



# CIGNA MEDICAL COVERAGE POLICY

The following Coverage Policy applies to all plans administered by CIGNA Companies including plans administered by Great-West Healthcare, which is now a part of CIGNA.

**Subject Quantitative  
Electroencephalography  
(QEEG)**

**Effective Date ..... 11/15/2010  
Next Review Date ..... 11/15/2011  
Coverage Policy Number ..... 0239**

## Table of Contents

Coverage Policy .....	1
General Background .....	2
Coding/Billing Information .....	4
References .....	5
Policy History .....	7

## Hyperlink to Related Coverage Policies

Hospitalization for the Initiation of a  
Ketogenic Diet  
Intracranial Electroencephalography (IEEG)  
Magnetoencephalography (MEG)  
Vagus Nerve Stimulation (VNS)  
Video Electroencephalographic (V-EEG)  
Monitoring

## INSTRUCTIONS FOR USE

Coverage Policies are intended to provide guidance in interpreting certain **standard** CIGNA HealthCare benefit plans as well as benefit plans formerly administered by Great-West Healthcare. Please note, the terms of a participant's particular benefit plan document [Group Service Agreement (GSA), Evidence of Coverage, Certificate of Coverage, Summary Plan Description (SPD) or similar plan document] may differ significantly from the standard benefit plans upon which these Coverage Policies are based. For example, a participant's benefit plan document may contain a specific exclusion related to a topic addressed in a Coverage Policy. In the event of a conflict, a participant's benefit plan document **always supercedes** the information in the Coverage Policies. In the absence of a controlling federal or state coverage mandate, benefits are ultimately determined by the terms of the applicable benefit plan document. Coverage determinations in each specific instance require consideration of 1) the terms of the applicable group benefit plan document in effect on the date of service; 2) any applicable laws/regulations; 3) any relevant collateral source materials including Coverage Policies and; 4) the specific facts of the particular situation. Coverage Policies relate exclusively to the administration of health benefit plans. Coverage Policies are not recommendations for treatment and should never be used as treatment guidelines. Proprietary information of CIGNA. Copyright ©2010 CIGNA

## Coverage Policy

**CIGNA covers the use of quantitative electroencephalography (QEEG) as medically necessary when used as an adjunct to and in combination with traditional electroencephalography (EEG) when ANY of the following criteria are met:**

- epilepsy, when ANY of the following are met:
  - when the surface or long-term EEG is inconclusive, and additional testing for possible epileptic spikes or seizures is needed
  - when ambulatory recording is needed to facilitate subsequent visual EEG interpretation
  - for topographic voltage and dipole analysis in presurgical candidates with intractable epilepsy
- cerebral vascular disease, dementia or encephalopathy: when neurological imaging and routine EEG outcomes are inconclusive to confirm diagnostic symptoms
- operating room (OR): to provide continuous monitoring for the early detection of an acute intracranial complication during cerebrovascular surgery (i.e., intracranial, carotid endarterectomy)
- intensive care unit (ICU) monitoring: for the detection of nonconvulsive seizures in high-risk ICU patients

**CIGNA does not cover the use of QEEG for ANY other indication, including but not limited to the following, because it is considered experimental, investigational or unproven for these indications:**

- alcohol and other drug use disorders
  - chronic fatigue syndrome
  - developmental delay
  - learning disorder
  - mild or moderate head injury
  - mental retardation
  - psychiatric and neuropsychiatric disorders (e.g., attention-deficit/hyperactivity disorders [ADD/ADHD], depression, schizophrenia)
- 

## **General Background**

The electroencephalogram (EEG) is useful in the evaluation of patients with several types of neurological disorders, including seizures, encephalopathy, and focal cerebral abnormalities. The goal of obtaining an EEG is to capture a sufficient amount of post-synaptic activity or to confirm the lack of neuron activity with characteristics that may assist in the diagnosis of specific neurological conditions. The traditional method of EEG interpretation depends on visual analysis, which is subjective and time-intensive. During this interpretation, it is important to distinguish between cerebral activity and artifact. Quantitative or computerized techniques, referred to as a quantitative electroencephalogram (QEEG), have been developed to assist in expediting the interpretation process of a surface EEG.

### **Quantitative Electroencephalogram (QEEG)**

A quantitative electroencephalogram (QEEG), also referred to as topographic EEG, or brain electrical activity mapping (BEAM), is a visual enhancement of a traditional surface EEG. The enhancement process transforms the surface EEG data into a pictorial mapping (i.e., topographic image) of the seizure activity. Enhanced images are then placed on a schematic map of the brain, and the activity data is algorithmically analyzed by the size of the activity spike, the frequency of the discharges and the locality of the spikes. This algorithmic data is then compared to a database of normal patient brainwave activity to determine specific seizure types, focal location of seizure activity, or possible underlying medical conditions. QEEG is not an invasive procedure; it can be used on all age groups but requires the interpretation of a specialist trained in quantitative encephalographic analysis.

Unlike standard EEG interpretation, which relies on waveform recognition, interpretation of the QEEG involves an assessment of the statistical degree of congruence or lack of congruence between a patient and the normal population, or the degree of similarity between a given patient and a QEEG profile that may be characteristic of some defined clinical group. The quantitative approach can display not only variations in the QEEG profiles but also progressive changes in neurophysiological function over time. Interelectrode comparative measures (e.g., phase and coherence) can be analyzed with the QEEG but cannot be calculated using conventional EEG methods (Gelb, et al., 2009; Grebb, 2005; Wallace, 2001; American Clinical Neurophysiology Society [ACNS] and the American Academy of Neurology [AAN], 1997).

The use of QEEG as an adjunct to and in combination with a traditional EEG is well established for certain clinical situations and has evolved into the standard of care for the diagnostic evaluation of a subset of patients. For epilepsy, QEEG is considered established as a practice option when used as an adjunct to routine or digital EEG for continuous brain monitoring by frequency trending in the operating room (OR) or intensive care unit (ICU) to detect early acute intracranial complications, and to screen for possible epileptic seizures in high-risk ICU patients. QEEG is considered an established adjunct to digital EEG for screening for possible spikes or seizures in long-term monitoring and ambulatory recording, to facilitate subsequent expert visual EEG interpretation. QEEG topographic voltage analysis with dipole analysis may be useful in pre-surgical evaluations as an addition to digital EEG. In cerebrovascular disease, the sensitivity and specificity of QEEG are high (>80%) for detection of ischemia-related cerebral impairment or similar focal impairment, with false-positive rates below 5%–10%. QEEG parallels the long-established role of routine EEG in the detection of diminished alpha and increased slowing in delirium and dementias. As such, QEEG may be useful in evaluating certain patients with dementia or encephalopathy whose neuroimaging and routine EEG studies are not conclusive (ACNS/AAN, 1997).

QEEG has also been proposed for the evaluation of psychiatric disorders such as depression and schizophrenia; learning disability (LD) and attention-deficit/hyperactivity disorders (ADD/ADHD); head injury; and substance abuse. However the role of QEEG in the diagnostic evaluation of these conditions has not been determined.

### **Literature Review**

The evidence supporting the effectiveness of QEEG in a number of clinical scenarios, such as those previously described, consists of older randomized controlled trials and case-control and cohort studies.

**Psychiatric Disorders:** Randomized and non-randomized comparative studies and case series with patient populations ranging from 32–94 have addressed the use of QEEG for the evaluation of various psychiatric conditions (Hunter, et al., 2010; Bjørk, et al., 2008; Hunter, et al., 2006; Crumbley, et al., 2005). Some study results have suggested that brainwave activity may be useful for predicting the response of patients with major depression and other psychiatric disorders to various treatment plans. However, larger well-designed studies examining the effectiveness of QEEG for psychiatric disorders are lacking and as such the available evidence is insufficient to support the use of QEEG for the evaluation of these disorders.

**Attention-deficit/hyperactivity disorder (ADD/ADHD):** The evidence in the published peer-reviewed medical literature examining EEG traits associated with ADD/ADHD have primarily included evaluation studies and few comparative trials with patient populations of 30–253 (Fonseca, et al., 2008; Hermens, et al., 2005; Magee, et al., 2005; Swartwood, et al., 2003; Clarke, et al., 2002). One meta-analysis of nine studies by Snyder and colleagues (2006) compared QEEG trait data of patients diagnosed with ADHD versus patients without ADHD. Results of the analysis indicated that an increase in the theta/beta ratio of brain activity in children with ADHD relative to controls was present. By statistical analysis, the sensitivity and specificity for an effect size of this magnitude was predicted to be approximately 94% and 94%–98% respectively. It was noted that the studies of controlled groups were often performed with retrospectively set limits, and that in practice the results would likely be more modest. In conclusion, a number of related issues were identified that warrant consideration: the specificity of the QEEG in the differential diagnosis of ADHD remains unknown; the effect of comorbid conditions on the QEEG requires further investigation; and the clinical utility of the QEEG in the differentiation of ADHD from other disorders needs to be determined (Snyder, et al., 2006).

There is insufficient evidence in the published peer-reviewed medical literature to support the use of QEEG for the diagnostic evaluation of ADD/ADHD.

**Miscellaneous:** There is a paucity of current evidence examining the effectiveness of QEEG for the following: developmental delay; learning disorders; mental retardation; head injury; chronic fatigue syndrome; and alcohol and other drug use disorders. A number of studies in the 1990s evaluated the use of QEEG for diagnosing these disorders. However, the role of QEEG in the diagnostic work-up has not been established, therefore, the use of QEEG for the evaluation of these conditions is unsupported.

### **Professional Societies/Organizations**

The AAN and the Practice Committee of the Child Neurology Society have published a practice parameter for evaluating children with global developmental delay which specifies that the use of EEG recording may be recommended when there is a history of epilepsy, or when a clinical examination provides indications of the presence of epilepsy, or a specific epileptic syndrome. Data is insufficient to recommend the use of EEG recording in children with developmental delay when there is no clinical evidence of epilepsy (Rivello, 2006; Shevell, 2003).

The ACNS and AAN do not recognize the use of QEEG for any of the following conditions:

- alcoholism
- attention-deficit/hyperactivity disorders (ADD/ADHD)
- depression
- drug/substance abuse
- mild or moderate head injury
- learning disability (LD)

- schizophrenia

Although numerous studies have been conducted in relation to using QEEG in the diagnosis and treatment of the above conditions, the efficacy and accuracy of its use remains investigational at this time. These studies lacked randomization, were conducted retrospectively, produced conflicting results and were difficult to assess (ACNS/AAN, 1997).

### Summary

The application of quantitative electroencephalography (QEEG) is supported in numerous textbooks and incorporated in several professional practice guidelines in relation to the diagnosis of patients with epilepsy, the quantitative monitoring of patients during cranial surgery, or when monitoring high-risk patients in an intensive care unit. The QEEG is a useful adjunct to a surface EEG and provides additional detail that can confirm the diagnosis of seizures or seizure-like activity, when performed and analyzed by a specially-trained diagnostician.

There is a lack of evidence in the published, peer-reviewed literature to permit conclusions regarding the accuracy, reproducibility, and clinical utility of QEEG for the assessment of psychiatric or neuropsychiatric disorders, developmental delay, learning disorders, mental retardation, head injury, chronic fatigue syndrome, and alcohol and other drug use disorders. The role of such testing in the management of individuals with these conditions, including the impact of QEEG results on health outcomes, has not been established.

### Coding/Billing Information

**Note:** This list of codes may not be all-inclusive.

**Covered when medically necessary when used to report quantitative electroencephalography (QEEG):**

CPT <sup>®</sup> * Codes	Description
95955	Electroencephalogram (EEG) during nonintracranial surgery (eg, carotid surgery)
95957	Digital analysis of electroencephalogram (EEG) (eg, for epileptic spike analysis)
95961	Functional cortical and subcortical mapping by stimulation and/or recording of electrodes on brain surface, or of depth electrodes, to provoke seizures or identify vital brain structures; initial hour of physician attendance
95962	Functional cortical and subcortical mapping by stimulation and/or recording of electrodes on brain surface, or of depth electrodes, to provoke seizures or identify vital brain structures; each additional hour of physician attendance (List separately in addition to code for primary procedure)

HCPCS Codes	Description
S8040	Topographic brain mapping

ICD-9-CM Diagnosis Codes	Description
290.0	Senile dementia, uncomplicated
290.4	Vascular dementia, uncomplicated
345.00 - 345.01	Generalized nonconvulsive epilepsy
345.10 - 345.11	Generalized convulsive epilepsy
345.40 - 345.41	Localization-related (focal) (partial) epilepsy and epileptic syndromes with complex partial seizures
345.50 - 345.51	Localization-related (focal) (partial) epilepsy and epileptic syndromes with simple partial seizures

345.60 - 345.61	Infantile spasms
345.80 - 345.81	Other forms of epilepsy and recurrent seizures
345.90 - 345.91	Unspecified epilepsy
348.30	Encephalopathy, unspecified
437.9	Unspecified cerebrovascular disease

**Experimental/Investigational/Unproven/Not Covered:**

<b>ICD-9-CM Diagnosis Codes</b>	<b>Description</b>
291.0- 291.9	Alcohol-induced mental disorders
295.00 – 295.95	Schizophrenic disorders
296.20 – 296.26	Major depressive disorder, single episode
296.30 – 296.36	Major depressive disorder, recurrent episode
298.0	Depressive type, psychosis
300.4	Dysthymic disorder
301.12	Chronic depressive personality disorder
303.00 – 303.93	Alcohol dependence syndrome
304.00 – 304.93	Drug dependence
310.2	Post concussion syndrome
311	Depressive disorder, not elsewhere classified
314.00 – 314.9	Hyperkinetic syndrome of childhood
315.00 – 315.9	Specific delays in development
317	Mild mental retardation
318.0 – 318.2	Other specified mental retardation
319	Unspecified mental retardation
780.71	Chronic fatigue syndrome
	All other codes

**\*Current Procedural Terminology (CPT®) © 2010 American Medical Association: Chicago, IL.**

## References

1. American Academy of Neurology and the American Clinical Neurophysiology Society. Assessment of digital EEG, quantitative EEG, and EEG brain mapping. *Neurology* 1997;49:277-92.
2. Barry RJ, Clarke AR, Johnstone SJ. A review of electrophysiology in attention-deficit/hyperactivity disorder: I. Qualitative and quantitative electroencephalography. *Clin Neurophysiol.* 2003 Feb;114(2):171-83.
3. Bjørk MH, Sand T, Bråthen G, Linaker OM, Morken G, Nilsen BM, et al. Quantitative EEG findings in patients with acute, brief depression combined with other fluctuating psychiatric symptoms: a controlled study from an acute psychiatric department. *BMC Psychiatry.* 2008 Nov 11;8:89.

4. Chabot RJ, Michele F, Prichep L. The role of quantitative electroencephalography in child and adolescent psychiatric disorders. *Child Adolesc Psychiatr Clin N Am*. 2005;14(1):21-53, v-vi.
5. Clarke AR, Barry RJ, McCarthy R, Selikowitz M, Brown CR. EEG evidence for a new conceptualisation of attention deficit hyperactivity disorder. *Clin Neurophysiol*. 2002 Jul;113(7):1036-44.
6. Gelb AW, Leslie K, Stanski DR, Shafer SL (authors). Chapter 39: Monitoring the Depth of Anesthesia. In: *Miller's Anesthesia*, 7th ed. Copyright © 2009 Churchill Livingstone, an Imprint of Elsevier.
7. Grebb JA. (author). Chapter 1: Neural Sciences. In: *Kaplan & Sadock's Comprehensive Textbook of Psychiatry*. Philadelphia, PA: Lippincott, Williams & Wilkins, 2005.
8. Hermens DF, Soei EX, Clarke SD, Kohn MR, Gordon E, Williams LM. Resting EEG theta activity predicts cognitive performance in attention-deficit hyperactivity disorder. *Pediatr Neurol*. 2005 Apr;32(4):248-56.
9. Hunter AM, Muthén BO, Cook IA, Leuchter AF. Antidepressant response trajectories and quantitative electroencephalography (QEEG) biomarkers in major depressive disorder. *J Psychiatr Res*. 2010 Jan;44(2):90-8. Epub 2009 Jul 24.
10. Hunter AM, Leuchter AF, Morgan ML, Cook IA. Changes in Brain Function (Quantitative EEG Cordance) During Placebo Lead-In and Treatment Outcomes in Clinical Trials for Major Depression. *Am J Psychiatry*. 2006;163:1426-32.
11. Magee CA, Clarke AR, Barry RJ, McCarthy R, Selikowitz M. Examining the diagnostic utility of EEG power measures in children with attention deficit/hyperactivity disorder. *Clin Neurophysiol*. 2005 May;116(5):1033-40. Epub 2005 Jan 25.
12. National Institutes of Health and Clinical Excellence (NICE). Clinical Guideline (20): The diagnosis and management of the epilepsies in adults and children in primary and secondary care. Updated Oct 2004. Accessed Oct 2007. Available at URL address: <http://guidance.nice.org.uk>
13. Nuwer MR, Hovda DA, Schrader LM, Vespa PM. Routine and quantitative EEG in mild traumatic brain injury. *Clin Neurophysiol*. 2005;116:2001-25.
14. Papadelis C, Maglaveras N, Kourtidou-Papadeli C, Bamidis P, Albani M, Chatzinikolaou K, Pappas K. Quantitative multichannel EEG measure predicting the optimal weaning from ventilator in ICU patients with acute respiratory failure. *Clin Neurophysiol*. 2006;117:752-70.
15. Rivello JJ, Ashwal S, Hirtz D, Glauser T, Ballaban-Gil K, Kelly K, et al. Practice Parameter: Diagnostic assessment of the child with status epilepticus (an evidence-based review). Report of the Quality Standards Subcommittee of the American Academy of Neurology and the Practice Committee of the Child Neurology Society. *Neurology*. 2006; 67:1542-50.
16. Shevell M, Ashwal S, Donley D, Flint J, Gingold M, Hirtz D, et al. Practice parameter: evaluation of the child with global developmental delay: report of the Quality Standards Subcommittee of the American Academy of Neurology and the Practice Committee of the Child Neurology Society. *Neurology*. 2003;60:367-80. Accessed Oct 2007. Available at URL address: <http://www.neurology.org/cgi/content/full/60/3/367>
17. Snyder SM, Hall JR. A meta-analysis of quantitative EEG power associated with Attention-Deficit Hyperactivity Disorder. *J Clin Neurophysiol*. 2006;23:441-56.
18. Swartwood JN, Swartwood MO, Lubar JF, Timmermann DL. EEG differences in ADHD-combined type during baseline and cognitive tasks. *Pediatr Neurol*. 2003 Mar;28(3):199-204.

19. Wallace BE, Wagner AK, Wagner EP, McDeavitt JT. A history and review of quantitative electroencephalography in traumatic brain injury. J Head Trauma Rehabil. 2001 Apr;16(2):165-90.

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## Policy History

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<b>Pre-Merger Organizations</b>	<b>Last Review Date</b>	<b>Policy Number</b>	<b>Title</b>
CIGNA HealthCare	11/15/2007	0239	Quantitative Electroencephalogram (QEEG)

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Connecticut General Life Insurance Company has acquired the business of Great-West Healthcare from Great-West Life & Annuity Insurance Company (GWLA). Certain products continue to be provided by GWLA (Life, Accident and Disability, and Excess Loss). GWLA is not licensed to do business in New York. In New York, these products are sold by GWLA's subsidiary, First Great-West Life & Annuity Insurance Company, White Plains, N.Y.