Aetna considers low-level infrared light (infrared therapy, Anodyne Therapy System) experimental and investigational for the treatment of the following indications because of insufficient evidence regarding the effectiveness of infrared therapy for these indications (not an all-inclusive list):

- Acne
- Back (lumbar and thoracic) pain
- Bell's palsy
- Cancer
- Cardiovascular diseases
- Central nervous system injuries
- Chronic kidney diseases
- Chronic non-healing wounds (including pressure ulcers)
- Diabetes mellitus (including diabetic macular edema and diabetic peripheral neuropathy)
- Disorders of consciousness
- Ischemic stroke
- Lymphedema
- Neck pain
- Onychomycosis
- Osteoarthritis

*Please see amendment for Pennsylvania Medicaid at the end of this CPB.*
- Parkinson's disease
- Retinal degeneration
- Seasonal affective disorder (for prevention)
- Stroke

**Note:** Infrared light treatment is considered medically necessary as a heat modality in physical therapy (see CPB 0325 - Physical Therapy).

Aetna considers infrared coagulation medically necessary for members with grade I or grade II internal hemorrhoids that are painful or persistently bleeding. (See Appendix for grading of internal hemorrhoids).

Aetna considers the infrared glove (e.g. the Prolotex Therapy Glove) experimental and investigational for the treatment of Raynaud's syndrome and all other indications because its effectiveness has not been established.

Also see CPB 0363 - Cold Laser and High-Power Laser Therapies.

**Background**

*Low-Level Infrared Therapy:*

Low-level infrared therapy, or monochromatic infrared energy (MIRE) therapy, is a type of low-energy laser that uses light in the infrared spectrum. MIRE therapy involves the use of devices that deliver single wavelength nonvisible light energy from the red end of the light spectrum via flexible pads that are applied to the skin. Each pad contains 60 infrared-emitting diodes. MIRE therapy is thought to stimulate the release of nitric oxide from the hemoglobin of the blood, which dilates the blood vessels, thereby reducing swelling and increasing circulation. MIRE has been proposed for treatment of conditions such as peripheral neuropathy, pain management and wound healing. An example of an MIRE device includes, but may not be limited to, the Anodyne Therapy System.

The Anodyne Therapy System is a type of low-level infrared therapy, developed by Integrated Systems Physiology Inc. (Aurora,
CO), that has been promoted for augmenting wound healing, for reversing the symptoms of peripheral neuropathy in people with diabetes, and for treating lymphedema. The manufacturer states that the Anodyne Therapy System increases circulation and reduces pain by increasing the release of nitric oxide.

Several meta-analyses have examined the evidence supporting the use of low-level (cold) lasers, including low-level infrared lasers, for treatment of chronic non-healing wounds. These meta-analyses are unanimous in concluding that there is insufficient evidence to support low-level laser in the treatment of chronic venous ulcers or other chronic non-healing wounds.

There is no evidence that infrared light therapy is any more effective than other heat modalities in the symptomatic relief of musculoskeletal pain. Glasgow (2001) reported on the results of a randomized controlled clinical trial of low-level infrared therapy in 24 subjects with experimentally induced muscle soreness, and found no significant differences between treatment and placebo groups.

There are no published studies of the effectiveness of low-level infrared therapy for treatment of diabetic peripheral neuropathy. The case series presented by the manufacturer of the Anodyne System on its web site have not been published in a peer-reviewed medical journal.

Finally, there is no evidence in the published peer-reviewed medical literature on the effectiveness of infrared therapy for the treatment of lymphedema. The Canadian Coordinating Office of Health Technology Assessment (2002) found that "[t]here is little high quality controlled clinical trial evidence for these therapies."

In a randomized, placebo-controlled study, Leonard et al (2004) examined whether treatments with the Anodyne Therapy System (ATS) would decrease pain and/or improve sensation diminished due to diabetic peripheral neuropathy (DPN). Tests involved the use of the 5.07 and 6.65 Semmes Weinstein monofilament (SWM) and a modified Michigan Neuropathy Screening Instrument (MNSI). Twenty-seven patients, 9 of whom were
Insensitive to the 6.65 SWM and 18 who were sensitive to this filament but insensitive to the 5.07 SWM, were studied. Each lower extremity was treated for 2 weeks with sham or active ATS, and then both received active treatments for an additional 2 weeks. The group of 18 patients who could sense the 6.65 SWM but were insensitive to the 5.07 SWM at baseline obtained a significant decrease in the number of sites insensate after both 6 and 12 active treatments (p < 0.02 and 0.001). Sham treatments did not improve sensitivity to the SWM, but subsequent active treatments did (p < 0.002). The MNSI measures of neuropathic symptoms decreased significantly (from 4.7 to 3.1; p < 0.001). Pain reported on the 10-point visual analog scale (VAS) decreased progressively from 4.2 at entry to 3.2 after 6 treatments and to 2.3 after 12 treatments (both p < 0.03). At entry, 90% of subjects reported substantial balance impairment; after treatment, this decreased to 17%. However, among the group of 9 patients with greater sensory impairment measured by insensitivity to the 6.65 SWM at baseline, improvements in sensation, neuropathic symptoms, and pain reduction were not significant. The authors concluded that ATS treatments improved sensation in the feet of subjects with DPN, improved balance, and reduced pain.

There are a few drawbacks in this study. They include the small size of the study, and that it involved a single investigator group, arguing for the need to replicate this study. There is also no information about whether the improvements were durable. Furthermore, although the results are encouraging, more discreet quantitative sensory tests would be helpful in determining the exact degree of sensory improvement experienced after the administration of ATS treatments.

Bhardwaj et al (2005) stated that an evolving understanding of laser-tissue interactions involving Propionibacterium acnes-produced porphyrins, and the development of infrared non-ablative lasers to target sebaceous glands, has led to the development of an escalating number of laser, light and radiofrequency devices for acne. Used as monotherapy or in combination, these devices are showing promise as a method to clear acne in a convenient, non-invasive manner, though there remains a clear need for long-term data and randomized, blinded
Chow and Barnsley (2005) examined the effectiveness of low-level laser therapy (LLLT) in the treatment of neck pain through systematically reviewing the literature. A search of computerized bibliographic databases covering medicine, physiotherapy, allied health, complementary medicine, and biological sciences was undertaken from date of inception until February 2004 for randomized controlled trials (RCTs) of LLLT for neck pain. A comprehensive list of search terms was applied and explicit inclusion criteria were developed a priori. A total of 20 studies were identified, 5 of which met the inclusion criteria. Significant positive effects were reported in 4 of 5 trials in which infrared wavelengths (\(\lambda = 780, 810\) to \(830, 904, 1,064\) nm) were used. Heterogeneity in outcome measures, results reporting, doses, and laser parameters precluded formal meta-analysis. Effect sizes could be calculated for only 2 of the studies. The authors concluded that this review provides limited evidence from 1 RCT for the use of infrared laser for the treatment of acute neck pain (\(n = 71\)) and chronic neck pain from 4 RCTs (\(n = 202\)). They noted that larger studies are needed to confirm the positive findings, and determine the most effective laser parameters, sites and modes of application.

In a randomized controlled cross-over study, Stange-Rezende et al (2006) examined the effect of infrared radiation of a tiled stove on patients with hand osteoarthritis (OA). A total of 45 patients with hand OA were randomly assigned to two groups: (i) group A -- [first 3 hours spent 3 times a week during 3 weeks in a heated tiled stove room ('Stove Period') and after 2 weeks without treatment this group was observed for another 3 weeks ('control period')]; and (ii) group B (first assigned to the control period and the stove period following the treatment-free period). Assessments included the VAS for general pain, pain in the hands, and global hand function, grip strength, the Moberg Picking-up Test (MPUT), the Australian/Canadian Osteoarthritis Hand Index (AUSCAN), and the Medical Outcomes Study (MOS) 36-item Short-Form Health Status Survey (SF-36). A total of 14 (31 %) patients improved on the VAS for general pain at the end of the tiled stove period as compared to 10 patients (22 %) during the
control period (p = 0.314, chi2-test). The AUSCAN pain domain showed a significant improvement after the tiled stove period (p = 0.034). Others pain parameters analyzed (VAS for pain in hands and SF-36 bodily pain) showed moderate but not significant improvement (p = 0.682 and p = 0.237, respectively) compared to the control period. The authors concluded that this study did not prove positive effects of the tiled stove exposure, although the numerical improvement in all pain measures suggests some possible positive effects on this symptom of hand OA.

Lampl and colleagues (2007) assessed the safety and effectiveness of the NeuroThera Laser System to improve the 90-day outcomes in ischemic stroke patients treated within 24 hours from stroke onset. The NeuroThera Laser System therapeutic approach involves use of infrared laser technology and has shown beneficial effects in animal models of ischemic stroke. A total of 120 ischemic stroke patients were randomized in a 2:1 ratio (n = 79 patients in the active treatment group and n = 41 in the placebo control group). Only patients with baseline stroke severity measured by National Institutes of Health Stroke Scale (NIHSS) scores of 7 to 22 were included. Patients who received tissue plasminogen activator were excluded. Outcome measures were the patients' scores on the NIHSS, modified Rankin Scale (mRS), Barthel Index, and Glasgow Outcome Scale at 90 days after treatment. The primary outcome measure was successful treatment, documented by NIHSS. This was defined as a complete recovery at day 90 (NIHSS 0 to 1), or a decrease in NIHSS score of at least 9 points (day 90 versus baseline), and was tested as a binary measure (bNIH). Secondary outcome measures included mRS, Barthel Index, and Glasgow Outcome Scale. Primary statistical analyses were performed with the Cochran-Mantel-Haenszel rank test, stratified by baseline NIHSS score or by time to treatment for the bNIH and mRS. Logistic regression analyses were conducted to confirm the results. Mean time to treatment was greater than 16 hours (median time to treatment 18 hours for active and 17 hours for control). Time to treatment ranged from 2 to 24 hours. More patients (70 %) in the active treatment group had successful outcomes than did controls (51 %), as measured prospectively on the bNIH (p = 0.035 stratified by severity and time to treatment; p = 0.048 stratified only by
Similarly, more patients (59%) had successful outcomes than did controls (44%) as measured at 90 days as a binary mRS score of 0 to 2 (p = 0.034 stratified by severity and time to treatment; p = 0.043 stratified only by severity). Also, more patients in the active treatment group had successful outcomes than controls as measured by the change in mean NIHSS score from baseline to 90 days (p = 0.021 stratified by time to treatment) and the full mRS ("shift in Rankin") score (p = 0.020 stratified by severity and time to treatment; p = 0.026 stratified only by severity). The prevalence odds ratio for bNIH was 1.40 (95% confidence interval [CI]: 1.01 to 1.93) and for binary mRS was 1.38 (95% CI: 1.03 to 1.83), controlling for baseline severity. Similar results held for the Barthel Index and Glasgow Outcome Scale. Mortality rates and serious adverse events (SAEs) did not differ significantly (8.9% and 25.3% for active 9.8% and 36.6% for control, respectively, for mortality and SAEs). The authors concluded that the NEST-1 study indicated that infrared laser therapy has shown initial safety and effectiveness for the treatment of ischemic stroke in humans when initiated within 24 hours of stroke onset. They stated that a larger confirmatory trial to demonstrate safety and effectiveness is warranted.

A decision memorandum from the Centers for Medicare and Medicaid Services (2006) has concluded that “there is sufficient evidence to conclude that the use of infrared devices is not reasonable and necessary for treatment of Medicare beneficiaries for diabetic and non-diabetic peripheral sensory neuropathy, wounds and ulcers, and similar related conditions, including symptoms such as pain arising from these conditions”.

In a double-blind, sham-controlled, randomized study, Lavery et al (2008) examined the effectiveness of Anodyne monochromatic infrared energy (MIRE) in-home treatments over a 90-day period to improve peripheral sensation and self-reported quality of life (QOL) in individuals with diabetes. A total of 69 individuals with diabetes and a vibration perception threshold (VPT) between 20 and 45 V were randomly assigned to 2 treatment groups: (i) active or (ii) sham treatment. Sixty patients (120 limbs) completed the study. Anodyne units were used at home every day for 40 minutes for 90 days. Nerve conduction velocities, VPT,
Semmes-Weinstein monofilaments (SWM) (4-, 10-, 26-, and 60-g monofilaments), the Michigan Neuropathy Screening Instrument (MNSI), a 10-cm visual analog pain scale, and a neuropathy-specific QOL instrument were measured. A nested repeated-measures multiple ANOVA design was employed. Two sites (great toe and 5th metatarsal) were tested on both the left and right feet of each patient, so two feet were nested within each patient and two sites were nested within each foot. To analyze the ordinal SWM scores, a non-parametric factorial analysis for longitudinal data was used. There were no significant differences in measures for QOL, MNSI, VPT, SWM, or nerve conduction velocities in active or sham treatment groups (p > 0.05). The authors concluded that Anodyne MIRE therapy was no more effective than sham therapy in the treatment of sensory neuropathy in individuals with diabetes.

In a controlled, double-blind, randomized clinical study, Franzen-Korzendorfer et al (2008) examined the effect of monochromatic infrared energy on transcutaneous oxygen measurements and protective sensation in patients with diabetes and a loss of protective sensation. A total of 18 adults (12 men, 6 women; mean age of 65 +/-13 years, range of 39 to 86 years) with diabetes and loss of protective sensation were recruited using convenience sampling methods. All patients served as their own control. Pre- and post-treatment tests assessed sensation, pain, and transcutaneous oxygen measurements on 2 sites/foot. Subjects underwent a series of 30-min monochromatic infrared energy treatments (1 foot active treatment, 1 foot sham). Monochromatic infrared energy was delivered at the manufacturer pre-set level of energy of 1.5 J/cm(2)/min at a wavelength of 890 nm; sham units delivered no energy. Scores were analyzed using paired t-tests and Pearson's correlation coefficient. No significant differences were observed between active and sham treatments for transcutaneous oxygen values, pain, or sensation. Both active and sham monochromatic infrared energy-treated feet had significantly improved sensation when compared to pretest baseline scores (p < 0.05). No statistical relationship was found between transcutaneous oxygen and sensation. The authors concluded that these findings did not demonstrate any effects of monochromatic infrared energy.
treatment on transcutaneous oxygen measurements, pain, or sensation in adults with diabetes and loss of protective sensation.

Ko and Berbrayer (2002) determined the effectiveness of ceramic impregnated gloves in the treatment of Raynaud's syndrome. A total of 93 patients met the "Pal" criteria for Raynaud's syndrome. Treatment period of 3 months with use of ceramic-impregnated gloves was adopted. Primary end points included pain VAS ratings and diary; disabilities of the arm, shoulder, hand (DASH) questionnaire; Jamar grip strength; and Purdue board test of hand dexterity. Secondary end points were infrared skin temperature measurements; 7-point Likert scale rating of treatment. In 60 participants with complete data, improvements were noted in the VAS rating (p = 0.001), DASH score (p = 0.001), Jamar grip strength (p = 0.002), infrared skin fingertip temperature (p = 0.003), Purdue hand dexterity test (p = 0.0001) and the Likert scale (p = 0.001) with ceramic gloves over the placebo cotton gloves. The authors concluded that the ceramic-impregnated "thermoflow" gloves have a clinically important effect in Raynaud's syndrome. The findings of this study need to be validated by well-designed studies with larger number of patients and longer follow-ups.

Fitzgerald et al (2013) stated that abstract Irradiation in the red/near-infrared spectrum (R/NIR, 630 to 1,000 nm) has been used to treat a wide range of clinical conditions, including disorders of the central nervous system (CNS), with several clinical trials currently underway for stroke and macular degeneration. However, R/NIR irradiation therapy (R/NIR-IT) has not been widely adopted in clinical practice for CNS injury or disease for a number of reasons, which include; (i) the mechanism(s) of action and implications of penetration have not been thoroughly addressed, (ii) the large range of treatment intensities, wavelengths and devices that have been assessed make comparisons difficult, and (iii) a consensus paradigm for treatment has not yet emerged. Furthermore, the lack of consistent positive outcomes in RCTs, perhaps due to sub-optimal treatment regimens, has contributed to skepticism. These researchers provided a balanced summary of outcomes described in the literature regarding treatment modalities and efficacy of
R/NIR-IT for injury and disease in the CNS. They have addressed the important issues of specification of treatment parameters, penetration of R/NIR irradiation to CNS tissues and mechanism(s), and provided the necessary detail to demonstrate the potential of R/NIR-IT for the treatment of retinal degeneration, damage to white matter tracts of the CNS, stroke and Parkinson’s disease.

Vujosevic et al (2013) reviewed the most important metabolic effects and clinical safety data of sub-threshold micropulse diode laser (D-MPL) in diabetic macular edema (DME). The MPL treatment does not damage the retina and is selectively absorbed by the retinal pigment epithelium (RPE). Micropulse diode laser stimulates secretion of different protective cytokines by the RPE. No visible laser spots on the retina were noted on any fundus image modality in different studies, and there were no changes of the outer retina integrity. Mean central retinal sensitivity (RS) increased in D-MPL group compared to standard Early Treatment Diabetic Retinopathy Study (ETDRS) photocoagulation group. The authors concluded that MPL is a new, promising treatment option in DME, with both infrared and yellow wavelengths using the less aggressive duty cycle (5 %) and fixed power parameters.

The Work Loss Data Institute’s guideline on “Low back -- lumbar & thoracic (acute & chronic)” (2013) noted that infrared therapy is one of the interventions/procedures that were considered, but not recommended.

The evidence-based guidelines for the chiropractic treatment of adults with neck pain (Bryans et al, 2014) stated that “Based on inconsistent findings from 3 low-risk-of-bias studies, there is insufficient evidence that supports a recommendation for the use of infrared laser (830 nm) in the treatment of chronic neck pain”.

Choi et al (2016) noted that maintenance of a well-functioning vascular access and minimal needling pain are important goals for achieving adequate dialysis and improving the quality of life in hemodialysis (HD) patients. Far-infrared therapy may improve endothelial function and increase access blood flow (Qa) and patency in HD patients. These researchers evaluated effects of FIR therapy on Qa and patency, and needling pain in HD patients.
This prospective clinical trial enrolled 25 outpatients who maintained HD with arterio-venous fistula. The other 25 patients were matched as control with age, sex, and diabetes; FIR therapy was administered for 40 minutes during HD 3 times/week and continued for 12 months. The Qa was measured by the ultrasound dilution method, whereas pain was measured by a numeric rating scale at baseline, then once per month. One patient was transferred to another facility, and 7 patients stopped FIR therapy because of an increased body temperature and discomfort. Far-infrared therapy improved the needling pain score from 4 to 2 after 1 year; FIR therapy increased the Qa by 3 months and maintained this change until 1 year, whereas control patients showed the decrease in Qa. The 1-year unassisted patency with FIR therapy was not significantly different from control. The authors concluded that FIR therapy improved needling pain. Moreover, they stated that although FIR therapy improved Qa, the unassisted patency was not different compared with the control. They stated that a larger and multi-center study is needed to evaluate the effect of FIR therapy.

**Infrared Coagulation for the Treatment of Hemorrhoids:**

Infrared coagulation is one of the several non-surgical outpatient therapies in treating hemorrhoids. Linares et al (2001) examined the effectiveness of rubber band ligation (RBL) and infrared photocoagulation (IRC) in treating internal hemorrhoids in 358 patients with a total of 817 hemorrhoid. There was a follow-up period of 36 months. Two hundred ninety five of 358 patients were treated with RBL (82.4 %), this treatment being effective in 98 % of the patients after 180 days and very good after 36 months. There were 6/295 relapses at 36 months (2 %). All minor and major complications were observed within the first 15 days of treatment: rectal tenesmus in 96/295 patients (32.5 %), mild anal pain in 115/295 (38.9 %), self-limited and mild bleeding after the detachment of the bands in 30/295 (10 %), and febricula in one patient. Sixty-three of 358 patients were treated with IRC (17.6 %). In this group, relapses were observed in 6/63 patients (9.5 %) at 36 months, all of them with grade III hemorrhoids that required additional treatment with RBL. All the complications (inherent to the technique) were observed within the first days:
mild anal pain in 40/63 patients (63.4 %) and mild bleeding in 1/63 (1.6 %). The treatment with RBL or IRC depended on the number of hemorrhoids and the hemorrhoidal grade. No significant differences were found regarding the effectiveness between RBL and IRC for the treatment of grade I-II hemorrhoids, while RBL was more effective for grade III and IV hemorrhoids (p < 0.05). The authors concluded that RBL and IRC should be considered as a good treatment for all grades of hemorrhoids, due to its effectiveness, its cost-benefit and its small short-term and long-term morbidity.

In a randomized study, Gupta (2003) compared infrared coagulation and rubber band ligation in treating patients with early stages of hemorrhoids. One hundred patients with second degree bleeding piles were randomized prospectively to either rubber band ligation (n = 54) or infrared coagulation (n = 46). Parameters measured included post-operative discomfort and pain, time to return to work, relief in incidence of bleeding, and recurrence rate. Post-operative pain during the first week was more intense in the band ligation group (2 to 5 versus 0 to 3 on a VAS). Post-defecation pain was more intense with band ligation and so was rectal tenesmus (p = 0.0059). The patients in the infrared coagulation group resumed their duties earlier (2 versus 4 days, p = 0.03), but also had a higher recurrence or failure rate (p = 0.03). The authors concluded that band ligation, although more effective in controlling symptoms and obliterating hemorrhoids, is associated with more pain and discomfort to the patient. As infrared coagulation can be conveniently repeated in case of recurrence, it could be considered to be a suitable alternative office procedure for the treatment of early stage hemorrhoids.

The American Gastroenterological Association’s technical review on the diagnosis and treatment of hemorrhoids (Madoff and Fleshman, 2004) stated that 1st degree and 2nd degree hemorrhoids (i.e., Grade I and Grade II hemorrhoids) can be treated with non-operative therapies such as infrared photocoagulation. Surgery is generally reserved for individuals who have large 3rd degree or 4th degree hemorrhoids, acutely incarcerated and thrombosed hemorrhoids, hemorrhoids with an
extensive and symptomatic external component, or individuals who have undergone less aggressive therapy with poor results.

**Onychomycosis:**

Nenoff et al (2014) noted that since 2010 the Food and Drug Administration (FDA) has approved laser systems as capable of producing a "temporary increase in clear nails" in patients with onychomycosis. Fungal eradication is probably mediated by heat in infrared laser systems; their efficacy has been confirmed thermographically, histologically and in electron microscopy. Another approach to decontaminate the nail organ is to disrupt fungi and spores by q-switched pulse applications. Recently specific combinations of wavelengths have been tested for their ability to disrupt the mitochondrial transmembrane potential at physiological temperatures by generating ATP and ROS. While clinically extremely high clearance rates of approximately 87.5 to 95.8 % have been reported, in-vitro investigations have failed to confirm the clearance. The variety of systems and advised parameters hampers a systematic evaluation. Recommendations for safe and practical treatment protocols, informed consent items, and combination with conventional treatment options are all areas of active work. The authors concluded that currently there is a lack of data concerning the long-term efficacy of laser therapy of onychomycosis; certified treatment protocols are needed.

An UpToDate review on “Onychomycosis” (Goldstein, 2015) states that “Laser/light therapy -- Although neodymium-doped:yttrium aluminum garnet (Nd:YAG) and diode lasers have emerged as treatment options for onychomycosis, data on the efficacy of these interventions are limited and the mechanisms of action and optimal regimens for these treatments remain unclear. Until more robust data supporting the efficacy of laser therapy for onychomycosis are available, we cannot recommend the routine use of this modality. Support for the efficacy of such laser devices is primarily limited to uncontrolled studies that document clinical improvement in varying proportions of patients. One small randomized trial found improvement in onychomycosis following the use of a dual wavelength near-infrared diode laser. In
contrast, a randomized trial in which 27 patients with onychomycosis involving 125 nails were randomly assigned to two treatments with a 1,064 nm Nd:YAG laser (17 patients) or no treatment (10 patients) did not find a statistically difference in the proportion of patients with mycological clearance of all affected nails after three months. In addition, a non-significant trend towards greater proximal nail clearance in the active treatment group detected at the 3-month time point dissipated by 12 months. Of note, responses could not be assessed in 5 of the 17 patients in the laser treatment group because of a failure to return for follow-up. Further study with randomized trials that compare laser devices to placebo and other onychomycosis treatments as well as long-term follow-up studies will be useful for clarifying the efficacy, mechanisms, optimal regimens, and indications for laser therapy”.

Pressure Ulcers:

The National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance’s clinical practice guideline on “Treatment of pressure ulcers” (2014) stated that “Due to current insufficiency of evidence to support or refute the use of infrared therapy in the treatment of pressure ulcers, infrared therapy is not recommended for routine use at this time”.

Other Indications:

Shui and colleagues (2015) noted that physical therapy (physiotherapy), a complementary and alternative medicine therapy, has been widely applied in diagnosing and treating various diseases and defects. Increasing evidence suggests that convenient and non-invasive far-infrared (FIR) rays, a vital type of physiotherapy, improve the health of patients with cardiovascular disease, diabetes mellitus, and chronic kidney disease. Nevertheless, the molecular mechanisms by which FIR functions remain elusive. These researchers reviewed and summarized the results of previous investigations and elaborated on the molecular mechanisms of FIR therapy in various types of disease. The authors concluded that FIR therapy may be closely related to
the increased expression of endothelial nitric oxide synthase as well as nitric oxide production and may modulate the profiles of some circulating miRNAs; thus, it may be a beneficial complement to treatments for some chronic diseases that yields no adverse effects.

**Disorders of Consciousness:**

Werner et al (2016) stated that in order to promote alertness and awareness in patients with severe disorders of consciousness (DOC) frontal near infrared laser stimulation (N-LT) or transcranial focused shock wave therapy (F-SWT) might be an option. The study compared both techniques in severe chronic DOC patients. A total of 16 DOC patients were allocated to 2 groups (A and B). A 3-week baseline either followed a frontal N-LT (0,1 mJ/mm², 10 mins per session), 5 times a week over 4 weeks (group A), or a F-SWT (0,1 mJ/mm², 4,000 stimuli per session) 3 times a week over 4 weeks (group B). The primary variable was the revised Coma Recovery Scale (r-CRS, 0-23), blindly assessed. Both groups improved in the r-CRS over time, but revealed no differences between groups. One patient of group B had a focal seizure in the 3rd therapy week; 1 patient with akinetic mutism improved most and 3 patients with global hypoxia did not improve at all. The authors concluded that both options might be an option to increase alertness and awareness of chronic DOC patients. An akinetic mutism appeared to be a positive and severe cerebral hypoxia a negative predictor; epileptic seizures are a potential unwanted side effect. The author stated that more clinical studies are needed.

**Seasonal Affective Disorder:**

In a Cochrane review, Nussbaumer et al (2015) evaluated the safety and effectiveness of light therapy (in comparison with no treatment, other types of light therapy, 2nd-generation antidepressants, melatonin, agomelatine, psychological therapies, lifestyle interventions and negative ion generators) in preventing seasonal affective disorder (SAD) and improving patient-centered outcomes among adults with a history of SAD. A search of the Specialised Register of the Cochrane Depression, Anxiety and
Neuorosis Review Group (CCDANCTR) included all years to August 11, 2015. The CCDANCTR contained reports of relevant RCTs derived from Embase (1974 to date), Medline (1950 to date), PsycINFO (1967 to date) and the Cochrane Central Register of Controlled Trials (CENTRAL). Furthermore, these investigators searched the Cumulative Index to Nursing and Allied Health Literature (CINAHL), Web of Knowledge, the Cochrane Library and the Allied and Complementary Medicine Database (AMED) (to May 26, 2014). These researchers also conducted a grey literature search and hand-searched the reference lists of all included studies and pertinent review articles. For effectiveness, the authors included RCTs on adults with a history of winter-type SAD who were free of symptoms at the beginning of the study. For adverse events, the authors also intended to include non-randomized studies. They intended to include studies that compared any type of light therapy (e.g., bright white light, administered by visors or light boxes, infrared light, dawn stimulation) versus no treatment/placebo, 2nd-generation antidepressants (SGAs), psychological therapies, melatonin, agomelatine, lifestyle changes, negative ion generators or another of the afore-mentioned light therapies. The authors also planned to include studies that looked at light therapy in combination with any comparator intervention and compared this with the same comparator intervention as monotherapy.

Two review authors screened abstracts and full-text publications against the inclusion criteria. Two review authors independently abstracted data and assessed risk of bias of included studies. These investigators identified 2,986 citations after de-duplication of search results. They excluded 2,895 records during title and abstract review. They assessed 91 full-text papers for inclusion in the review, but only 1 study providing data from 46 people met the eligibility criteria. The included RCT had methodological limitations. These researchers rated it as having high risk of performance and detection bias because of lack of blinding, and as having high risk of attrition bias because study authors did not report reasons for drop-outs and did not integrate data from drop-outs into the analysis. The included RCT compared preventive use of bright white light (2,500 lux via visors), infrared light (0.18 lux via visors) and no light treatment. Overall, both forms of preventive light therapy reduced the incidence of SAD
numerically compared with no light therapy. In all, 43% (6/14) of participants in the bright light group developed SAD, as well as 33% (5/15) in the infrared light group and 67% (6/9) in the non-treatment group. Bright light therapy reduced the risk of SAD incidence by 36%; however, the 95% CI was very broad and included both possible effect sizes in favor of bright light therapy and those in favor of no light therapy (risk ratio (RR) 0.64, 95% CI: 1.30 to 1.38). Infrared light reduced the risk of SAD by 50% compared with no light therapy, but in this case also the CI was too broad to allow precise estimations of effect size (RR 0.50, 95% CI 0.21 to 1.17). Comparison of both forms of preventive light therapy versus each other yielded similar rates of incidence of depressive episodes in both groups (RR 1.29, 95% CI: 0.50 to 3.28). The quality of evidence for all outcomes was very low. Reasons for down-grading evidence quality included high risk of bias of the included study, imprecision and other limitations, such as self-rating of outcomes, lack of checking of compliance throughout the study duration and insufficient reporting of participant characteristics. Investigators provided no information on adverse events. These researchers could find no studies that compared light therapy versus other interventions of interest such as SGA, psychological therapies, melatonin or agomelatine. The authors concluded that evidence on light therapy as preventive treatment for patients with a history of SAD is limited. Methodological limitations and the small sample size of the only available study have precluded review author conclusions on effects of light therapy for SAD.

**Cancer:**

Tsai and Hamblin (2017) noted that IR radiation is electromagnetic radiation with wavelengths between 760 and 100,000 nm while LLLT or photobiomodulation (PBM) therapy generally employs light at red and near-IR wavelengths (100 to 600 nm) to modulate biological activity. Many factors, conditions, and parameters influence the therapeutic effects of IR, including fluence, irradiance, treatment timing and repetition, pulsing, and wavelength. Increasing evidence suggested that IR can carry out photo-stimulation and PBM effects particularly benefiting neural stimulation, wound healing, and cancer treatment. Nerve cells
respond particularly well to IR, which has been proposed for a range of neuro-stimulation and neuro-modulation applications, and recent progress in neural stimulation and regeneration were discussed in this review.

Hou and co-workers (2017) stated that theranostics based on nanoparticles have developed rapidly in the past decade and have been widely used in the diagnosis and treatment of liver cancer, breast cancer, and other tumors. However, for skin cancers, there are limited studies. These researchers successfully synthesized a theranostic nanoparticle by grating IR820 onto the surface of chitosan-coated magnetic iron oxide, IR820-CS-Fe3O4, showing an excellent magnetic resonance imaging (MRI) capability and cytotoxic effects against melanoma under irradiation with a near-infrared (NIR) laser (808 nm) in-vitro. Furthermore, good stability for up to 8 days and negligible cytotoxicity were observed; these characteristics are important for biomedical applications of nanoparticles. The authors concluded that they provided a novel and potential theranostic platform for melanoma treatment and detection.

Zhang and colleagues (2017) noted that although triple-negative breast cancer (TNBC) is a small percentage of all breast cancers, to date, TNBC is one of the most challenging types of breast cancer for basic and clinic research because TNBC patients display a high risk of relapse, shorter overall survival (OS) and limited therapeutic options after completion of conventional chemotherapy compared with patients with other BC subtypes. The epidermal growth factor receptor (EGFR) is a promising target for TNBC treatment. Although NIR photo-thermal therapy (NIR-PTT) using anti-EGFR antibody-conjugated gold nanorods (anti-EGFR-GNs), has attracted considerable interest for non-invasive and targeted TNBC treatment through an activation of apoptotic pathway, it is unclear whether anti-EGFR-GNs-combined NIR-PTT modulates the induction of autophagy contributing to cell death. These researchers examined the autophagic cell death in cultured TNBC cells and mouse xenograft tumors during anti-EGFR-GNs-combined NIR-PTT. They found that the cytotoxicity induced by anti-EGFR-GNs-combined NIR-PTT was rescued by treatment with autophagy inhibitor,
3-methyladenine (3-MA). Anti-EGFR-GNs-combined NIR-PTT induced remarkable levels of autophagy activity as evidenced by a large number of autophagic vesicles and a significant increase in autophagy-specific proteins; microtubule-associated protein light chain 3 (LC3), p62, beclin-1, and autophagy-related gene5 (Atg5), accompanying the inhibition of AKT-mTOR signaling pathway responsible for inducing autophagy. Moreover, in mouse xenograft tumors, anti-EGFR-GNs-combined NIR-PTT also increased LC3 and beclin-1 levels. The authors concluded that these findings, for the first time, demonstrated that anti-EGFR-GNs-combined NIR-PTT remarkably induced autophagy leading to EGFR-targeted cancer cell death.

Xu and associates (2017) stated that while immunotherapy has become a highly promising paradigm for cancer treatment (e.g., colorectal cancer) in recent years, it has long been recognized that photodynamic therapy (PDT) has the ability to trigger anti-tumor immune responses. However, conventional PDT triggered by visible light has limited penetration depth, and its generated immune responses may not be robust enough to eliminate tumors. Up-conversion nanoparticles (UCNPs) are simultaneously loaded with chlorin e6 (Ce6), a photosensitizer, and imiquimod (R837), a Toll-like-receptor-7 agonist. The obtained multi-tasking UCNP-Ce6-R837 nanoparticles under NIR irradiation with enhanced tissue penetration depth would enable effective photodynamic destruction of tumors to generate a pool of tumor-associated antigens, which in the presence of those R837-containing nanoparticles as the adjuvant are able to promote strong anti-tumor immune responses. More significantly, PDT with UCNP-Ce6-R837 in combination with the cytotoxic T-lymphocyte-associated protein 4 (CTLA-4) checkpoint blockade not only showed excellent effectiveness in eliminating tumors exposed to the NIR laser, but also resulted in strong anti-tumor immunities to inhibit the growth of distant tumors left behind after PDT treatment. Furthermore, such a cancer immunotherapy strategy has a long-term immune memory function to protect treated mice from tumor cell re-challenge. The authors concluded that these findings presented an immune-stimulating UCNP-based PDT strategy in combination with CTLA-4 checkpoint blockade to effectively destroy primary tumors under light
exposure, inhibit distant tumors that can hardly be reached by light, and prevent tumor reoccurrence via the immune memory effect.

Appendix

Infrared coagulation usually requires 2 sessions to eradicate the hemorrhoids.

Internal hemorrhoids are classified by the following grades:

- Grade I: Bleeding without prolapse
- Grade II: Prolapse with spontaneous reduction
- Grade III: Prolapse with manual reduction
- Grade IV: Incarcerated, irreducible prolapse

CPT Codes / HCPCS Codes / ICD-10 Codes

*Information in the [brackets] below has been added for clarification purposes. Codes requiring a 7th character are represented by "+":*

**CPT codes covered if selection criteria are met:**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>46930</td>
<td>Destruction of internal hemorrhoid(s), by thermal energy (eg, infrared coagulation, cautery, radiofrequency)</td>
</tr>
</tbody>
</table>

**CPT codes not covered for indications listed in the CPB:**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>97026</td>
<td>Application of a modality to one or more areas; infrared</td>
</tr>
</tbody>
</table>

**HCPCS codes not covered for indications listed in the CPB:**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A4639</td>
<td>Replacement pad for infrared heating pad system, each</td>
</tr>
<tr>
<td>E0221</td>
<td>Infrared heating pad system</td>
</tr>
</tbody>
</table>

**ICD-10 codes covered if selection criteria are met:**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>K64.0</td>
<td>First degree and second degree hemorrhoids</td>
</tr>
<tr>
<td>K64.1</td>
<td>First degree and second degree hemorrhoids</td>
</tr>
</tbody>
</table>

**ICD-10 codes not covered for indications listed in the CPB (not all-inclusive):**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B35.1</td>
<td>Tinea unguium [onychomycosis]</td>
</tr>
</tbody>
</table>
E08.00 - Diabetes mellitus
E13.9

F33.0 - F33.9 Major depressive disorder, recurrent [not covered for prevention of seasonal affective disorder]

G20 - G21.9 Parkinson's disease
G51.0 Bell's palsy

H35.30 - Degeneration of macula and posterior pole and peripheral retinal
H35.466

I00 - I52 Acute rheumatic fever, chronic rheumatic heart diseases, hypertensive disease, ischemic heart disease, pulmonary heart disease and disease of pulmonary circulation and other forms of heart diseases [cardiovascular diseases]
I63.00 - Cerebral infarction
I63.9

I73.00 - Raynaud's syndrome
I73.01

I89.0 Lymphedema, not elsewhere classified
I97.2 Postmastectomy lymphedema syndrome

L70.0 - L70.9 Acne
L89.000 - Pressure ulcer
L89.95

M15.0 - Osteoarthritis
M19.93

M54.2 Cervicalgia
M54.4 Low back pain
M54.6 Pain in thoracic spine
M54.9 Dorsalgia, unspecified

N18.1 - Chronic kidney disease (CKD)
N18.9

Q82.0 Hereditary lymphedema
R40.0 - Somnolence, stupor and coma [disorders of consciousness]
R40.4
S02.0xx+ - Fracture of vault and base of skull
S02.19x+, S02.91x+ (must be billed with intracranial injury codes)

S06.0x0+ - Intracranial injury
S06.9x9+ (must be billed with fracture of skull codes)

S12.000+ - Fracture of vertebral column
S12.9xx+, S22.000+ - S22.089+, S32.000+ - S32.2xx+ (must be billed with spinal cord injury codes)

S14.0xx+ - Spinal cord injury
S14.9, S24.0xx+ - S24.9, S34.01x+ - S34.9xx+ (must be billed with fracture of vertebral column codes)

T81.30X+ - Disruption of wound, not elsewhere classified
T81.33X+
T81.89X+ Other complications of procedures, not elsewhere classified [non-healing surgical wound]

Numerous Open Wounds [chronic non-healing wounds] [Codes options not listed due to expanded specificity]

The above policy is based on the following references:


38. Ricci MP, Matos D, Saad SS. Rubber band ligation and infrared photocoagulation for the outpatient treatment of...


45. Ronthal M. Bell’s palsy: Prognosis and treatment in adults. UpToDate [online serial]. Waltham, MA: UpToDate; reviewed April 2012.


52. Goldstein AO. Onychomycosis. UpToDate Inc., Waltham, mA. Last reviewed April 2015.


Amendment to
Aetna Clinical Policy Bulletin Number: 0604 Infrared Therapy

There are no amendments for Medicaid.