Medical Policy
Quantitative Electroencephalography as a Diagnostic Aid for Attention-Deficit/Hyperactivity Disorder

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Policy Number: 554
BCBSA Reference Number: 3.01.03
NCD/LCD: NA

Related Policies
- Neurofeedback, #515

Policy
Commercial Members: Managed Care (HMO and POS), PPO, and Indemnity Medicare HMO Blue℠ and Medicare PPO Blue℠ Members

Quantitative electroencephalographic (EEG)-based assessment of the theta/beta ratio is considered INVESTIGATIONAL as a diagnostic aid for attention-deficit/hyperactivity disorder.

Prior Authorization Information
Pre-service approval is required for all inpatient services for all products. See below for situations where prior authorization may be required or may not be required for outpatient services.
Yes indicates that prior authorization is required.
No indicates that prior authorization is not required.
N/A indicates that this service is primarily performed in an inpatient setting.

<table>
<thead>
<tr>
<th>Outpatient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial Managed Care (HMO and POS)</td>
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<tr>
<td>Commercial PPO and Indemnity</td>
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<tr>
<td>Medicare HMO Blue℠</td>
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<td>Medicare PPO Blue℠</td>
</tr>
</tbody>
</table>

CPT Codes / HCPCS Codes / ICD Codes
Inclusion or exclusion of a code does not constitute or imply member coverage or provider reimbursement. Please refer to the member’s contract benefits in effect at the time of service to determine coverage or non-coverage as it applies to an individual member.
Providers should report all services using the most up-to-date industry-standard procedure, revenue, and diagnosis codes, including modifiers where applicable.

### CPT Codes

<table>
<thead>
<tr>
<th>CPT codes:</th>
<th>Code Description</th>
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<tbody>
<tr>
<td>95957</td>
<td>Digital analysis of electroencephalogram (EEG) (eg, for epileptic spike analysis)</td>
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<tr>
<td>95812</td>
<td>Electroencephalogram (EEG) extended monitoring; 41-60 minutes</td>
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<tr>
<td>95813</td>
<td>Electroencephalogram (EEG) extended monitoring; greater than 1 hour</td>
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</tbody>
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### Description

Patients with attention-deficit/hyperactivity disorder (ADHD) may have alterations in their brain wave patterns that can be measured by quantitative electroencephalography (EEG). A commercially available system, the Neuropsychiatric EEG-based ADHD Assessment Aid (NEBA®), measures the resting theta/beta ratio of the EEG. This technology is being evaluated to aid in the diagnosis of ADHD.

### Background

Attention-deficit/hyperactivity disorder is a common disorder in children, adolescents, and adults. ADHD is defined as involving pervasive symptoms of inattention and/or hyperactivity-impulsivity. The behaviors, which are frequently considered to be age-inappropriate, can lead to impairment in the school and home environment. Stimulant medications have been shown to reduce symptoms associated with ADHD, although there are concerns about the potential for overdiagnosis and overprescribing of medication. Presently, ADHD is diagnosed clinically by assessing behavioral symptoms and impairment via interviews and standard questionnaires. Diagnosis can be challenging, as the core symptoms are non-specific. They may be present in other psychiatric disorders (e.g., learning disabilities, conduct disorders, or affective disorders) or be a result of environmental influences such as a lack of discipline. In addition, ADHD may be a heterogeneous disorder with multiple subtypes.

There has been a substantial amount of research over the last several decades on whether EEG-derived brain wave patterns in patients with ADHD differ from those without ADHD. EEG is typically categorized into 4 frequency ranges, delta (<4 Hz), theta (4-7 Hz), alpha (8-12 Hz), and beta (13-25 Hz). The largest focus of research on brain wave patterns in ADHD has been on whether there is increased theta wave activity and an increased theta/beta ratio in ADHD patients. The NEBA® system is a quantitative EEG system (QEEG) that measures the resting theta/beta ratio of the EEG with an electrode located at the central midline position (CZ). QEEG uses computer analysis with mathematical transformation from the time domain into the frequency domain (fast Fourier transform) to determine the total power at each frequency. Relative power of the waveform can then be calculated in relation to the total power of the 4 frequency ranges.

It is proposed that the NEBA system can be used to confirm a clinical diagnosis or support further testing in children and adolescents with ADHD. The system is not intended to evaluate patients in whom the clinician’s diagnosis of ADHD is negative, and the system does not generate an interpretive report in this situation. It is also proposed that the clinician’s diagnostic impression plus the results generated by the NEBA system may reduce the potential for overdiagnosis of ADHD, and thereby reduce the risks of administering unnecessary pharmacologic therapy in the intended use population. In addition, as a result of research on EEG brain waves in ADHD, neurofeedback has been developed as a potential treatment for ADHD. This treatment employs principles of biofeedback using EEG brain wave activity and attempts to alter the brain wave patterns in beneficial ways.

### Summary

Patients with attention-deficit/hyperactivity disorder (ADHD) may have alterations in their brain wave patterns that can be measured by quantitative electroencephalography (QEEG). A commercially available system, the Neuropsychiatric EEG-based ADHD Assessment Aid (NEBA®), measures the resting...
theta/beta ratio of the EEG. This technology is being evaluated to aid in the diagnosis of ADHD in adolescents and children for whom there is a clinical suspicion of ADHD.

The evidence related to the use of QEEG in the diagnosis of ADHD includes numerous studies that have evaluated quantitative EEG at the CZ position and other positions with standard EEG equipment, and 1 pivotal trial submitted to the U.S. Food and Drug Administration (FDA) that used the NEBA system to assess test-retest reliability, sensitivity, specificity, and reclassification analysis in an appropriate population of patients. In the FDA pivotal trial, the specificity and positive predictive value (PPV) of QEEG was high, although the reclassification analysis showed little benefit of a positive NEBA over clinical assessment alone. The reclassification analysis suggests that a negative NEBA might make ADHD less likely, although it is not clear from this study whether the consensus diagnosis was more accurate than the initial clinical diagnosis that included patient interview and parent rating scales. Further research is needed to evaluate the potential impact of NEBA on management of ADHD. In addition, the effect of the test on patient outcomes, such as rates of medication use, would allow greater certainty regarding the usefulness of NEBA.

The larger body of evidence also raises questions about the utility of measuring the theta/beta ratio in patients suspected of ADHD, as this has not been a consistent finding across studies. Recent studies show low accuracy (58%) and no significant increase in the theta/beta ratio in children and adolescents with ADHD compared with age- and sex-matched controls. Other studies show an increase in beta (rather than a decrease) in a subgroup of affected children and adolescents. Given the uncertainty of an increase in the theta/beta ratio in children and adolescents with ADHD, additional study is needed to determine how strongly the theta/beta ratio is associated with ADHD. Therefore, quantitative EEG as a diagnostic aid for ADHD is considered investigational.

### Policy History

<table>
<thead>
<tr>
<th>Date</th>
<th>Action</th>
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<tbody>
<tr>
<td>11/2017</td>
<td>New references added from BCBSA National medical policy.</td>
</tr>
<tr>
<td>1/2016</td>
<td>New references added from BCBSA National medical policy.</td>
</tr>
<tr>
<td>12/2014</td>
<td>BCBSA National medical policy review. Wording of policy statement changed to clarify the type of quantitative EEG and the diseases addressed in the policy. Effective 12/1/2014.</td>
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### Information Pertaining to All Blue Cross Blue Shield Medical Policies

Click on any of the following terms to access the relevant information:

- Medical Policy Terms of Use
- Managed Care Guidelines
- Indemnity/PPO Guidelines
- Clinical Exception Process
- Medical Technology Assessment Guidelines

### References

1. Blue Cross and Blue Shield Association Technology Evaluation Center (TEC). Quantitative Electroencephalography as a Diagnostic Aid for Attention-Deficit/Hyperactivity Disorder. TEC Assessments. 2014; Volume 29: Tab 1 PMID


