

AmeriHealth Caritas Louisiana

National Imaging Associates, Inc.*	
Clinical guidelines FUNCTIONAL BRAIN MRI	Original Date: June 2007
CPT Codes: 70554, 70555	Last Revised Date: May 2020
Guideline Number: NIA_CG_013	Implementation Date: January 2021 <u>TBD</u>

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. All prior relevant imaging results, and the reason that alternative imaging (gold standard, protocol, contrast, etc.) cannot be performed must be included in the documentation submitted.

INDICATIONS FOR FUNCTIONAL BRAIN MRI (~~ACR-ACR-ASNR-SPP~~, 2017)

Pre-operative/procedural Evaluation (Bizzi, 2008; Petrella, 2006)

In the following where fMRI may have a significant role in the mapping a lesion in relation to eloquent cortex (i.e., language, motor, sensory and visual centers)-

- Focal brain lesion (i.e., tumor or vascular malformation) for presurgical planning (Jiao, 2017; Stancanello, 2017; ~~Vysotski, 2018~~ ~~Chakraborty, 2008; Hall, 2009~~).
- ~~Brain tumor for radiation treatment planning (Liu, 2000; Wengenroth, 2011).~~
- Pre-operative evaluation for epilepsy surgery (~~Benjamin, 2018; Janecek, 2013; Benjamin, 2018~~). ~~Chandrasekharan, 2008~~
- ~~Brain tumor for radiation treatment planning (Wengenroth, 2011; Kovacs, 2011; Wang 2015; Wengenroth, 2011).~~

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).

BACKGROUND:

* [National Imaging Associates, Inc. \(NIA\) is a subsidiary of Magellan Healthcare, Inc.](#)

Functional MRI (fMRI) of the brain is a non-invasive imaging technique, using radio waves and a strong magnetic field, to image the brain activity of a patient prior to undergoing brain surgery for tumors or epilepsy. It is based on the increase in blood flow to the local vasculature when parts of the brain are activated and helps to determine the location of vital areas of brain function. 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 as an Alternative to the 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. It can assess the surgical risk of damaging the 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.

fMRI and Brain Tumors – fMRI may significantly affect therapeutic planning in patients who have potentially resectable brain tumors. Due to its non-invasiveness, its relatively high spatial resolution, and its pre-operative results, fMRI is 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, sensory 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.

fMRI and Seizures – Brain fMRI can influence the diagnostic and therapeutic decisions of the seizure team, thereby affecting the surgical approach and outcomes. Brain surgery is often the treatment for patients with epilepsy, especially patients with a single seizure focus. fMRI can be used to image and localize abnormal brain function in patients with seizures. fMRI can help determine brain functions (language, sensory motor, and visual) of areas bordering the lesion, resulting in better outcomes with less neurologic deficit.

~~**fMRI as an Alternative to the 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. It can assess the surgical risk of damaging the 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.~~

POLICY HISTORY:

Review Date: August 2019

Review Summary:

- Modified pre-operative/procedural evaluation section to include focal brain lesion for pre-surgical planning, brain tumor for radiation treatment planning AND epilepsy surgery pre-operative evaluation.

Review Date: May 2020

Review Summary:

- Updated references
- Reordered indications



REFERENCES:

~~[American College of Radiology \(ACR\) ACR Appropriateness Criteria®. https://acsearch.acr.org/list. Published 2017.](https://acsearch.acr.org/list)~~

[American College of Radiology \(ACR\). ACR–ASNR–SPR practice parameter for the performance of functional magnetic resonance imaging \(fmri\) of the brain. http://www.acr.org. Published 2017.](http://www.acr.org)

~~[American College of Radiology \(ACR\) ACR Appropriateness Criteria®. https://acsearch.acr.org/list. Published 2017.](https://acsearch.acr.org/list)~~

[Benjamin CFA, Dhingra I, Li AX, et al. Blumenfeld H, Alkawadri R, Bickel S, Helmstaedter C, Meletti S, Bronen RA, Warfield SK, Peters JM, Reutens D, Połczyńska MM, Hirsch LJ, Spencer DD. Presurgical language fMRI: Technical practices in epilepsy surgical planning. Hum Brain Mapp. 2018 Oct; 39\(10\):4032-4042. doi: 10.1002/hbm.24229. Epub 2018 Jul 1. PubMed PMID:](https://doi.org/10.1002/hbm.24229)

[Binder JR. Functional MRI is a valid noninvasive alternative to Wada testing. Epilepsy Behav. 2011; 20:214-222.](https://doi.org/10.1016/j.epilepsy.2011.05.011)

Bizzi A, Blasi V, Falini A, et al. Presurgical functional MR imaging of language and motor functions: validation with intraoperative electrocortical mapping. *Radiology*. 2008; 248:579-589.

~~[Chakraborty A, McEvoy AW. Presurgical functional mapping with functional MRI. Curr Opin Neurol. 2008; 21\(4\):446-451. doi: 10.1097/WCO.0b013e32830866e2.](https://doi.org/10.1097/WCO.0b013e32830866e2)~~

~~[Chandrasekharan K, Thomas B. Clinical applications of functional MRI in epilepsy. Indian J Radiol Imaging. August 2008; 18\(3\):210-217.](https://doi.org/10.1007/s12276-008-9111-1)~~

~~[Hall WA, Kim P, Truwit CL. Functional magnetic resonance imaging-guided brain tumor resection. Top Magn Reson Imaging. 2009; 19\(4\):205-212. doi: 10.1097/RMR.0b013e3181934a09.](https://doi.org/10.1097/RMR.0b013e3181934a09)~~

[Janecek JK, Swanson SJ, Sabsevitz DS, et al. Language lateralization by fMRI and Wada testing in 229 patients with epilepsy: Rates and predictors of discordance. Epilepsia. 2013; 54:314-322.](https://doi.org/10.1097/EPS.0b013e3182411111)

Jiao Y, Lin F, Wu J, et al. Brain arteriovenous malformations located in language area: Surgical outcomes and risk factors for postoperative language deficits. *World Neurosurg*. 2017 Sep; 105:478-491. doi: 10.1016/j.wneu.2017.05.159. Epub 2017 Jun 8.

[Kovács A, Tóth L, Glavák C, et al. Liposits G, Hadjiev J, Antal G, Emri M, Vandulek G, Repa L. Integrating functional MRI information into conventional 3D radiotherapy planning of CNS tumors. Is it worth it? J Neurooncol. 2011](https://doi.org/10.1007/s12220-011-9411-1)

Dec; 105(3):629-37. doi: 10.1007/s11060-011-0633-2. Epub 2011 Jul 2. PubMed PMID:21725803.

Liu WC, Schulder M, Narra V, et al. Functional magnetic resonance imaging aided radiation treatment planning. Med Phys. 2000 Jul; 27(7):1563-72.

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; 240:793-802. doi: 10.1148/radiol.2403051153.

Silva MA, See AP, Essayed WI, et al. Challenges and techniques for presurgical brain mapping with functional MRI. *Neuroimage Clin*. 2017; 17:794–803. ~~Published 2017 Dec 6.~~ doi:10.1016/j.nicl.2017.12.008.

Stancanello J, Cavedon C, Francescon P, et al. fMRI integration into radiosurgery treatment planning of cerebral vascular malformations *Med Phys*. 2007 Apr; 34(4):1176-84.

Vysotski S, Madura C, Swan B, et al. Holdsworth R, Lin Y, Rio AMD, Wood J, Kundu B, Penwarden A, Voss J, Gallagher T, Nair VA, Field A, Garcia Ramos C, Meyerand EM, Baskaya M, Prabhakaran V, Kuo JS. Preoperative FMRI associated with decreased mortality and morbidity in brain tumor patients. Interdiscip Neurosurg. 2018 Sep; 13:40-45. doi: 10.1016/j.inat.2018.02.001. Epub 2018 Feb 14. PubMed PMID:31341789; PubMed Central PMCID: PMC6653633.

Wang M, Ma H, Wang X, et al. Guo Y, Xia X, Xia H, Guo Y, Huang X, He H, Jia X, Xie Y. Integration of BOLD-fMRI and DTI into radiation treatment planning for high-grade gliomas located near the primary motor cortexes and corticospinal tracts. Radiat Oncol. 2015 Mar 8; 10:64. doi: 10.1186/s13014-015-0364-1. PubMed PMID: 25884395; PubMed Central PMCID: PMC4357178.

Wengenroth M, Blatow M, Guenther J, et al. Diagnostic benefits of presurgical fMRI in patients with brain tumours in the primary sensorimotor cortex. *Eur Radiol*. 2011; 21(7):1517–1525. doi:10.1007/s00330-011-2067-9.

Reviewed / Approved by  M. Atif Khalid, M.D., Medical Director, Radiology
~~Reviewed / Approved by~~  ~~ig, VP, Medical Director~~

Disclaimer: Magellan Healthcare service authorization policies do not constitute medical advice and are not intended to govern or otherwise influence the practice of medicine. These policies are not meant to supplant your normal procedures, evaluation, diagnosis, treatment and/or care plans for your patients. Your professional judgement must be exercised and followed in all respects with regard to the treatment and care of your patients. These policies apply to all Magellan Healthcare subsidiaries including, but not limited to, National Imaging Associates (“Magellan”). The policies constitute only the reimbursement and coverage guidelines of Magellan. Coverage for services varies for individual members in accordance with the terms and conditions of applicable Certificates of Coverage, Summary Plan Descriptions, or contracts with governing regulatory agencies. Magellan reserves the right to review and update the guidelines at its sole discretion. Notice of such changes, if necessary, shall be provided in accordance with the terms and conditions of provider agreements and any applicable laws or regulations.