Bright HealthCare™

Medical Policy

Magnetoencephalography (MEG) Policy	
MEDICAL POLICY NUMBER	MED_Clin_Ops-015
POLICY OWNER	A. Bartley Bryt, MD, Chief Medical Officer
ORIGINAL EFFECTIVE DATE	12/5/2019
CURRENT VERSION NUMBER	3
CURRENT VERSION EFFECTIVE DATE	12/30/2021
APPLICABLE PRODUCT AND MARKET	*Individual Family Plan*: All *Small Group*: All *Medicare Advantage*: All

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Before using this policy, please check the member benefit plan document and any federal or state mandates, if applicable. Bright Health policies and practices are compliant with all federal and state requirements, including mental health parity laws.

PURPOSE

The purpose of this policy is to establish the clinical review criteria that support the determination of medical necessity for Magnetoencephalography (MEG), also known as Magnetic Source Imaging (MSI).

POLICY/CRITERIA

Clinical Indications for authorization of Magnetoencephalography (MEG):

1. Epilepsy – Pre-surgical evaluation in patients with intractable focal epilepsy to identify and localize area(s) of epileptiform activity. MEG can be valuable when discordance or continuing questions arise from amongst other techniques designed to localize a focus.
2. Epilepsy, Tumors and Vascular Anomalies (e.g., arteriovenous or cavernous malformations)

3. Surgical candidates to identify eloquent cortex areas – Pre-surgical evaluation of brain tumors and vascular malformations. The aim is to identify, localize and preserve eloquent cortex during resective surgery

Limitations/Exclusions:

1. MEG cannot replace, but may guide the placement of intracranial EEG and, in some patients, avoid an unnecessary intracranial EEG.
2. MEG must not be the first order of test after clinical and routine EEG diagnosis of epilepsy. It is one of several advanced pre-surgical investigative technologies. The need for MEG is much lower than surface EEG and anatomical imaging studies.
3. MEG must not be a stand-alone test.

BACKGROUND

The American Academy of Neurology published a Model Medical Policy Document that covers the indications, limitations and references that support this Bright Health Medial Policy[1]. The following background information comes from that professional specialty organization. *Magnetoencephalography (MEG)*, also known as *Magnetic Source Imaging (MSI)* is the noninvasive measurement of the magnetic fields generated by brain activity. Typical MEG recordings are made within a magnetically shielded room using a device that has 100 to 300 magnetometers or gradiometers (sensors). They are arranged in a helmet-shaped container called a Dewar. The Dewar is filled with liquid helium needed to produce superconductivity. The brain sources producing the magnetic field maps can be easily mapped and displayed on a co-registered MRI. This results in a visual display of normal brain activity such as the location of eloquent cortex for vision, touch, movement, or language. It displays equally well abnormal brain activity such as epileptic discharges. Such depictions are useful in pre-surgical brain mapping in patients with epilepsy, brain tumors, and vascular malformations.

Importance of epilepsy surgery

Recurrent seizures, resistant to pharmacotherapy, are associated with decreased survival and increased mortality ratios. Patients who experience freedom from seizures have lower mortality rates when compared with those who continue to experience seizures[2]. Early resective epilepsy surgery has beneficial effects on progressive and disabling consequences of uncontrolled seizures. Timely recognition and referral are vital to realization of the benefits of epilepsy resective surgery[3,4]. Along with a MEG study, there is typically simultaneous EEG data collected, reported on and submitted for reimbursement.

Some centers will add the dipole/source modeling of EEG as well (CPT description is Digital Analysis of EEG or Digital EEG Spike Analysis). Since the purpose of MEG is to guide epilepsy surgery for those with medically intractable epilepsy, MEG and MEG/EEG studies are typically of a longer duration than standard routine EEGs used in the diagnosis of (non-surgical) epilepsy. Routine EEGs are relatively brief, and only typically about 60% sensitive, primarily due to under-sampling in time. In MEG/EEG studies, longer recordings greatly increase the

odds of seeing spikes and sharp waves to detect and map the affected areas to reduce the need for repeat testing or losing critical diagnostic localization of abnormality. Most, but not all of these cases will also include one or more evoked MEG studies, depending on whether or not the presumed epileptogenic focus is near eloquent cortex/cortices or not.[9]

Value of MEG in localization and resective surgery

A cardinal principle in resective surgery is to remove only the abnormal tissue and preserve normal functional tissue. This is particularly crucial in the cortical regions of the brain. Normal and abnormal tissues are often in close proximity and may appear contiguous and indistinguishable to naked eye inspection. Even when the abnormal structure, such as a vascular malformation, may be obvious, the location of a normal eloquent brain tissue cannot be determined without specialized testing. Eloquent areas are those subserving essential functions such as the sense of touch, vision or language. They often surround a lesion that requires extirpation. The value of MEG and certain other tests lies in their ability to localize and demarcate both normal and abnormal functioning regions of the brain.

DEFINITIONS

1. **EEG**, like MEG, measures brain activity with millisecond resolution. Both MEG are far more sensitive than PET and SPECT to rapid changes in brain activity. Such rapid changes occur during the propagation of a seizure. EEG can be recorded noninvasively like MEG but surface EEG has limited resolution: it usually has inadequate sensitivity for presurgical decisions.
2. **Intracranial EEG** (ICEEG) has the millisecond resolution and localization sensitivity of MEG but requires a major neurosurgical procedure to implant electrodes on the surface or in the depths of the brain. These procedures carry potential risks and expense of intensive care unit hospitalization. In addition, implanted electrodes can only detect brain activity occurring within a few millimeters from the electrodes requiring some a priori knowledge of the source of the signal being investigated and/or a large exposure of the brain for implantation of up to 150 electrodes at a time. Most intracranial EEG (or “electrocorticography” or “ECoG” or depth electrodes) is usually performed in restricted regions on one hemisphere at a time because of the surgical risks of bilateral implantations, or in a few lobes, because of the risk of hemorrhage.
3. **MRI**, unlike the following functional tests, provides a structural estimate of the location of scar tissue or malformations of cortical development, which are major causes of intractable epileptic seizures.
4. **fMRI** provides an indirect estimate of the location of active brain tissue by measuring the changes in venous blood oxygen levels produced by neuronal activity.
5. **PET** images reveal relative uptake of radioactively labeled glucose or neurotransmitters. They show areas of the brain with increased or decreased metabolism or neurotransmitter binding on a time scale of several minutes.
6. **SPECT** scans are images of cerebral blood flow averaged over the course of one to two minutes made by measuring the radioactively labeled tracer material as it travels though the blood vessels.

7. **Neuropsychometric testing** is performed prior to the Wada test. It assesses virtually all brain functions but usually does not localize functions.
8. **The Wada test**, also known as the intracarotid amobarbital anesthesia test, is an angiographic technique where one hemisphere of the brain is given a short acting barbiturate, amobarbital, putting half the brain "asleep" for aboutfive minutes and permitting an estimation of language and memory functional capacity of the unaffected hemisphere. In the typical Wada test, after a washout period of half an hour, the angiographic catheter is repositioned to the other carotid artery and the test is performed a second time in the contralateral hemisphere to provide an estimate of language and memory functional capacity in each hemisphere.

CODING

Applicable CPT® codes:

95965	Magnetoencephalography (MEG), recording and analysis; for spontaneous brain magnetic activity (e.g., epileptic cerebral cortex localization)
95966	Magnetoencephalography (MEG), recording and analysis; for evoked magnetic fields, single modality (e.g., sensory, motor, language, or visual cortex localization)
95967	Magnetoencephalography (MEG), recording and analysis; for evoked magnetic fields, each additional modality (e.g., sensory, motor, language, or visual cortex localization)

Applicable ICD-10-CM codes:

C71.1	Malignant neoplasm of frontal lobe
C71.2	Malignant neoplasm of temporal lobe
C71.3	Malignant neoplasm of parietal lobe
C71.4	Malignant neoplasm of occipital lobe
D33.0	Benign neoplasm of brain, supratentorial
D33.1	Benign neoplasm of brain, infratentorial
D33.2	Benign neoplasm of brain, unspecified
G40.211	Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with complex partial seizures, intractable, with status epilepticus
G40.219	Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with complex partial seizures, intractable, without status epilepticus
G40.111	Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with simple partial seizures, intractable, with status epilepticus
G40.119	Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with simple partial seizures, intractable, without status epilepticus
Additional codes for brain tumors and vascular malformations in conjunction with MEG are applicable as well.	

EVIDENCE BASED REFERENCES

1. American Academy of Neurology Professional Association (AANPA). Magnetoencephalography (MEG) Policy. Recommended by the AANPA Medical Economics and Management Committee. Approved by the AANPA Board of Directors on May 8, 2009. St. Paul, MN: AANPA; 2009.

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3. Engel J, Jr., Wiebe S, French J, et al. Practice parameter: temporal lobe and localized neocortical resections for epilepsy: report of the Quality Standards Subcommittee ofthe American Academy of Neurology, in association with the American Epilepsy Society and the American Association of Neurological Surgeons. Neurology 2003;60(4):538-47.
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6. Englot DJ, Nagarajan SS, Imber BS, Raygor K, et al., Epileptogenic zone localization using magnetoencephalography predicts seizure freedom in epilepsy surgery.Epilepsia 2015. doi: 10.1111/epi.13002
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9. Michael Stein, MD, Neurology Expert Consultant, Dignity Health, Phoenix, AZ, November 2019.

POLICY HISTORY

Original Effective Date	December 5, 2019
Revised Date	*Version History* V2 December 17, 2020 – Annual review, no changes made V3 December 30, 2021 – Annual review, no changes made

DISCLAIMER

Approved by the Utilization Management Committee

By: A Bartley Bryt MD MPH

A. Bartley Bryt, MD, MPH, Chief Medical Officer

Date: January 14, 2022