent cortex).

LEGISLATIVE LANGUAGE

State of Washington ~~(44)~~

WSHCA 20150116A ⁽¹¹⁾

Number and Coverage Topic:

20150116A – **Functional Neuroimaging for Primary Degenerative Dementia or Mild Cognitive Impairment***

HTCC Coverage Determination:

Functional neuroimaging for primary degenerative dementia or mild cognitive impairment is **not covered**.

HTCC Reimbursement Determination:

Limitations of Coverage: N/A

Non-covered Indicators:

Functional imaging technologies including: fludeoxyglucose (FDG) Positron Emission Tomography (PET), (11)C-dihydrotrabenazine (C-DTBZ) PET, Single Photon Emission Computed Tomography (SPECT), Functional Magnetic Resonance Imaging (fMRI) for the diagnosis of primary degenerative dementia or mild cognitive impairment.

* Beta-amyloid PET imaging is outside the scope of this coverage determination.


CODING AND STANDARDS

Coding

~~CPT~~ Codes

70554, 70555

Applicable Lines of Business

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

BACKGROUND

Task vs. Resting State fMRI

During resting-state fMRI (rs-fMRI), unlike task-based functional MRI, the individual is not required to perform any specific task ^(12–14). This is beneficial for patients who have difficulty performing tasks, such as pediatric and certain neurologic or psychiatric patients. This technique has been well-utilized in research, and its clinical use is increasing considerably, especially in presurgical planning (e.g., mapping epileptic foci) and neuropsychiatric diseases.

For the above indications, non-tasked based fMRI such as resting state fMRI can also be performed.

~~fMRI as an Alternative to Invasive Wada Test and Direct Electrical Stimulation~~

~~fMRI is considered an alternative to the Wada test and direct electrical stimulation as it is a non-invasive method for location of vital brain areas. The Wada test is used for the pre-operative evaluations of patients with brain tumors and seizures to determine which side of the brain is responsible for vital cognitive functions (e.g., speech and memory) and can assess the surgical risk of damaging vital areas of the brain. The Wada test is invasive, involving an angiography procedure to guide a catheter to the internal carotid where a barbiturate is injected, putting one hemisphere of the brain to sleep. Direct electrical stimulation mapping is invasive requiring the placement of electrodes in the brain. The electrodes are used to stimulate multiple cortical sites in the planned area of resection to allow the surgeons to identify and mark which areas can be safely resected. ^(15,16)~~

fMRI and Brain Tumors

~~Due to its non-invasiveness, its relatively high spatial resolution, and its pre-operative results,~~ fMRI is often used before surgery in the evaluation of patients with brain tumors. fMRI may have a significant role in mapping lesions that are located in close proximity to vital areas of brain function (language, sensoriy-motor, and visual). It can determine the precise spatial relationship between the lesion and adjacent functionally essential parenchyma, allowing removal of as much pathological tissue as possible during resection of brain tumors without compromising essential brain functions. fMRI provides an alternative to other invasive tests, such as the Wada test and direct electrical stimulation.⁽¹⁵⁾

fMRI and Seizures

Brain fMRI

Brain surgery is often the treatment for patients with refractory epilepsy, especially patients with a single seizure focus. fMRI can be used to image and localize abnormal brain function in patients with seizures and help determine brain functions (language, sensoriy-motor, and visual) of areas bordering the lesion, resulting in better outcomes with less neurologic deficit.⁽¹⁶⁾

fMRI is increasingly being used to evaluate candidates for surgical treatment of intractable epilepsy (Phase 1 evaluation) to see if they are an appropriate candidate.

~~and can aid in surgical decision-making. It can 1) help to improve functional outcome by enabling surgery that spares functional cortex, 2) guide surgical intervention by revealing when reorganization of function has occurred, and 3) show when abnormal cortex is also functionally active, and hence that surgery may not be the best option.~~^(19,20)

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

Current State of Functional MRI in the Presurgical Planning of Brain Tumors⁽⁵⁾

- Study Design: This review article discusses the current state of functional MRI (fMRI) for preoperative assessment in patients undergoing brain tumor resection.

- **Target Population:** The study focuses on patients with malignant primary brain tumors, particularly astrocytomas, which commonly occur in the frontal, temporal, and parietal lobes.
- **Key Factors:** The article highlights the use of fMRI for noninvasive preoperative mapping of brain function, emphasizing its advantages over direct cortical stimulation (DCS). It discusses task-based fMRI (tb-fMRI) and resting-state fMRI (rs-fMRI), noting the challenges and limitations of each technique. The review also addresses the impact of fMRI on surgical planning, extent of resection, and functional outcomes, while acknowledging the limited evidence supporting its impact on survival and functional outcomes.

Integration of BOLD-fMRI and DTI into radiation treatment planning for high-grade gliomas located near the primary motor cortexes and corticospinal tracts ⁽¹⁰⁾

- **Study Design:** This research article evaluates the efficacy of integrating blood oxygen level dependent functional magnetic resonance imaging (BOLD-fMRI) and diffusion tensor imaging (DTI) data into radiation treatment planning for high-grade gliomas located near the primary motor cortexes (PMCs) and corticospinal tracts (CSTs).
- **Target Population:** The study includes 20 patients with high-grade gliomas adjacent to PMCs and CSTs, recruited between 2012 and 2014.
- **Key Factors:** The article discusses the integration of BOLD-fMRI and DTI into radiation treatment planning, comparing different treatment plans (3DCRT, IMRT, and IMRT PMC&CST). The findings indicate that integrating BOLD-fMRI and DTI is feasible and beneficial, as it helps to spare critical brain structures during treatment without compromising target volume coverage.

Neurological update: structural and functional imaging in epilepsy surgery ⁽⁸⁾

- **Study Design:** This neurological update reviews the role of structural and functional imaging in epilepsy surgery, focusing on techniques such as computed tomography (CT), magnetic resonance imaging (MRI), functional MRI (fMRI), single photon emission computed tomography (SPECT), and positron emission tomography (PET).
- **Target Population:** The review targets patients with medically refractory epilepsy who are potential candidates for resective surgery.
- **Key Factors:** The article highlights the importance of fMRI in localizing eloquent brain areas, such as language and motor cortices, to minimize postoperative deficits. It discusses the advantages of fMRI over invasive techniques like direct cortical stimulation (DCS) and the Wada test. The review also addresses the use of PET and SPECT in identifying the epileptogenic zone and guiding surgical planning.

ANALYSIS OF EVIDENCE



Shared Conclusions ^(5,8,10):

- All three studies emphasize the importance of advanced imaging techniques, such as fMRI, in preoperative assessment and treatment planning for brain conditions.
- They highlight the noninvasive nature of fMRI and its role in improving surgical planning and minimizing functional deficits.
- The studies underscore the need for accurate and timely diagnosis to facilitate appropriate treatment and improve patient outcomes.

Summary ^(5,8,10):

In summary, these articles collectively provide valuable insights into the use of fMRI for preoperative assessment and treatment planning in patients with brain tumors and epilepsy. They highlight both the shared importance of advanced imaging techniques and the unique contributions of each study to the understanding of functional brain MRI.

POLICY HISTORY

~~SUMMARY~~

Date	Summary
<u>June 2025</u>	<ul style="list-style-type: none">● <u>Updated background and references</u>● <u>This guideline replaces Evolent Clinical Guideline 013 for Functional Brain MRI</u>● <u>Guideline name changed to Functional MRI Brain</u>● <u>Added third bullet to General Information</u>● <u>Added Summary of Evidence and Analysis of Evidence</u>● <u>Checked Medicare Advantage Line of Business</u>
-July 2024	<ul style="list-style-type: none">● Updated background and references● Contraindications and preferred studies section added to the



	background <ul style="list-style-type: none">● Added legislative language for Washington
May 2023	<ul style="list-style-type: none">● Updated background and references● Added to determine the appropriateness of surgical intervention● Background section regarding non-task-based fMRI● 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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