

| MEDICAL POLICY | | Biofeedback and Neurofeedback | |
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| Effective Date: 1/1/2021 | | Section: MED | Policy No: 438 |
|  1/1/2021 | | Medical Policy Committee Approved Date: 12/2020 | |
| Medical Officer | Date | | |

See Policy CPT/HCPCS CODE section below for any prior authorization requirements

SCOPE:

Providence Health Plan, Providence Health Assurance, Providence Plan Partners, and Ayin Health Solutions as applicable (referred to individually as “Company” and collectively as “Companies”).

APPLIES TO:

All lines of business

BENEFIT APPLICATION

Medicaid Members

Oregon: Services requested for Oregon Health Plan (OHP) members follow the OHP Prioritized List and Oregon Administrative Rules (OARs) as the primary resource for coverage determinations. Medical policy criteria below may be applied when there are no criteria available in the OARs and the OHP Prioritized List.

POLICY CRITERIA

- I. Biofeedback may be considered **medically necessary and covered** for the following indications (A. and B.):
 - A. Urinary incontinence (please see **Urinary Incontinence Treatments** policy for medical necessary criteria); **or**
 - B. Migraine headaches
- II. Biofeedback with EEG monitoring (i.e., neurofeedback) is considered **not medically necessary and not covered** for the treatment of any indication, including but not limited to:
 - C. Anxiety
 - D. Attention deficit hyperactivity disorder
 - E. Depression

- F. Obsessive-compulsive disorder
- G. Post-traumatic stress disorder
- H. Substance use disorder
- I. Asthma
- J. Epilepsy
- K. Fibromyalgia
- L. Primary headaches
- M. Traumatic brain injury

III. The use of home biofeedback devices is considered **not medically necessary and not covered** for all conditions.

Link to [Policy Summary](#)

BILLING GUIDELINES

CPT codes 90875, 90876, and 90901 will be considered not medically necessary and not covered for the indications addressed in this policy when the request is billed with any of the ICD-10 diagnosis codes listed in the [Billing Guidelines Appendix](#) below.

CPT/HCPCS CODES

| All Lines of Business | |
|---------------------------------|--|
| No Prior Authorization Required | |
| 90875 | Individual psychophysiological therapy incorporating biofeedback training by any modality (face-to-face with the patient), with psychotherapy (eg, insight oriented, behavior modifying or supportive psychotherapy); 30 minutes |
| 90876 | Individual psychophysiological therapy incorporating biofeedback training by any modality (face-to-face with the patient), with psychotherapy (eg, insight oriented, behavior modifying or supportive psychotherapy); 45 minutes |
| 90901 | Biofeedback training by any modality |
| E0746 | Electromyography (EMG), biofeedback device |

DESCRIPTION

Indications

Anxiety disorder

Anxiety is the most common mental health disorder in the United States, affecting 18.1% of the population annually.¹ Anxiety disorders interfere with daily activities, and feelings of anxiety and panic are difficult to control and can persist for long periods of time and throughout a person’s life. Anxiety

disorders may develop from a myriad of mental health and physical issues. Some examples of anxiety disorders include generalized anxiety disorder, social anxiety disorder, separation anxiety disorder, and specific phobias. Common treatments for anxiety include therapy, medication, and mindfulness practices.

Attention deficit hyperactivity disorder (ADHD)

Attention deficit hyperactivity disorder (ADHD) is neuropsychiatric condition that most commonly affects children and adolescence and often continues into adulthood.² The disorder commonly manifests as persistent difficulties in sustaining attention, hyperactivity, and impulsive behavior and may affect cognitive, academic, behavioral, emotional, and social functioning. While symptoms tend to become less severe with age, ADHD can persist throughout adulthood. Standard treatments are designed to manage symptoms, and include behavior/psychotherapy interventions and pharmacotherapy. Others treatments that have limited evidence include physical exercise, diets, mindfulness, and other complementary and alternative therapies.

Depression/major depressive disorder

Depression is a mood disorder that is characterized by prolonged and persistent feelings of sadness and a loss of interest. Major depressive disorder is defined as a period of at least 2 weeks of depressed mood or a loss of interest in daily activities while experiencing a majority of specified symptoms such as issues with sleep, eating, energy, concentration, or self-worth. In 2017, it was estimated that 7.1% of US adults experienced at least one major depressive episode.³ Antidepressant medications and psychotherapy are common, effective treatments for people experiencing depression.

Obsessive-compulsive disorder (OCD)

Obsessive-compulsive disorder (OCD) is a type of anxiety disorder, defined by UpToDate as a disorder “characterized by recurrent intrusive thoughts, images, or urges (obsessions) that typically cause anxiety or distress, and by repetitive mental or behavioral acts (compulsions) that the individual feels driven to perform, either in relation to an obsession or according to rules that he or she believes must be applied rigidly or to achieve a sense of “completeness.”⁴ OCD generally occurs in childhood or adolescence and can persist throughout a person’s life, impairing daily functioning. OCD has a lifetime prevalence of 2.3% in the United States. Standard treatments are psychotherapy and medications, often in combination. When medication and therapy are not effective, more intensive treatments are sometimes used, including intensive outpatient and residential treatment programs, deep brain stimulation, and transcranial magnetic stimulation.

Post-traumatic stress disorder (PTSD)

Post-traumatic stress disorder (PTSD) is a mental health condition triggered by a traumatic event that can cause intrusive thoughts, nightmares, flashbacks to the trauma, sleep disturbance, and other issues that disturb social, occupational, and interpersonal daily experiences.⁵ Lifetime prevalence rates of PTSD range from 6.1 to 9.2% in the United States and Canada. PTSD is associated with other mental health disorders, including depression and anxiety. Standard treatment is psychotherapy, using specific therapy modalities such as cognitive therapy, exposure therapy, eye movement desensitization and reprocessing

therapy, and other behavioral treatments developed specifically for PTSD. Medication may also be used to alleviate PTSD symptoms such as depression and anxiety.

Substance use disorder

Substance use disorder occurs when an individual's use of alcohol and/or other substances (drugs) leads to health, social, occupational, and interpersonal issues. Substance abuse is highly prevalent in the United States, affecting approximately 7.2% of individuals age 12 and over.⁶ Individuals with substance use disorders are at higher risk for and more likely to have other mental health disorders, including depression, anxiety, bipolar disorder, post-traumatic stress disorder, and attention deficit hyperactivity disorder. Common therapies for substance use disorder include medically-supervised withdrawal management, psychotherapy, medications, and support groups. Treatment differs based on the substance being used.

Asthma

Asthma is a respiratory condition in which inflammation in the lungs causes airflow obstruction and bronchial spasms.⁷ Asthma is characterized by symptoms of intermittent dyspnea, coughing, and wheezing. Asthma often begins in childhood and management of the condition focuses on reducing risk of triggers (e.g. allergens, irritants), controlling symptoms, and minimizing medication adverse effects. Medications include both long term treatments, such as inhaled corticosteroids, and quick-relief medications, such as short-acting beta agonists. More intensive treatments, such as bronchial thermoplasty, are used for severe cases, although high-quality evidence on its efficacy is lacking. The prevalence of asthma in the United States is approximately 7.7%.⁸

Epilepsy

Epilepsy is a group of neurological disorders characterized by recurrent and unpredictable seizures caused by excessive and abnormal electrical activity in the brain.⁹ Brain dysfunction leading to epilepsy may be caused by a plethora of medical issues. Symptoms can vary greatly, with some episodes causing minor reactions such as twitching while others causing severe reactions that can lead to injury, such as vigorous shaking. Treatments for epilepsy include anti-seizure medication, vagus nerve stimulation, ketogenic diet, and, for severe cases, brain surgery. As of 2015, 1.2% of the United States had active epilepsy.¹⁰

Fibromyalgia

Fibromyalgia is a medical disorder characterized by chronic widespread musculoskeletal pain and often accompanied by fatigue, cognitive disturbance, psychiatric symptoms, and multiple somatic symptoms. The etiology and pathophysiology of fibromyalgia is unknown as there is no evidence of inflammation in the areas of pain. Due to the unidentifiable source of pain and the absence of inflammation, fibromyalgia is a controversial condition and has been considered psychosomatic, although evidence suggests that it is a disorder of pain regulation and over-sensitization of nerves.

Primary headaches/Migraines

Headaches are a continuous pain in the head and are among the most common medical complaints.¹¹ Headaches vary in intensity, location on the head, frequency, and cause. Common headaches include migraine headaches, tension headaches, and cluster headaches. Migraine headaches are characterized by intense throbbing pain on one side of the head and symptoms such as sensitivity to light, sound, and smell accompany the pain. Tension headaches are characterized by dull, constant pain on both sides of the head. Cluster headaches are severe and recurrent headaches characterized by intense piercing pain behind or around one eye. Causes of headaches are unclear, but stress, anxiety, dehydration, and poor sleep are common triggers. Headaches are commonly treated with over the counter nonsteroidal anti-inflammatory drugs, although severe cases of migraine and cluster headaches may be treated with prescription medications such as triptans and preventive medications (including beta blockers, anti-seizure drugs, and Botox injections).

Traumatic brain injury (TBI)

The Centers for Disease Control and Prevention defines traumatic brain injury (TBI) as “a disruption in the normal function of the brain that can be caused by a bump, blow, or jolt to the head, or penetrating head injury.”¹² Severity of TBI varies from mild to severe, with severe injury at times leading to permanent disability or death. Mild TBI is commonly called concussion, and most recover completely from these injuries. Symptoms include difficulty thinking clearly and concentrating, headache, blurry vision, sensitivity to noise or light, balance issues, malaise, irritability and sadness, and sleeping issues. For mild cases, generally no treatment other than rest is recommended, with pain medication offered to alleviate headache symptoms. Those with severe TBI requiring rehabilitation commonly work with occupational therapists, physical therapists, speech and language pathologists, neuropsychologists, and other rehabilitation specialists to improve daily activity performance.

Urinary incontinence

Urinary incontinence refers to the involuntary loss of urine. It has a high degree of prevalence in the older population and is a significant contributor to healthcare costs, disability and reduced quality of life.

Urinary incontinence is categorized as stress incontinence (SUI), urge incontinence (UII) or mixed incontinence (MUI) (a combination of stress and urge incontinence). Stress urinary incontinence is the predominant type of urinary incontinence in women, and is the complaint of involuntary leakage of urine during exertion, sneezing or coughing. Urge urinary incontinence is the predominant type of urinary incontinence in men, and describes the sudden urge to urinate and the involuntary loss of urine. Nearly all people with incontinence will benefit from conservative treatment including physical therapy, increasing fitness and weight loss. Those with an element of urge incontinence may also benefit from treatment with a medication aimed at reducing detrusor muscle over activity. Stress incontinence may be effectively treated in some women with a pessary.

Treatment

Biofeedback

Biofeedback is a technique used to control bodily processes that are generally thought to be involuntary. Biofeedback therapy works by recording physiological signals such as brain waves or heart rate and presenting them as audio or visual cues to patients, who then are guided by practitioners to develop

control over these signals.¹³ There are a multitude of biofeedback modalities, including electromyograph to detect muscle action potential, feedback thermometer to detect skin temperature, electrodermograph to measure skin conductance and potential, electrocardiogram to measure electrical activity of the heart, and others. This technique is used to treat a variety of different physiological and psychological issues, including headaches, chronic pain, anxiety, hypertension, urinary incontinence, post-traumatic stress disorder, and more.

Neurofeedback

Neurofeedback is a type of psychophysiological biofeedback treatment in which neural activity is measured and feedback is presented as audio or video to teach self-regulation of brain function. The most common type of neurofeedback treatment is electroencephalogram (EEG) neurofeedback, where sensors are placed on the scalp and computer software detects and records brain activity, most commonly. The information is played back to the patient through an audio or visual training that allows the patient to view changes in neural activity in real time. Another form of neurofeedback used is functional magnetic resonance imaging (fMRI) neurofeedback, similar to EEG neurofeedback, where fMRI readings of brain activity can be played back to patient in real time. By viewing changes in activity, patients are thought to learn to alter brain function and train their brain to control emotion, attention, and behaviors. As neurofeedback is repeated, habits are formed in brain function with the help of practitioner guidance, creating new, healthy patterns in neural activity. Neurofeedback is designed to treat psychological and medical disorders such as attention deficit disorder (ADHD), anxiety, depression, autism, headaches, brain damage due to trauma, and other conditions. It is also used to improve creative performance.

REVIEW OF EVIDENCE

A review of the ECRI, Hayes, Cochrane, and PubMed databases was conducted regarding the use of biofeedback and neurofeedback as a treatment for behavioral health and medical indications. Below is a summary of the available evidence identified through July of 2020.

Medically Necessary Indications for Biofeedback

Urinary Incontinence

- In 2019, Nunes and colleagues published a systematic review investigating the efficacy of biofeedback (BF) with pelvic floor muscle training (PFMT) in women with stress urinary incontinence.¹⁴ Eleven randomized studies were included in the analysis, totalling 649 participants. Sample sizes ranged from 32 to 120 participants. Perineometer BF improved quality of life measurements in lower quality RCTs, but a higher quality trial found that PFMT and PFMT with electrical stimulation were better than perineometer BF. Urine leakage frequency was improved with PFMT plus perineometer BF when compared with alternative treatments in 2 studies, while a third study found that alternative treatments were more effective. The authors noted that the ambiguity of the results prevent them from demonstrating a clear advantage of PFMT with perineometer BF versus alternative treatments. Electromyography BF showed similar results, with improved quality of life and urine leakage, but

the low quality of trials and the considerable heterogeneity of results led authors to conclude that no advantages can be determined with the present data.

- A 2018 systematic review and meta-analysis by Kannan and colleagues investigated the effectiveness of pelvic floor muscle training (PFMT) alone in combination with biofeedback (BF), electrical stimulation (ES), or both for urinary incontinence in men following prostatectomy.¹⁵ Fifteen publications on 16 randomized controlled trials (RCTs) were included in the analysis, with 3503 participants aged 45 to 90 years. Sample sizes ranged from 16 to 203 participants. Comparators included no treatment (13 studies) and sham ES in 2 studies. Analysis from the 374 men in the trials comparing PFMT + BF to no treatment found that more men in the experimental group achieved continence (63/194) after intervention compared to the control group (38/180), although the effect was not significant (RR: 1.70; 95% CI, 0.95-3.04; $p=0.07$). Similar non-significant benefit was found at follow up. Limitations of the study include small sample sizes in many of the trials, heterogeneity among studies, and low-quality study designs. The authors concluded that the review found low to moderate quality of evidence that suggests that PFMT alone could improve recovery of continence in men following prostatectomy and the addition of BF to PFMT may further improve recovery, although this remains uncertain. More high-quality, large RCTs are needed to determine efficacy of BF as an additional treatment for this population.
- In 2011, Cochrane published a systematic review on biofeedback (BF) to augment pelvic floor muscle training (PFMT) for urinary incontinence in women.¹⁶ Twenty-four randomized and quasi-randomized trials involving 1583 women were included in the analysis. One trial was deemed to have a low risk of bias, ten had a moderate risk, and 12 were at a higher risk. Pooled analysis found that PFMT+BF led to more cases of improved or cured urinary incontinence compared to PFMT alone (RR: 0.75; 95% CI, 0.66-0.86). These results may be confounded by a difference in PFMT programs across studies. Among 3 trials that assessed participant satisfaction with progress or outcome, participants favored PFMT+BF (RR: 0.65; 95% CI 0.46-0.90). While outcomes favored the addition of BF to PFMT, the authors noted that participants in the BF arms had more contact with health professionals than those in the non-BF arms and many of the trials had moderate to high risk. Small sample sizes, variation in regimens, and variations in outcomes are among the limitations of the available studies in this review. The authors concluded that BF may provide benefit in addition to PFMT in women with urinary incontinence, yet further research is needed to determine if the benefits seen in these trials are effected by other factors such as more interactions with health professionals.

Migraine Headaches

- In 2016, Stubberud and colleagues published a meta-analysis on biofeedback as a prophylaxis for pediatric migraines.¹⁷ Twelve randomized controlled trials were included in the review, and 5 studies were deemed appropriate to include in a pooled analysis. Data from 3 studies (72 participants) showed that biofeedback significantly reduced frequency of migraines compared to a waiting-list control group ($p<0.0001$), by a mean difference of 1.97 attacks per week. One study compared biofeedback and waiting-list control at 6 months follow up and found significant reductions in headache frequency and duration across time for all subjects. One study compared biofeedback to an active control (progressive relaxation) and found no significant differences in migraine frequency, intensity, duration, or analgesic intake. One study

compared biofeedback to sham biofeedback and found no differences in frequency, but the biofeedback back had a significantly higher proportion of responders compared to the sham group.

Limitations of the meta-analysis included small sample sizes, heterogeneity of interventions, and moderate risk of bias in the majority of studies analyzed. The authors concluded:

“Biofeedback delivered together with relaxation therapy or autogenic training seems to be effective in reducing the frequency of migraine in the pediatric population. In addition, the apparent lack of adverse events should qualify biofeedback as an attractive treatment alternative for pediatric migraine. Despite the positive findings, the number of identified studies and participants was small, and a series of methodologic issues hampered proper meta-analyses. Therefore, continued research is warranted.”¹⁷

- In 2007, Nestoriuc and colleagues published a meta-analysis on the efficacy of biofeedback in treating migraines.¹⁸ The analysis included 55 studies, either randomized trials or pre- post-comparator trials, totalling 2229 migraine patients. In comparison to wait-list control groups, biofeedback showed a significant reduction in headache relief. This reduction was also seen when comparing biofeedback to pseudo-feedback and pseudo-relaxation. The effect of biofeedback appeared to be stable over follow-up periods up to several years. No significant differences between biofeedback and relation or ergotamine treatment were found. Limitations of this analysis include small sample sizes, considerable heterogeneity in treatment protocol and methodology, as well as high risk of bias in many of the studies. The authors conclude that biofeedback has a medium effect sizes for short and long-term outcomes in adults with migraines. Biofeedback can substantially reduce pain and psychological symptoms of patients. They recommend biofeedback as an evidence-based behavioral treatment option for the prevention of migraine.
- A 2004 Hayes report (archived in 2009) assessed the efficacy of biofeedback for headache and chronic musculoskeletal pain. Reviewing the literature identified a number of randomized trials and 2 meta-analyses that supported the use of biofeedback for recurrent tension headaches in adults and pediatric migraines. Data on the efficacy of biofeedback for chronic neuromuscular pain was more limited. Hayes gave the following ratings:
 - B rating (some proven benefit): For the treatment of pediatric migraine and tension type headache.
 - C rating (Potential by unproven benefit): For the treatment of headache in adults and for chronic low back pain and temporomandibular joint disorders.
 - D rating (No proven benefit): For the treatment of other chronic pain syndromes, including fibromyalgia. This rating reflects the paucity of evidence regarding the efficacy of biofeedback for these indications.¹⁹

Not Medically Necessary Indications for EEG Biofeedback/Neurofeedback

Anxiety disorder

Systematic reviews

- A 2017 evidence review was conducted by ECRI on biofeedback for treating generalized anxiety disorder.²⁰ A literature search was conducted from January 1, 2012 to November 25, 2017, and one systematic review, 3 RCTs, one nonrandomized comparative study, 6 case series, and 4 narrative reviews were included. The systematic review analyzed 5 studies on EEG biofeedback for OCD and anxiety, and 4 of 5 studies found significantly improved symptoms compared to baseline. Two of three RCTs analyzed EEG biofeedback, and both found that EEG biofeedback improved symptoms of generalized anxiety disorder compared to waitlist. Evidence from these studies had a number of limitations. All trials included had small sample sizes and were single-center studies. Variability was high across studies in terms of treatment protocol, study methodology, outcome assessment, and follow up times. These limitations reduce generalizability and validity of results. ECRI concluded that additional multi-centered studies are needed with larger participant groups and standardized protocol to determine efficacy.
- A 2020 quantitative and qualitative systematic review was conducted by Tolin and colleagues on the effects of biofeedback and neurofeedback for anxiety disorders.²¹ The authors searched medical and psychological databases for peer-reviewed literature from 1987 to 2019 and included 21 randomized controlled trials in their analysis. Among the included articles, 10 investigated EEG neurofeedback and one investigated fMRI neurofeedback. The effect size analysis found that EEG neurofeedback (n=130) was associated with a moderate effect size ($g=0.79$; 95% CI, -0.03 to 1.62) when compared to various control conditions. When comparing EEG neurofeedback to waitlist (4 trials), the effect size was large ($g=1.84$; 95% CI, 0.49 to 3.18). When comparing EEG neurofeedback to active treatment (3 trials), there was a small negative effect ($g= -0.26$; 95% CI= -1.5 to 0.97). One study compared neurofeedback to a reverse neurofeedback condition and the results showed a negligible effect. There was high heterogeneity between studies.

Only one RCT by Zilverstand and colleagues investigated fMRI neurofeedback for anxiety disorders.²² The study recruited patients with specific phobias and randomized them to fMRI neurofeedback or to a control behavioral modification training. During exposure to the specific phobic stimuli, neurofeedback patients reported lower fear levels compared to control patients, and at 3 months, both groups experienced significant reductions in fear. No effect size analysis was done on fMRI neurofeedback do to a lack of useable data.

The authors concluded that the majority of the trials had significant methodological limitations. Sample sizes were very small, there was inadequate blinding or research participants and assessors, measures of anxiety were highly variable, and there was high dropout rate and loss to follow up. The meta-analysis found that neurofeedback showed efficacy in reducing anxiety symptoms over waitlist or no treatment, but did not appear to be as effective as active treatment.

Randomized controlled studies

- Results from a 2020 randomized controlled non-inferiority trial by Schoneveld and colleagues investigated the preventive effects of a neurofeedback video game, *MindLight*, on mental health outcomes associated with anxiety symptoms (internalizing problems, externalizing problems, and self-efficacy).²³ One hundred seventy-four children, ages 8 to 12 years, were randomized to *MindLight* or a cognitive behavioral therapy (CBT) program and outcomes were assessed at

baseline, end of intervention, and at 3 and 6 months follow-up. A significant reduction in mother-reported internalization and externalization of problems was reported in both groups, as well as an increase in self-efficacy. *MindLight* was found to be noninferior to CBT in affecting internalizing problems and self-efficacy, but not decreasing externalizing symptoms. A number of limitations exist in this trial. Participants were excluded if they already received anxiety treatment or if they were previously diagnosed with obsessive compulsive disorder, post-traumatic stress disorder, or autism spectrum disorder, potentially restricting the participant group to children with less intense anxiety symptoms and limiting the generalizability of the cohort. Indeed, the authors include the fact that the cohort comprised of highly-functioning children as a main limitation to the study. Children were recruited from primary schools in the Netherlands, which may have different cultural and educational norms than the United States, and therefore results may not be generalizable to US children with anxiety. The publication did not specify whether the mothers or investigators were blinded, an important factor in determining the levels of potential bias. The study was designed as a non-inferiority study, yet there is no justification for this study design. Neurofeedback is an expensive treatment and has no addressed advantages over CBT. The authors conclude that more research is needed on the effectiveness of *MindLight* neurofeedback game in children with anxiety, but the treatment could be implemented as a prevention program in schools to reduce anxiety symptoms in children. Mixed results and methodology limitations bring into question the results of this study.

Neurofeedback for Attention deficit hyperactivity disorder (ADHD)

Due to the large quantity of studies on neurofeedback for ADHD, only systematic reviews and meta-analyses were included in this evidence review.

Systematic Reviews

- A 2020 evidence review was conducted by ECRI on neurofeedback for treating ADHD in children and adolescents.²⁴ ECRI conducted a literature search from 2015- January 2020 and identified 3 systematic reviews and 3 randomized controlled trials (RCTs) that met their inclusion criteria, reporting in >10,000 patients total.

Overall, neurofeedback was found to be less effective than pharmacotherapy and behavioral therapy for managing ADHD symptoms. A meta-analysis by Yan and colleagues, published in 2019, reviewed 18 studies and found that methylphenidate, a stimulant medication, had a greater 6-month reduction in teacher-reported inattention but there was no significant difference in parent-reported changes.²⁵ A 2017 meta-analysis by Catalá-López and colleagues found neurofeedback to be less effective than stimulants combined with non-stimulant drugs (Odds ratio: 7.8; 95% CI: 1.6 to 34.6) or with behavioral therapy (OR: 6.9; 95% CI: 1.4 to 30.7).²⁶

When comparing neurofeedback to placebo or inactive interventions such as sham neurofeedback, waiting list, attention training, and physical exercise, the results were mixed. A 2019 meta-analysis by Van Doren and colleagues found that neurofeedback had a greater 1-year ADHD improvement than inactive interventions. Catalá-López et al found no difference in ADHD symptom scores between neurofeedback and placebo. Three RCTs comparing neurofeedback to

delayed treatment, physical activity, and electromyography biofeedback muscle training reported inconsistent results.

Evidence from 3 meta-analyses of low-quality studies and 3 additional randomized controlled trials (RCTs) shows that NF is less effective than pharmacotherapy and behavioral therapy for managing ADHD symptoms. Whether NF is more effective than inactive interventions (sham NF, waiting list, attention training, physical exercise) or placebo is unclear because studies reported mixed findings. Studies used different NF protocols, outcome assessment methods, and patient groups. Larger RCTs using standardized methods for NF are needed to assess comparative safety and effectiveness. Clinical guidelines state that evidence is insufficient to recommend NF for ADHD management.

Limitations in the RCTs and studies included in the systematic review included:

- Small sample sizes
- Single-center trials
- Lack of blinding
- Short follow up
- High heterogeneity in participant group, ADHD severity, age, outcome assessors, and protocols

ECRI concluded that the evidence available raises concerns as to whether neurofeedback is an appropriate treatment for ADHD in children and adolescents. They recommend larger RCTs using standardized methods be conducted to assess comparative safety and effectiveness.

- A systematic review published in 2018 by Razoki and colleagues evaluated the efficacy of neurofeedback compared to stimulant medication in children and adolescents with ADHD.²⁷ Twelve publications reporting on 8 randomized controlled trials were included in the analysis. Age range of participants was 6-18 years in 11 studies, with one study reporting on participants aged 12-24 years. Sample sizes ranged from 32 to 130 participants. Four studies compared neurofeedback plus medication to medication alone, and 4 studies compared neurofeedback alone to medication. Outcomes measured were largely subjective behavioral assessments by parents and teachers. Other outcomes measures included self-reports, neurocognitive tests, electroencephalogram parameters, and event-related potentials.

Among the studies that compared neurofeedback alone to medication alone, 2 showed improvement in both groups, with no significant differences in results, while 3 showed greater improvement among the medication groups compared to neurofeedback groups. Among the studies that compared combination therapy to medication alone, neurofeedback plus medication was found to be statistically superior to medication alone in two studies, and a third found no difference between groups. Medication dosages were reduced when neurofeedback was given in conjunction in two studies, implying that neurofeedback may be helpful in reducing dosages for ADHD patients with side effects from medication. When only analyzing trials in the review that include probably ratings, those that are sham controlled or semi-active controlled, or those that employed optimally titration procedures, theta/beta neurofeedback was shown to be not as effective as standard treatment for children or adolescents with ADHD. Authors concluded that neurofeedback in combination with medication may decrease medication dosage in children already using ADH medication and may improve treatment effects and that

neurofeedback should be considered a complementary treatment for children with ADHD. Still, they note that neurofeedback is expensive and it is important to conduct further research to ensure effectiveness of the treatment.

- A 2016 meta-analysis was conducted by Cortese and colleagues on the clinical and neuropsychological outcomes of neurofeedback as a treatment for ADHD.²⁸ Thirteen trials were included, totalling 520 participants. Similar to the analysis conducted by Razoki and colleagues,²⁷ Cortes and colleagues found that neurofeedback improved ADHD symptoms such as inattention and hyperactivity/impulsivity, but these effects disappeared when probably blinded ratings were the outcome or in trials with active or sham controls. The authors conclude that current literature fails to support the use of neurofeedback for ADHD. Future research should include standardized treatment/training protocol, ensuring learning, and optimizing clinically relevant transfer in order to determine effectiveness.
- In 2009 (reviewed in 2013 and archived in 2014), Hayes conducted a health technology assessment on neurofeedback as a nonpharmacological treatment for ADHD.²⁹ A search was conducted for peer-reviewed medical literature published from 1990 to May 2009 and 9 studies were selected for inclusion in the review. Sample sizes ranged from 20 to 100 participants, 3 studies used randomization, and all but one had a comparator group. The participant population consisted primarily of children, ages 7 to 13 years, with a DSM-IV diagnosis of ADHD. The systematic review found that neurofeedback was associated with a reduction in parent or teacher reported ADHD symptoms (inattention, hyperactivity, and impulsivity) in all 9 studies. Neurofeedback was also associated with improvements in objective assessments of attention and impulsivity and estimated of IQ (measured in 3 studies). Four studies measured ability to control brain activity, which is thought to be the mechanism behind neurofeedback, and found that regulation of brain activity was improved along with behavioral measures. Three studies collected follow up outcome data at 6 months and 10 months and found that neurofeedback effects remained. No negative side effects were reported. A number of limitations were identified among the included studies.

Limitations:

- Sample sizes were small.
- Studies comparing neurofeedback did not randomize groups, leading to potential selection bias and limiting generalizability of results.
- Randomized studies had inappropriate control groups, comparing neurofeedback to no treatment, waiting list, or attention skills training program rather than standard of care.
- Lack of blinding in the studies may influence subjective outcome reporting by teachers and parents.
- Majority of studies had short-term follow up.

Hayes concluded that the quality of evidence was moderate. They gave a B rating (some proven benefit) for neurofeedback in children with a diagnosis of ADHD, for whom ADHD and its related symptoms impair functioning. Hayes gave a D rating for neurofeedback in adolescents and adults with ASHS, due to a lack of studies evaluating participants above the age of 13 years. Hayes also offered a safety consideration, stating, "It should be noted that neurofeedback may alter seizure threshold (Serman, 2000). Patients with a history of such seizures should receive

neurofeedback training only from a practitioner with experience in neurofeedback for seizure disorders.”²⁹

Neurofeedback for Depression/ Major Depressive Disorder

A 2017 evidence review was conducted by ECRI on biofeedback for major depressive disorder, searching peer-reviewed medical literature from January 1, 2012 to November 28, 2017.³⁰ One systematic review and 3 RCTs were included in the analysis. The systematic review included 9 studies, 5 RCTs, one nonrandomized comparative study, and 3 case series. The review found evidence that biofeedback, including EEG alone or multimodal biofeedback, improved depression symptoms over standard of care in patients with major depression disorder. Similarly, the 3 RCTs reviewed found that patients treated with fMRI neurofeedback plus standard treatment reported greater depression symptom reduction compared to sham biofeedback and standard treatment.

The reviewed publications suffered from a number of limitations. All studies were single-centered trials with small participant groups, with potential for patient selection bias. Treatment protocols, patient populations, and research methodology were highly variable, limiting generalizability of results. Most of the studies only collected data for short term follow up, and therefore long term efficacy cannot be confidently determined from the included data. ECRI concluded that evidence suggests biofeedback may improve depressive symptoms, but larger, multicenter RCTs are needed to confirm results.

Neurofeedback for Obsessive-compulsive disorder (OCD)

A 2017 evidence review was conducted by ECRI on biofeedback for treating OCD.³¹ Four randomized controlled trials were included in the analysis, totalling 121 participants. Two of the RCTs assessed EEG biofeedback and reported OCD symptoms improvements. One study found that participants who received biofeedback plus cognitive behavioral therapy had significantly greater improvement compared to cognitive behavioral therapy alone. The second RCT found that effects of EEG biofeedback were similar to pharmacotherapy. Two other RCTs found that EEG biofeedback had no added benefit compared with pharmacotherapy alone or sham biofeedback. The 4 reviewed RCTs suffered a number of limitations. The sample sizes were small and participants were recruited from single centers. Treatment protocols, methodology, and outcome assessment varied considerably, limiting generalizability. ECRI concluded that larger, multicenter studies with standardized protocols are needed to validate EEG biofeedback.

Neurofeedback for Post-traumatic stress disorder (PTSD)

Systematic reviews

- A 2019 systematic review was conducted on neurofeedback as a treatment for PTSD. Chiba and colleagues included 13 trials in their review, 10 of which investigated EEG neurofeedback, and 3 of which investigated fMRI neurofeedback.³² Four of the studies had a randomized trial design and sample sizes varied from 2 to 29 participants. The review did not analyze the results of the included studies, although they discussed a 2016 randomized, waitlist-controlled trial by van der Kolk that found that patients with chronic PTSD showed significant PTSD symptom improvement and improvement in affect regulation capacities compared to the control group.³³ The authors

concluded that “Despite promising results are derived from both EEG and fMRI neurofeedback (Table 1), the efficacies of these approaches have not yet been warranted.”³²

- In 2018, Panisch and Hai published a systematic review on neurofeedback as a treatment for PTSD.³⁴ Ten studies were included in the review, 3 of which were randomized trials. Eight studies used EEG neurofeedback and 2 used functional MRI. Due to differences among studies, the authors did not pool study outcomes. They concluded that all studies found positive findings in at least one outcome but that variability among study designs and the relatively small number of RCTs limit the ability to draw conclusions about the efficacy of neurofeedback for treating PTSD, and additional rigorous studies are needed.

Randomized controlled trials

- A 2016 randomized waitlist-controlled study (mentioned in the systematic review above) was conducted by van der Kolk and colleagues on the effects of EEG neurofeedback in patients with chronic PTSD.³³ Fifty-two participants were randomized to neurofeedback or waitlist, and it was found that PTSD symptoms were significantly reduced in the neurofeedback group. Both groups experienced significant decreases in Clinician Administered PTSD scores from pre-treatment to one month post treatment, but the neurofeedback group had substantially larger reductions ($d = -1.71$). Limitations of the study include small sample size, short follow up, and non-active control. The authors conclude that EEG neurofeedback may improve symptoms of PTSD, but further clinical trials are need to substantiate their findings.

Substance use disorder

- A 2015 study was conducted by Lackner and colleagues on the effectiveness of visual short-term neurofeedback on brain activity and clinical characteristics in alcohol use disorders.³⁵ Twenty-five male patients with alcohol use disorder were randomized to neurofeedback or treatment as usual. Absolute alpha and theta amplitudes were higher by trend (nonsignificant) in the eyes-open neurofeedback treatment compared to the control group, but not in the eyes closed treatment. No significant differences were found in psychometric parameters when comparing pre- and post-test results. Patients’ psychological well-being, including depressive and psychiatric symptoms, posttraumatic growth, and coping strategies improved in the neurofeedback group and not in the control group.

Aspects of this study limit its results generalizability and utility. This was a single-center study with a small sample size of only men. Over half of the participants did not complete the study and no long-term effects could be analyzed. The control was not active and does not address potential biases and placebo effect. The results were conflicting, as there was no significant neurological changes from neurofeedback and only small effects were seen in terms of subjective, patient reported clinical variables.

- A 2013 trial was conducted on neurofeedback training for opiate addiction.³⁶ Twenty opiate dependent patients undergoing Methadone or Buprenorphine maintenance treatment were randomized to neurofeedback training or no additional treatment and outcomes were compared pre and post treatment. Multivariate analysis of covariance showed that the experimental group achieved improvement in somatic symptoms, depression, and total score in

general mental health; and in anticipation of positive outcome, desire to use opioid, and relief from withdrawal of craving in comparison with the control group. Limitations of the study include small sample size of only men, no statistical comparisons between groups, lack of generalizability of the study cohort, high risk of bias due to lack of blinding, and short follow up. Further research should focus on long-term follow up, a more representative cohort, and a sham/placebo control.

Neurofeedback for Asthma

No systematic review, randomized trials, prospective/retrospective cohort studies, or case series were identified on the use of neurofeedback for relieving asthma symptoms.

Neurofeedback for Epilepsy

In a 2009 meta-analysis on EEG biofeedback in treating epilepsy, Tan and colleagues identified 10 studies that met their inclusion criteria.³⁷ Nine of the ten studies had fewer than 10 subjects and were published between 1974 and 2001. All studies reported a decrease in seizure incidence among patients treated with EEG biofeedback, with 64 out of 87 patients (74%) reporting fewer weekly seizures after treatment. While results showed improvement for patients, the limitations of the studies, namely small sample size and nonrandomized, non-comparator designs, make it difficult to interpret results and prove efficacy of the treatment for patients with epilepsy.

No newer prospective comparator studies have been identified on the treatment of epilepsy with neurofeedback therapy. Due to the lack of current evidence and the paucity of large randomized trials on neurofeedback for epilepsy, effectiveness of the treatment cannot be determined with the available data.

Neurofeedback for Fibromyalgia

- In 2010, Kayiran and colleagues published results from a randomized controlled trial on neurofeedback for treating fibromyalgia syndrome.³⁸ Thirty-six patients were randomized to 20 sessions of neurofeedback sensory motor rhythm treatment or to escitalopram treatment (control group) for 8 weeks. Both groups had a significant decrease in Visual Analog Scale (VAS) pain and fatigue scores after treatment and scores stayed significantly lower at 24 weeks follow up. The neurofeedback group's mean VAS-pain and VAS-fatigue scores were significantly lower than the control group at every follow-up visit. Depression and anxiety scores decreased in both groups, and neurofeedback scores were significantly lower than the control group. Overall, the neurofeedback group showed significant improvements compared to the control. The study was limited by a small sample size from one center, the lack of a placebo/sham control group, and significantly different baseline depression and anxiety scores at baseline between groups. Further studies are needed with larger cohorts and sham control groups.
- In 2008, Kravitz and colleagues published results of a randomized controlled trial on low-intensity neurofeedback as a treatment for fibromyalgia syndrome.³⁹ Sixty-four patients with fibromyalgia were randomized to EEG neurofeedback or sham treatment. At the end of treatment, the treatment group had more improvement in Clinical Global Impressions scores compared to the control group ($p= 0.01$) and this difference continued at follow up ($p= 0.04$).

Clinicians reported improved response rates from neurofeedback, but there was no difference in patient-reported improvements between groups. Side effects were more prevalent in the neurofeedback group compared to the control group ($p < 0.007$) and included fatigue/tiredness and pain. The authors concluded that neurofeedback was ineffective in treating chronic, non-remitting fibromyalgia and that research should focus on other noninvasive techniques to reduce pain in this population.

Neurofeedback for Headaches

Systematic reviews

- In 2020, a systematic review was published on the effects of neurofeedback for pain management.⁴⁰ The review included 24 studies, including 3 randomized trials, 19 nonrandomized studies, and 2 case series. Pain types investigated were mainly headaches, followed by fibromyalgia, spinal cord injury, and chronic pain. Nineteen of the studies examined EEG neurofeedback and 5 used fMRI neurofeedback. The neurofeedback protocols differed across studies and there was high heterogeneity. Across the studies, neurofeedback improved pain intensity and frequency when comparing pre and post treatments, with some studies reporting positive follow up results. Yet there were high levels of heterogeneity across the cohorts and outcomes measured. The analysis did not separate results by pain type. The nonrandomized, non-comparator design of the studies, along with the variability of protocols, participants, and outcomes act as limitations in interpreting these results. Neurofeedback for treating pain may potentially benefit patients, but more RCTs with standardized protocols are needed.

Randomized controlled trials

- A randomized controlled trial published in 2014 compared the effects of neurofeedback and transcutaneous electrical nerve stimulation (TENS) as treatments for primary headaches.⁴¹ A total of 45 participants who suffered from primary headaches were randomized to neurofeedback, TENS, or a control group. Both the neurofeedback and TENS groups had a reduction in pain frequency, pain severity, and headache duration after treatment and both treatment groups had significantly improved symptoms compared to the control group. This study has several limitations. The sample size was small, and the cohort was chosen through convenience sampling. The statistical analysis was powered to detect inconsequential clinical differences and the results therefore cannot be used to determine treatment efficacy for neurofeedback or TENS in relieving headache pain or frequency.

Non-randomized trials

- A 2011 study on quantitative EEG (QEEG) neurofeedback was performed on 71 patients with recurrent migraine headaches from a single neurological center.⁴² Forty-six patient opted for neurofeedback and 25 chose to continue treatment with medications. After treatment, 54% of the participants in the neurofeedback group experienced complete cessation of their migraines, and 39% experienced a reduction in frequency greater than 50%. Sixty-eight percent of those in the drug (control) group had no change in migraine frequency, and 8% of them experiencing a reduction in frequency greater than 50%. While these results show potential for migraine pain

relief and frequency reduction with the use of QEEG neurofeedback, several limitations exist. The cohort was small, chosen from a single center, and participants chose their preferred treatment, which can introduce bias. Larger, multicenter, randomized controlled trials are needed to determine the effects of neurofeedback on migraine headache frequency.

Neurofeedback for Traumatic Brain Injury (TBI)

A 2013 literature review was conducted by May and colleagues on neurofeedback as a treatment for TBI.⁴³ The review included 22 research studies, consisting of 2 RCTs and 5 studies which were self-published (rather than published by peer reviewed journal). When excluding case studies, sample sizes ranged from 6 to 26 participants. All studies showed improvements in cognitive outcomes with neurofeedback treatment. Outcomes investigated included attention, impulse control, processing speed, and short-term memory. Although the findings are promising, there were numerous limitations in the studies reviewed. Small sample sizes and largely uncontrolled, unblinded, single center studies were conducted. Treatment protocol was high variant, as were patient symptoms, making it difficult to generalize findings. The review concluded that neurofeedback has promise but is currently an unproven treatment for TBI. Randomized, double-blind, placebo-controlled trials are needed.

CLINICAL GUIDELINES

American Academy of Pediatrics

In 2019, the Academy of Pediatrics published clinical practice guidelines for the diagnosis, evaluation, and treatment of ADHD in children and adolescents. The guidelines state: "Some nonmedication treatments for ADHD-related problems have either too little evidence to recommend them or have been found to have little or no benefit. These include mindfulness, cognitive training, diet modification, EEG biofeedback, and supportive counseling."⁴⁴

American Academy of Family Physician

In 2019, the American Academy of Family Physicians (AAFP) published guidelines on Migraine Headache Prophylaxis. The guidelines state:

"A U.S. Headache Consortium meta-analysis concluded that relaxation training, thermal biofeedback combined with relaxation training, electromyographic biofeedback, and cognitive behavior therapy may be considered as treatment options for the prevention of migraine. Additionally, behavioral therapy (i.e., relaxation, biofeedback) may be combined with preventive drug therapy (i.e., propranolol, amitriptyline) for patients to achieve additional clinical improvement for migraine relief."⁴⁵

American College of Obstetricians and Gynecologists

A 2015 guidelines by the American College of Obstetricians and Gynecologists (ACOG) states that "Pelvic muscle exercises may be used alone or augmented with bladder training, biofeedback, or electrical stimulation."⁴⁶

American College of Physicians

A 2014 guideline published by the American College of Physicians (ACP) recommends pelvic floor muscle training (PFMT) with bladder training in women with mixed urinary incontinence (UI). This recommendation was graded as “strong recommendation, high quality of evidence.”

The guidelines states: “Low-quality evidence showed that PFMT with biofeedback using a vaginal electromyography probe increased continence compared with no active treatment. High-quality evidence showed that this treatment improved UI compared with no active treatment.”⁴⁷

CENTERS FOR MEDICARE & MEDICAID SERVICES

As of 9/28/2020, Centers for Medicare & Medicaid (CMS) has published the following national and local guidance on biofeedback therapy. The policy’s criteria are in line with CMS guidance:

- National Coverage Determination (NCD) for Biofeedback Therapy ([30.1](#))⁴⁸
- National Coverage Determination (NCD) for Biofeedback Therapy for the Treatment of Urinary Incontinence ([30.1.1](#))⁴⁹
- Local Coverage Article: Outpatient Therapy Biofeedback Training ([A52755](#))⁵⁰

The Local Coverage Article, Billing and Coding: Psychiatry and Psychology Services ([A57480](#)), states that CMS does not cover biofeedback for the treatment of psychosomatic disorders, which is in line with the Neurofeedback policy criteria.⁵¹

POLICY SUMMARY

Low- to moderate-quality evidence indicates that biofeedback is an effective tool for improving urinary incontinence and reducing frequency, duration, and intensity of migraines in both adult and pediatric populations. Behavioral therapies such as biofeedback act as safe, noninvasive tools to support pelvic floor muscle training in those suffering with urinary incontinence. Similarly, biofeedback as a complementary therapy to relaxation techniques offers a noninvasive tool to prevent migraines.

There is insufficient evidence to support the use of biofeedback with EEG monitoring (i.e., neurofeedback) as a treatment for behavioral health or medical indications. In the case of ADHD, published data indicates that neurofeedback is ineffective compared to standard of care pharmacotherapy in improving ADHD symptoms in children, and there is not enough evidence to determine whether neurofeedback is effective as a complementary therapy. Additionally, the American Academy of Pediatrics does not recommend non-medication therapies for ADHD due to a lack of evidence or evidence indicating inefficacy. For anxiety, depression, OCD, PTSD, substance use disorder, asthma, epilepsy, fibromyalgia, headaches, and TBI, the current evidence on neurofeedback treatment suffers from a number of limitations in study design, methodology, and execution.

More randomized control trials are needed with large, multi-center cohorts and standardized protocols to determine the efficacy of neurofeedback as a treatment for behavioral health and medical disorders. Due to the paucity of evidence and the low quality of available evidence evaluating neurofeedback, there is no clinical circumstance in which this service would be medically necessary and covered. Therefore, neurofeedback for the treatment of medical and behavioral health indications is considered not medically necessary.

INSTRUCTIONS FOR USE

Company Medical Policies serve as guidance for the administration of plan benefits. Medical policies do not constitute medical advice nor a guarantee of coverage. Company Medical Policies are reviewed annually and are based upon published, peer-reviewed scientific evidence and evidence-based clinical practice guidelines that are available as of the last policy update. The Companies reserve the right to determine the application of Medical Policies and make revisions to Medical Policies at any time. Providers will be given at least 60-days’ notice of policy changes that are restrictive in nature.

The scope and availability of all plan benefits are determined in accordance with the applicable coverage agreement. Any conflict or variance between the terms of the coverage agreement and Company Medical Policy will be resolved in favor of the coverage agreement.

REGULATORY STATUS

FDA regulated devices for neurofeedback

| DEVICE NAME, MANUFACTURER, PRODUCT CODE | INDICATIONS FOR USE | CONTRAINDICATIONS FOR USE |
|---|--|---|
| Monarch ETNS System by NeuroSignma, QGL ⁵² | The Monarch external Trigeminal Nerve Stimulation (eTNS) System is indicated for treatment of pediatric Attention Deficit Hyperactivity Disorder as a monotherapy in patients ages 7 through 12 years old who are not currently taking prescription ADHD medications. The device is used for patient treatment by prescription only and is intended to be used in the home under the supervision of a caregiver during periods of sleep. | The device is contraindicated for use by patients with: <ul style="list-style-type: none"> • Implanted cardiac and/or neurostimulation systems • Implanted metallic or electronic device in their head |
| BrainMaster 2E by BrainMaster, HCC ⁵³ | The BrainMaster 2E is indicated for relaxation training using alpha EEG Biofeedback. | n/a |
| Neurosearch (NRS)-2D by Lexicor, OLT ⁵⁴ | The NRS-2D uses Lexicor’s BioLex software to perform its intended use. BioLex is indicated for relaxation training using alpha EEG biofeedback. | BioLex is contraindicated in patients with the following conditions: <ul style="list-style-type: none"> • Individuals who are unwilling or unable to understand the general principles and goals of feedback used. This includes individuals with excessive behavioral problems or low IQ. |

| | |
|-----------------------|--------------------------------------|
| MEDICAL POLICY | Biofeedback and Neurofeedback |
|-----------------------|--------------------------------------|

| | | |
|--|--|--|
| | | <ul style="list-style-type: none"> • Individuals who experience anxiety or an unpleasant experience associated with EEG biofeedback training. |
|--|--|--|

Mental Health Parity Statement

Coverage decisions are made on the basis of individualized determinations of medical necessity and the experimental or investigational character of the treatment in the individual case. In cases where medical necessity is not established by policy for specific treatment modalities, evidence not previously considered regarding the efficacy of the modality that is presented shall be given consideration to determine if the policy represents current standards of care.

MEDICAL POLICY CROSS REFERENCES

- Urinary Incontinence Treatments (All Lines of Business except Medicare), SUR359
- Urinary Incontinence Treatments (Medicare Only), SUR440

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BILLING GUIDELINES APPENDIX

Diagnosis codes for not medically necessary indications include but are not limited to any of the ICD-10 codes listed below. Additional ICD codes may apply.

| Code | Description |
|--------|--|
| F064 | Anxiety disorder due to known physiological condition |
| F10180 | Alcohol abuse with alcohol-induced anxiety disorder |
| F10280 | Alcohol dependence with alcohol-induced anxiety disorder |
| F10980 | Alcohol use, unspecified with alcohol-induced anxiety disorder |
| F12180 | Cannabis abuse with cannabis-induced anxiety disorder |
| F12280 | Cannabis dependence with cannabis-induced anxiety disorder |
| F12980 | Cannabis use, unspecified with anxiety disorder |
| F13180 | Sedative, hypnotic or anxiolytic abuse with sedative, hypnotic or anxiolytic-induced anxiety disorder |
| F13280 | Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced anxiety disorder |
| F13980 | Sedative, hypnotic or anxiolytic use, unspecified with sedative, hypnotic or anxiolytic-induced anxiety disorder |
| F14180 | Cocaine abuse with cocaine-induced anxiety disorder |
| F14280 | Cocaine dependence with cocaine-induced anxiety disorder |
| F14980 | Cocaine use, unspecified with cocaine-induced anxiety disorder |
| F15180 | Other stimulant abuse with stimulant-induced anxiety disorder |
| F15280 | Other stimulant dependence with stimulant-induced anxiety disorder |
| F15980 | Other stimulant use, unspecified with stimulant-induced anxiety disorder |
| F16180 | Hallucinogen abuse with hallucinogen-induced anxiety disorder |
| F16280 | Hallucinogen dependence with hallucinogen-induced anxiety disorder |
| F16980 | Hallucinogen use, unspecified with hallucinogen-induced anxiety disorder |
| F18180 | Inhalant abuse with inhalant-induced anxiety disorder |
| F18280 | Inhalant dependence with inhalant-induced anxiety disorder |
| F18980 | Inhalant use, unspecified with inhalant-induced anxiety disorder |

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| F19180 | Other psychoactive substance abuse with psychoactive substance-induced anxiety disorder |
| F19280 | Other psychoactive substance dependence with psychoactive substance-induced anxiety disorder |
| F19980 | Other psychoactive substance use, unspecified with psychoactive substance-induced anxiety disorder |
| F40 | Phobic anxiety disorders |
| F400 | Agoraphobia |
| F401 | Social phobias |
| F402 | Specific (isolated) phobias |
| F408 | Other phobic anxiety disorders |
| F409 | Phobic anxiety disorder, unspecified |
| F41 | Other anxiety disorders |
| F410 | Panic disorder [episodic paroxysmal anxiety] |
| F411 | Generalized anxiety disorder |
| F413 | Other mixed anxiety disorders |
| F418 | Other specified anxiety disorders |
| F419 | Anxiety disorder, unspecified |
| F4322 | Adjustment disorder with anxiety |
| F4323 | Adjustment disorder with mixed anxiety and depressed mood |
| F930 | Separation anxiety disorder of childhood |
| F938 | Other childhood emotional disorders |
| F90 | Attention-deficit hyperactivity disorders |
| F900 | Attention-deficit hyperactivity disorder, predominantly inattentive type |
| F901 | Attention-deficit hyperactivity disorder, predominantly hyperactive type |
| F902 | Attention-deficit hyperactivity disorder, unspecified type |
| F908 | Attention and concentration deficit following nontraumatic subarachnoid hemorrhage |
| F909 | Attention and concentration deficit following nontraumatic intracerebral hemorrhage |
| I69210 | Attention and concentration deficit following other nontraumatic intracranial hemorrhage |
| I69310 | Attention and concentration deficit following cerebral infarction |
| I69810 | Attention and concentration deficit following other cerebrovascular disease |
| I69910 | Attention and concentration deficit following unspecified cerebrovascular disease |
| R41840 | Attention and concentration deficit |
| F320 | Major depressive disorder, single episode, mild |
| F321 | Major depressive disorder, single episode, moderate |
| F322 | Major depressive disorder, single episode, severe without psychotic features |

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| F323 | Major depressive disorder, single episode, severe with psychotic features |
| F324 | Major depressive disorder, single episode, in partial remission |
| F325 | Major depressive disorder, single episode, in full remission |
| F328 | Other depressive episodes |
| F329 | Major depressive disorder, single episode, unspecified |
| F330 | Major depressive disorder, recurrent, mild |
| F331 | Major depressive disorder, recurrent, moderate |
| F332 | Major depressive disorder, recurrent severe without psychotic features |
| F333 | Major depressive disorder, recurrent, severe with psychotic symptoms |
| F3340 | Major depressive disorder, recurrent, in remission, unspecified |
| F3341 | Major depressive disorder, recurrent, in partial remission |
| F3342 | Major depressive disorder, recurrent, in full remission |
| F339 | Major depressive disorder, recurrent, unspecified |
| F42 | Obsessive-compulsive disorder |
| F422 | Mixed obsessional thoughts and acts |
| F423 | Hoarding disorder |
| F424 | Excoriation (skin-picking) disorder |
| F428 | Other obsessive-compulsive disorder |
| F429 | Obsessive-compulsive disorder, unspecified |
| F605 | Obsessive-compulsive personality disorder |
| R4681 | Obsessive-compulsive behavior |
| F431 | Post-traumatic stress disorder (PTSD) |
| F4310 | Post-traumatic stress disorder, unspecified |
| F4311 | Post-traumatic stress disorder, acute |
| F4312 | Post-traumatic stress disorder, chronic |
| F1021 | Alcohol dependence, in remission |
| F191 | Other psychoactive substance abuse |
| F1910 | Other psychoactive substance abuse, uncomplicated |
| F1911 | Other psychoactive substance abuse, in remission |
| F1912 | Other psychoactive substance abuse with intoxication |
| F19120 | Other psychoactive substance abuse with intoxication, uncomplicated |
| F19121 | Other psychoactive substance abuse with intoxication delirium |
| F19122 | Other psychoactive substance abuse with intoxication with perceptual disturbances |
| F19129 | Other psychoactive substance abuse with intoxication, unspecified |
| F1914 | Other psychoactive substance abuse with psychoactive substance-induced mood disorder |
| F1915 | Other psychoactive substance abuse with psychoactive substance-induced psychotic disorder |

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| F19150 | Other psychoactive substance abuse with psychoactive substance-induced psychotic disorder with delusions |
| F19151 | Other psychoactive substance abuse with psychoactive substance-induced psychotic disorder with hallucinations |
| F19159 | Other psychoactive substance abuse with psychoactive substance-induced psychotic disorder, unspecified |
| F1916 | Other psychoactive substance abuse with psychoactive substance-induced persisting amnesic disorder |
| F1917 | Other psychoactive substance abuse with psychoactive substance-induced persisting dementia |
| F1918 | Other psychoactive substance abuse with other psychoactive substance-induced disorders |
| F19180 | Other psychoactive substance abuse with psychoactive substance-induced anxiety disorder |
| F19181 | Other psychoactive substance abuse with psychoactive substance-induced sexual dysfunction |
| F19182 | Other psychoactive substance abuse with psychoactive substance-induced sleep disorder |
| F19188 | Other psychoactive substance abuse with other psychoactive substance-induced disorder |
| F1919 | Other psychoactive substance abuse with unspecified psychoactive substance-induced disorder |
| F1921 | Other psychoactive substance dependence, in remission |
| F199 | Other psychoactive substance use, unspecified |
| F1990 | Other psychoactive substance use, unspecified, uncomplicated |
| F1992 | Other psychoactive substance use, unspecified with intoxication |
| F19920 | Other psychoactive substance use, unspecified with intoxication, uncomplicated |
| F19921 | Other psychoactive substance use, unspecified with intoxication with delirium |
| F19922 | Other psychoactive substance use, unspecified with intoxication with perceptual disturbance |
| F19929 | Other psychoactive substance use, unspecified with intoxication, unspecified |
| F1993 | Other psychoactive substance use, unspecified with withdrawal |
| F19930 | Other psychoactive substance use, unspecified with withdrawal, uncomplicated |
| F19931 | Other psychoactive substance use, unspecified with withdrawal delirium |
| F19932 | Other psychoactive substance use, unspecified with withdrawal with perceptual disturbance |
| F19939 | Other psychoactive substance use, unspecified with withdrawal, unspecified |
| F1994 | Other psychoactive substance use, unspecified with psychoactive substance-induced mood disorder |
| F1995 | Other psychoactive substance use, unspecified with psychoactive substance-induced psychotic disorder |

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| F19950 | Other psychoactive substance use, unspecified with psychoactive substance-induced psychotic disorder with delusions |
| F19951 | Other psychoactive substance use, unspecified with psychoactive substance-induced psychotic disorder with hallucinations |
| F19959 | Other psychoactive substance use, unspecified with psychoactive substance-induced psychotic disorder, unspecified |
| F1996 | Other psychoactive substance use, unspecified with psychoactive substance-induced persisting amnesic disorder |
| F1997 | Other psychoactive substance use, unspecified with psychoactive substance-induced persisting dementia |
| F1998 | Other psychoactive substance use, unspecified with other psychoactive substance-induced disorders |
| F19980 | Other psychoactive substance use, unspecified with psychoactive substance-induced anxiety disorder |
| F19981 | Other psychoactive substance use, unspecified with psychoactive substance-induced sexual dysfunction |
| F19982 | Other psychoactive substance use, unspecified with psychoactive substance-induced sleep disorder |
| F19988 | Other psychoactive substance use, unspecified with other psychoactive substance-induced disorder |
| F1999 | Other psychoactive substance use, unspecified with unspecified psychoactive substance-induced disorder |
| F10 | Alcohol related disorders |
| F101 | Alcohol abuse |
| F1010 | Alcohol abuse, uncomplicated |
| F1011 | Alcohol abuse, in remission |
| F1012 | Alcohol abuse with intoxication |
| F10121 | Alcohol abuse with intoxication delirium |
| F10129 | Alcohol abuse with intoxication, unspecified |
| F1014 | Alcohol abuse with alcohol-induced mood disorder |
| F1015 | Alcohol abuse with alcohol-induced psychotic disorder |
| F10150 | Alcohol abuse with alcohol-induced psychotic disorder with delusions |
| F10151 | Alcohol abuse with alcohol-induced psychotic disorder with hallucinations |
| F10159 | Alcohol abuse with alcohol-induced psychotic disorder, unspecified |
| F1018 | Alcohol abuse with other alcohol-induced disorders |
| F10180 | Alcohol abuse with alcohol-induced anxiety disorder |
| F10181 | Alcohol abuse with alcohol-induced sexual dysfunction |
| F10182 | Alcohol abuse with alcohol-induced sleep disorder |
| F10188 | Alcohol abuse with other alcohol-induced disorder |
| F1019 | Alcohol abuse with unspecified alcohol-induced disorder |
| F102 | Alcohol dependence |
| F1022 | Alcohol dependence with intoxication |

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| F10229 | Alcohol dependence with intoxication, unspecified |
| F1023 | Alcohol dependence with withdrawal |
| F10231 | Alcohol dependence with withdrawal delirium |
| F1024 | Alcohol dependence with alcohol-induced mood disorder |
| F1025 | Alcohol dependence with alcohol-induced psychotic disorder |
| F10250 | Alcohol dependence with alcohol-induced psychotic disorder with delusions |
| F10251 | Alcohol dependence with alcohol-induced psychotic disorder with hallucinations |
| F10259 | Alcohol dependence with alcohol-induced psychotic disorder, unspecified |
| F1027 | Alcohol dependence with alcohol-induced persisting dementia |
| F1028 | Alcohol dependence with other alcohol-induced disorders |
| F10280 | Alcohol dependence with alcohol-induced anxiety disorder |
| F10281 | Alcohol dependence with alcohol-induced sexual dysfunction |
| F10282 | Alcohol dependence with alcohol-induced sleep disorder |
| F10288 | Alcohol dependence with other alcohol-induced disorder |
| F1029 | Alcohol dependence with unspecified alcohol-induced disorder |
| F109 | Alcohol use, unspecified |
| F1092 | Alcohol use, unspecified with intoxication |
| F1094 | Alcohol use, unspecified with alcohol-induced mood disorder |
| F1095 | Alcohol use, unspecified with alcohol-induced psychotic disorder |
| F10950 | Alcohol use, unspecified with alcohol-induced psychotic disorder with delusions |
| F10951 | Alcohol use, unspecified with alcohol-induced psychotic disorder with hallucinations |
| F10959 | Alcohol use, unspecified with alcohol-induced psychotic disorder, unspecified |
| F1097 | Alcohol use, unspecified with alcohol-induced persisting dementia |
| F1098 | Alcohol use, unspecified with other alcohol-induced disorders |
| F10980 | Alcohol use, unspecified with alcohol-induced anxiety disorder |
| F10981 | Alcohol use, unspecified with alcohol-induced sexual dysfunction |
| F10982 | Alcohol use, unspecified with alcohol-induced sleep disorder |
| F1099 | Alcohol use, unspecified with unspecified alcohol-induced disorder |
| J45 | Asthma |
| J452 | Mild intermittent asthma |
| J4520 | Mild intermittent asthma, uncomplicated |
| J4521 | Mild intermittent asthma with (acute) exacerbation |
| J4522 | Mild intermittent asthma with status asthmaticus |
| J453 | Mild persistent asthma |
| J4530 | Mild persistent asthma, uncomplicated |
| J4531 | Mild persistent asthma with (acute) exacerbation |
| J4532 | Mild persistent asthma with status asthmaticus |
| J454 | Moderate persistent asthma |

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| J4540 | Moderate persistent asthma, uncomplicated |
| J4541 | Moderate persistent asthma with (acute) exacerbation |
| J4542 | Moderate persistent asthma with status asthmaticus |
| J455 | Severe persistent asthma |
| J4550 | Severe persistent asthma, uncomplicated |
| J4551 | Severe persistent asthma with (acute) exacerbation |
| J4552 | Severe persistent asthma with status asthmaticus |
| J459 | Other and unspecified asthma |
| J4590 | Unspecified asthma |
| J45901 | Unspecified asthma with (acute) exacerbation |
| J45902 | Unspecified asthma with status asthmaticus |
| J45909 | Unspecified asthma, uncomplicated |
| J4599 | Other asthma |
| J45991 | Cough variant asthma |
| J45998 | Other asthma |
| G40 | Epilepsy and recurrent seizures |
| G400 | Localization-related (focal) (partial) idiopathic epilepsy and epileptic syndromes with seizures of localized onset |
| G4001 | Localization-related (focal) (partial) idiopathic epilepsy and epileptic syndromes with seizures of localized onset, intractable |
| G401 | Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with simple partial seizures |
| G4010 | Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with simple partial seizures, not intractable |
| G4011 | Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with simple partial seizures, intractable |
| G402 | Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with complex partial seizures |
| G4020 | Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with complex partial seizures, not intractable |
| G40209 | Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with complex partial seizures, not intractable, without status epilepticus |
| G4021 | Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with complex partial seizures, intractable |
| G40219 | Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with complex partial seizures, intractable, without status epilepticus |
| G403 | Generalized idiopathic epilepsy and epileptic syndromes |
| G4030 | Generalized idiopathic epilepsy and epileptic syndromes, not intractable |
| G40301 | Generalized idiopathic epilepsy and epileptic syndromes, not intractable, with status epilepticus |
| G40309 | Generalized idiopathic epilepsy and epileptic syndromes, not intractable, without status epilepticus |

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| G4031 | Generalized idiopathic epilepsy and epileptic syndromes, intractable |
| G40311 | Generalized idiopathic epilepsy and epileptic syndromes, intractable, with status epilepticus |
| G40319 | Generalized idiopathic epilepsy and epileptic syndromes, intractable, without status epilepticus |
| G404 | Other generalized epilepsy and epileptic syndromes |
| G4040 | Other generalized epilepsy and epileptic syndromes, not intractable |
| G40401 | Other generalized epilepsy and epileptic syndromes, not intractable, with status epilepticus |
| G40409 | Other generalized epilepsy and epileptic syndromes, not intractable, without status epilepticus |
| G4041 | Other generalized epilepsy and epileptic syndromes, intractable |
| G40411 | Other generalized epilepsy and epileptic syndromes, intractable, with status epilepticus |
| G40419 | Other generalized epilepsy and epileptic syndromes, intractable, without status epilepticus |
| G405 | Epileptic seizures related to external causes |
| G408 | Other epilepsy and recurrent seizures |
| G4080 | Other epilepsy |
| G40801 | Other epilepsy, not intractable, with status epilepticus |
| G40802 | Other epilepsy, not intractable, without status epilepticus |
| G40803 | Other epilepsy, intractable, with status epilepticus |
| G40804 | Other epilepsy, intractable, without status epilepticus |
| G4081 | Lennox-Gastaut syndrome |
| G4082 | Epileptic spasms |
| G4089 | Other seizures |
| G409 | Epilepsy, unspecified |
| G4090 | Epilepsy, unspecified, not intractable |
| G40901 | Epilepsy, unspecified, not intractable, with status epilepticus |
| G40909 | Epilepsy, unspecified, not intractable, without status epilepticus |
| G4091 | Epilepsy, unspecified, intractable |
| G40911 | Epilepsy, unspecified, intractable, with status epilepticus |
| G40919 | Epilepsy, unspecified, intractable, without status epilepticus |
| G40A | Absence epileptic syndrome |
| G40B | Juvenile myoclonic epilepsy [impulsive petit mal] |
| G40B0 | Juvenile myoclonic epilepsy, not intractable |
| G40B01 | Juvenile myoclonic epilepsy, not intractable, with status epilepticus |
| G40B09 | Juvenile myoclonic epilepsy, not intractable, without status epilepticus |
| G40B1 | Juvenile myoclonic epilepsy, intractable |
| G40B11 | Juvenile myoclonic epilepsy, intractable, with status epilepticus |
| G40B19 | Juvenile myoclonic epilepsy, intractable, without status epilepticus |
| M797 | Fibromyalgia |

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| G43C | Periodic headache syndromes in child or adult |
| G43C0 | Periodic headache syndromes in child or adult, not intractable |
| G43C1 | Periodic headache syndromes in child or adult, intractable |
| G44 | Other headache syndromes |
| G4400 | Cluster headache syndrome, unspecified |
| G44001 | Cluster headache syndrome, unspecified, intractable |
| G44009 | Cluster headache syndrome, unspecified, not intractable |
| G4401 | Episodic cluster headache |
| G44011 | Episodic cluster headache, intractable |
| G44019 | Episodic cluster headache, not intractable |
| G4402 | Chronic cluster headache |
| G44021 | Chronic cluster headache, intractable |
| G44029 | Chronic cluster headache, not intractable |
| G441 | Vascular headache, not elsewhere classified |
| G442 | Tension-type headache |
| G4420 | Tension-type headache, unspecified |
| G44201 | Tension-type headache, unspecified, intractable |
| G44209 | Tension-type headache, unspecified, not intractable |
| G4421 | Episodic tension-type headache |
| G44211 | Episodic tension-type headache, intractable |
| G44219 | Episodic tension-type headache, not intractable |
| G4422 | Chronic tension-type headache |
| G44221 | Chronic tension-type headache, intractable |
| G44229 | Chronic tension-type headache, not intractable |
| G443 | Post-traumatic headache |
| G4430 | Post-traumatic headache, unspecified |
| G44301 | Post-traumatic headache, unspecified, intractable |
| G44309 | Post-traumatic headache, unspecified, not intractable |
| G4431 | Acute post-traumatic headache |
| G44311 | Acute post-traumatic headache, intractable |
| G44319 | Acute post-traumatic headache, not intractable |
| G4432 | Chronic post-traumatic headache |
| G44321 | Chronic post-traumatic headache, intractable |
| G44329 | Chronic post-traumatic headache, not intractable |
| G445 | Complicated headache syndromes |
| G4451 | Hemicrania continua |
| G4452 | New daily persistent headache (NDPH) |
| G4453 | Primary thunderclap headache |
| G4459 | Other complicated headache syndrome |
| G448 | Other specified headache syndromes |
| G4481 | Hypnic headache |

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| G4482 | Headache associated with sexual activity |
| G4483 | Primary cough headache |
| G4484 | Primary exertional headache |
| G4485 | Primary stabbing headache |
| G4489 | Other headache syndrome |
| R51 | Headache |
| S062 | Diffuse traumatic brain injury |
| S062X | Diffuse traumatic brain injury |
| S062X0 | Diffuse traumatic brain injury without loss of consciousness |
| S062X0A | Diffuse traumatic brain injury without loss of consciousness, initial encounter |
| S062X0D | Diffuse traumatic brain injury without loss of consciousness, subsequent encounter |
| S062X0S | Diffuse traumatic brain injury without loss of consciousness, sequela |
| S062X1 | Diffuse traumatic brain injury with loss of consciousness of 30 minutes or less |
| S062X2 | Diffuse traumatic brain injury with loss of consciousness of 31 minutes to 59 minutes |
| S062X3 | Diffuse traumatic brain injury with loss of consciousness of 1 hour to 5 hours 59 minutes |
| S062X4 | Diffuse traumatic brain injury with loss of consciousness of 6 hours to 24 hours |
| S062X5 | Diffuse traumatic brain injury with loss of consciousness greater than 24 hours with return to pre-existing conscious levels |
| S062X8 | Diffuse traumatic brain injury with loss of consciousness of any duration with death due to other cause prior to regaining consciousness |
| S062X9 | Diffuse traumatic brain injury with loss of consciousness of unspecified duration |
| S063 | Focal traumatic brain injury |
| S0630 | Unspecified focal traumatic brain injury |
| S06300 | Unspecified focal traumatic brain injury without loss of consciousness |
| S06300A | Unspecified focal traumatic brain injury without loss of consciousness, initial encounter |
| S06300D | Unspecified focal traumatic brain injury without loss of consciousness, subsequent encounter |
| S06300S | Unspecified focal traumatic brain injury without loss of consciousness, sequela |
| S06301 | Unspecified focal traumatic brain injury with loss of consciousness of 30 minutes or less |
| S06302 | Unspecified focal traumatic brain injury with loss of consciousness of 31 minutes to 59 minutes |
| S06303 | Unspecified focal traumatic brain injury with loss of consciousness of 1 hour to 5 hours 59 minutes |
| S06304 | Unspecified focal traumatic brain injury with loss of consciousness of 6 hours to 24 hours |

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| S06305 | Unspecified focal traumatic brain injury with loss of consciousness greater than 24 hours with return to pre-existing conscious level |
| S06307 | Unspecified focal traumatic brain injury with loss of consciousness of any duration with death due to brain injury prior to regaining consciousness |
| S06307A | Unspecified focal traumatic brain injury with loss of consciousness of any duration with death due to brain injury prior to regaining consciousness, initial encounter |
| S06309 | Unspecified focal traumatic brain injury with loss of consciousness of unspecified duration |
| S0637 | Contusion, laceration, and hemorrhage of cerebellum |
| S0638 | Contusion, laceration, and hemorrhage of brainstem |
| S065X7 | Traumatic subdural hemorrhage with loss of consciousness of any duration with death due to brain injury before regaining consciousness |
| S065X7A | Traumatic subdural hemorrhage with loss of consciousness of any duration with death due to brain injury before regaining consciousness, initial encounter |
| S066X7 | Traumatic subarachnoid hemorrhage with loss of consciousness of any duration with death due to brain injury prior to regaining consciousness |
| S069X0 | Unspecified intracranial injury without loss of consciousness |
| S069X0A | Unspecified intracranial injury without loss of consciousness, initial encounter |
| S069X0D | Unspecified intracranial injury without loss of consciousness, subsequent encounter |
| S069X0S | Unspecified intracranial injury without loss of consciousness, sequela |