Noninvasive Electroencephalogram (EEG) — Commercial/Medicaid

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Background

A noninvasive Electroencephalogram (EEG) records electrical activity of the brain via scalp electrodes. An EEG can be used to confirm a diagnosis of epilepsy and classify it as partial (focal) or generalized. The EEG is also helpful in the evaluation and management of coma and impaired cognitive states. A normal EEG does not necessarily exclude the diagnosis of epilepsy, and an abnormal EEG may be unrelated to the patient's clinical presentation.

Guideline

Noninvasive (scalp) EEG may be indicated for **1 or more** of the following:

- Brain death determination
- Change in neurologic status (eg, altered mental status, confusional state, delirium, encephalopathy, impaired cognition)
- Comatose patient after cardiac resuscitation
- Differentiation of epileptic from nonepileptic events[1]
- Epilepsy, known, and need for repeat evaluation, as indicated by **1 or more** of the following:
    - Change in clinical status (eg, new symptoms)
    - Focal epilepsy, and need to characterize location of seizure
    - Withdrawal of anticonvulsant medication under consideration
- Epilepsy, suspected, and need for repeat evaluation after nondiagnostic initial EEG but persistent high clinical suspicion

[1] Epilepsy is defined by any of the following: At least 2 unprovoked or reflex seizures occurring greater than 24 hours apart; one unprovoked or reflex seizure and a 60% or greater probability of further seizures occurring over the next 10 years; or diagnosis of an epilepsy syndrome.

- Epilepsy or nonfebrile infantile spasms (ie, West syndrome), suspected new onset
- Intracranial infection, suspected, such as viral or bacterial encephalitis.
- Persistent vegetative state or other disorder of consciousness
- Seizures associated with abnormal mental status or focal neurologic deficit
- Syncope with atypical features, as indicated by 1 or more of the following:
    - Automatisms (eg, chewing, lip smacking)
    - Cyanosis during episode
    - Confusion after episode, prolonged
    - Tongue biting during episode
    - Tonic-clonic movements or seizure-like activity

Limitations/Exclusions

(See Medical Necessity Guidelines: Experimental, Investigational or Unproven Services or table below)

EEG is considered experimental, investigational or unproven for following (list not all-inclusive):

- Alzheimer disease
- Attention-deficit hyperactivity disorder (ADD/ADHD)
- Autism spectrum disorders
- Depression
- Febrile seizures in children
- Headache
- Postraumatic Stress disorder (PTSD)
- Preterm infant neurodevelopmental prognostic evaluation

For Alzheimer disease, evidence is insufficient, conflicting, or poor and demonstrates an incomplete assessment of net benefit vs harm; additional research is recommended. A literature review states that resting state EEG has variable accuracy in differentiating Alzheimer disease from mild cognitive impairment or normal healthy older patients, limiting its role as a stand-alone population screening tool.
For attention-deficit hyperactivity disorder, evidence is insufficient, conflicting, or poor and demonstrates an incomplete assessment of net benefit vs harm; additional research is recommended. A systematic review found insufficient evidence to recommend EEG-based tests for the diagnosis of attention-deficit hyperactivity disorder due to limited studies that have variable and inconsistent findings. Review articles state that although some studies have shown a relationship between the EEG theta:beta ratio and attention-deficit hyperactivity disorder, other studies have questioned its use as a reliable diagnostic marker. Additional research is needed to better characterize any potential diagnostic utility of the theta:beta ratio. A specialty society practice guideline states that the EEG theta:beta ratio has an unacceptably high false-positive rate compared with clinical evaluation and should not be used for the diagnosis of attention-deficit hyperactivity disorder.
For autism spectrum disorders, evidence is insufficient, conflicting, or poor and demonstrates an incomplete assessment of net benefit vs harm; additional research is recommended. Review articles state that although several studies have utilized EEG wave patterns to differentiate patients with autism spectrum disorders from normal controls, these measures have not been validated as being sensitive or specific for the diagnosis of autism.
For depression, evidence is insufficient, conflicting, or poor and demonstrates an incomplete assessment of net benefit vs harm; additional research is recommended. A review article states that although resting state EEG holds promise as a means of predicting and optimizing antidepressant treatment outcomes, its specificity in predicting response to a particular intervention remains uncertain. Another review article notes that although the use of EEG parameters as a biomarker appears intriguing, randomized controlled trials are required to compare outcomes for EEG-guided and therapist-guided treatment decisions.
For febrile seizures in children, evidence demonstrates a lack of net benefit; additional research is recommended. An evidence-based review states that EEG is of limited value in the evaluation of febrile seizures; although abnormalities may be

present on EEG, their clinical significance is unclear in terms of predicting febrile seizure recurrence or the development of epilepsy. Practice guidelines and review articles have concluded that EEG is not recommended for simple febrile seizures in children with normal neurologic examinations. A systematic review found that there were no randomized controlled trials to support or refute the use of EEG and determine its optimal timing after complex febrile seizures in children.
For headache, evidence demonstrates a lack of net benefit; additional research is recommended. A national neurology specialty society recommends against the use of EEG in the evaluation of headaches, citing the lower sensitivity of electroencephalography in detecting structural lesions, as compared with CT scan or MRI, lack of demonstrable value in diagnosing migraine headaches, and the potential for discovery of incidental findings that would require performing unnecessary procedures and treatment. An evidence-based specialty society consensus guideline states that EEG is not considered to be useful in the investigation of headache.
For posttraumatic stress disorder, evidence is insufficient, conflicting, or poor and demonstrates an incomplete assessment of net benefit vs harm; additional research is recommended. A systematic review of 34 studies evaluating the efficacy of EEG wave patterns for assessment of the severity of symptoms of posttraumatic stress disorder concluded that although their use seems promising, additional studies are necessary to confirm the findings.
For preterm infant neurodevelopmental prognostic evaluation, evidence is insufficient, conflicting, or poor and demonstrates an incomplete assessment of net benefit vs harm; additional research is recommended. A systematic review and meta-analysis of 13 studies (1181 preterm infants) evaluating the predictive accuracy of EEG background activity for neurodevelopmental outcomes 1 to 10 years after birth concluded that although EEG may have potential as a surrogate marker for neurodevelopmental outcomes, additional high-quality studies were recommended to confirm the findings.

Revision History

May 13, 2022	Non-substantive edits pertaining to medical terminology
May 8, 2020	New policy eff. Nov. 1, 2020

Applicable Procedure Codes

95812	Electroencephalogram (EEG) extended monitoring; 41-60 minutes
95813	Electroencephalogram (EEG) extended monitoring; 61-119 minutes
95816	Electroencephalogram (EEG); including recording awake and drowsy
95819	Electroencephalogram (EEG); including recording awake and asleep
95822	Electroencephalogram (EEG); recording in coma or sleep only
95824	Electroencephalogram (EEG); cerebral death evaluation only
95957	Digital analysis of electroencephalogram (EEG) (eg, for epileptic spike analysis)

Applicable Diagnosis Codes

A81.00	Creutzfeldt-Jakob disease, unspecified
A81.01	Variant Creutzfeldt-Jakob disease
A81.09	Other Creutzfeldt-Jakob disease
F05	Delirium due to known physiological condition
F44.5	Conversion disorder with seizures or convulsions
F44.6	Conversion disorder with sensory symptom or deficit

F44.7	Conversion disorder with mixed symptom presentation
F44.89	Other dissociative and conversion disorders
F84.2	Rett's syndrome
G40.001	Localization-related (focal) (partial) idiopathic epilepsy and epileptic syndromes with seizures of localized onset, not intractable, with status epilepticus
G40.009	Localization-related (focal) (partial) idiopathic epilepsy and epileptic syndromes with seizures of localized onset, not intractable, without status epilepticus
G40.011	Localization-related (focal) (partial) idiopathic epilepsy and epileptic syndromes with seizures of localized onset, intractable, with status epilepticus
G40.019	Localization-related (focal) (partial) idiopathic epilepsy and epileptic syndromes with seizures of localized onset, intractable, without status epilepticus
G40.101	Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with simple partial seizures, not intractable, with status epilepticus
G40.109	Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with simple partial seizures, not 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
G40.201	Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with complex partial seizures, not intractable, with status epilepticus
G40.209	Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with complex partial seizures, not intractable, without status epilepticus
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
G40.301	Generalized idiopathic epilepsy and epileptic syndromes, not intractable, with status epilepticus
G40.309	Generalized idiopathic epilepsy and epileptic syndromes, not intractable, without status epilepticus
G40.311	Generalized idiopathic epilepsy and epileptic syndromes, intractable, with status epilepticus
G40.319	Generalized idiopathic epilepsy and epileptic syndromes, intractable, without status epilepticus
G40.42	Cyclin-Dependent Kinase-Like 5 Deficiency Disorder (eff. 10/01/2020)
G40.401	Other generalized epilepsy and epileptic syndromes, not intractable, with status epilepticus
G40.409	Other generalized epilepsy and epileptic syndromes, not intractable, without status epilepticus
G40.411	Other generalized epilepsy and epileptic syndromes, intractable, with status epilepticus
G40.419	Other generalized epilepsy and epileptic syndromes, intractable, without status epilepticus
G40.501	Epileptic seizures related to external causes, not intractable, with status epilepticus
G40.509	Epileptic seizures related to external causes, not intractable, without status epilepticus
G40.801	Other epilepsy, not intractable, with status epilepticus
G40.802	Other epilepsy, not intractable, without status epilepticus
G40.803	Other epilepsy, intractable, with status epilepticus
G40.804	Other epilepsy, intractable, without status epilepticus
G40.811	Lennox-Gastaut syndrome, not intractable, with status epilepticus
G40.812	Lennox-Gastaut syndrome, not intractable, without status epilepticus
G40.813	Lennox-Gastaut syndrome, intractable, with status epilepticus
G40.814	Lennox-Gastaut syndrome, intractable, without status epilepticus
G40.821	Epileptic spasms, not intractable, with status epilepticus

G40.822	Epileptic spasms, not intractable, without status epilepticus
G40.823	Epileptic spasms, intractable, with status epilepticus
G40.824	Epileptic spasms, intractable, without status epilepticus
G40.833	Dravet syndrome, intractable, with status epilepticus (eff. 10/01/2020)
G40.834	Dravet syndrome, intractable, without status epilepticus (eff. 10/01/2020)
G40.89	Other seizures
G40.901	Epilepsy, unspecified, not intractable, with status epilepticus
G40.909	Epilepsy, unspecified, not intractable, without status epilepticus
G40.911	Epilepsy, unspecified, intractable, with status epilepticus
G40.919	Epilepsy, unspecified, intractable, without status epilepticus
G40.A01	Absence epileptic syndrome, not intractable, with status epilepticus
G40.A09	Absence epileptic syndrome, not intractable, without status epilepticus
G40.A11	Absence epileptic syndrome, intractable, with status epilepticus
G40.A19	Absence epileptic syndrome, intractable, without status epilepticus
G40.B01	Juvenile myoclonic epilepsy, not intractable, with status epilepticus
G40.B09	Juvenile myoclonic epilepsy, not intractable, without status epilepticus
G40.B11	Juvenile myoclonic epilepsy, intractable, with status epilepticus
G40.B19	Juvenile myoclonic epilepsy, intractable, without status epilepticus
G47.51	Confusional arousals
G93.40	Encephalopathy, unspecified
R41.82	Altered mental status, unspecified
R56.1	Post traumatic seizures

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