Clinical Policy Title: Ambulatory and video electroencephalography

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Related policies:

CP# 18.01.02 Telehealth

Policy contains:

- Ambulatory electroencephalography.
- Video electroencephalography.
- Intraoperative electroencephalography.
- Epilepsy/seizure disorder.

ABOUT THIS POLICY: *AmeriHealth Caritas has developed clinical policies to assist with making coverage determinations. AmeriHealth Caritas' clinical policies are based on guidelines from established industry sources, such as the Centers for Medicare & Medicaid Services (CMS), state regulatory agencies, the American Medical Association (AMA), medical specialty professional societies, and peer-reviewed professional literature. These clinical policies along with other sources, such as plan benefits and state and federal laws and regulatory requirements, including any state- or plan-specific definition of "medically necessary," and the specific facts of the particular situation are considered by AmeriHealth Caritas when making coverage determinations. In the event of conflict between this clinical policy and plan benefits and/or state or federal laws and/or regulatory requirements, the plan benefits and/or state and federal laws and/or regulatory requirements shall control. AmeriHealth Caritas' clinical policies are for informational purposes only and not intended as medical advice or to direct treatment. Physicians and other health care providers are solely responsible for the treatment decisions for their patients. AmeriHealth Caritas' clinical policies are reflective of evidence-based medicine at the time of review. As medical science evolves, AmeriHealth Caritas will update its clinical policies as necessary. AmeriHealth Caritas' clinical policies are not guarantees of payment.*

Coverage policy

AmeriHealth Caritas considers the use of either ambulatory electroencephalography or video electroencephalography to be clinically proven and, therefore, medically necessary for the following indications when ordered by a pediatric or adult neurologist or neurosurgeon (Interqual, 2017a and b; Pichon-Riviere, 2011; Noachtar, 2009; Krumholz, 2007; Hirtz, 2003):

- Indications for unattended ambulatory electroencephalography with or without video monitoring:
  - Diagnosis of a suspected seizure disorder not defined by history, physical examination, or resting electroencephalography; performed at a free-standing center or in a hospital setting.
  - Suspected nonepileptic seizure in members with recurrent nonclassic symptoms for seizure and nondiagnostic history, laboratory results, and routine electroencephalography; performed at home, at a free-standing center, or in a hospital setting.
- Indications for attended video electroencephalography performed in a hospital setting:

  - For treatment planning in members with known seizure disorder and continued seizures despite antiepileptic medication and no concurrent seizure-provoking mediations.
  - Suspected seizure and a nonspecific routine electroencephalography.
  - Suspected nonepileptic seizure in members with recurrent nonclassic symptoms for seizure and nondiagnostic history, laboratory results, and routine electroencephalography.
  - Preoperative evaluation of members undergoing epilepsy surgery.
- Indications for intraoperative electroencephalography (Noachtar, 2009):
  - By scalp electrodes: To monitor cerebral function during intracranial vascular surgery.
  - By grid monitoring: To assist with localization of epileptogenic foci for potential resection in cases of intractable seizure activity not responsive to medical management and when surface electroencephalography did not provide adequate data.

Limitations:

All other uses of ambulatory electroencephalography with or without video monitoring are not medically necessary, including, but not limited to:

- Monitoring medication adjustments or treatments.
- Evaluating classic febrile seizures.

Video electroencephalography monitoring exceeding 72 hours does not generally improve diagnostic capability and is not medically necessary.

Repeat video electroencephalography tests are not commonly indicated and will be evaluated individually based on unique circumstances.

Video electroencephalography is not medically necessary to establish a diagnosis of brain death.

Alternative covered services:

Primary care and specialist evaluations within the network are covered alternative services. Diagnostic tests such as resting electroencephalography and standard laboratory and imaging services may be covered in the evaluation of a patient with an apparent seizure disorder.

Background

According to the American Academy of Neurology, annually 150,000 adults present with an initial seizure. An estimated 45,000 children under age 15 have a new diagnosis of epilepsy each year

(Krumholz, 2007; Hirtz, 2003). Seizures may be the result of nonneurologic causes such as arrhythmias; transient ischemic attacks; migraine; hypoglycemia; cocaine use; or other cardiovascular, chemical or metabolic causes. Psychogenic seizures are relatively common but may be difficult to diagnose. Epilepsy itself may be defined in classifications, such as partial or focal seizures or generalized. This latter classification includes absence or petit mal seizures, myoclonic seizures, atonic seizures, and grand mal type of tonic-clonic seizures.

Accurate diagnosis is important to treatment. These different seizure types have distinct clinical presentations and respond to different classes of anti-epileptic drugs. The goal of treatment is to prevent or reduce the frequency of the occurrence of the specific seizure. Reports indicate that the incidence of a second seizure after an initial unprovoked episode is 30 percent to 50 percent in the next two years (Pohlmann-Eden, 2006).

The American Academy of Neurology recommends detailed history and physical examination, including a neurologic evaluation as the initial step, followed by routine resting electroencephalography in the neurodiagnostic evaluation (Krumholz, 2007; Hirtz, 2003). Neuroimaging with magnetic resonance imaging or computed tomography has a diagnostic yield of 10 percent and has value in evaluating the initial epileptic seizure of unknown etiology. Routine laboratory blood work, lumbar puncture, and toxicology should be performed if history and physical examination are suggestive. When routine electroencephalography does not help diagnose the type of seizure, additional studies of longer duration may be necessary.

Ambulatory and video electroencephalography:

Ambulatory electroencephalography, also referred to as “long-term electroencephalography,” provides up to 72 hours of continuous recording of an electroencephalography in the ambulatory setting. The extended recording period increases the opportunity to capture ictal and post-ictal events. While most ambulatory electroencephalography systems include an event-recording capability, many forms of epilepsy do not always provide symptoms recognizable to the patient.

Video electroencephalography allows simultaneous recording of electroencephalographic patterns and videographic capture of patient activity, thereby linking physical activity to the electroencephalography recording. Typically there are two cameras: one trained on the face and the other on the entire body. Video electroencephalography may be performed in the hospital setting or in an ambulatory environment. The typical duration for use of video electroencephalography is 48 hours, but there is no literature to standardize a longer duration of use.

Invasive electroencephalography monitoring has become key in the presurgical preparation and intrasurgical management of patients with intractable seizure disorder. The use of this technology helps localize the epileptogenic foci. Van Loo (2011) found that invasive video electroencephalography monitoring increased diagnostic success, but had demonstrated complication rates including death at rates of 0.5 percent to 2.8 percent.

Searches

AmeriHealth Caritas searched PubMed and the databases of:

- UK National Health Services Centre for Reviews and Dissemination.
- Agency for Healthcare Research and Quality Guideline Clearinghouse and evidence-based practice centers.
- The Centers for Medicare & Medicaid Services (CMS).

Searches were conducted on March 6, 2018. Search terms were: "Electroencephalography" (MeSH), "Monitoring, Ambulatory"(MeSH), "Epilepsy/diagnosis" (MeSH), and free text terms "ambulatory electroencephalography," and "video electroencephalography."

We included:

- **Systematic reviews**, which pool results from multiple studies to achieve larger sample sizes and greater precision of effect estimation than in smaller primary studies. Systematic reviews use predetermined transparent methods to minimize bias, effectively treating the review as a scientific endeavor, and are thus rated highest in evidence-grading hierarchies.
- **Guidelines based on systematic reviews.**
- **Economic analyses**, such as cost-effectiveness, and benefit or utility studies (but not simple cost studies), reporting both costs and outcomes — sometimes referred to as efficiency studies — which also rank near the top of evidence hierarchies.

Findings

The studies and guidelines listed in this clinical policy suggest that ambulatory electroencephalography with or without video monitoring can be useful for the initial diagnosis of epilepsy, when the routine workup fails to establish the diagnosis and type of seizure or exclude psychogenic seizures (Lawley, 2016; Elgavish, 2011; Pichon-Riviere, 2011; Alving, 2009; Krumholz, 2007; Asano, 2005; Hirtz, 2003). History, physical examination, and careful neurologic evaluation are the cornerstones of diagnosis. Routine, resting electroencephalography, and imaging studies are considered the next appropriate evaluation of an initial seizure in a child or adult in whom history and physical and neurologic evaluation do not suggest an etiology of the seizure activity. Laboratory studies, including toxicology and spinal fluid analysis, are guided by the initial assessment; if there are still areas lacking clarity of diagnosis, then either ambulatory electroencephalography or video electroencephalography may be performed to help establish the diagnosis and type of seizure, and to exclude psychogenic seizures.

Video electroencephalography and ambulatory electroencephalography are not considered to be helpful in medication management (Pichon-Riviere, 2011). Their utility declines significantly with use beyond 72 hours for ambulatory electroencephalography and beyond 48 hours for video electroencephalography.

Policy updates:

In 2018, we modified the coverage policy according to Interqual criteria for pediatric and adult populations (Interqual, 2017a and b). These changes clarify the settings (i.e., attended or unattended) in which ambulatory and video electroencephalography are indicated and can be used safely.

Summary of clinical evidence:

Citation	Content, Methods, Recommendations
Lawley (2016) Video-ambulatory (long-term) electroencephal-ography in a secondary care center	**Key points:** • Retrospectively evaluated 88 recordings in 87 patients with a history of clinical events that were classified according to three diagnostic categories: epileptic seizures (six studies, 6.8%); physiologic nonepileptic events (13 studies, 14.8%); or psychogenic nonepileptic seizures (36 studies, 40.9%). • Of the studies with an event not recorded on video, a confident diagnosis could be reached in 55.2% of cases. • The main reason for unsuccessful video recording was failure to activate the camcorder by the patient or caregiver. • The authors found an overall diagnostic utility of 67.0%, which confirms the findings of previous reports evaluating the diagnostic yield of long-term video electroencephalography.
Elgavish (2011) What is the diagnostic value of repeating a nondiagnostic video electroencephalography study?	**Key points:** • Study of 3,727 patients completing scalp video electroencephalography at the University of Alabama at Birmingham Epilepsy Center from 2002 to 2009. • A total of 82.4% were diagnosed on the first admission (2,622 of 3,183 patients), with 54% of the remainder diagnosed on the second admission. • Conclusion: Repeat video electroencephalography may increase diagnostic yield, but the test is resource-intensive, time-consuming, and expensive, and poses some potential risks to patients.
Pichon-Riviere (2011) for the Institute for Clinical Effectiveness and Health Policy Usefulness of video electroencephalography for the assessment of patients with refractory epilepsy	**Key points:** • Systematic review findings: In patients with refractory epilepsy who have previously been studied using the standard diagnostic tests, telemetry video electroencephalography seems to be an adequate diagnostic test to differentiate a crisis from a pseudocrisis, characterize the different types of crises, and localize the epileptic area. • Continuous video electroencephalography monitoring is not considered medically necessary to monitor the antiepileptic drug response or drug titration.
Van Loo (2011) Surgical successes and failures of invasive video electroencephalography	**Key points:** • Invasive video electroencephalography monitoring improved diagnostic capabilities with 47% to 98% of cases with attributable and resectable cortex; but with a significant complication rate.

Citation	Content, Methods, Recommendations
monitoring	• Cerebrospinal fluid leaks and infections are the most frequent complications, with an incidence ranging from 0% to 31.3% and from 0% to 17.4%, respectively. • The incidence of intracranial hemorrhage is reported to be up to 14%, with subdural hematomas being the most prevalent. • Epidural hematomas are less frequent and encountered in up to 2.6% of cases.
Alving (2009) Diagnostic usefulness and duration of the inpatient long-term video electroencephalography monitoring	**Key points:** • Evaluated 234 consecutive video electroencephalography sessions (221 patients) over a two-year period. • In 44% of the cases, the video electroencephalography was diagnostically useful regardless of whether it was used to diagnose or classify a seizure. • Average duration of study was 2.4 days.
Noachtar (2009) The role of electroencephalography in epilepsy: a critical review	**Key points:** • Ictal video/ electroencephalography recording is considered critical to localizing the epileptogenic zone, along with first clinical signs and symptoms of a seizure and of the evolution of the seizure symptomatology. • Surface electroencephalography recordings are less sensitive than invasive studies but provide the best overview and most efficient way to define the approximate localization of the epileptogenic zone. • Invasive recordings are used in patients in whom the epileptogenic zone either cannot be located with noninvasive diagnostic methods or is adjacent to eloquent cortex (on a potentially resectable area). • The most commonly used invasive electrodes are stereotactically implanted depth electrodes and subdural strip or grid electrodes.
Asano (2005) The diagnostic value of initial video electroencephalography monitoring in children	**Key points:** • Evaluation of clinical utility of video electroencephalography on 1,000 children age 1.7 years to 17 years (mean 7). • A total of 315 studies were considered ”useful-epileptic”; 219 “useful-nonepileptic”; 224 ”uneventful”; 242 ”inconclusive.” • Average duration of study was 1.5 days. • Found maximal impact on diagnosis occurred within the first three days for most patients.
Hirtz (2003) for the American Academy of Neurology Practice parameter: treatment of the child with a first unprovoked seizure	**Key points:** • Lifetime cumulative risk of recurrent seizures by age 80 is 1.4% to 3.3%. • Evaluation after initial unprovoked seizure for Class I evidence is history, physical examination, neurologic examination, and routine resting electroencephalography. • Class I and II evidence is for neuroimaging with magnetic resonance imaging preferred over computed tomography. • Class II evidence for selective use of laboratory studies, toxicology, and spinal fluid assessment.

References

Professional society guidelines/other:

Hirtz D, Berg A, Bettis D, et al.; Quality Standards Subcommittee of the American Academy of Neurology; Practice Committee of the Child Neurology Society. Practice parameter: treatment of the child with a first unprovoked seizure: Report of the Quality Standards Subcommittee of the American Academy of Neurology and the Practice Committee of the Child Neurology Society. *Neurology*. 2003; 60(2): 166 – 175. Reaffirmed 2016. DOI: 10.1212/01.WNL.0000033622.27961.B6.

Krumholz A, Wiebe S, Gronseth G, et al.; Quality Standards Subcommittee of the American Academy of Neurology; American Epilepsy Society. Practice Parameter: evaluating an apparent unprovoked first seizure in adults (an evidence-based review): report of the Quality Standards Subcommittee of the American Academy of Neurology and the American Epilepsy Society. *Neurology*. 2007; 69(21): 1996 – 2007. DOI: 10.1212/01.wnl.0000285084.93652.43.

Peer-reviewed references:

Alving J, Beniczky S. Diagnostic usefulness and duration of the inpatient long-term video-EEG monitoring: findings in patients extensively investigated before the monitoring. *Seizure*. 2009 Sep; 18(7): 470 – 473. DOI: 10.1016/j.seizure.2009.04.005.

Asano E, Pawlak C, Shah A, et al. The diagnostic value of initial video-EEG monitoring in children--review of 1000 cases. *Epilepsy Res*. 2005; 66(1 – 3): 129 – 135. DOI: 10.1016/j.eplepsyres.2005.07.012.

Elgavish RA, Cabaniss WW. What is the diagnostic value of repeating a nondiagnostic video-EEG study? *J Clin Neurophysiol*. 2011 Jun; 28(3): 311 – 313. DOI: 10.1097/WNP.0b013e31821c3aa9.

Interqual. 2017 Procedures Criteria. Video encephalographic (EEG) Monitoring (Pediatric). McKesson Corporation.

Interqual. 2017 Procedures Criteria. Video encephalographic (EEG) Monitoring (Adult). McKesson Corporation.

Lawley A, Manfredonia F, Cavanna AE. Video-ambulatory EEG in a secondary care center: A retrospective evaluation of utility in the diagnosis of epileptic and nonepileptic seizures. *Epilepsy Behav.* 2016; 57(Pt A): 137 – 140. DOI: 10.1016/j.yebeh.2016.02.005.

Noachtar S, Rémi J. The role of EEG in epilepsy: a critical review. *Epilepsy Behav*. 2009 May; 15(1): 22 – 33. DOI: 10.1016/j.yebeh.2009.02.035.

Pichon Riviere A, Augustovski F, Garcia Marti S, et al. Utilidad del video EEG en la evaluacion de paciente con epilepsia refractaria. [Usefulness of video EEG for the assessment of patients with

refractory epilepsy]. Buenos Aires: Institute for Clinical Effectiveness and Health Policy (IECS). Informe de Respuesta Rapida No 220. 2011.

Pohlmann-Eden B, Beghi E, Camfield C, Camfield P. The first seizure and its management in adults and children. *BMJ*. 2006 Feb 11; 332(7537): 339 – 342. DOI: 10.1136/bmj.332.7537.339.

Van Loo P, Carrette E, Meurs A, et al. Surgical successes and failures of invasive video-EEG monitoring in the presurgical evaluation of epilepsy. *Panminerva Med*. 2011; 53(4): 227 – 240. Available at: https://www.minervamedica.it/en/journals/panminerva-medica/article.php?cod=R41Y2011N04A0227&acquista=1. Accessed March 12, 2018.

CMS National Coverage Determinations (NCDs):

No NCDs identified as of the writing of this policy.

Local Coverage Determinations (LCDs):

L33447 Special Electroencephalography. CMS website. https://www.cms.gov/medicare-coverage-database/details/lcd-details.aspx?LCDId=33447&ver=29. Accessed March 12, 2018. .

Commonly submitted codes

Below are the most commonly submitted codes for the service(s)/item(s) subject to this policy. This is not an exhaustive list of codes. Providers are expected to consult the appropriate coding manuals and bill accordingly.

CPT Codes	Description	Comments
95812	Electroencephalogram (EEG); extended monitoring; 41-60 minutes	
95813	Electroencephalogram (EEG) extended monitoring; greater than 1 hour	
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	
95827	Electroencephalogram (EEG); all night recording	
95950	Monitoring for identification and lateralization of cerebral seizure focus, electroencephalographic (eg, 8 channel eeg) recording and interpretation, each 24 hours	
95951	Monitoring for localization of cerebral seizure focus by cable or radio, 16 or more channel telemetry, combined electroencephalographic (EEG) and video recording and interpretation (eg, for presurgical localization), each 24 hours	
95953	Monitoring for localization of cerebral seizure focus by computerized portable 16 or more channel eeg, electroencephalographic (eeg) recording and interpretation, each 24 hours, unattended	
95954	Pharmacological or physical activation requiring physician or other qualified health care professional attendance during eeg recording of activation phase (eg, thiopental activation test)	
95956	Monitoring for localization of cerebral seizure focus by cable or radio, 16 or more	

CPT Codes	Description	Comments
	channel telemetry, electroencephalographic (EEG) recording and interpretation, each 24 hours, attended by a technologist or nurse	
95957	Digital analysis of electroencephalogram (EEG) (eg, for epileptic spike analysis)	

ICD-10 Codes	Description	Comments
F44.5	Conversion disorder with seizures or convulsions	
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	
G40.401	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	

ICD-10 Codes	Description	Comments
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	
G40.89	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	
O99.350	Diseases of the nervous system complicating pregnancy, unspecified trimester	
O99.351	Diseases of the nervous system complicating pregnancy, first trimester	
O99.352	Diseases of the nervous system complicating pregnancy, second trimester	
O99.353	Diseases of the nervous system complicating pregnancy, third trimester	
O99.354	Diseases of the nervous system complicating childbirth	
O99.355	Diseases of the nervous system complicating the puerperium	
R56.1	Post traumatic seizures	
R56.9	Unspecified convulsions	
R90.81	Abnormal echoencephalogram	
R94.01	Abnormal electroencephalogram [EEG]	
Z86.69	Personal history of other diseases of the nervous system and sense organs	

HCPCS Level II Codes	Description	Comments
N/A		