

Clinical Policy: Functional MRI

Reference Number: LA.CP.MP.43

Date of Last Revision: 4/23

[Coding Implications](#)

[Revision Log](#)

See [Important Reminder](#) at the end of this policy for important regulatory and legal information.

Description

Functional magnetic resonance imaging (fMRI) is a noninvasive neuroimaging procedure in which an MRI is used to localize regions of activity in the brain by measuring blood flow and/or metabolism following task activation.¹ It localizes areas for critical functions such as thought, speech, movement and sensation. It is most appropriately used in preoperative planning when the patient has a lesion located in or near eloquent areas of the brain.^{3,1,2}

Policy/Criteria

- I. It is the policy of Louisiana Healthcare Connections that functional magnetic resonance imaging (fMRI) is **medically necessary** when performed for one of the following:
 - A. Assessment of intracranial neoplasm, vascular malformations, and other targeted lesions for one of the following:
 1. Pre-surgical planning and operative risk assessment;
 2. Assessment of eloquent cortex (e.g. language, sensory motor, visual centers) in relation to tumor or other focal lesions;
 3. Surgical planning (biopsy or resection);
 4. Therapeutic follow-up;
 - B. Evaluation of preserved eloquent cortex.
 - C. Assessment of eloquent cortex and language lateralization for epilepsy surgery;
 - D. Assessment of radiation treatment planning and post-treatment evaluation of eloquent cortex;
 - E. Assessment of cerebral vascular reactivity for consideration of revascularization procedures.
- II. It is the policy of Louisiana Healthcare Connections that fMRI for any indication not listed above is not supported by current evidence.

Background

Functional magnetic resonance imaging (fMRI) using the blood oxygenation level dependent imaging (BOLD) technique has proven to be an effective tool for the assessment of eloquent cortex in relation to a focal brain lesion, such as a neoplasm or vascular malformation.³

There are several methods used to identify eloquent areas of the brain including the intracarotid amobarbital procedure (IAP), known as the Wada test, and electrocortical stimulation mapping (ESM). The Wada test consists of a cerebral angiogram followed by the injection of a drug to evaluate which side of the brain is responsible for speech and memory.⁴ ESM involves the surgical placement of electrodes on the brain to identify and mark specific areas of importance.² Both tests are invasive, time consuming and involve multiple resources.^{2,5} fMRI is now used as an

alternative to these methods and is preferred over IAP since it is less invasive and has a high safety profile.⁴

During fMRI, the patient is asked to conduct specific language, memory or motor activities while sequential MRI images are collected. The activities cause an increase in blood flow to the areas of the brain being used, allowing for their identification and location.²

Evidence in published, peer-reviewed scientific literature indicates a good correlation between fMRI pre-surgical brain mapping and invasive pre-surgical brain mapping.^{1,2,6} Current literature supports fMRI as a valuable adjunct tool when used in conjunction with other brain mapping techniques because the fMRI provides information that aids the surgical team in pre-surgical planning.^{7,8,9}

A 2003 study by Woermann et al¹⁰ compared the determination of language dominance using fMRI with results of the Wada test in 100 patients with different localization-related epilepsies. The concordance between both tests was 91% with a 9% overall rate of false categorization by fMRI. It was concluded that language evaluation using fMRI may reduce the necessity of the Wada test for language lateralization, particularly in temporal lobe epilepsy.¹⁰

A 2005 study by Medina et al⁵ examined the effect of fMRI on diagnostic work-up and treatment planning in 60 patients with seizure disorders who were candidates for surgical treatment. The study revealed change in anatomic location or lateralization of language-receptive and language-expressive areas (28% and 21% of patients respectively) and showed a considerable increase in confidence levels with the use of fMRI when assessing motor and visual cortical function. In 63% of patients, the utilization of fMRI eliminated the need for additional testing, including the Wada test. Additional results concluded that information gained from the use of fMRI altered intraoperative mapping in 52% of patients and altered surgical plans in 42% of patients included in this study.⁵

In 2006 Patrella et al¹¹ evaluated the effect of preoperative fMRI localization of language and motor areas on therapeutic decision making in 39 patients with potentially resectable brain tumors. Results showed treatment plans before and after fMRI differed in 19 patients ($P < .05$), with a more aggressive approach recommended after imaging in 18 patients. The study showed that the use of fMRI resulted in reduced surgical time (estimated 15 to 60 minutes) in 22 patients and showed a more aggressive resection in six patients and a smaller craniotomy in two patients. The outcomes illustrate how fMRI enables the option of a more aggressive therapeutic approach than might otherwise be considered because of functional risk. Results of the study indicate that in certain patients there may be a reduction in surgical time, an increase in the extent of resection, and a decrease in craniotomy size.¹¹

American Academy of Neurology

- The following are the results and recommendations per the American Academy of Neurology for the use of fMRI in the presurgical evaluation of patients with epilepsy¹²: The use of fMRI may be considered an option for lateralizing language functions in place of intracarotid amobarbital procedure (IAP) in patients with medial temporal lobe epilepsy (MTLE), temporal epilepsy in general or extratemporal epilepsy (Level C). For patients with temporal neocortical epilepsy or temporal tumors, the evidence is insufficient (Level U);

- fMRI may be considered to predict postsurgical language deficits after anterior temporal lobe resection (Level C);
- The use of fMRI may be considered for lateralizing memory functions in place of IAP in patients with MTLE (Level C) but is of unclear utility in other epilepsy types (Level U);
- fMRI of verbal memory or language encoding should be considered for predicting verbal memory outcome (Level B);
- fMRI using nonverbal memory encoding may be considered for predicting visuospatial memory outcomes (Level C);
- Presurgical fMRI could be an adequate alternative to IAP memory testing for predicting verbal memory outcome (Level C);
- Clinicians should carefully advise patients of the risks and benefits of fMRI vs IAP during discussions concerning choice of specific modality in each case.

Coding Implications

This clinical policy references Current Procedural Terminology (CPT®). CPT® is a registered trademark of the American Medical Association. All CPT codes and descriptions are copyrighted 2022, American Medical Association. All rights reserved. CPT codes and CPT descriptions are from the current manuals and those included herein are not intended to be all-inclusive and are included for informational purposes only. Codes referenced in this clinical policy are for informational purposes only and may not support medical necessity. Inclusion or exclusion of any codes does not guarantee coverage. Providers should reference the most up-to-date sources of professional coding guidance prior to the submission of claims for reimbursement of covered services.

CPT®* Codes	Description
70554	MRI, brain, functional MRI; including test selection and administration of repetitive body part movement and/or visual stimulation; not requiring physician or psychologist administration
70555	Magnetic resonance imaging, brain, functional MRI; requiring physician or psychologist administration of entire neurofunctional testing

Reviews, Revisions, and Approvals	Revision Date	Approval Date
Converted corporate to local policy.	08/15/2020	
Annual review. References reviewed and updated. Updated description and background with no clinical significance. “Not medically necessary” verbiage replaced in criteria II. with descriptive language. Reviewed by specialist. Added “and may not support medical necessity” in coding implications.	5/22	8/13/22

Annual review. Criteria I.A. updated to include vascular malformations. Criteria I.C. updated to include assessment of language lateralization. Criteria I.E. added per ACR-ASNR-SPR practice parameters and states, “Assessment of cerebral vascular reactivity for consideration of revascularization procedures. References reviewed and updated.	4/23	7/24/23
--	------	---------

References

- Haider HA, Bullinger, K. Neuroimaging in the evaluation of seizures and epilepsy. UpToDate. www.uptodate.com. Updated September 02, 2022. Accessed January 12, 2022.
- Bookheimer S. Pre-surgical language mapping with functional magnetic resonance imaging. *Neuropsychol Rev*. 2007;17(2):145 to 155. doi:10.1007/s11065-007-9026-x
- ACR-ASNR-SPR practice parameter for the performance of functional magnetic resonance imaging (fMRI) of the brain. The American College of Radiology. <https://www.acr.org/-/media/ACR/Files/Practice-Parameters/fmr-brain.pdf>. Published 2022. Accessed January 13, 2023.
- Cascino GD. Surgical treatment of epilepsy in adults. UpToDate. www.uptodate.com. Updated November 11, 2022. Accessed January 05, 2023.
- Medina LS, Bernal B, Dunoyer C, et al. Seizure disorders: functional MR imaging for diagnostic evaluation and surgical treatment--prospective study. *Radiology*. 2005;236(1):247 to 253. doi:10.1148/radiol.2361040690
- Brown GG. Functional magnetic resonance imaging in clinical practice: look before you leap. *Neuropsychol Rev*. 2007;17(2):103 to 106. doi:10.1007/s11065-007-9027-9
- Stancanello J, Cavedon C, Francescon P, et al. BOLD fMRI integration into radiosurgery treatment planning of cerebral vascular malformations. *Med Phys*. 2007;34(4):1176 to 1184. doi:10.1118/1.2710326
- Stippich C, Rapps N, Dreyhaupt J, et al. Localizing and lateralizing language in patients with brain tumors: feasibility of routine preoperative functional MR imaging in 81 consecutive patients. *Radiology*. 2007;243(3):828 to 836. doi:10.1148/radiol.2433060068
- Wong ET, Wu JK. Overview of the clinical features and diagnosis of brain tumors in adults. UpToDate. www.uptodate.com. Updated December 07, 2021. Accessed January 12, 2023.
- Woermann FG, Jokeit H, Luerding R, et al. Language lateralization by Wada test and fMRI in 100 patients with epilepsy. *Neurology*. 2003;61(5):699 to 701. doi:10.1212/01.wnl.0000078815.03224.57
- Petrella JR, Shah LM, Harris KM, et al. Preoperative functional MR imaging localization of language and motor areas: effect on therapeutic decision making in patients with potentially resectable brain tumors. *Radiology*. 2006;240(3):793 to 802. doi:10.1148/radiol.2403051153
- Szaflarski JP, Gloss D, Binder JR, et al. Practice guideline summary: Use of fMRI in the presurgical evaluation of patients with epilepsy: Report of the Guideline Development, Dissemination, and Implementation Subcommittee of the American Academy of Neurology. *Neurology*. 2017;88(4):395 to 402. doi:10.1212/WNL.0000000000003532
- Liu P, Liu G, Pinho MC, et al. Cerebrovascular Reactivity Mapping Using Resting-State BOLD Functional MRI in Healthy Adults and Patients with Moyamoya Disease. *Radiology*. 2021;299(2):419 to 425. doi:10.1148/radiol.2021203568

Important Reminder

This clinical policy has been developed by appropriately experienced and licensed health care professionals based on a review and consideration of currently available generally accepted standards of medical practice; peer-reviewed medical literature; government agency/program approval status; evidence-based guidelines and positions of leading national health professional organizations; views of physicians practicing in relevant clinical areas affected by this clinical policy; and other available clinical information. LHCC makes no representations and accepts no liability with respect to the content of any external information used or relied upon in developing this clinical policy. This clinical policy is consistent with standards of medical practice current at the time that this clinical policy was approved.

The purpose of this clinical policy is to provide a guide to medical necessity, which is a component of the guidelines used to assist in making coverage decisions and administering benefits. It does not constitute a contract or guarantee regarding payment or results. Coverage decisions and the administration of benefits are subject to all terms, conditions, exclusions and limitations of the coverage documents (e.g., evidence of coverage, certificate of coverage, policy, contract of insurance, etc.), as well as to state and federal requirements and applicable LHCC administrative policies and procedures.

This clinical policy is effective as of the date determined by LHCC. The date of posting may not be the effective date of this clinical policy. This clinical policy may be subject to applicable legal and regulatory requirements relating to provider notification. If there is a discrepancy between the effective date of this clinical policy and any applicable legal or regulatory requirement, the requirements of law and regulation shall govern. LHCC retains the right to change, amend or withdraw this clinical policy, and additional clinical policies may be developed and adopted as needed, at any time.

This clinical policy does not constitute medical advice, medical treatment or medical care. It is not intended to dictate to providers how to practice medicine. Providers are expected to exercise professional medical judgment in providing the most appropriate care, and are solely responsible for the medical advice and treatment of members/enrollees. This clinical policy is not intended to recommend treatment for members/enrollees. Members/enrollees should consult with their treating physician in connection with diagnosis and treatment decisions.

Providers referred to in this clinical policy are independent contractors who exercise independent judgment and over whom LHCC has no control or right of control. Providers are not agents or employees of LHCC.

This clinical policy is the property of LHCC. Unauthorized copying, use, and distribution of this clinical policy or any information contained herein are strictly prohibited. Providers, members/enrollees and their representatives are bound to the terms and conditions expressed herein through the terms of their contracts. Where no such contract exists, providers, members/enrollees and their representatives agree to be bound by such terms and conditions by providing services to members/enrollees and/or submitting claims for payment for such services.

©2023 Louisiana Healthcare Connections. All rights reserved. All materials are exclusively owned by Louisiana Healthcare Connections and are protected by United States copyright law and international copyright law. No part of this publication may be reproduced, copied, modified, distributed, displayed, stored in a retrieval system, transmitted in any form or by any means, or otherwise published without the prior written permission of Louisiana Healthcare Connections. You may not alter or remove any trademark, copyright or other notice contained herein. Louisiana Healthcare Connections is a registered trademark exclusively owned by Louisiana Healthcare Connections.