



CIGNA MEDICAL COVERAGE POLICY

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

Effective Date9/15/2008
Next Review Date.....8/15/2009
Coverage Policy Number0166

Subject Biofeedback

Table of Contents

Coverage Policy	1
General Background	2
Coding/Billing Information	13
References	13
Policy History.....	25

Hyperlink to Related Coverage Policies

Attention-Deficit/Hyperactivity Disorder (ADHD): Assessment and Treatment
 Bedwetting Alarm for Nocturnal Enuresis
 Complementary and Alternative Medicine
 Extracorporeal Electromagnetic Stimulation for Urinary Incontinence
 Hyperhidrosis Treatments
 Injectable Bulking Agents for Urinary Conditions
 Surgical Interventions for Urinary Incontinence

INSTRUCTIONS FOR USE

Coverage Policies are intended to provide guidance in interpreting certain **standard** CIGNA HealthCare benefit plans as well as benefit plans formerly administered by Great-West Healthcare. Please note, the terms of a participant's particular benefit plan document [Group Service Agreement (GSA), Evidence of Coverage, Certificate of Coverage, Summary Plan Description (SPD) or similar plan document] may differ significantly from the standard benefit plans upon which these Coverage Policies are based. For example, a participant's benefit plan document may contain a specific exclusion related to a topic addressed in a Coverage Policy. In the event of a conflict, a participant's benefit plan document **always supercedes** the information in the Coverage Policies. In the absence of a controlling federal or state coverage mandate, benefits are ultimately determined by the terms of the applicable benefit plan document. Coverage determinations in each specific instance require consideration of 1) the terms of the applicable group benefit plan document in effect on the date of service; 2) any applicable laws/regulations; 3) any relevant collateral source materials including Coverage Policies and; 4) the specific facts of the particular situation. Coverage Policies relate exclusively to the administration of health benefit plans. Coverage Policies are not recommendations for treatment and should never be used as treatment guidelines. Proprietary information of CIGNA. Copyright ©2008 CIGNA

Coverage Policy

Biofeedback and biofeedback devices are specifically excluded under many benefit plans. In addition, biofeedback and biofeedback devices are considered behavioral training and education/training in nature, and such services are specifically excluded under many benefit plans. Please refer to the applicable benefit plan document to determine benefit availability and the terms, conditions and limitations of coverage.

If coverage is available for biofeedback, the following conditions of coverage apply.

CIGNA covers biofeedback as medically necessary for the following conditions:

- constipation in adults
- fecal incontinence in adults
- urinary incontinence (i.e., stress, urge, mixed, overflow) in children and adults
- migraine and tension headaches in children and adults
- cancer pain in children and adults

CIGNA does not cover biofeedback for any other indication because it is considered experimental, investigational or unproven:

CIGNA does not cover ANY of the following because they are considered experimental, investigational or unproven.

- electroencephalography (EEG) biofeedback or neurofeedback
- in-home biofeedback devices

General Background

According to the National Center for Complementary and Alternative Medicine (NCCAM), biofeedback is considered an alternative medicine technique under the mind-body category of complementary and alternative medicine (CAM) practices. CAM is a group of diverse medical and health care systems, practices and products that are not presently considered to be part of conventional medicine. Mind-body techniques such as biofeedback, relaxation, meditation and hypnosis have been proposed as methods to strengthen the communication between mind and body (NCCAM, 2007).

Biofeedback is a therapeutic process that electronically monitors bodily functions such as breathing, heart rate, blood pressure, skin temperature and muscle tension, which are fed back to the individual by means of sounds, lights or electronic gauges. It emphasizes relaxation and stress-reducing techniques. Most proponents believe that by using these techniques, individuals can learn to control a variety of physiological responses formerly thought to be completely involuntary and thereby help manage anxiety and pain commonly associated with stress reactions (Payne, 2002; Holroyd, et al., 2003; Karmody, 2003; Kiresuk, et al., 2005).

There are several different types of biofeedback. The biofeedback modality selected for therapy depends upon the condition to be treated. EMG biofeedback measures muscle tension and is proposed for the treatment of chronic muscle stiffness, injury and pain (e.g., neck and back pain); headaches, asthma, incontinence; and intestinal symptoms. Thermal or temperature biofeedback measures skin temperature and is proposed for the treatment of circulatory disorders, such as headaches, hypertension, and Raynaud's phenomenon. Galvanic skin response (GSR) biofeedback, also called electrodermal response (EDR), electrodermal activity (EDA), skin conductance response (SCR) or skin conductance level (SCL) biofeedback, measures electrical conductance in the skin associated with sweat gland activity and perspiration. GSR is proposed for the treatment of anxiety disorders and phobias (EEG Spectrum International, 2001a; Allen, 2007).

Another form of biofeedback is electroencephalogram (EEG) biofeedback, also called neurofeedback or neurotherapy, which measures alpha (associated with relaxation and meditation) and theta (associated with focused attention) brainwave activity. It is proposed to counterbalance genetic and environmental tendencies by learning to alter brain wave patterns. EEG biofeedback has been proposed for the treatment of multiple conditions including insomnia, attention deficit hyperactivity disorder (ADHD), anxiety disorders, epilepsy, addictions, tinnitus, brain injury, depression, and learning disabilities. However, the evidence in the peer-reviewed literature does not support the efficacy of EEG biofeedback.

Although there are numerous biofeedback devices available for home use, biofeedback should be performed by a trained professional in a clinical setting. Examples of home devices include: StressEraser® (Helicor, Inc., New York, NY) for mind and body relaxation; BrainMaster (BrainMaster Technologies, Inc., Oakwood Village, OH) EEG biofeedback device; GSR/Temp2X™ (Biofeedback Instrument Corp., New York, NY) temperature biofeedback system; and RESPeRate (Intercure Ltd., Lod, Israel) which uses therapeutic paced breathing to lower blood pressure.

Although the scientific rationale for biofeedback is unclear, biofeedback is supported by professional societies and the evidence in the peer-reviewed scientific literature for the treatment of constipation, fecal and urinary incontinence, migraine and tension headaches and cancer pain.

U.S. Food and Drug Administration (FDA)

The FDA classifies biofeedback medical devices as 510(k), Class II, special controls, medical devices, subject to certain limitations, and they are exempt from the premarket notification requirements. The FDA defines a biofeedback device as “an instrument that provides a visual or auditory signal corresponding to the status of one or more of a patient's physiological parameters (e.g., brain alpha wave activity, muscle activity, skin temperature, etc.) so that the patient can control voluntarily these physiological parameters” (FDA, 2007). There are numerous biofeedback devices available from multiple manufacturers.

Constipation/Fecal Incontinence

According to The American Gastroenterological Association (AGA), symptoms of constipation are commonly reported in individuals seeking medical care. Although constipation can be associated with more serious disease, many times it is a feature of a colorectal motility disorder such as pelvic floor dysfunction (also known as pelvic floor dyssynergia, anismus, or outlet obstruction) where there is a normal or slightly slowed colonic transit and a prolonged storage of residue in the rectum. The AGA guidelines on the management of constipation note that “biofeedback and relaxation training have been quite successful and, importantly, free of morbidity. Biofeedback can be used to train patients to relax their pelvic floor muscles during straining and to facilitate relaxation and pushing to achieve defecation. By the relearning process, the non-relaxing pelvic floor is gradually suppressed and normal coordination restored. Biofeedback is also used in the treatment of fecal incontinence. There are, however, major differences between the approaches to fecal incontinence and constipation. The incontinent patient with intact neural pathways is able to appreciate a sensation of muscular contractile activity, whereas the constipated patient does not have a similar sensation of muscular relaxation. Nevertheless, biofeedback has been shown to reduce obstructive symptoms, with an increase in the frequency of bowel actions, the ability to develop a more obtuse anorectal angle at the time of defecation, and more dynamic pelvic floor movements when the anal sphincter is contracted.” The results of the use of biofeedback in intensive programs with adults are highly successful; however, its use in children has been disappointing (AGA, 2000).

The evidence in the peer-reviewed scientific literature supports the use of biofeedback for the treatment of constipation and fecal incontinence in adults. Systematic reviews, meta-analysis, randomized controlled trials and comparative studies (Heyman, et al., 2003; Norton, et al., 2003; Illnyckyj, et al., 2005; Brazzelli, et al., 2006; Chiarioni, et al., 2006; Heyman, et al., 2007; Rao, et al., 2007) have reported positive results when biofeedback was used for the treatment of these conditions. Biofeedback modalities used for the treatment of constipation included various types of EMG-based biofeedback, manometry-based biofeedback and pressure biofeedback. Positive results were reported in 69–78% of patients with improvements maintained for up to two years. Biofeedback was used alone or in conjunction to other therapies and compared to standard conventional therapies such as diet and exercise, and the use of laxatives, fibers, suppositories, and enemas. Positive outcomes included: relief of straining, abdominal pain, and bloating; reduced use of laxatives; improvement in spontaneous bowel movements; less straining and digital maneuvers; and improved quality of life and psychological state. In the treatment of incontinence, biofeedback was compared to medical treatments such as education and sphincter exercises. Biofeedback groups experienced improvement in continence scores, squeeze and anal pressures, squeeze duration, and improvement in vitality, social functioning and mental health. Improvements were consistent for up to one year following therapy.

The use of biofeedback for the treatment of constipation and fecal incontinence in children is not well established and has not been proven to add additional benefit to conventional therapy (Brazzelli et al. 2004; Brazzelli, et al. 2006; Agency for Healthcare Research and Quality [AHRQ], 2001).

In their guideline on the management of fecal incontinence, the National Institute for Health and Clinical Excellence (NICE) (United Kingdom), states that adults who have persistent fecal incontinence after initial management should consider special continence services which include biofeedback (NICE, 2007).

The AGA issued a medical position statement on anorectal testing techniques, which states that “neurogenic fecal incontinence associated with weakness of the external anal sphincter and/or decreased ability to perceive rectal distention because of nerve injury can be treated with biofeedback training. Anorectal dysfunction in patients with associated pelvic floor dyssynergia has been treated with biofeedback techniques, with an overall improvement rate of 84%” (AGA, 1998).

In their clinical practice guidelines for the evaluation and treatment of constipation in children, the North American Society for Pediatric Gastroenterology, Hematology and Nutrition (2006) included a review of six

publications which confirmed that biofeedback is not a long-term treatment for constipation in children, but “can be an effective short-term treatment of intractable constipation in a small subgroup of patients.”

Urinary Incontinence (UI)

UI is an involuntary leakage of urine caused by a variety of conditions that directly or indirectly affect bladder control. The types of urinary incontinence include stress, urge, mixed, overflow and functional. The inability of the bladder to hold urine during activities that increase abdominal pressure (e.g., exercise, coughing, sneezing, laughing) is called stress incontinence; a sudden, involuntary loss of urine for no apparent reason accompanied by a strong sense to void is called urge incontinence; and a combination of stress and urge incontinence is called mixed incontinence. Overflow incontinence involves an overdistention of the bladder causing the bladder to never empty completely, and functional, or environmental, incontinence is leakage of urine due to the individual's inability to get to the bathroom in time due to mental or physical difficulties (e.g., Alzheimer's disease, arthritis). Nonsurgical treatment options may include pharmacological treatment and behavioral therapy such as pelvic muscle exercises (PME) and bladder training exercises. Kegel exercises can be performed to improve the strength of the pelvic floor muscles. Biofeedback has been proposed as a treatment modality for stress, urge, mixed and overflow urinary incontinence because it may enhance awareness of body functions and assist the individual in learning muscle strengthening pelvic floor exercises (FDA, 2005; Holroyd-Leduc, et al., 2008; Shamliyan, et al., 2008).

There are several proposed methods of biofeedback which may be employed for the treatment of urinary incontinence including:

- Vaginal cones are a simple method of providing biofeedback for females in the home setting. The cone is inserted into the vagina above the levator muscles, and biofeedback is produced when the patient feels the cone slipping down, as the pelvic muscles must be tightened to retain the cone. When the patient is able to easily hold the lightest cone, a succession of heavier cones is used. Vaginal cones have some limitations: some patients will not use any vaginal device; some patients cannot retain the cone; and some patients retain the cones with the use of thigh adductor muscles rather than proper levator contraction.
- Perineometers measure vaginal or anal squeeze pressure and may be more effective in teaching a patient to identify the proper muscles than vaginal cones. Perineometers have some limitations as abdominal pressure is also transmitted to the probe. A patient may perform a Valsalva maneuver (which is counterproductive) and believe that the pelvic muscles are contracting.
- Electromyographic (EMG) systems with vaginal and rectal sensors and perineal patches reduce the problem with Valsalva maneuvers; however, proper muscle isolation may still be impaired, as they register activity of only one muscle group (Payne, 2002; Payne, 2007)

Biofeedback is well established as a treatment alternative for urinary incontinence in children and adults. The peer-reviewed literature includes systematic reviews, randomized controlled trials, and case series (n=43–466) which have reported an improvement in incontinence for up to two years following the use of biofeedback (Porena, et al., 2000; Burgio, et al., 2002; Hunter, et al., 2004; Herbison, et al., 2004; Yabci, et al., 2005; Dannecker, et al., 2005; Burgio, et al., 2006; Klijn, et al., 2006). Biofeedback was used in combination with other therapies and compared to conventional therapies such as, voiding and drinking schedules, education and instructions on toilet behavior, self-help books and antibiotics when a urinary tract infection was present. Improvements were reported in nocturnal enuresis, staccato voiding, detrusor-sphincter dyssynergia, enuresis, vesicoureteral reflux, pelvic floor contraction strength. A decrease in high-grade stress incontinence, urine loss with activity, as well as infections was also reported.

In their guideline on the management of urinary incontinence in women, NICE states that “perineometry or pelvic floor electromyography as biofeedback should not be used as a routine part of pelvic floor muscle training”, but that “electrical stimulation and/or biofeedback should be considered in women who cannot actively contract pelvic floor muscles in order to aid motivation and adherence to therapy” (NICE, Oct 2006).

Headaches

A migraine is a type of headache that is usually localized to one area of the head and may be accompanied by nausea, vomiting, light sensitivity and visual disturbances. A tension headache involves pain in the head, scalp, or neck, with muscle tightness in the affected area. A migraine may also be present with a tension headache (i.e., mixed tension migraine) and has features of both tension headache and migraine (National Library of

Medicine [NLM], and National Institutes of Health [NIH], Nov 2006; NLM/NIH, Sep 2006; NLM/NIH, 2007; National Institute of Neurological Disorders and Stroke [NINDS], 2008). In addition to migraine and tension headaches, chronic (i.e., occurring on more days than not for a three month period or longer) or recurrent headaches may occur secondary to multiple conditions, such as medication usage, infectious process, brain tumor, caffeine withdrawal, sleep deprivation, trauma and psychogenic disorders. In these conditions, the treatment is aimed at the underlying cause, and the use of biofeedback is typically not indicated (International Headache Society [IHS], 2004; Huffman and Sakonju, 2005; Gladstein, 2006; McConaghy, 2007).

Biofeedback is considered a standard of care for the treatment of migraine and tension headaches. Systematic reviews and randomized controlled trials (n=18–2229) utilizing biofeedback as a treatment modality for migraine and tension headaches have reported that biofeedback is effective in reducing the severity and frequency of these headaches in adults and children (Vasudeva, et al., 2003; Eccleston, et al., 2004; Kaushik, et al., 2005; Nestoriuc and Martin 2007). Biofeedback techniques included: peripheral skin temperature feedback, blood-volume-pulse feedback (vasoconstriction and dilation), vasoconstriction training (temporalis artery), and EMG biofeedback. Biofeedback was used alone or in conjunction with other therapies (e.g., relaxation, behavioral management, medication) and was more effective than controls. Improvements were reported for up to 17 months. After conducting a meta-analysis of 55 randomized controlled trials, including 1718 patients assigned to biofeedback and 511 patients assigned to controls, Nestoriuc and Martin (2007) stated that biofeedback “can be recommended as an evidence-based behavioral treatment option for the prevention of migraine.”

The American Academy of Neurology’s (AAN) recommendations for the evaluation and treatment of migraine headaches states:

- “Relaxation training, thermal biofeedback combined with relaxation training, electromyographic biofeedback, and cognitive-behavioral therapy may be considered as treatment options for prevention of migraine. Specific recommendations regarding which of these to use for specific patients cannot be made.
- Behavioral therapy may be combined with preventive drug therapy to achieve additional clinical improvement for migraine relief“ (Silberstein, 2000).

The American Academy of Family Physicians (AAFP) guidelines on migraine preventive therapy, developed by the U.S. Headache Consortium, include the use of relaxation exercises with thermal biofeedback and EMG biofeedback as “somewhat effective” treatment options for the prevention of migraines. Nonpharmacological therapies may be useful for patients who have failed or are intolerant to drug therapy; patients who have a history of long-term, frequent or excessive use of analgesics or other acute medications; patients with significant stress; or in patients who are pregnant, planning to become pregnant or are nursing (AAFP, 2000).

Guidelines by the National Headache Foundation (NHF) list biofeedback as a treatment option for evaluation and management of migraine headaches. The NHF states that non-pharmacologic adjuncts used for the treatment of migraine including biofeedback may be effective and eliminate the need for pharmacologic interventions (Landy, et al., 2004; Mauskop, 2004). Thermal and EMG biofeedback have been shown to be effective in the prevention and relief of migraine headaches (Farmer, et. al., 2004). Biofeedback has also been proposed as a migraine treatment option for pregnant women, menstrually-related migraines and in children over age ten years ((Diamond, 2004; Pearlman, 2004).

In their discussion of the treatment of chronic pain in the pediatric patient, the American Pain Society (APS) states that treatment should be based on underlying pain mechanisms and address symptom-focused management, and as an example, may include the use of biofeedback in conjunction with other appropriate therapies.

NINDS (2008) lists biofeedback as one form of stress management that may help limit discomfort and reduce the occurrence and severity of migraine attacks.

Cancer Pain

Patients undergoing oncologic therapy frequently experience persistent pain. Additional modalities which can be utilized to manage pain include relaxation and biofeedback (Villaret, et al., 2001).

In their guidance on the treatment of breast cancer, NICE states that for cancer patients in general " there is very strong evidence that cognitive and behavioral interventions, including biofeedback, can reduce side effects of therapy and alleviate psychological and functional disturbances. Some forms of psychological and psychosocial counseling have been shown to increase life expectancy and improve a range of psychological, quality of life and other functional outcomes" (NICE, 2002).

In reference to the management of cancer pain, the National Cancer Institute (NCI) states that alternative therapies (e.g., biofeedback) may be used in conjunction with pain medication in an effort to control pain. NCI states that even though some of these "methods have not been tested in cancer pain studies", they may help to relieve pain, stress, and anxiety therefore, improving the patient's quality of life (NCI, 2008).

The National Comprehensive Cancer Network (NCCN) states that cancer pain can be treated in several ways including the use of medication and other therapies such as relaxation techniques or biofeedback, physical therapy, anesthesia procedures and surgical procedures (NCCN, 2001).

In a guideline for the treatment of nausea and vomiting, the American Cancer Society (ACS) and NCCN (2007) state that biofeedback used in combination with progressive muscle relaxation is a non-pharmacological treatment option for patients who experience nausea and vomiting associated with chemotherapy and radiation.

In the information discussed above regarding the treatment of cancer pain, nausea, and vomiting no references are made to limiting the use of biofeedback to adults.

Other Conditions

Biofeedback has been proposed as a treatment modality for numerous other conditions including: alcohol and drug abuse, anxiety disorders, asthma, attention deficit hyperactivity disorder (ADHD), cardiovascular disease, chronic back pain, epilepsy, fibromyalgia, functional dyspepsia, hypertension, Raynaud's syndrome, rheumatoid arthritis, stroke, temporomandibular disorders, tinnitus and upper limb pain. However, the evidence in the scientific, peer-reviewed literature does not support the efficacy of biofeedback for the treatment of these conditions. Overall, there is a lack of randomized controlled trials using sufficient sample sizes, comparing biofeedback to established therapeutic modalities (e.g., pharmacotherapy, behavior therapy) with long-term follow-ups. Patient selection criteria for biofeedback for these conditions have not been established and reported sustained benefit past the treatment period are lacking.

The evidence in the clinical trials has not established clinical efficacy and effectiveness of EEG biofeedback (EEG Spectrum International, 2001b; Angelakis, et al., 2007; Dohrmann, et al., 2007; McDonough-Means and Cohen, 2007; Heinrich, et al., 2007). A Hayes (2003) review of six studies that met inclusion criteria concluded that "there is insufficient evidence from the available peer-reviewed literature to conclude that EEG biofeedback therapy is effective for the treatment of disorders such as ADHD, epilepsy, insomnia, depression, mood disorders, posttraumatic stress disorder, alcoholism, drug addiction, or menopausal symptoms." Limitations of the studies included small patient populations, inadequate or no controls, lack of randomization or comparison to conventional therapies, and/or long-term follow-up, as well as inconsistent outcome measures and incomplete reporting of data. Because of these methodologic flaws, Hayes stated that "no definitive conclusions regarding the efficacy of EEG biofeedback can be drawn." In a subsequent literature search (2008), Hayes' conclusions have not changed.

Attention Deficit Hyperactivity Disorder (ADHD): Biofeedback is proposed for the treatment of ADHD under the hypothesis that EEG biofeedback can correct the abnormal brain wave activity associated with the condition. However, the effects of biofeedback remain controversial. In addition to the methodological flaws of the clinical trials, it is unclear if the positive outcomes following neurofeedback are due to the electrophysiological mechanisms or other factors such as parental intervention or properties of the therapeutic setting and content (Drechsler, et al., 2007; Heinrich, et al., 2007; Leins, et al., 2007; McDonough-Means and Cohen, 2007).

In a review of the literature on EEG biofeedback for the treatment of ADHD, Monastra et al. (2005) summarized the results of five case studies (n=322) and five controlled-group studies (n=214) that were conducted between 1976 and 2003. The studies were reviewed by applying guidelines established by the AAPB and the International Society for Neuronal Regulation (ISNR). The authors determined that biofeedback was "probably" an efficacious treatment option for ADHD (i.e., 75% of patients demonstrated significant clinical improvement), but stated that randomized controlled trials were needed to demonstrated who will benefit from this treatment.

In a narrative review of the literature, Holtmann and Stadler (2006) stated that EEG biofeedback for the treatment of ADHD has shown short-term effects comparable to the effects of medication at the behavioral and neuropsychological level. Nine studies were reviewed, including 293 subjects. Studies involved the assessment of EEG-frequency training and training of slow cortical potentials. Decreases were seen in inattention, hyperactivity and impulsivity without side effects. The authors stated that although the results were encouraging, EEG biofeedback has not been an accepted treatment modality for ADHD and there is a "strong need for empirically and methodologically sound evaluation studies." **Level of Evidence 4**

Fuchs et al. (2003) conducted a nonrandomized comparison study of children (n=34) diagnosed with ADHD. Their parents chose which treatment the child would receive, pharmaceutical management (n=12) or EEG biofeedback (n=22). The treatment was provided for 12 weeks, and both regimens were associated with improvements on all subscales of the Test of Variables of Attention and on the speed and accuracy measures of the d2 Attention Endurance Test. ADHD-related behaviors were noted to be significantly reduced in both groups when rated by both teachers and parents using the IOWA-Conners Behavior Rating Scale. In a randomized controlled trial, Leins et al. (2007) compared ADHD children treated with slow cortical potential (n=19) to theta/beta therapy (n=19). After three phases of ten sessions improvement were reported by parents and teachers and were maintained for six months.

The 2003 Hayes review referenced above stated that EEG biofeedback has not been proven to be an effective treatment modality for ADHD.

The American Academy of Pediatrics (AAP) clinical practice guideline on the treatment of the school-aged children with ADHD indicates the need for well-designed, rigorous studies of currently promoted but less well-established therapies such as occupational therapy, biofeedback, herbs, vitamins and food supplements. The guideline states that these interventions are not supported by evidence-based studies (AAP, 2001).

Chronic Back Pain: Biofeedback has been proposed as a treatment modality for chronic back pain to help relieve the tension in the back muscles and alleviate pain. Ostelo et al. (2005) conducted a systematic review of the literature to determine if behavioral treatments (including biofeedback) for nonspecific chronic low back pain (CLBP) were more effective than other treatments compared to waiting-list controls (WLC). Twenty-one randomized controlled trials met inclusion criteria. CLBP was defined as back pain that persisted for 12 weeks or more. Studies of individuals with CLBP caused by pathological entities including infection, neoplasm, fracture, osteoporosis and rheumatoid arthritis (RA) were excluded. The investigators reported that there is moderate evidence (three studies, n=88) that there is no significant difference between EMG biofeedback and WLC on behavioral outcomes in the short term. There is conflicting evidence (two studies, n=60) on the effectiveness of EMG biofeedback versus WLC on general functional status. There is limited evidence (one study, n=28) of EMG biofeedback for a small short-term positive effect on back-specific functional status. CBT was compared to EMG biofeedback in one study (n=28), which found no differences in the groups for pain or any behavioral outcome measures either in the short or long term. A combination of CBT and EMG biofeedback compared to WLC (four studies, n=134) found strong evidence for a short-term, positive effect on pain intensity, but no differences on behavioral outcomes or general functional status in the short term compared to WLC. The investigators concluded that combined CBT and EMG biofeedback and progressive relaxation therapy alone are effective for short-term pain reduction in patients with CLBP; however, more research is needed to determine what types of behavioral interventions are most effective for pain relief and which patients would benefit most from a specific type of behavioral treatment. The investigators stated no determination could be made from this review as to whether patients should be referred to behavioral treatment programs or to active conservative treatment programs.

The North American Spine Society's (NASS) guideline for unremitting low back pain does not include the use of biofeedback as a treatment option for this condition.

The 2006 guidelines for acute and chronic low back pain (CLBP) published by the Work Loss Data Institute have biofeedback listed as a treatment modality that they do not recommend.

Epilepsy: In an effort to reduce abnormal brain waves and seizure frequency, biofeedback has been proposed for the treatment of epilepsy. Nagai et al. (2004) conducted a preliminary single-blind, randomized controlled study on 18 adults with drug-refractory epilepsy to evaluate the effect of galvanic skin response (GSR)

biofeedback (n=10) as compared to sham (n=8) on seizure frequency. The primary outcome measure was change in seizure frequency after one month of biofeedback. The patients receiving biofeedback training significantly reduced the seizure frequency. There was no change in seizure activity in the sham group. Limitations of the study include the small patient population, lack of monitoring of medication compliance which could affect seizure activity, and short-term follow-up.

In a Cochrane review, Ramaratnam et al. (2005) conducted a meta-analysis of psychological treatments, including biofeedback, for epilepsy. Randomized and quasi-randomized studies were analyzed. Outcomes included quality of life and seizure frequency. Of the two trials including relaxation and behavioral therapy, one showed positive results by decreasing anxiety and enhancing adjustment. Another study of galvanic skin response reported reduction in seizure activity. A study using EEG biofeedback improved cognitive and motor functions in subjects with the greatest seizure reduction. The studies were deficient in methodology and, due to the limited number of studies, no reliable evidence was evident.

In their clinical guideline for diagnosing and managing epilepsy in children and adults, NICE states that psychological interventions, including biofeedback, may be used as an adjuvant therapy to anti-epileptic drugs (AED) to improve quality of life in adults who are not receiving optimal benefit from AED. They go on to state that psychological interventions have not proven to affect seizure frequency and are not an alternative to pharmacological treatment (NICE 2004).

Fibromyalgia: Biofeedback has been proposed for the treatment of fibromyalgia in an effort to facilitate and train an individual in maintaining a state of relaxation and decreased pain. Babu et al. (2007) compared the use of EMG biofeedback (n=15) to sham (n=15) and reported a significant decrease in pain and the number of tender points in the treatment group. However, there were no significant differences in the fibromyalgia impact questionnaire (FIQ), or the six-minute walk test (SMWT). Both groups experienced a significant decrease in FIQ and visual analogue scale (VAS) but the decreases were greater in the biofeedback group.

Functional Dyspepsia (FD): Because low vagal tone may be a mediating mechanism by which psychological factors induce dyspepsia in FD, it has been hypothesized that biofeedback may be helpful in the treatment of FD by enhancing vagal tone, leading to improvement in parasympathetic activity and drinking capacity. In a randomized controlled trial (n=40) patients were allocated to investigation, information, and biofeedback with breathing exercises or to investigation and information only. Drinking capacity and quality of life improved (p=0.02, p=0.01, respectively) following biofeedback, but an improvement in baseline vagal tone was not noted (Hjelland, et al., 2007).

Hypertension: Because of its potential to decrease stress and enhance relaxation, biofeedback has been proposed for the treatment of hypertension. Yucha et al. (2001) conducted a meta-analysis of 23 randomized controlled studies to determine the effectiveness of biofeedback in the treatment of stages I and II essential hypertension. Biofeedback therapy included different biofeedback modalities and elements of cognitive behavior therapy and relaxation training. The active control group included treatments known to reduce blood pressure such as relaxation training, cognitive therapy and home blood pressure monitoring. The inactive control group included waiting-list control, clinic blood pressure monitoring and sham biofeedback. The investigators concluded that both biofeedback and active control treatments resulted in a reduction in systolic blood pressure (SBP) and diastolic blood pressure (DBP), but only biofeedback showed a significantly greater reduction in both SBP (6.7 mm Hg) and DBP (4.8 mm Hg) when compared to inactive control treatments. The authors noted that statistical significance was achieved only in comparison with the inactive control groups. They also noted the difficulty in determining the effectiveness of specific biofeedback modalities because of the small number of studies using each modality. Some studies tested one treatment at a time, while others used combined treatments, and complete data were not reported in many studies. The authors concluded that biofeedback as a treatment for stage I and II hypertension in healthy adults should be considered before the initiation of pharmacological treatments and as adjunctive therapy to standard pharmacological treatment.

Nakao et al. (2003) conducted a meta-analysis of 22 randomized controlled studies of essential hypertensive patients (n=905). Biofeedback intervention resulted in blood pressure reductions that were greater by 7.3 mmHg systolic and 5.8 mmHg diastolic compared to nonintervention controls (such as clinical visits or self-monitoring of blood pressure). Compared to sham or nonspecific behavioral intervention controls, the net reductions in systolic and diastolic blood pressures by biofeedback intervention were 3.9 mmHg and 3.5 mmHg, respectively. Reviewers were unable to determine whether biofeedback itself has an antihypertensive effect beyond the

general relaxation response because biofeedback was only found to be superior to sham or nonspecific behavioral intervention when combined with other relaxation techniques. The investigators concluded that large, randomized controlled trials are needed to determine whether biofeedback itself has an antihypertensive effect beyond the general relaxation response.

A 2006 Hayes report included three meta-analysis of 26 (n=1264), 21, and 22 randomized controlled trials and 11 prospective reports that investigated the effectiveness of biofeedback in the treatment of hypertension. Of the prospective reports, five studies compared biofeedback plus relaxation training or another cognitive behavioral health modality to no intervention or to clinic blood pressure monitoring or to home blood pressure training; four studies with no controls compared biofeedback effects in various patient populations; and two studies used placebo biofeedback as part of the control intervention. Hayes concluded that the evidence suggested that "biofeedback training programs including relaxation training may be beneficial for the management of hypertension, but the effects of biofeedback alone remain to be determined" (Hayes, Feb 2006).

In their guidelines on the management of hypertension, NICE (2006) states that relaxation therapies, including biofeedback, can reduce blood pressure but "routine provision by primary care teams is not recommended". They stated individuals may want to pursue the use of relaxation therapies on their own.

Raynaud's Syndrome: Proponents of biofeedback for Raynaud's state that using thermal biofeedback to produce vasodilation may help relieve the severity and frequency of attacks. In 2000, a multicenter randomized clinical trial (i.e., The Raynaud's Treatment Study) included 313 patients with primary Raynaud's phenomenon. Patients were randomized into one of four treatment groups: sustained-release nifedipine, pill placebo, temperature biofeedback and EMG biofeedback (control). The primary outcome measures were self-reported Raynaud's attacks one year after initiation of treatment. The results revealed that temperature biofeedback was not better than its control treatment, and biofeedback was inferior to specific pharmaceutical therapy for treating primary Raynaud's (No author, 2000; Middaugh, et al., 2001).

The National Institute of Arthritis and Musculoskeletal Diseases (NIAMS) states that while biofeedback is used for the treatment of a Raynaud's attack, formal studies have suggested that it is not helpful (NIAMS, 2006).

The Raynaud's and Scleroderma Association states "many people have tried self-hypnosis, biofeedback techniques and acupuncture with some success. Unfortunately, there have been very few clinical trials, but they do seem to show that although initially the patients claim some improvement, after about a year many patients stop the treatment because they feel no benefit or it takes up too much time" (2005).

Rheumatoid Arthritis (RA): Biofeedback has been proposed for the treatment of RA to help alleviate tension, stress, anxiety, insomnia and other symptoms that may cause acute flairs-ups and/or enhance arthritic pain. Astin et al. (2002) conducted a systematic review of the literature to investigate the effect of psychological interventions (including biofeedback) on patients with RA. Outcome measures included functional ability, pain, tender joints, psychological status and coping ability. Twenty-five randomized controlled trials of 1676 patients met inclusion criteria. Because separate results by type of intervention (i.e., relaxation, biofeedback, CBT) were not identified, the authors could not report which psychological interventions or combinations of interventions were most effective and for which types of patients. Although the investigators noted some methodological flaws in the studies (e.g., inadequate description of controls, effect sizes not always consistent with signs of confidence intervals), they stated that psychological interventions may be more effective for patients who have had RA for shorter duration. The authors concluded that more research was needed to determine which treatments may be of benefit for patients with RA.

The American College of Rheumatology (ACR) guidelines for the management of osteoarthritis of the hip and knee do not include biofeedback as a treatment modality in rheumatoid arthritis (RA) or osteoarthritis (ACR, 2000).

Stroke: The proposed indications for the treatment of stroke with biofeedback is to retrain the injured brain to replace the inattentive states of consciousness (theta wave) and/or excessive anxiety and tension (beta waves) with healthy waves needed for normal cognition, alertness and mental focus (Litvinas, 2007). Pollock et al. (2003) conducted a Cochrane review and reported the results of a literature search for recovery of postural control and lower limb function following stroke. The objective was to determine if outcomes were different if the physiotherapy treatment was based on orthopedic, neurophysiology, motor learning principles, or a mixture of

these modalities. They reviewed randomized or quasi-randomized controlled trials with interventions of physiotherapies, including biofeedback. Outcomes measured degree of disability and motor impairment. Eighteen studies were categorized as EMG biofeedback and fifteen studies as positional biofeedback. The authors concluded that there was insufficient evidence to determine if one method was more effective than the other.

A 2006 Hayes report on neurological disorders included 22 abstracts on the use of biofeedback following stroke for the treatment of dysphagia, gait disturbances and upper and lower limb hemiplegia. They concluded that the literature did not support the safety and efficacy of biofeedback for the treatment of stroke patients (Hayes, May 2006).

In 2007, Hayes reported on the use of biofeedback for the treatment of stroke with and without physical therapy. Nine studies met inclusion criteria and involved "patients with hemiplegia (3 studies), hemiparesis (6 studies), knee hyperextension (1 study) and narrow base of support (1 study)." The evidence suggested that biofeedback might improve physical function when combined with physical therapy, but the results were weak due to a lack of true control conditions and blind assessments and the lack of long-term follow-up data.

Woodford and Price (2007) conducted a meta-analysis of 13 studies (n=269) on the use of electromyographic biofeedback (EMG-BFB) for the recovery of motor function following a stroke. The analysis included randomized controlled trials and quasi-randomized controlled trials that compared physiotherapy or exercises or physical therapy alone to these treatment modalities plus EMG/EMG-BFB. There were variations in the time from stroke to randomization (35 to 1140 days), and the length of the studies ranged from four to 16 weeks. Small sample sizes (n=10–40) were also a limitation of the studies. Outcome criteria included changes in motor strength, range of motion, stride length, gait speed, functional ability and gait quality score. Overall, the data did not demonstrate a positive effect on the outcomes. The authors concluded that EMG-BFB "does not appear to have a positive benefit for recovery after stroke," and it could not be recommended as a routine treatment modality. However, in view of the absence of reported adverse events, EMG-BFB could be considered as a cautious treatment for a select group of patients.

The Veterans Administration/Department of Defense (VA/DoD) issued a clinical practice guideline for the management of stroke rehabilitation in the primary care setting. The guidelines state that there can be no recommendation made either for or against routine use of biofeedback for post-stroke patients. The decision is deferred to the individual provider (VA/DoD, 2003).

Temporomandibular Disorders (TMD)/Temporomandibular Joint (TMJ) Disorders: As in other chronic pain conditions, biofeedback has been investigated to determine if relaxation and relief of stress and tension from biofeedback will alleviate the pain of TMD. Crider and Glaros (1999) performed a systematic review of literature to determine the efficacy of biofeedback-based treatments in patients with TMJ disorders. The review included six controlled studies, four comparative studies and three uncontrolled studies of EMG biofeedback treatment for TMJ disorders. Outcome measurements included patient pain reports, clinical exam findings and ratings of global improvement. Five of the six controlled trials found EMG biofeedback treatments to be superior to no treatment or psychological placebo controls for at least one of the three outcome measures. Sixty-nine percent of patients who received EMG biofeedback treatments were rated as symptom-free or significantly improved compared to 35% of patients treated with a variety of placebo interventions. Although data appeared to support the efficacy of EMG biofeedback treatments for TMJ disorders, study methodology was unclear or inconsistent, study sizes were small, and results were not statistically significant.

In 2005, Crider et al. reported on six randomized controlled trials regarding the efficacy of biofeedback-based therapy for TMD. Two trials included surface electromyographic (SEMG) training of masticatory muscles; two combined SEMG with cognitive-behavioral therapy (CBT); and two involved biofeedback-assisted relaxation training (BART). The review determined the extent that each intervention met treatment efficacy criteria established by the Association for Applied Psychophysiology and Biofeedback (AAPB). Based upon the review of the studies, the authors stated that SEMG training and BART were "probably an efficacious treatment" and SEMG with CBT is an efficacious treatment. They recommended additional studies to identify specific treatment combinations.

A systematic review by Medicott and Harris (2006) included seven randomized controlled trials which evaluated the effectiveness of relaxation training or biofeedback in the management of TMD. From the review of these

studies, the authors stated, "Programs involving relaxation techniques and biofeedback, EMG training, and proprioceptive reeducation may be more effective than placebo treatment or occlusal splints in decreasing pain and increasing total vertical opening (TVO) in people with acute or chronic myofascial or muscular TMD in the short term and the long term." They stated that "these recommendations should be viewed cautiously."

Upper Limb Pain: A limited number of studies have been conducted to determine if the muscle relaxation effect of biofeedback could help alleviate the pain of repetitive strain in the upper limbs. Karjalainen et al. (2004) conducted a systematic review of the literature to determine the effectiveness of biopsychosocial rehabilitation for upper-limb repetitive strain injuries among working-age adults. The investigators found two prospective randomized studies and considered both studies to be of low quality due to methodological flaws. Studies which included EMG biofeedback as the only component of physiological rehabilitation were excluded. One study (n=32) compared the extra effect of hypnosis combined with biofeedback and autogenics (a form of autohypnosis using self-suggestion), given once a week for six weeks, compared to WLC. The investigators concluded that the evidence was limited due to the low quality of the studies, but they noted there was a positive effect of hypnosis combined with biofeedback and autogenics as compared to biofeedback and autogenics after six weeks of follow-up. The second study (n=48) compared three behavioral therapies: EMG biofeedback, applied relaxation with progressive muscular relaxation and imagery methods. The biopsychosocial intervention groups were given a combination of EMG biofeedback and applied relaxation, or applied relaxation only. One control group was given EMG biofeedback, and the other control group waited eight weeks before treatment. The drop-out rate was reported to be 20.8% in this study. The investigators concluded that there were no differences in effect between applied relaxation, EMG biofeedback plus applied relaxation, and WLC after eight weeks and six months of follow-up.

Vulvodynia: Following the hypothesis that vulvodynia, or vulvar vestibulitis, and vulvar vestibulodynia may be due to an abnormality in pelvic floor muscle tone, biofeedback has been investigated as a treatment modality for muscle training. Updike et al. (2005) investigated the practice patterns among clinicians who frequently treated patients with vulvar pain syndromes. A cross-sectional survey was sent to 327 providers who were asked to report what treatments they would use for patients with generalized and localized vulvodynia. The overall response rate was 51%. The most commonly used treatment for vulvodynia was tricyclic antidepressants. There was no difference in the use of physical therapy, estrogens, injected or topical steroids, interferon, or laser therapy to treat generalized or localized vulvodynia. There was a great variation in practice patterns for the treatment of generalized and localized vulvodynia. The authors stated, "It is nearly impossible to practice evidence-based medicine in the care of women with vulvodynia with so few clinical trials. Until prospective comparative data are available, clinicians must rely on personal experience and expert consensus in developing treatment strategies for treating vulvar pain."

In a randomized controlled study, Bergeron et al. (2001) prospectively evaluated and compared EMG biofeedback (12-week trial), group cognitive-behavioral (12-week trial), and vestibulectomy in the treatment of dyspareunia resulting from vulvar vestibulodynia. Seventy-eight women were randomly assigned to one of the three treatment regimens. Following treatment, all groups reported statistically significant reductions on pain measures up to the six-month follow-up. The vestibulectomy group was significantly more successful than the other two groups, reporting a 70% mean reduction in pain and a greater quality of life improvement. The biofeedback participants experienced a higher six-month dropout rate, reflecting patient difficulty following through with the long-term and repetitive treatment protocols. The author stated, that the "results need to be interpreted with caution since there were significantly more participants in the vestibulectomy condition who refused to undergo the treatment they had been randomized to, as compared to participants in the two other treatment conditions."

In a case series study, McKay et al. (2001) evaluated the effectiveness of EMG biofeedback of pelvic floor musculature in the management of patients with moderate to severe vulvar vestibulodynia syndrome. Fifteen of the 29 treated patients (51.7%) demonstrated a decrease in introital tenderness and 14 of the 15 were able to resume intercourse without discomfort. Following completion of treatment, 88.9% reported mild pain, and five of 29 women did not show any significant improvement and were unable to resume sexual activity. Within six months of starting therapy, 90% of the patients ultimately resuming sexual activity had done so. The authors noted that the open-ended evaluation of the severity of pain associated with intercourse, as well as sexual activity before, during, and after completion of a program of biofeedback was a limitation of the study.

In a 2008 Hayes review, five studies (i.e., two randomized controlled trials, two case series, one retrospective review) (n=33–87) utilizing biofeedback for the treatment of vulvodynia were identified in a search of the literature. Hayes noted that the overall quality of the studies was limited by the “small number of well-designed studies and small samples sizes.” Duration of the studies ranged from two to three months, follow-up ranged from six months to over three years, compliance was unknown since biofeedback training was continued at home, and in some cases, drop-out rates were unknown or high. Hayes also noted that definitive patient selection criteria for biofeedback training for this indication have not been established.

In a patient education brochure, the American College of Obstetricians and Gynecologists (ACOG) (2007) states that physical therapy or biofeedback may be tried by women with vulvodynia to learn to control vaginal muscles which may help to reduce the pain.

Home Biofeedback Devices

Biofeedback should be performed in a clinical setting by trained professionals. The evidence in the peer-reviewed literature does not support the effectiveness of home use of electronic biofeedback devices. In some instances the results of clinical trials were limited due to the inability to monitor the use of home biofeedback used by subjects in the trial. One randomized controlled trial compared the use of anorectal manometry EMG biofeedback performed in a laboratory (n=24) to EMG biofeedback performed in the home (n=12) for children with chronic constipation who had failed conventional treatment. The outcomes indicated that no additional benefit was gained by the use of home biofeedback (Croffie, et al., 2005). In a randomized controlled trial, Aukee et al. (2004) reported that 11 of 16 women who received 12 weeks of home EMG-assisted biofeedback (FemiScan™, MegaElectronics, Kuopio, Finland) avoided surgical intervention compared to ten of 19 control subjects who did not use home biofeedback. In a 2002 decision memo regarding the use of home biofeedback for urinary incontinence, the Centers for Medicare and Medicaid (CMS), stated that “the scientific evidence is not adequate to conclude that the use of home biofeedback devices for the treatment of urinary incontinence is clinically effective, and, therefore, is not reasonable and necessary for treating urinary incontinence or to improve the functioning of a malformed body member” (CMS, 2002).

Summary

The evidence in the peer-reviewed literature and/or professional societies supports the safety and efficacy of biofeedback for the treatment of constipation and fecal incontinence in adults and the treatment of stress, urge, mixed and overflow urinary incontinence, migraine and tension headaches and cancer pain in adults and children.

The evidence in the peer-reviewed literature does not support the therapeutic effectiveness of biofeedback for any other diagnoses or conditions due to the small number of clinical trials and/or small patient populations, short-term follow-ups, lack of documentation of sustained benefits and lack of a comparison to established therapeutic modalities for the various conditions. In most cases, patient selection criteria for biofeedback have not been established. There is insufficient evidence in the published, peer-reviewed scientific literature to conclude that biofeedback is effective for any of the following indications (list is not all inclusive):

- alcohol and drug abuse
- anxiety disorders
- asthma
- attention deficit hyperactivity disorder
- cardiovascular disease
- chronic back pain
- epilepsy
- fibromyalgia
- functional dyspepsia
- hypertension
- Raynaud’s syndrome
- rheumatoid arthritis,
- stroke
- temporomandibular disorders
- tinnitus
- upper limb pain

Coding/Billing Information

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

Covered when medically necessary, if coverage is available:

CPT^{®*} Codes	Description
90875	Individual psychophysiological therapy incorporating biofeedback training by any modality (face-to-face with the patient), with psychotherapy (e.g., insight oriented, behavior modifying or supportive psychotherapy); approximately 20-30 minutes
90876	Individual psychophysiological therapy incorporating biofeedback training by any modality (face-to-face with the patient), with psychotherapy (e.g., insight oriented, behavior modifying or supportive psychotherapy); approximately 45-50 minutes
90901	Biofeedback training by any modality
90911	Biofeedback training, perineal muscles, anorectal or urethral sphincter, including EMG and/or manometry

ICD-9-CM Diagnosis Codes	Description
307.81	Tension headache
346.00- 346.91	Migraine
338.3	Neoplasm related pain (acute) (chronic)
564.00- 564.09	Constipation
787.6	Incontinence of feces
788.30- 788.39	Urinary incontinence
	Multiple/varied

Experimental/Investigational/Unproven/Not Covered:

HCPCS Codes	Description
E0746	Electromyography (EMG), biofeedback device

ICD-9-CM Diagnosis Codes	Description
	Multiple/varied

***Current Procedural Terminology (CPT[®]) ©2007 American Medical Association: Chicago, IL.**

References

1. Agency for Healthcare Research and Quality (AHRQ). Evidence report/technology assessment: number 11 Treatment of attention-deficit/hyperactivity disorder summary. Dec, 1999. Accessed Jun 16, 2008. Available at URL address: <http://www.ahrq.gov/clinic/epcsums/adhdsum.htm>

2. Agency for Healthcare Research and Quality (AHRQ). Evidence report/technology assessment: number 35. Management of cancer pain summary. Jan, 2001 Accessed Jun 16, 2008. Available at URL address: <http://www.ahrq.gov/clinic/epcsums/canpainsum.htm>
3. Agency for Healthcare Research and Quality (AHRQ). Evidence report/technology assessment: number 39. Management of newly diagnosed patients with epilepsy: a systematic review of the literature summary. Feb 2001. Accessed Jun 16 2008. Available at URL address: <http://www.ahrq.gov/clinic/epcsums/epilepsum.htm>
4. Agency for Healthcare Research and Quality (AHRQ). Evidence report/technology assessment: number 40 mind-body interventions for gastrointestinal conditions summary. Mar 2001. Accessed Jun 16, 2008. Available at URL address: <http://www.ahrq.gov/clinic/epcsums/mindsum.htm>
5. Agency for Healthcare Research and Quality (AHRQ). Evidence report/technology assessment: number 77. Management of treatment-resistant epilepsy, volumes 1 and 2. Apr 2003. Accessed Jun 16, 2008. Available at URL address: <http://www.ahrq.gov/clinic/epcsums/epilsum.htm>
6. Agency for Healthcare Research and Quality. (AHRQ). Urinary incontinence in adults, clinical practice guideline update. Mar 1996. Accessed Jun 13, 2008. Available at URL address: <http://www.ahrq.gov/clinic/uiovervw.htm>
7. Allen J. Photoplethysmography and its application in clinical physiological measurement. *Physiol Meas.* 2007 Mar;28(3):R1-39. Epub 2007 Feb 20.
8. American Academy of Child and Adolescent Psychiatry (AACAP). Practice Parameter for the Assessment and Treatment of Children and Adolescents with Anxiety Disorders (AACAP). 1997. Accessed Jun 17, 2008. Available at URL address: http://www.aacap.org/cs/root/member_information/practice_information/practice_parameters/summaries/summary_of_the_practice_parameters_for_the_assessment_and_treatment_of_children_and_adolescents_with_anxiety_disorder
9. American Academy of Family Physicians (AAFP). Practice Guidelines. Guidelines on Migraine: Part 4. General Principles of Preventive Therapy. Nov 15, 2000. Accessed Jun 16, 2008. Available at URL address: <http://www.aafp.org/afp/20001115/practice.html>
10. American Academy of Pediatrics. ADHD-Unproven treatments. Accessed Jun 16, 2008. Available at URL address: http://www.medem.com/search/article_display.cfm?path=%5C%5CTANQUERAY%5CM_ContentItem&mstr=/M_ContentItem/ZZZXL1ITXSC.html&soc=AAP&srch_typ=NAV_SERCH
11. American Academy of Pediatrics (AAP). Clinical Practice Guideline: Treatment of the School-Aged Child With Attention-Deficit/Hyperactivity Disorder. Oct 2001. Accessed Jun 16, 2008. Available at URL address: <http://aappolicy.aappublications.org/cgi/reprint/pediatrics;108/4/1033.pdf>
12. American Association of Oral and Maxillofacial Surgeons. Statements by the American Association of Oral and Maxillofacial Surgeons Concerning the Management of Selected Clinical Conditions and Associated Clinical Procedures Temporomandibular Disorders. Mar 2008. Accessed Jun 16, 2008. Available at URL address: http://www.aaoms.org/docs/practice_mgmt/condition_statements/tmj_disorders.pdf
13. American Cancer Society (ACS) and National Comprehensive Cancer Network (NCCN). Treatment guidelines for patients with cancer. Jun 2007. Accessed Jul 7, 2008. Available at URL address: http://www.nccn.org/patients/patient_gls/_english/pdf/NCCN%20Nausea%20Guidelines.pdf
14. American College of Obstetricians and Gynecologists. Gynecological Problems: Vulvodynia. August 2007. Accessed Jun 30, 2008. Available at URL address: http://www.acog.org/publications/patient_education/bp127.cfm

15. American College of Rheumatology (ACR). Practice guidelines. Recommendations for the medical management of osteoarthritis of the hip and knee. 2000. Accessed Jun 16, 2008. Available at URL address: <http://www.rheumatology.org/publications/guidelines/oa-mgmt/oa-mgmt.asp?aud=mem>
16. American Dental Association. Oral Health Topics. TMD/TMJ (Temporomandibular Disorders). Accessed Jun 16, 2008. Available at URL address: http://www.ada.org/public/topics/tmd_tmj.asp
17. American Gastroenterological Association medical position statement: Guidelines on constipation. Dec 2000. Accessed Jun 13, 2008. Available at URL address: [http://www2.us.elsevierhealth.com/inst/serve?action=searchDB&searchDBfor=art&artType=abs&id=a0060001761&nav=abs&special=hilite&query=\[all_fields\]\(constipation\)](http://www2.us.elsevierhealth.com/inst/serve?action=searchDB&searchDBfor=art&artType=abs&id=a0060001761&nav=abs&special=hilite&query=[all_fields](constipation))
18. American Gastroenterological Association medical position statement on anorectal testing techniques. Jul 1998. Accessed Jun 13, 2008. Available at URL address: [http://www2.us.elsevierhealth.com/inst/serve?action=searchDB&searchDBfor=art&artType=abs&id=a1163990732&nav=abs&special=hilite&query=\[all_fields\]\(anorectal+testing+techniques,\)](http://www2.us.elsevierhealth.com/inst/serve?action=searchDB&searchDBfor=art&artType=abs&id=a1163990732&nav=abs&special=hilite&query=[all_fields](anorectal+testing+techniques,))
19. American Headache Society. U.S. Headache Consortium guidelines. Behavioral and physical treatments. 2006. Accessed Jun 20, 2008. Available at URL address: <http://www.americanheadachesociety.org/professionalresources/USHeadacheConsortiumGuidelines.asp>
20. American Pain Society (APS). Pediatric chronic pain-A position statement from the American Pain Society. Accessed Jun 16, 2008. Available at URL address: <http://www.ampainsoc.org/advocacy/pediatric.htm>
21. American Pain Society (APS). Biofeedback as an Adjunctive Treatment Modality in Pain Management. 2004. Accessed Jun 16, 2008. Available at URL address: <http://www.ampainsoc.org/pub/bulletin/jul04/clin1.htm>
22. American Psychiatric Association. Let's Talk About Anxiety Disorders. 2005. Accessed Jun 16, 2008. Available at URL address: <http://www.healthyminds.org/multimedia/anxietydisorders.pdf>
23. American Urological Association. Female Stress Incontinence. The American Urological Association Female Stress Urinary Incontinence Clinical Guidelines Panel. Report on The Surgical Management of Female Stress Urinary Incontinence. Clinical Practice Guidelines. 1997. Accessed Jun 13, 2008. Available at URL address: <http://www.auanet.org/guidelines/>
24. American Urological Association. Aug 2003. Minimally invasive management of urinary incontinence. Accessed Jun 13, 2008. Available at URL address: <http://urologyhealth.org/adult/index.cfm?cat=03&topic=106>
25. Angelakis E, Stathopoulou S, Frymiare JL, Green DL, Lubar JF, Kounios J. EEG neurofeedback: a brief overview and an example of peak alpha frequency training for cognitive enhancement in the elderly. *Clin Neuropsychol*. 2007 Jan;21(1):110-29.
26. Applied Psychophysiology and Biofeedback. Biofeedback. 2008. Accessed Jun 16, 2008. Available at URL address: <http://www.aapb.org/i4a/pages/Index.cfm?pageID=3634>
27. Applied Psychophysiology and Biofeedback. Disorders that are amenable to intervention by biofeedback and neurofeedback. 2008. Accessed Jun 16, 2008. Available at URL address: <http://www.aapb.org/i4a/pages/Index.cfm?pageID=3634>
28. Astin JA, Beckner W, Soeken K, Hochberg MC, Berman B. Psychological interventions for rheumatoid arthritis: a meta-analysis of randomized controlled trials. *Arthritis Rheum*. 2002;47(3):291-302.
29. Aukee P, Immonen P, Laaksonen DE, Laippala P, Penttinen J, Airaksinen O. The effect of home biofeedback training on stress incontinence. *Acta Obstet Gynecol Scand*. 2004 Oct;83(10):973-7.

30. Aukerman G. Practical therapeutics. Management of the acute migraine headache. *Am Fam Physician*. 2002;66(11).
31. Babu AS, Mathew E, Danda D, Prakash H. Management of patients with fibromyalgia using biofeedback: A randomized control trial. *Indian J Med Sci* 2007;61:455-61.
32. Bassotti G, Chistolini F, Sietchiping-Nzepa F, de Roberto G, Morelli A, Chiarioni G. Biofeedback for pelvic floor dysfunction in constipation. *BMJ*. 2004 Feb 14;328(7436):393-6.
33. Beauregard M, Levesque J. Functional magnetic resonance imaging investigation of the effects of neurofeedback training on the neural bases of selective attention and response inhibition in children with attention-deficit/hyperactivity disorder. *Appl Psychophysiol Biofeedback*. 2006 Mar;31(1):3-20.
34. Bergeron S, Binik YM, Khalife S, Pagidas K, Glazer HI, Meana M, Amsel R. A randomized comparison of group cognitive-behavioral therapy, surface electromyographic biofeedback, and vestibulectomy in the treatment of dyspareunia resulting from vulvar vestibulitis. *Pain*. 2001 Apr;91(3):297-306.
35. Biggs WS, Dery WH. Evaluation and treatment of constipation in infants and children. *Am Fam Physician*. 2006 Feb 1;73(3):469-77.
36. Brazzelli M, Griffiths P. Behavioural and cognitive interventions with or without other treatments for the management of faecal incontinence in children. *Cochrane Database Syst Rev*. 2006 Apr 19;(2):CD002240.
37. Brazzelli M, Griffiths P. Behavioural and cognitive interventions with or without other treatments for defaecation disorders in children. *The Cochrane Review*. In: *The Cochrane Library*, Issue 4, 2001. Chichester, UK:John Wiley & sons, Ltd.; 2004. Oxford: Update software.
38. Bronfort G, Nilsson N, Haas M, Evans R, Goldsmith CH, Assendelft WJJ, Bouter LM. Non-invasive physical treatments for chronic/recurrent headache *The Cochrane Review*. In: *The Cochrane Library*, Issue 3, 2004. Oxford: Update software.
39. Burgio KL, Goode PS, Locher JL, Umlauf MG, Roth DL, Richter HE, Varner RE, Lloyd LK. Behavioral training with and without biofeedback in the treatment of urge incontinence in older women: a randomized controlled trial. *JAMA*. 2002 Nov 13;288(18):2293-9.
40. Burgio KL, Goode PS, Urban DA, Umlauf MG, Locher JL, Bueschen A, Redden DT. Preoperative biofeedback assisted behavioral training to decrease post-prostatectomy incontinence: a randomized, controlled trial. *J Urol*. 2006 Jan;175(1):196-201; discussion 201.
41. Catto-Smith AG. 5. Constipation and toileting issues in children. *Med J Aust*. 2005 Mar 7;182(5):242-6.
42. Centers for Medicare and Medicaid (CMS). Decision Memo for Home Biofeedback For Urinary Incontinence (CAG-00118N). Mar 1, 2002. Accessed Jul 3, 2008. Available a URL address: <http://www.cms.hhs.gov/mcd/viewdecisionmemo.asp?from2=viewdecisionmemo.asp&id=34&>
43. Chiarioni G, Whitehead WE, Pezza V, Morelli A, Bassotti G. Biofeedback is superior to laxatives for normal transit constipation due to pelvic floor dyssynergia. *Gastroenterology*. 2006 Mar;130(3):657-64.
44. Chiarioni G, Whitehead WE. The role of biofeedback in the treatment of gastrointestinal disorders. *Nat Clin Pract Gastroenterol Hepatol*. 2008 Jun 3.
45. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr. Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. 1997. Updated 2003. Accessed Jun 22, 2005. Available at URL address: http://www.guideline.gov/summary/summary.aspx?doc_id=4771&nbr=3450&string=raynaud

46. Crider A, Glaros AG, Gevirtz RN. Efficacy of biofeedback-based treatments for temporomandibular disorders. *Appl Psychophysiol Biofeedback*. 2005 Dec;30(4):333-45.
47. Crider AB, Glaros AG. A meta-analysis of EMG biofeedback treatment of temporomandibular disorders. [Abstract]. *J Orofac Pain*. 1999 Winter;13(1):29-37.
48. Croffie JM, Ammar MS, Pfefferkorn MD, Horn D, Klipsch A, Fitzgerald JF, Gupta SK, Molleston JP, Corkins MR. Assessment of the effectiveness of biofeedback in children with dyssynergic defecation and recalcitrant constipation/encopresis: does home biofeedback improve long-term outcomes. *Clin Pediatr (Phila)*. 2005 Jan-Feb;44(1):63-71.
49. Damen L, Bruijn J, Koes BW, Berger MY, Passchier J, Verhagen AP. Prophylactic treatment of migraine in children. Part 1. A systematic review of non-pharmacological trials. *Cephalalgia*. 2006 Apr;26(4):373-83.
50. Dannecker C, Wolf V, Raab R, Hepp H, Anthuber C. EMG-biofeedback assisted pelvic floor muscle training is an effective therapy of stress urinary or mixed incontinence: a 7-year experience with 390 patients. *Arch Gynecol Obstet*. 2005 Dec;273(2):93-7. Epub 2005 Jul 6.
51. De Paepe H, Hoebeke P, Renson C, Van Laecke E, Raes A, Van Hoecke E, Van Daele J, Vande Walle J. Pelvic-floor therapy in girls with recurrent urinary tract infections and dysfunctional voiding. *Br J Urol*. 1998 May;81 Suppl 3:109-13.
52. Diamond M. Special treatment situations: menstrual migraine and menstrually-related migraine. Standards of care for headache diagnosis and treatment. National Headache Foundation. 2004. Accessed Jun13, 2008. Available at URL address: http://www.guideline.gov/summary/summary.aspx?doc_id=6587&nbr=4147
53. Dohrmann K, Weisz N, Schlee W, Hartmann T, Elbert T. Neurofeedback for treating tinnitus. *Prog Brain Res*. 2007;166:473-85.
54. Drechsler R, Straub M, Doehnert M, Heinrich H, Steinhausen HC, Brandeis D. 1Controlled evaluation of a neurofeedback training of slow cortical potentials in children with Attention Deficit/Hyperactivity Disorder (ADHD). *Behav Brain Funct*. 2007 Jul 26;3:35.
55. Eccleston C, Yorke L, Morley S, Williams AC de C, Mastroiannopoulou K. Psychological therapies for the management of chronic and recurrent pain in children and adolescents. *The Cochrane Review*. In: *The Cochrane Library*, Issue 1, 2003. Updated Oct 2004. Chichester, UK:John Wiley & sons, Ltd.; 2005. Oxford:
56. EEG Spectrum International. History of biofeedback. 2001a. Accessed June 20, 2008. Available at URL address: <http://www.eegspectrum.com/Applications/InfoNetwork/>
57. EEG Spectrum International. Therapeutic applications of neurofeedback. 2001b. Accessed June 20, 2008. Available at URL address: <http://www.eegspectrum.com/Applications/InfoNetwork/>
58. Farmer K, Freitag F. Special treatment situations: behavioral interventions for management of primary head pain. National Headache Foundation 2004. Accessed Jun13, 2008. Available at URL address: http://www.guideline.gov/summary/summary.aspx?doc_id=6584&nbr=4144
59. Fuchs T, Birbaumer N, Lutzenberger W, Gruzelier JH, Kaiser J. Neurofeedback treatment for attention-deficit/hyperactivity disorder in children: a comparison with methylphenidate. *Appl Psychophysiol Biofeedback*. 2003 Mar;28(1):1-12.
60. Gladstein J. Headache. *Med Clin North Am*. 2006 Mar;90(2):275-90.
61. Glazer HI. Dysesthetic vulvodinia. Long-term follow-up after treatment with surface electromyography-assisted pelvic floor muscle rehabilitation. *J Reprod Med*. 2000 Oct;45(10):798-802.

62. Goldenberg DL, Burckhardt C, Crofford L. Management of fibromyalgia syndrome. *JAMA*. 2004 Nov 17;292(19):2388-95.
63. Greydanus DE, Pratt HD, Patel DR. Attention deficit hyperactivity disorder across the lifespan: the child, adolescent, and adult. *Dis Mon*. 2007 Feb;53(2):70-131.
64. Hammond DC. Neurofeedback with anxiety and affective disorders. *Child Adolesc Psychiatric Clin N Am*. 2005;14:105-23.
65. Hay-Smith EJC, Bø K, Berghmans LCM, Hendriks HJM, de Bie RA, van Waalwijk van Doorn ESC. Pelvic floor muscle training for urinary incontinence in women. *The Cochrane Review*. In: *The Cochrane Library*, Issue 1, 2001. Chichester, UK:John Wiley & sons, Ltd.; 2005.
66. HAYES Medical Technology Directory™. Biofeedback as an adjunct to physical therapy for recovery after stroke. Lansdale, PA: HAYES Inc; 2007 ©Winifred S. Hayes, Inc. Jul 5, 2007.
67. HAYES Medical Technology Directory™. Biofeedback for headache and chronic musculoskeletal pain. Lansdale, PA: HAYES Inc; 2004 ©Winifred S. Hayes, Inc. Nov 3, 2004
68. HAYES Medical Technology Directory™. Biofeedback for the treatment of hypertension. Lansdale, PA: HAYES Inc; 2005 ©Winifred S. Hayes, Inc. Nov 8, 2005. Updated Feb 27, 2006.
69. HAYES Medical Technology Directory™. Biofeedback therapy for vulvodynia and vulvar vestibulitis.. Lansdale, PA: HAYES Inc; 2003 ©Winifred S. Hayes, Inc. Jan 9, 2003. Updated Mar 18, 2008.
70. HAYES Medical Technology Directory™. Electroencephalogram (EEG) biofeedback therapy. Lansdale, PA: HAYES Inc; 2003 ©Winifred S. Hayes, Inc. Apr 11, 2003
71. HAYES Update Search™. Biofeedback for headache and chronic musculoskeletal pain. Lansdale, PA: HAYES Inc; 2006 ©Winifred S. Hayes, Inc. Dec 16, 2007.
72. HAYES Search and Summary™. Biofeedback for neuromuscular rehabilitation for neurological disorders. Lansdale, PA: HAYES Inc; ©Winifred S. Hayes, Inc. May 9, 2006.
73. HAYES Search and Summary™. Biofeedback for Raynaud's disease. Lansdale, PA: HAYES Inc; 2007 ©Winifred S. Hayes, Inc. Feb 17, 2006.
74. HAYES Update Search™. Biofeedback for the treatment of hypertension. Lansdale, PA: HAYES Inc; 2008 ©Winifred S. Hayes, Inc. Mar 3, 2008.
75. HAYES Update Search™. Biofeedback therapy for vulvodynia and vulvar vestibulitis. Lansdale, PA: HAYES Inc; 2007 ©Winifred S. Hayes, Inc. Feb 28, 2007.
76. HAYES Update Search™. Electroencephalogram (EEG) Biofeedback Therapy. Lansdale, PA: HAYES Inc; 2007 ©Winifred S. Hayes, Inc. Mar 13, 2008.
77. Heinrich H, Gevensleben H, Strehl U. Annotation: neurofeedback - train your brain to train behaviour. *J Child Psychol Psychiatry*. 2007 Jan;48(1):3-16.
78. Herbison P, Plevnik S, Mantle J. Weighted vaginal cones for urinary incontinence. *The Cochrane Review*. In: *The Cochrane Library*, Issue 2, 2000. Update Jul 2003.Chichester, UK:John Wiley & sons, Ltd.; 2004. Oxford: Update software.
79. Heymen S, Scarlett Y, Jones K, Ringel Y, Drossman D, Whitehead WE. Randomized, controlled trial shows biofeedback to be superior to alternative treatments for patients with pelvic floor dyssynergia-type constipation. *Dis Colon Rectum*. 2007 Apr;50(4):428-41.

80. Heymen S, Jones KR, Scarlett Y, Whitehead WE. Biofeedback treatment of constipation: a critical review. *Dis Colon Rectum*. 2003 Sep;46(9):1208-17.
81. Hjelland IE, Svebak S, Berstad A, Flatabø G, Hausken T. Breathing exercises with vagal biofeedback may benefit patients with functional dyspepsia. *Scand J Gastroenterol*. 2007 Sep;42(9):1054-62.
82. Holroyd KA, Mauskop A. Complementary and alternative treatments. *Neurology*. 2003 Apr 8;60(7).
83. Holroyd-Leduc JM, Tannenbaum C, Thorpe KE, Straus SE. What type of urinary incontinence does this woman have? *JAMA*. 2008 Mar 26;299(12):1446-56.
84. Holtmann M, Stadler C. Electroencephalographic biofeedback for the treatment of attention-deficit hyperactivity disorder in childhood and adolescence. *Expert Rev Neurother*. 2006 Apr;6(4):533-40.
85. Huang H, Wolf SL, He J. Recent developments of biofeedback for neuromotor rehabilitation. *J Neuroengineering Rehabil*. 2006 Jun 21;3(1):11.
86. Huffman J, Sakonju A. Chapter 19 – Neurology. Differential diagnosis of recurrent or chronic headaches. In: *Johns Hopkins: The Harriet Lane Handbook: A Manual for Pediatric House Officers*, 17th ed. Philadelphia. Mosby's, 2005.
87. Hunter KF, Moore KN, Cody DJ, Glazener CM. Conservative management for postprostatectomy urinary incontinence. *Cochrane Database Syst Rev*. 2004;(2):CD001843.
88. Institute for Clinical Systems Improvement (ICSI). Health care guideline: adult low back pain. Sep 2006. Accessed Jun 17, 2008. Available at URL address:
http://www.icsi.org/low_back_pain/adult_low_back_pain__8.html
89. Institute for Clinical Systems Improvement (ICSI). Health care guideline: assessment and management of chronic pain. Second edition: March 2007. Accessed Jun 17, 2008. Available at URL address:
http://www.icsi.org/pain__chronic__assessment_and_management_of_14399/pain__chronic__assessment_and_management_of__guideline_.html
90. Institute for Clinical Systems Improvement (ICSI). Health care guideline: assessment and management of acute pain. Fifth edition: March 2008. Accessed Jun 17, 2008. Available at URL
http://www.icsi.org/pain_acute/pain__acute__assessment_and_management_of__3.html
91. Institute for Clinical Systems Improvement (ICSI). Health care guideline: diagnosis and treatment of headache. Eighth edition: Jan 2007. Accessed Jun 17, 2008. Available at URL address:
http://www.icsi.org/headache/headache__diagnosis_and_treatment_of_2609.html
92. International Headache Society (HIS). Cephalalgia. The international classification of headache disorders. 2004. Accessed June 20, 2008. Available at URL address:
http://216.25.100.131/ihscommon/guidelines/pdfs/ihc_II_main_no_print.pdf
93. Karmody CS. Alternative therapies in the management of headache and facial pain. *Otolaryngol Clin N Am*. 2003;36:1221–30.
94. Karjalainen K, Malmivaara A, van Tulder M, Roine R, Jauhiainen M, Hurri H, et al. Biopsychosocial rehabilitation for upper limb repetitive strain injuries in working age adults. *The Cochrane Review*. In: *The Cochrane Library*, Issue 3, 2000. Update Dec 2004. Chichester, UK: John Wiley & sons, Ltd.; 2004. Oxford: Update software.
95. Kaushik R, Kaushik RM, Mahajan SK, Rajesh V. Biofeedback assisted diaphragmatic breathing and systematic relaxation versus propranolol in long term prophylaxis of migraine. *Complement Ther Med*. 2005 Sep;13(3):165-74.

96. Kiresuk TJ, Trachtenberg A. Alternative and complementary health practices. Sadock BJ, Sadock VA, editors. In: Kaplan & Sadock's Comprehensive textbook of psychiatry. PA: Lippincott Williams & Wilkins. 2005.
97. Klijn AJ, Uiterwaal CS, Vijverberg MA, Winkler PL, Dik P, de Jong TP. Home uroflowmetry biofeedback in behavioral training for dysfunctional voiding in school-age children: a randomized controlled study. *J Urol*. 2006 Jun;175(6):2263-8; discussion 2268.
98. Landy S, Smith T. Treatment of primary headache: acute migraine treatment. National Headache Foundation. 2004. Accessed Jun 16, 2008. Available at URL address: http://www.guideline.gov/summary/summary.aspx?doc_id=6579&nbr=4139
99. Leins U, Goth G, Hinterberger T, Klinger C, Rumpf N, Strehl U. Neurofeedback for children with ADHD: a comparison of SCP and Theta/Beta protocols. *Appl Psychophysiol Biofeedback*. 2007 Jun;32(2):73-88.
100. Lewis D, Ashwal S, Hershey A, Hirtz D, Yonker M, Silberstein S. Practice Parameter: Pharmacological treatment of migraine headache in children and adolescents. Report of the American Academy of Neurology Quality Standards Subcommittee and the Practice Committee of the Child Neurology Society. *Neurol*. 2004;63:2215-24.
101. Linden W, Moseley JV. The efficacy of behavioral treatments for hypertension. *Appl Psychophysiol Biofeedback*. 2006 Mar;31(1):51-63.
102. Litvinas, I. Ch 31 - stroke (cerebrovascular disease). In: Rakel: Integrative Medicine, 2nd ed. Philadelphia: Saunders Elsevier, 2007.
103. Ilnyckyj A, Fachnie E, Tougas G. A randomized-controlled trial comparing an educational intervention alone vs education and biofeedback in the management of faecal incontinence in women. *Neurogastroenterol Motil*. 2005 Feb;17(1):58-63.
104. Mahony RT, Malone PA, Nalty J, Behan M, O'Connell PR, O'Herlihy C. Randomized clinical trial of intra-anal electromyographic biofeedback physiotherapy with intra-anal electromyogenic biofeedback augmented with electrical stimulation of the anal sphincter in the early treatment of postpartum fecal incontinence. *Am J Obstet Gynecol*. 2004;191:885-90.
105. Mauskop A, Graff-Radford S. Special treatment situations: alternative headache treatments. National Headache Foundation. 2004. Accessed Jun 16, 2008. Available at URL address: http://www.guideline.gov/summary/summary.aspx?doc_id=6588&nbr=4148
106. McConaghy JR. Headache in primary care. *Prim Care*. 2007 Mar;34(1):83-97.
107. McDonough-Means SI, Cohen MW. Chapter 11. Attention deficit disorder. In: Rakel: Integrative Medicine, 2nd ed. Philadelphia: Saunders Elsevier, 2007.
108. McKay E, Kaufman RH, Doctor U, Berkova Z, Glazer H, Redko V. Treating vulvar vestibulitis with electromyographic biofeedback of pelvic floor musculature. *J Reprod Med*. 2001 Apr;46(4):337-42.
109. Medicott MS, Harris SR. A systematic review of the effectiveness of exercise, manual therapy, electrotherapy, relaxation training, and biofeedback in the management of temporomandibular disorder. *Phys Ther*. 2006 Jul;86(7):955-73.
110. Middaugh SJ, Haythornthwaite JA, Thompson B, Hill R, Brown KM, Freedman RR, Attanasio V, Jacob RG, Scheier M, Smith EA. The Raynaud's Treatment Study: biofeedback protocols and acquisition of temperature biofeedback skills. *Appl Psychophysiol Biofeedback*. 2001 Dec;26(4):251-78.

111. Monastra VJ, Lynn S, Linden M, Lubar JF, Gruzelier J, LaVaque TJ. Electroencephalographic biofeedback in the treatment of attention-deficit/hyperactivity disorder. *Appl Psychophysiol Biofeedback*. 2005 Jun;30(2):95-114.
112. Morley S, Eccleston C, Williams A. Systematic review and meta-analysis of randomized controlled trials of cognitive behavior therapy and behavior therapy for chronic pain in adults, excluding headache. *Pain*. 1999;80(1-2):1-3.
113. Nagai Y, Goldstein LH, Fenwick PB, Trimble MR. Clinical efficacy of galvanic skin response biofeedback training in reducing seizures in adult epilepsy: a preliminary randomized controlled study. *Epilepsy Behav*. 2004 Apr;5(2):216-23.
114. Nakao M, Yano E, Nomura S, Kuboki T. Blood pressure-lowering effects of biofeedback treatment in hypertension: a meta-analysis of randomized controlled trials. *Hypertens Res*. 2003 Jan;26(1):37-46.
115. National Association for Continence (NAFC). What is incontinence? 2008. Accessed Jun 13, 2008. Available at URL address: http://www.nafc.org/about_incontinence/treatment.htm
116. National Cancer Institute. Pain control: a guide for people with cancer and their families. Jan 24, 2008. Accessed Jun 16, 2008. Available at URL address: <http://www.cancer.gov/cancertopics/paincontrol/allpages>
117. National Center for Complementary and Alternative Medicine (NCCAM). Mind-Body medicine: an overview. May 2007. Accessed Jun 13, 2008. Available at URL address: <http://nccam.nih.gov/health/backgrounds/mindbody.htm>
118. National Comprehensive Cancer Network (NCCN). Treatment guidelines for patients. 2001. Accessed Jun 16, 2008. Available at URL address: http://www.cancer.org/downloads/CRI/NCCN_pain.pdf
119. National Heart, Lung, and Blood Institute (NHLBI). The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7). Aug, 2004. Accessed Jun 16, 2008. Available at URL address: <http://www.nhlbi.nih.gov/guidelines/hypertension/jnc7full.pdf>
120. National Institute for Health and Clinical Excellence (NICE). Clinical guideline 49. Faecal incontinence. Jun 2007. Accessed Jun 13, 2008. Available at URL address: <http://guidance.nice.org.uk/CG49/guidance/pdf/English>
121. National Institute for Health and Clinical Excellence (NICE). Clinical guideline 40. The management of urinary incontinence in women. Oct 2006. Accessed Jun 16, 2008. Available at URL address: <http://guidance.nice.org.uk/CG40/niceguidance/pdf/English>
122. National Institute for Health and Clinical Excellence (NICE). Clinical guideline 34. Management of hypertension in adults in primary care. Jun 28, 2006. Accessed Jun 16, 2008. Available at URL address: <http://guidance.nice.org.uk/CG34/niceguidance/pdf/English>
123. National Institute for Health and Clinical Excellence (NICE). Clinical guideline 20. The epilepsies: the diagnosis and management of the epilepsies in adults and children in primary and secondary care. Oct 27, 2004. Accessed Jun 16, 2008. Available at URL address: <http://guidance.nice.org.uk/CG20/niceguidance/pdf/English>
124. National Institute for Health and Clinical Excellence (NICE). Guidance on cancer services. Improving outcomes in breast cancer. Manual Update. Aug 28, 2002. Accessed Jun 16, 2008. Available at URL address: <http://guidance.nice.org.uk/csgbc/guidance/pdf/English>
125. National Institute for Health and Clinical Excellence (NICE). CG22 Anxiety: Full guideline. Dec 22, 2004. Accessed Jun 16, 2008. Available at URL address: <http://www.nice.org.uk/guidance/index.jsp?action=download&o=29636>

126. National Institute for Health and Clinical Excellence (NICE). CG17 Dyspepsia: Full guideline. Aug 23, 2004. Accessed Jun 16, 2008. Available at URL address: <http://www.nice.org.uk/guidance/index.jsp?action=download&o=29459>
127. National Institute for Health and Clinical Excellence (NICE). CG51 Drug misuse: psychosocial interventions: Full guideline. Jul 25, 2007. Accessed Jun 23, 2008. Available at URL address: <http://www.nice.org.uk/guidance/index.jsp?action=download&o=35975>
128. National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS). Health topics. Questions and answers about Raynaud's phenomenon. May 2001. Revised Jun 2006. Accessed Jun 16, 2008. Available at URL address: <http://www.niams.nih.gov/hi/topics/raynaud/ar125fs.htm#5>
129. National Institute of Dental and Craniofacial Research (NIDCR). TMJ disorders. June 2006. Accessed Jun 16, 2008. Available at URL address: <http://www.nidcr.nih.gov/NR/rdonlyres/39C75C9B-1795-4A87-8B46-8F77DDE639CA/0/TMJDisorders.pdf>
130. National Institutes of Health. Clinical Trials. Hypertension: Prediction of biofeedback success. Accessed Jun 16, 2008. Available at URL address: <http://www.clinicaltrials.gov/ct/show/NCT00026065?order=1>
131. National Institutes of Health. National Library of Medicine. Generalized anxiety disorder. Feb 6, 2008. Accessed Jul 3, 2007. Available at URL address: <http://www.nlm.nih.gov/medlineplus/ency/article/000917.htm>
132. National Institute of Neurological Disorders and Stroke (NINDS). Migraine information page. May 9, 2008. Accessed Jun 13, 2008. Available at URL address: <http://www.ninds.nih.gov/disorders/migraine/migraine.htm>
133. National Institute of Mental Health. Generalized anxiety disorder. Apr 2, 2008. Accessed Jun 16, 2008. Available at URL address: <http://www.nimh.nih.gov/healthinformation/gadmenu.cfm>
134. National Kidney and Urologic Diseases Information Clearinghouse (NKUDIC). Urinary Incontinence in Women. Oct 2007. Accessed Jun 13, 2008. Available at URL address: <http://kidney.niddk.nih.gov/kudiseases/pubs/uiwomen/#treatment>
135. National Library of Medicine and National Institutes of Health. Medline Plus. Migraine. Nov 21, 2006. Accessed Jun 13, 2008. Available at URL address: <http://www.nlm.nih.gov/medlineplus/ency/article/000709.htm>
136. National Library of Medicine (NLM) and National Institutes of Health (NIH). Medline Plus. Mixed tension migraine. Mar 5, 2007. Accessed Jun 13, 2008. Available at URL address: <http://www.nlm.nih.gov/medlineplus/ency/article/000798.htm>
137. National Library of Medicine (NLM) and National Institutes of Health (NIH). Medline Plus. Tension Headache. Sep 7, 2006. Accessed Jun 13, 2008. Available at URL address: <http://www.nlm.nih.gov/medlineplus/ency/article/000797.htm>
138. Nelson LA. The role of biofeedback in stroke rehabilitation: past and future directions. *Top Stroke Rehabil.* 2007 Jul-Aug;14(4):59-66.
139. Nestoriuc Y, Martin A. Efficacy of biofeedback for migraine: a meta-analysis. *Pain.* 2007 Mar;128(1-2):111-27.
140. Nestoriuc Y, Rief W, Martin A. Meta-analysis of biofeedback for tension-type headache: Efficacy, specificity, and treatment moderators. *J Consult Clin Psychol.* 2008 Jun;76(3):379-96.
141. Nicholson R, Penzien D, McCrory DC, Gray RN, Nash J, Dickersin K . Behavioral therapies for migraine The Cochrane Review. In: *The Cochrane Library, Issue 1, 2003 .*

142. [No author]. Comparison of sustained-release nifedipine and temperature biofeedback for treatment of primary Raynaud phenomenon. Results from a randomized clinical trial with 1-year follow-up. *Arch Intern Med.* 2000 Apr 24;160(8):1101-8.
143. North American Society for Pediatric Gastroenterology, Hepatology and Nutrition. Evaluation and treatment of constipation in children: summary of updated recommendations of the North American Society for Pediatric Gastroenterology, Hepatology and Nutrition. *J Pediatr Gastroenterol Nutr.* 2006 Sep;43(3):405-7.
144. North American Spine Society. Chronic low back pain. Accessed Jun 16, 2008. Available at URL address: http://www.spine.org/fsp/prob_action-chronic_lbp.cfm
145. Norton C, Cody JD, Hosker G. Biofeedback and/or sphincter exercises for the treatment of faecal incontinence in adults. *Cochrane Database Syst Rev.* 2006 Jul 19;3:CD002111.
146. Norton C, Hosker G, Brazzelli M. Biofeedback and/or sphincter exercises for the treatment of faecal incontinence in adults. *The Cochrane Review.* In: *The Cochrane Library*, Issue 2, 2000. Update Jan 31, 2002. Chichester, UK:John Wiley & sons, Ltd.; 2002.
147. Norton C, Chelvanayagam S, Wilson-Barnett J, Redfern S, Kamm MA. Randomized controlled trial of biofeedback for fecal incontinence. *Gastroenterol.* 2003 Nov;125(5):1320-9.
148. Ostelo RW, van Tulder MW, Vlaeyen JW, Linton SJ, Morley SJ, Assendelft WJ. Behavioural treatment for chronic low-back pain. *The Cochrane Review.* In: *The Cochrane Library*, Issue 2, 2000. Update Oct 1, 2003. Chichester, UK:John Wiley & sons, Ltd.; 2005.
149. Payne CK. Urinary incontinence: nonsurgical management. In: Walsh PC, Retik AB, Vaughan ED Jr, Wein AJ, editors. *Campbell's urology.* 8th ed. Philadelphia, PA: W.B. Saunders Company;2002.p.1070-3.
150. Payne, CK. Chapter 63 - Conservative management of urinary incontinence: behavioral and pelvic floor therapy, urethral and pelvic devices. *Pelvic floor rehabilitation.* In: Wein AJ, Kavoussi LR, Novick AC, Partin AW, Peters CA, editors. *Wein: Campbell-Walsh Urology*, 9th ed. Orlando, Fl. WB Sanders Company. 2007.
151. Pearlman E. Special treatment situations: pediatric migraine. National Headache Foundation. 2004. Accessed Jun 16, 2008. Available at URL address: http://www.guideline.gov/summary/summary.aspx?doc_id=6586&nbr=4146
152. Pollock A, Baer G, Pomeroy V, Langhorne P. Physiotherapy treatment approaches for the recovery of postural control and lower limb function following stroke. *Cochrane Database Syst Rev.* 2007 Jan 24;(1):CD001920.
153. Pollock A, Baer G, Pomeroy V, Langhorne P. Physiotherapy treatment approaches for the recovery of postural control and lower limb function following stroke. *Cochrane Database Syst Rev.* 2003;(2):CD001920.
154. Porena M, Costantini E, Rociola W, Mearini E. Biofeedback successfully cures detrusor-sphincter dyssynergia in pediatric patients. *J Urol.* 2000 Jun;163(6):1927-31.
155. Ramaratnam S, Baker GA, Goldstein LH. Psychological treatments for epilepsy. *Cochrane Database Syst Rev.* 2005 Oct 19;(4):CD002029.
156. Rao SS, Seaton K, Miller M, Brown K, Nygaard I, Stumbo P, Zimmerman B, Schulze K. Randomized controlled trial of biofeedback, sham feedback, and standard therapy for dyssynergic defecation. *Clin Gastroenterol Hepatol.* 2007 Mar;5(3):331-8.

157. Raynaud's and Scleroderma Association. Frequently asked questions. 2005. Accessed Jun 16, 2008. Available at URL address: <http://www.raynauds.org.uk/potioncms/viewer.asp?a=44>
158. Raynauds Treatment Study Investigators. Comparison of sustained-release nifedipine and temperature biofeedback for treatment of primary raynaud phenomenon. *Arch Intern Med.* 2000;160(8):1101-8.
159. Reiner R. Integrating a portable biofeedback device into clinical practice for patients with anxiety disorders: results of a pilot study. *Appl Psychophysiol Biofeedback.* 2008 Mar;33(1):55-61. Epub 2008 Feb 20.
160. Shamliyan TA, Kane RL, Wyman J, Wilt TJ. Systematic review: randomized, controlled trials of nonsurgical treatments for urinary incontinence in women. *Ann Intern Med.* 2008 Mar 18;148(6):459-73. Epub 2008 Feb 11.
161. Silberstein SD. Practice parameter: evidence-based guidelines for migraine headache (an evidence-based review): report of the Quality Standards Subcommittee of the American Academy of Neurology. *Neurol.* 2000 Sep 26; 55(6):754-62.
162. Sierpina V, Astin J, Giordano J. Mind-body therapies for headache. *Am Fam Physician.* 2007 Nov 15;76(10):1518-22.
163. Sokhadze TM, Cannon RL, Trudeau DL. EEG biofeedback as a treatment for substance use disorders: review, rating of efficacy, and recommendations for further research. *Appl Psychophysiol Biofeedback.* 2008 Mar;33(1):1-28.
164. Trautmann E, Lackschewitz H, Kröner-Herwig B. Psychological treatment of recurrent headache in children and adolescents--a meta-analysis. *Cephalalgia.* 2006 Dec;26(12):1411-26.
165. Tsai PS, Chang NC, Chang WY, Lee PH, Wang MY. Blood pressure biofeedback exerts intermediate-term effects on blood pressure and pressure reactivity in individuals with mild hypertension: a randomized controlled study. *J Altern Complement Med.* 2007 Jun;13(5):547-54.
166. Tsao JC, Zeltzer LK. Complementary and alternative medicine approaches for pediatric pain: A review of the state-of-the-science. *eCAM.* 2005;2(2):149-59.
167. Updike GM, Wiesenfeld HC. Insight into the treatment of vulvar pain: A survey of clinicians. *Am J Obstet Gynecol.* 2005 Oct;193(4):1404-9.
168. U.S. Food and Drug Administration (FDA). Guidance for Industry, FDA Reviewers and Compliance on Off-The-Shelf Software Use in Medical Devices. 1999. Accessed Jun 13, 2008. Available at URL address: <http://www.fda.gov/cdrh/ode/guidance/585.html>
169. U.S. Food and Drug Administration (FDA). Title 21—food and drugs. Biofeedback device. Apr 1, 2007. Accessed Jun 13, 2008. Available at URL address: <http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfCFR/CFRSearch.cfm?FR=882.5050>
170. U.S. Food and Drug Administration (FDA). Controlling Urinary Incontinence. Sep-Oct 2005. Accessed Jun 25, 2008. Available at URL address: http://www.fda.gov/fdac/features/2005/505_incontinence.html
171. Vasudeva S, Claggett AL, Tietjen GE, McGrady AV. Biofeedback-assisted relaxation in migraine headache: relationship to cerebral blood flow velocity in the middle cerebral artery. *Headache.* 2003;43:245-50.
172. Veterans Health Administration, Department of Defense. VA/DoD clinical practice guideline for the management of stroke rehabilitation in the primary care setting. Feb 2003. Accessed Jun 16, 2008. Available at URL address: http://www.guideline.gov/summary/summary.aspx?doc_id=3846&nbr=3061

173. Villaret DB, Weymuller EA Jr. Pain caused by cancer of the head and neck. Loeser JD, editor. In: Bonica's Management of Pain. Philadelphia, PA:Lippincott Williams & Wilkins. 2001.
174. Wahbeh H, Elsas SM, Oken BS. Mind-body interventions: applications in neurology. Neurology. 2008 Jun 10;70(24):2321-8
175. Wang J, Luo MH, Qi QH, Dong ZL. Prospective study of biofeedback retraining in patients with chronic idiopathic functional constipation. World J Gastroenterol. 2003 Sep;9(9):2109-13.
176. Weber W, Newmark S. Complementary and alternative medical therapies for attention-deficit/hyperactivity disorder and autism. Pediatr Clin North Am. 2007 Dec;54(6):983-1006; xii.
177. Woodford H, Price C. EMG biofeedback for the recovery of motor function after stroke. Cochrane Database Syst Rev. 2007 Apr 18;(2):CD004585.
178. Work Loss Data Institute. Low back - lumbar & thoracic (acute & chronic). Corpus Christi (TX): Work Loss Data Institute; 2006. 390 p.
179. Work Loss Data Institute. Pain. Corpus Christi (TX): Work Loss Data Institute; 2006. 196 p.
180. Yagci S, Kibar Y, Akay O, Kilic S, Erdemir F, Gok F, Dayanc M. The effect of biofeedback treatment on voiding and urodynamic parameters in children with voiding dysfunction. J Urol. 2005 Nov;174(5):1994-7; discussion 1997-8.
181. Yucha CB, Clark L, Smith M, Uris P, LaFleur B, Duval S. The effect of biofeedback in hypertension. Applied Nursing Research. 2001;14(1):29-35.

Policy History

Pre-Merger Organizations	Last Review Date	Policy Number	Title
CIGNA HealthCare	8/15/2008	0166	Biofeedback
Great-West Healthcare	12/20/07	00.241.04	Biofeedback

"CIGNA" and the "Tree of Life" logo are registered service marks of CIGNA Intellectual Property, Inc., licensed for use by CIGNA Corporation and its operating subsidiaries. All products and services are provided exclusively by such operating subsidiaries and not by CIGNA Corporation. Such operating subsidiaries include Connecticut General Life Insurance Company, CIGNA Behavioral Health, Inc., Intracorp, and HMO or service company subsidiaries of CIGNA Health Corporation and CIGNA Dental Health, Inc. In Arizona, HMO plans are offered by CIGNA HealthCare of Arizona, Inc. In California, HMO plans are offered by CIGNA HealthCare of California, Inc. and Great-West Healthcare of California, Inc. In Connecticut, HMO plans are offered by CIGNA HealthCare of Connecticut, Inc. In North Carolina, HMO plans are offered by CIGNA HealthCare of North Carolina, Inc. In Virginia, HMO plans are offered by CIGNA HealthCare Mid-Atlantic, Inc. All other medical plans in these states are insured or administered by Connecticut General Life Insurance Company.

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