Transcutaneous Electrical Nerve Stimulation (TENS)

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Origination: 10/1988  
Next Review: 9/2019

Policy

Blue Cross and Blue Shield of Kansas City (Blue KC) may provide coverage for transcutaneous electrical stimulation (TENS) when it is determined to be medically necessary because the criteria shown below are met.

Please note that this is a type of electrical stimulation that is considered a benefit exclusion in many health plan contracts.

When Policy Topic is covered

A trial of transcutaneous electrical nerve stimulation (TENS) of at least 30 days may be considered medically necessary to establish efficacy for the management of refractory chronic pain (e.g., chronic musculoskeletal pain or neuropathic pain) that causes significant disruption of function when the following conditions have been met:

- The pain is unresponsive to at least 3 months of conservative medical therapy; AND
- The trial is monitored by a physician.

Continued use of transcutaneous electrical nerve stimulation (TENS) may be considered medically necessary for treatment of refractory chronic pain (e.g., chronic musculoskeletal or neuropathic pain) that causes significant disruption of function when the following conditions have been met:

- Efficacy has been demonstrated in an initial therapeutic trial (see considerations); AND
- Compliance has been demonstrated in the therapeutic trial with the device used on a regular basis (e.g., daily or near daily use) throughout the trial period.

When Policy Topic is not covered

TENS is considered investigative for the management of acute pain (e.g., postoperative or during labor and delivery).
The use of TENS for any other condition, including the treatment of dementia and prevention of migraine headaches, is considered **investigational**.

**Considerations**

TENS units may be covered for Ford and BPU members when prescribed by a physician. Electrical stimulation (97014 or 97032) provided in the office setting is a covered benefit for Ford and BPU members.

Refractory chronic pain is defined in this policy as pain that causes significant disruption of function and has not responded to at least 3 months of conservative therapy, including non-steroidal anti-inflammatory medications, ice, rest and/or physical therapy.

Documentation for the trial should include:

- Initial assessment/evaluation of the nature, duration, and perceived intensity of pain;
- The types and duration of prior treatments;
- Treatment plan including ongoing medications and proposed use of TENS unit including the frequency and duration of treatment.

Clinical summary of the trial to determine efficacy should include:

- Perceived intensity of pain with and without TENS (e.g., 2 point or 30% improvement in VAS);
- Ongoing medication requirements for pain relief (if any);
- Other modalities (if any) in use for pain control;
- Actual use of TENS on a daily basis (frequency and duration of application).

TENS devices may be delivered through a practitioner and require a prescription, or obtained without a prescription. It is possible that prescribed devices provide higher intensity stimulation than units sold directly to the public.

There is no specific coding for the Cefaly device. Coding would most likely be reported with the miscellaneous durable medical equipment code E1399.

**Description of Procedure or Service**

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<thead>
<tr>
<th>Populations</th>
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<th>Comparators</th>
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<tr>
<td>Individuals: With chronic pain (eg, musculoskeletal, neuropathic, and mixed pain conditions)</td>
<td>Interventions of interest are: • Transcutaneous electrical nerve stimulation</td>
<td>Comparators of interest are: • Physical therapy • Pharmacotherapy</td>
<td>Relevant outcomes include: • Symptoms • Functional outcomes • Quality of life • Medication use</td>
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Transcutaneous electrical nerve stimulation (TENS) describes the application of electrical stimulation to the surface of the skin at the site of pain. In addition to more traditional settings such as a physician’s office or an outpatient clinic, TENS can be self-administered in a patient’s home.

For individuals who have chronic pain (eg, musculoskeletal, neuropathic, and mixed pain conditions) who receive TENS, the evidence includes numerous randomized controlled trials (RCTs) and systematic reviews. Relevant outcomes are symptoms, functional outcomes, quality of life, and medication use. The overall strength of the evidence is weak. The best evidence exists for treatment of chronic, intractable pain. Available evidence indicates that TENS can improve chronic intractable pain in some patients, and there is support for its use in clinical guidelines by specialty societies. To best direct TENS toward patients who will benefit, a short-term trial of TENS is appropriate, with continuation only in patients who show an initial improvement. The evidence is sufficient to determine that the technology results in a meaningful improvement in the net health outcome.

For individuals who have acute pain (eg, surgical, musculoskeletal, labor, and mixed pain conditions) who receive TENS, the evidence includes RCTs and systematic reviews. Relevant outcomes are symptoms and medication use. Overall, evidence for the use of TENS from high-quality trials remains inconclusive for most indications. A Cochrane review of TENS for acute pain (eg, cervical laser treatment, venipuncture, screening flexible sigmoidoscopy, postpartum uterine contractions, rib fractures) found some evidence that TENS reduces pain intensity over and above that seen with placebo, but the high risk of bias made definitive conclusions impossible. For the treatment of pain after total knee arthroplasty, 2 large RCTs found no benefit of TENS compared with sham TENS. For the prevention of migraine headaches, a small RCT reported a greater proportion of patients achieving at least 50% reduction in migraines with TENS than with sham placebo, and modest reductions in the number of total headache and migraine days. This manufacturer-sponsored trial needs corroboration before conclusions can be made about the efficacy of TENS for preventing migraine headaches. For the relief of pain during office-based hysteroscopy, an RCT found decreased pain and higher patient satisfaction in patients receiving TENS compared with placebo or control. The evidence is insufficient to determine the effects of the technology on health outcomes.

Clinical input was generally in agreement that TENS is investigational for the management of acute pain and for other conditions such as dementia. Clinical input was, for the most part, in agreement that TENS is a generally accepted treatment modality and can be beneficial for the management of chronic pain in some patients. A trial period, similar to that listed in Medicare Coverage guidelines, was recommended by some.
Background
TENS has been used to treat chronic intractable pain, postsurgical pain, and pain associated with active or post-trauma injury unresponsive to other standard pain therapies. It has been proposed that TENS may provide pain relief through release of endorphins in addition to potential blockade of local pain pathways. TENS has also been used to treat dementia by altering neurotransmitter activity and increasing brain activity that is thought to reduce neural degeneration and stimulate regenerative processes. Percutaneous electrical nerve stimulation (located in a separate policy) is similar to TENS but uses microneedles that penetrate the skin instead of surface electrodes. Interferential stimulation (located in a separate policy) uses a modulated waveform for deeper tissue stimulation and is believed to improve blood flow to the affected area.

Regulatory Status
TENS devices consist of an electrical pulse generator, usually battery operated, connected by wire to 2 or more electrodes, which are applied to the surface of the skin at the site of the pain. Since 1977, a large number of devices have received marketing clearance through the U.S. Food and Drug Administration (FDA) 510(k) process. Marketing clearance via the 510(k) process does not require data regarding clinical efficacy; these devices are considered substantially equivalent to predicate devices marketed in interstate commerce prior to May 1976, the enactment date of the Medical Device Amendments, or to devices that have been reclassified and do not require approval of a premarket approval application (PMA).

On March 11, 2014, FDA granted de novo 510(k) approval for marketing to Cefaly® (STX-med, Herstal, Belgium), which is a TENS device for the prophylactic treatment of migraine in patients 18 years of age or older. (1)

Rationale
This evidence review was created in November 1996 and has been updated regularly with searches of the MEDLINE database. The most recent literature update was performed through September 12, 2017.

Assessment of efficacy for therapeutic intervention involves a determination of whether an intervention improves health outcomes. The optimal study design for this purpose is a randomized controlled trial (RCT) that includes clinically relevant measures of health outcomes. Intermediate outcome measures, also known as surrogate outcome measures, may also be adequate if there is an established link between the intermediate outcome and true health outcomes. Nonrandomized comparative studies and uncontrolled studies can sometimes provide useful information on health outcomes but are prone to biases such as noncomparability of treatment groups, placebo effect, and variable natural history of the condition.

Transcutaneous Electrical Nerve Stimulation
This evidence review was informed by a 1996 TEC Assessment on transcutaneous electrical nerve stimulation (TENS) for the treatment of chronic and postoperative
pain, which concluded that the evidence did not clearly show that the effects of TENS exceeded placebo effects. Over the intervening years, a large number of Cochrane reviews of TENS for a variety of pain conditions have been published, including the topics of osteoarthritis, rheumatoid arthritis, pancreatitis, myofascial trigger points, temporomandibular joint pain, cancer pain, neck pain, acute pain, phantom limb pain, labor pain, and chronic back pain. In 2010, the American Academy of Neurology (AAN) published an evidence-based review of the efficacy of TENS for the treatment of pain in neurologic disorders, including low back pain and diabetic peripheral neuropathy. The evidence on TENS for specific conditions is described next.

**Chronic Pain**

**Low Back Pain**

Cochrane reviews from 2005, updated in 2008, concluded that there is limited and inconsistent evidence for the use of TENS as an isolated treatment for low back pain. For the treatment of chronic low back pain, 4 high-quality RCTs met the selection criteria (n=585 patients). There was conflicting evidence about whether TENS reduced back pain, and consistent evidence from 2 of the trials (n=410 patients) indicating that it did not improve back-specific functional status. Reviewers concluded that available evidence did not support the use of TENS in the routine management of chronic low back pain.

In 2010, AAN published an evidence-based review of the efficacy of TENS in the treatment of pain in neurologic disorders. The evidence on TENS for chronic low back pain of various etiologies (some neurologic) included 2 class I studies (prospective randomized trial with masked outcome assessment in a representative population) and 3 class II studies (randomized trial not meeting class I criteria or a prospective matched group cohort study in a representative population). The class I studies compared TENS with sham TENS for 4 or 6 weeks of treatment. Although both studies were adequately powered to find a 20% or greater difference in pain reduction by visual analog scale (VAS), after correction for multiple comparisons, no significant benefit was found for TENS compared with sham TENS. In 2 of the 3 class II studies, no significant differences were found between TENS and sham TENS. In the third class II study, benefit was found in 1 of 11 patients treated with conventional TENS, 4 of 11 treated with burst-pattern TENS, and 8 of 11 treated with frequency-modulated TENS. Overall, evidence was conflicting. Because class I studies provide stronger evidence, AAN considered the evidence sufficient to conclude that TENS is ineffective for the treatment of chronic low back pain.

Subsequently, Keskin et al (2012) reported on an RCT of TENS for pregnancy-related low back pain. Seventy-nine patients were randomized to 6 TENS sessions over 3 weeks, a home exercise program, acetaminophen, or a no-treatment control. In the control group, pain intensity increased in 57% of participants. Pain decreased in 95% of participants in the exercise group and in all participants in the acetaminophen and TENS groups. The VAS score improved by a median of 4 points in the TENS group and by 1 point in the exercise and
acetaminophen groups. In the control group, the VAS score worsened by 1 point. Roland-Morris Disability Questionnaire scores indicated a significantly greater improvement in function in the TENS group (-8.5) compared with the control (+1), exercise (-3), and acetaminophen (-3) groups. This trial lacked a sham TENS control.

**Diabetic Peripheral Neuropathy**

AAN’s 2010 evidence-based review also identified 2 class II studies comparing TENS with sham TENS and 1 class III study comparing TENS with high-frequency muscle stimulation for patients with mild diabetic peripheral neuropathy. The studies found a modest reduction in VAS scores for TENS compared with sham, and a larger proportion of patients experiencing benefit with high-frequency muscle stimulation than with TENS. Reviewers concluded that, on the basis of these 2 class II studies, TENS is likely effective in reducing pain from diabetic peripheral neuropathy; however, no studies compared TENS with other treatment options.

A small 2011 RCT found no difference between microcurrent TENS (micro-TENS) compared with sham in 41 patients with diabetic peripheral neuropathy. In this trial, current was applied at an intensity of 30 to 40 microamps rather than the usual intensity of several milliamps, and patients were treated for 30 minutes, 3 times per week. After 4 weeks of treatment, 29% of the micro-TENS group and 53% of the sham group showed a response to therapy, defined as a minimum 30% reduction in neuropathic pain score. Median Pain Disability Index was reduced to a similar extent in the TENS group (23%) and the sham group (25%).

**Cancer Pain**

For the 2008 Cochrane review on TENS for cancer pain, only 2 RCTs (total N=64 participants) met the selection criteria for inclusion in the systematic review. There were no significant differences between TENS and placebo in the included studies. One RCT found no differences between TENS and placebo for pain secondary to breast cancer treatment. The other RCT examined acupuncture-type TENS in palliative care patients but was underpowered. Results of the review were considered inconclusive due to a lack of suitable RCTs. A 2012 update of the Cochrane review identified an additional RCT (a feasibility study of 24 patients with cancer bone pain) that met selection criteria. The small sample sizes and differences in patient study populations of the 3 RCTs precluded meta-analysis. Results on TENS for cancer pain remain inconclusive.

**Fibromyalgia**

A placebo-controlled crossover RCT from 2013 investigated the effect of a single treatment of TENS in 41 patients with fibromyalgia. Patients were blindly allocated to either no treatment, active TENS treatment, or placebo treatment. Each treatment arm had therapy once weekly for a 3-week period. Patients rated the average pain intensity before and after treatment on a 0-to-10 scale and found that pain with movement was less during active TENS compared with placebo or no TENS (p<0.05). Patients also rated fatigue with movement and found that fatigue decreased with active TENS compared with placebo or no TENS (p<0.05
and p<0.01, respectively). Pressure pain threshold improvement was significantly greater with active TENS (30%, p<0.05) than with placebo (11%) or no TENS (14%).

Another RCT published in 2013 investigated TENS in fibromyalgia. In this trial, 39 patients were randomized into 3 groups: a group with placebo devices at both lumbar and cervical sites, a group with a single active TENS device at the lumbar or cervical site and a placebo device at the second site, and a group with 2 active TENS devices at both lumbar and cervical sites. TENS was administered for 20 minutes at 12-hour intervals for 7 consecutive days. In the dual placebo group, VAS pain scores did not improve compared with baseline. Patients who had a single site of active TENS reported a reduction in pain of 2.5 cm (p<0.05 vs baseline), and patients in the dual TENS group experienced the greatest reduction in pain of 4.2 cm (p<0.02 vs baseline). Consumption of medication for pain was also decreased significantly from baseline in the single TENS and dual TENS groups (p<0.05 and p<0.02, respectively). Sleep improvements were reported by 10 patients in the dual TENS group, eight in the single TENS group, and four in the placebo group. Fatigue increased for 3 patients in the placebo group but decreased in 7 patients in the dual TENS group; moreover, fatigue decreased for 5 patients in the single TENS group. No adverse events were reported.

Refractory Chronic Pelvic Pain
There is limited literature on the use of TENS for chronic pelvic pain. No RCTs were identified. An observational study of 60 men consecutively treated with TENS for refractory chronic pelvic pain syndrome was published in 2013. TENS was performed at home for 12 weeks with participants keeping a pain diary for the calculation of VAS score. A successful treatment response was defined as a 50% or greater reduction in VAS and absolute VAS of less than 3 at the end of treatment. TENS was successful in 29 (48%) of patients, and treatment response was sustained at a mean follow-up of 44 months (95% confidence interval [CI], 33 to 56 months). After 12 weeks of treatment, VAS score decreased significantly (p<0.001) from 6.6 to 3.9. Quality of life, assessed by the National Institutes of Health Chronic Prostatitis Symptom Index, improved significantly after 12 weeks of TENS treatment (p<0.001). No adverse events were reported.

Osteoarthritis of the Knee
A 2009 Cochrane review found that the evidence on TENS for pain relief in patients with osteoarthritis of the knee was inconclusive. Included in the review were 18 small trials assessing 813 patients; 11 trials used TENS, four used interferential current stimulation, one used both TENS and interferential current stimulation, and two used pulsed electrostimulation. Methodologic quality and quality of reporting were rated poor. Additionally, there was a high degree of heterogeneity among the trials, and the funnel plot for pain was asymmetrical, suggesting both publication bias and bias from small studies.

Additional randomized trials were published after this systematic review. The largest is a 2014 RCT of 224 participants with osteoarthritis of the knee that assigned patients to 1 of 3 interventions: TENS combined with education and
exercise (n=73), sham TENS combined with education and exercise (n=74), or education and exercise alone (n=77). Investigators and participants were blinded to treatment. Participants were treated for 6 weeks and directed to use the TENS device as needed for pain relief. Western Ontario and McMaster Universities Arthritis Index pain, function, and total scores improved significantly over time from baseline to 24 weeks but did not vary between groups (p>0.05). TENS as an adjunct to exercise did not elicit additional benefits.

A 2012 RCT with 75 patients examined the effect of a single session of high-frequency TENS, low-frequency TENS, or placebo TENS. Double-blind assessment during the treatment session found a significant increase in pressure pain threshold at the knee for both low- and high-frequency TENS. There was no effect of TENS on cutaneous mechanical pain threshold, heat pain threshold, or heat temporal summation. All 3 groups reported a reduction in pain at rest and during the Timed Up & Go test, and there were no differences in pain scores between groups. These pain score results suggest a strong placebo component of TENS treatment.

Another small RCT (2013) compared intra-articular hyaluronic acid injections with TENS for the management of knee osteoarthritis in 50 participants. Twenty-seven patients were randomized to hyaluronic acid and received 1 intra-articular injection weekly for 5 weeks. Twenty-three patients in the TENS group received 20-minute sessions of TENS 3 times weekly for 4 weeks. The TENS group exhibited a modest but significantly greater improvement (p=0.03) than the hyaluronic acid group on VAS pain score (mean final score, 4.17 vs 5.31, respectively) at 2 weeks, but there was no difference between groups at 2 or 3 months posttreatment. The TENS group also had a greater improvement on the Lequesne Index at 2-week follow-up compared with the hyaluronic acid group (mean final score, 7.78 vs 9.85, respectively; p=0.01) and at 3-month follow-up (mean final score, 7.07 vs 9.2, respectively; p=0.03). Both treatment groups had significant improvements from baseline to 3 months on scores in walking time, patient global assessment, and disability in activities of daily life.

Cherian et al published an RCT in 2016 comparing TENS with standard of care in the treatment for 70 patients with knee osteoarthritis; all patients had previously taken part in a prospective 3-month trial of TENS, allowing researchers to collect data on the long-term efficacy of TENS (mean follow-up time, 19 months). The follow-up study evaluated pain (using a VAS) and function (measured by new Knee Society Scale and lower-extremity functional scores) and a number of secondary outcomes, including medication usage, quality of life, device use, and conversion to total knee arthroplasty. For all outcomes, reviewers reported a general trend of improvement for the TENS group compared with the standard of care group; however, no statistical analyses were provided for secondary outcomes, and several differences were not significant among primary outcomes. When measured from pretreatment to final follow-up, Knee Society Scale and lower-extremity functional scores were significantly increased for the TENS group (p=0.002 and p<0.001 for the respective tests). The trial's limitations included a small sample size and possible variance in the amount of medication taken by
each patient; also, the interviews were not conducted in person, meaning that some conclusions about functional improvement were not confirmed by a physical examination.

**Rheumatoid Arthritis**
Cochrane reviews from 2002 and 2003 concluded that outcomes for patients with rheumatoid arthritis treated with TENS were conflicting.⁴,⁵

**Multiple Sclerosis**
Sawant et al (2015) reported a meta-analysis of 4 RCTs of TENS for the management of central pain in multiple sclerosis.³⁴ Two studies had a sample size of 10; the other two had sample sizes of 59 and 60. One study examined the effect of TENS on upper-extremity pain, and the other three studied the effect of TENS on low back pain. The exact electrode placement could not be identified. Effect sizes, extracted from the 4 studies, showed a medium sized effect of TENS (Hedges’ g=0.35, p=0.009). The overall level of evidence was considered to be GRADE 2.

**Phantom Limb Pain**
A 2015 Cochrane review found no RCTs on TENS for phantom limb or stump pain after amputation.³⁵ Reviewers concluded that the published literature on TENS for phantom limb pain in adults lacks the methodologic rigor and robust reporting needed to assess its effectiveness confidently and that RCT evidence is required.

**Neck Pain**
A 2013 report by the Cochrane Collaboration reviewed the evidence on TENS for the treatment of chronic neck pain.¹³ Four studies (two with high risk of bias, two with low risk of bias) compared TENS with placebo for immediate pain relief. Three studies with a high risk of bias also compared TENS with electrical muscle stimulation, ultrasound, or manual therapy for the treatment of chronic neck pain. The treatment schedules and differing outcomes precluded pooling of results, and group sizes were very small (7-43 participants) with varied results for TENS therapy. Overall, the quality of this evidence is very low for TENS vs all comparators for the treatment of chronic neck pain.

**Pain After Stroke**
Evidence on the efficacy of TENS for shoulder pain after stroke was considered inconclusive in a 2000 Cochrane review.¹⁹

**Pain After Spinal Cord Injury**
A 2014 Cochrane review on nonpharmacologic interventions for chronic pain in individuals with spinal cord injury identified an RCT on TENS.³⁶ This trial had a high risk of bias, and no conclusion could be drawn on the effectiveness of TENS compared with sham for reducing chronic pain in this population.

**Headache**
A 2004 Cochrane review assessed noninvasive physical treatments for chronic/recurrent headache.³ Twenty-two studies with a total of 2628 patients
(age range, 12-78 years) met inclusion criteria. Reviewers included 5 types of headache and various noninvasive treatments including spinal manipulation, electromagnetic fields, and a combination of TENS and electrical neurotransmitter modulation. Combination TENS and electrical neurotransmitter modulation had weak evidence of effectiveness for migraine headache. Both combination treatment and TENS alone had weak evidence of effectiveness for the prophylactic treatment of chronic tension-type headache. Reviewers concluded that, although these treatments appear to be associated with little risk of serious adverse events, clinical effectiveness and cost-effectiveness of noninvasive physical treatments could require further research using scientifically rigorous methods.

The Cefaly device is a TENS headband device intended for the prophylactic treatment of migraine in patients 18 years of age or older. Clinical information on Cefaly was supplied by 2 studies: the Prevention of Migraine using the STS Cefaly (PREMICE) trial (2013) and a European postmarketing surveillance study (2013). PREMICE was a double-blind, sham-controlled randomized trial conducted at 5 tertiary care headache clinics in Belgium. Sixty-seven patients were randomized to active (n=34) or sham (n=33) neurostimulation for 3 months, and 59 (88%) completed the trial on protocol. No serious adverse events occurred, although 1 patient discontinued the trial because of a reported device-caused headache. After a 1-month run-in period, patients were instructed to use the device daily for 3 months. Adherence was recorded by the TENS device. Ninety stimulation sessions were expected, but on average, 56 sessions were completed by the active group, and 49 were completed by the sham group. Primary outcome measures were changes in the number of migraine days and the percent of responders.

The authors presented both intention-to-treat and per-protocol analyses, but we only discuss the intention-to-treat. The reduction in the number of migraine days (run-in vs 3-month) was 2.06 (95% CI, -0.54 to -3.58) for the TENS group and 0.32 (-0.63 to +1.27) for the sham group; this difference was not statistically significant (p=0.054). The proportion of responders (≥50% reduction in the number of migraine days/month) was 38% (95% CI, 22% to 55%) in the TENS group and 12% (95% CI, 1% to 23%) in the sham group (p=0.014). The number of migraine attacks from the run-in period to the 3-month evaluation was significantly lower for the active TENS group (decrease of 0.82 in the TENS group vs 0.15 in the sham group, p=0.044). Moreover, the number of headache days was lower in the TENS group than in the sham group (decrease of 2.5 vs 0.2, p=0.041). Patients in the active TENS group reported a 36.6% reduction in the number of acute antimigraine drugs taken compared with a 0.5% reduction in the sham group (p=0.008). Severity of migraine days did not differ significantly between groups.

Participants rated their satisfaction with treatment more highly in the active group (70.6%) than in the sham group (39%). During postmarketing surveillance, 53% (1226/2313) of participants were satisfied with the device and willing to continue using it. Ninety-nine (4%) participants reported a complaint with the device, but none was a serious adverse event. The most commonly reported adverse events
included: insomnia in 4 (0.2%) participants, reversible forehead skin irritation in 5 (0.2%) participants, headache after a TENS session in 12 (0.5%) participants, sleepiness during a Cefaly session (0.5%), and a dislike of how the device felt, leading to discontinuation in 29 (1.3%) participants.

**Facial Myalgia**
A 2017 RCT by De Giorgi et al evaluated the efficacy of TENS in treating subjective and objective pain in 49 women diagnosed with chronic facial myalgia; 34 patients received TENS treatment daily for 10 weeks but were evaluated for pain up to 25 weeks, and 15 patients received no treatment but were evaluated for pain up to 10 weeks. TENS treatment consisted of daily 60-minute sessions at 50 Hz, and VAS scores were taken for average and maximum pain intensity in the previous 30 days, as well as the level of pain at examination. The other primary outcome was the assessment of pain at muscular palpation sites, measured by the Pericranial Muscle Tenderness Score and Cervical Muscle Tenderness Score; for this outcome and that of VAS (mean and maximum measurements), patients in the TENS group had significantly lower pain levels than those for the control group at 10 weeks (p<0.05). Within the TENS group, the authors found that VAS scores tended to decrease throughout the trial duration, as did Pericranial Muscle Tenderness and Cervical Muscle Tenderness scores (p<0.05); these differences were significant except for the period between 15 weeks and 25 weeks. Secondary outcomes included mandibular movement and range of motion, and the TENS group showed no significant improvement over the control group for either outcome. Although a limitation of the trial was that observation of control patients ended at 10 weeks, these results confirmed results of several similar studies of TENS in treating musculoskeletal pain. The trialists concluded that TENS is an effective treatment for chronic facial myalgia, although studies with more participants are needed.

**Temporomandibular Disorder**
A 2017 randomized placebo-controlled trial by Ferreira et al evaluated TENS in the treatment of individuals with temporomandibular disorder; 40 patients (30 female, 10 male) were randomized into 2 groups, receiving either placebo or active TENS. The trial used both high- and low-frequency TENS, allotting to the active TENS patients 25 minutes of 4 Hz followed by 25 minutes of 100 Hz; measuring pain intensity and pressure pain threshold immediately after treatment and again 48 hours later. When compared with baseline values, pain intensity was reduced for patients in the active TENS group, and pressure pain threshold was significantly increased (p<0.05); for those in the placebo group, there were no significant improvements for either primary outcome. A secondary outcome was electromyography activity in TENS-treated areas, measured in 3 positions (mandibular rest position, maximal voluntary contraction, habitual chewing); for this outcome, results varied among placebo and active TENS. Limitations of the trial included the short duration of the assessment, and the absence of control groups either receiving no treatment or evaluating the same treatment in patients without temporomandibular disorder. The authors concluded that longer term studies were needed, especially those evaluating the efficacy of both high- and low-frequency TENS.
**Mixed Chronic Pain Conditions**

A 2008 Cochrane review updated the evidence on the use of TENS for the treatment of various chronic pain conditions, including rheumatoid arthritis with wrist pain, temporomandibular joint dysfunction, multiple sclerosis with back pain, osteoarthritis with knee pain, neuropathy, pancreatitis, and myofascial trigger points; it included 25 RCTs (total N=1281 patients).\(^2\)\(^,\)\(^1\)\(^2\) Due to heterogeneity, meta-analysis was not possible; slightly more than half of the studies found a positive analgesic outcome in favor of active TENS treatments. Reviewers concluded that the 6 studies added since the 2001 review did not provide sufficient additional information to change the conclusions (ie, the published literature still lacked the methodologic rigor needed to make confident assessments of the role of TENS in chronic pain management).

An industry-sponsored meta-analysis by Johnson and Martinson (2007) included 38 randomized controlled comparisons (1227 patients from 29 publications) of TENS or percutaneous electrical nerve stimulation (PENS) for chronic musculoskeletal pain, using any stimulation parameters on any location (eg, back, neck, hip, knee).\(^4\)\(^1\) Data were converted to percentage improvement in VAS scores, then transformed into standardized differences (a continuous measure that adjusts for variability in different outcome measures). Based on the combined standardized difference, reviewers concluded that TENS provided “nearly 3 times” the pain relief provided by placebo. A number of sources of bias in the analysis seriously limited interpretation of the results. First, statistical heterogeneity of the individual studies (\(I^2=82\)% raised questions about the appropriateness of combining these studies in a meta-analysis (see previous discussion on the decision not to combine studies for the 2000 and 2008 Cochrane reviews on chronic pain). Further limiting interpretation was the transformation of data to standardized effect sizes, which appears to have led to discrepant effect sizes of otherwise similar results. For example, comparison of the untransformed and transformed data showed that while two of the included trials (Deyo et al [1990],\(^4\)\(^2\) Machin et al [1988]\(^4\)\(^3\) found similar percentage-point differences in VAS scores between active (5%) and control (8%) groups, standardized effect sizes were not equivalent.

Positive standardized effect sizes from data that were not statistically or clinically significant (eg, 47% vs 42% change from baseline in Deyo et al) also raised concerns about the appropriateness of the data transformation. The inclusion of poor-quality studies is another concern because several studies with the greatest effect sizes reported dropout rates exceeding 25%. Furthermore, bias for publication of small positive studies may not have been adequately addressed, because the “fail-safe N” method used to assess publication bias is problematic. Another major constraint in the interpretation of this meta-analysis is the lack of clarity about whether PENS resulted in a clinically meaningful improvement. For example, there was no discussion of the magnitude of the combined change in VAS scores or of the proportion of patients who achieved clinically meaningful improvements. Examination of the data indicated that the difference between the electrical nerve stimulation and placebo groups was less than 15% for 13 (34%) of the 38 comparisons (average difference, 4%). The small effect observed in many
of these small studies raised further questions about the impact of publication bias on the meta-analysis. Also at issue was the relative contribution of PENS, because meta-regression found PENS to be more effective than TENS. Given the substantial uncertainty on the appropriateness of the studies included, how data were transformed, and the clinical significance of the results, results from this meta-analysis are considered inconclusive.

A 2006 randomized, sham-controlled trial (163 patients with diverse pain states) by Oosterhof et al reported that, although no differences in VAS pain scores were observed, more patients were satisfied (ie, willing to continue treatment) after 10 days (10-12 h/d) of TENS (58%) than after use of a sham device (43%). Analysis of the results by type of pain (osteoarthritic, neuropathic, or bone/soft tissue/visceral) in a subsequent report showed no difference in patient satisfaction for the group with osteoarthritis and related disorders (39% vs 31%, n=31, 26, both respectively) or in patients with neuropathic pain (63% vs 48%, n=16, 25, both respectively), greater satisfaction with TENS in the group of patients with bone and soft tissue injury or visceral pain (74% vs 48%, n=34, 31, both respectively). The nearly 50% patient satisfaction rating in the sham control group suggests a strong nonspecific effect with this treatment protocol. Survival analysis over the course of 1 year revealed no significant difference in the percentage of patients satisfied with treatment (willing to continue). At 1-year follow-up, 30% of the TENS group and 23% of the sham TENS group remained satisfied with treatment (not significantly different). For the satisfied patients, there was no significant difference between the TENS and sham groups in the magnitude of improvement (61.7% vs 63.9%), pain intensity (change in VAS, 27.7 vs 29.4), disability (12.4 vs 12.2), or perceived health status (5.2 vs 5.8), all respectively. This study supported a sustained placebo effect.

**Section Summary: Chronic Pain**
Available evidence indicates that TENS can improve chronic intractable pain in some patients, and there is support for its use in clinical guidelines by specialty societies. To best direct TENS toward patients who will benefit, a short-term trial of TENS is appropriate, with continuation only in patients who show an initial improvement.

**Acute Pain**

**Injury**
One double-blind, randomized, sham-controlled trial found that during emergency transport of 101 patients, TENS reduced posttraumatic hip pain (change in VAS score, 89 to 59), whereas the sham-stimulated group remained relatively unchanged (change in VAS score, 86 to 79).

**Surgical Pain**
A large RCT on postsurgical TENS was published by Rakel et al in 2014. This double-blind study compared TENS once or twice daily for 6 weeks with sham TENS and with standard care to reduce pain during rehabilitation in 317 patients who had undergone total knee arthroplasty. The primary outcome was pain.
intensity during range of motion and during walking (as measured by a 21-point numeric rating scale on postoperative day 1 and week 6). Secondary outcomes were pain intensity at rest, hyperalgesia, and function. Intention-to-treat analysis showed that patients who used TENS during exercises had less pain compared with standard care in the near postoperative period, but there was no significant difference in subjective pain compared with patients who used sham TENS. There was also no significant difference between the active and control groups when tested at 6 weeks. This trial, which found no benefit of TENS over placebo or sham, had good methodologic quality and a low risk of bias.

In 2017, Ramanathan et al published a prospective RCT of 66 patients having undergone total knee arthroplasty who were assigned to active or placebo TENS; patients used the device as needed for 2 hours with 30 minutes of rest afterward and had follow-up visits 2, 4, and 6 weeks after surgery. For the primary outcome, reduction of opioid intake, no significant difference was observed between active and placebo TENS groups (p=0.60); this was also the case for secondary outcomes, which included assessment of pain, function, and clinical outcomes. The trial was limited by a high withdrawal rate (of 116 patients enrolled, only 66 completed) and a lack of uniformity in the device settings chosen by patients. The authors found no significant benefit of TENS treatment following total knee arthroplasty.

Smaller studies with higher risk of bias have tended to support the use of TENS. In a 2008 double-blind RCT of 40 patients undergoing inguinal herniorrhaphy, two 30-minute sessions of TENS at 2 and 4 hours after surgery (vs sham) reduced both analgesic use and pain scores when measured up to 24 hours postsurgery. A 2014 patient-blinded study post abdominal surgery (N=55) found that application of TENS for 1 h/d resulted in a significant reduction in pain, particularly at rest, measured both during and immediately after treatment compared with sham TENS. Pulmonary function (vital capacity, cough peak flow) was also significantly better in the active TENS arm. Another assessor-blinded study (2015) of TENS in 74 living kidney donors found a modest reduction in pain at rest and during the measurement of pulmonary function 1 day postoperatively. A 2012 single-blinded randomized trial with 42 patients assessed the analgesic effect of TENS after laparoscopic cholecystectomy. Pain improved by a median of 2.4 points of 10 after TENS compared with 0.4 points after placebo treatment. The relative risk of nausea and/or emesis was 2.2 times greater for patients in the placebo group.

It is unclear whether the differences in findings between the Rakel RCT and the smaller RCTs were due to increased risk of bias in small studies, or to the differences in time since surgery or type of surgery. One could conclude with relative certainty that TENS has no greater effect than placebo on pain measured at least 1 day following total knee arthroplasty. Additional study is needed to determine the effect of TENS in the immediate postoperative period after other types of surgery.
**Bone Marrow Sampling**
Tucker et al (2015) reported on a double-blind RCT of TENS administered during bone marrow sampling in 70 patients.\(^{54}\) There was no significant difference in a numeric pain score between patients who received strong TENS impulses and the control group that received TENS just above the sensory threshold as reported immediately after the procedure (5.6 vs 5.7, respectively). Over 94% of patients in both groups felt they benefited from TENS.

**Dysmenorrhea**
One 2002 Cochrane review of 9 small, controlled trials found high-frequency TENS to be effective for the treatment of dysmenorrhea.\(^{20}\)

**Hysteroscopy**
In 2017, Lison et al published an RCT of the use of TENS to treat pain in women undergoing hysterectomy without sedation; the study included 138 women receiving active TENS, placebo TENS, or neither treatment during the procedure.\(^{55}\) Unlike previous studies of the use of TENS in hysterectomy, the trial used varying high-fixed TENS (fluctuating between 80 and 100 Hz) and isolated the relief of pain by prohibiting oral medications taken before the procedure. Women in the active TENS group reported significantly lower VAS scores than women in the control or placebo TENS groups reported; this was the case at each stage measured (entry, contact, biopsy [when necessary], and residual). To validate these measurements, the authors included a second pain scale (Likert scale), which found a significant correlation with the VAS results (p<0.001). For secondary end points (eg, procedure duration, vital parameters, vasovagal symptoms), the authors reported that differences between the groups were insignificant. However, patient satisfaction was significantly higher in the active TENS group than in either placebo TENS or control groups (p<0.001 and p=0.001, respectively). Limitations of the trial included that it did not account for the use of a flexible hysteroscope, instead using a rigid hysteroscope; this may limit the generalizability of its results. In addition, the study excluded patient anxiety as an outcome, focusing instead on pain and patient satisfaction.

**Labor and Delivery**
A 2009 Cochrane review included 19 studies with 1671 women in labor.\(^{8}\) Overall, there was little difference in pain ratings between TENS and control groups, although women receiving TENS to acupuncture points were less likely to report severe pain (risk ratio, 0.41). Reviewers found limited evidence that TENS reduced pain in labor or had any impact (either positive or negative) on other outcomes for mothers or babies. Reviewers concluded that, although it is unclear whether TENS reduces pain, women should have the choice of using TENS in labor if they think it will be helpful.

A 2014 placebo-controlled, randomized trial of TENS assessed 200 women who gave birth between January 2010 and July 2010.\(^{56}\) One hundred women who gave birth vaginally were allocated to active TENS or sham TENS in a 1:1 ratio; this same assignment was performed for 100 women who gave birth by cesarean delivery. TENS was performed once for 30 minutes after childbirth was completed.
After vaginal delivery or cesarean delivery but before administration of TENS, the placebo and active groups did not significantly differ in VAS scores or verbal numeric scale (VNS) scores. However, after active TENS in the cesarean group, there was a significant reduction in VAS score \( (p<0.001) \) and VNS score \( (p<0.001) \) compared with the placebo group. A similar benefit was observed in the vaginal delivery group with the active treatment showing a significant reduction in VAS \( (p=0.022) \) and VNS \( (p=0.005) \) scores. The authors also assessed whether TENS reduced the need for additional analgesia. There was no difference between the active TENS and the placebo groups for vaginal delivery \( (p=0.83) \), but, in the cesarean arm, the active treatment group had a significant reduction in analgesic need \( (p=0.006) \).

**Mixed Acute Pain Conditions**

A 2015 Cochrane review assessed the efficacy of TENS as a sole treatment for acute pain conditions that included procedural pain (eg, cervical laser treatment, venipuncture, screening flexible sigmoidoscopy) and nonprocedural pain (eg, postpartum uterine contractions, rib fractures). Nineteen RCTs involving 1346 participants at entry were included. Data on pain intensity were pooled for 6 trials, showing a mean difference of -24.62 mm on a 100-mm VAS in favor of TENS, with significant heterogeneity between the trials. Data on the proportion of participants achieving at least 50% reduction in pain was pooled for 4 trials, with a relative risk of 3.91 in favor of TENS over placebo. There was a high risk of bias associated with inadequate sample sizes in the treatment arms and unsuccessful blinding of treatment interventions. The authors concluded that the analysis provided tentative evidence that TENS reduces pain intensity over and above that seen with placebo, but the high risk of bias made definitive conclusions impossible.

A systematic review and meta-analysis of TENS for acute pain management in the prehospital setting was published in 2014. A literature search identified 4 sham-controlled randomized trials of TENS, including 128 patients. On pooled analysis of these studies, TENS was superior to sham, with a clinically significant reduction in pain severity and a 38-mm reduction on VAS score \( (95\% \text{ CI}, 28 \text{ to } 48; p<0.001) \). The 4 studies had significant heterogeneity \( (I^2=94\%) \). The difference between final pain scores for TENS and sham was 33 mm \( (95\% \text{ CI}, 21 \text{ to } 44; p<0.001) \). The authors found that TENS significantly reduced anxiety compared with sham treatment, with an overall 26-mm lower score on VAS for TENS \( (95\% \text{ CI}, 17 \text{ to } 35; p<0.001) \). No studies reported adverse events for TENS.

**Tennis Elbow**

A 2013 multicenter RCT of TENS as an adjunct to primary care management for tennis elbow was identified. Thirty-eight general practices in the United Kingdom recruited 241 adults who had a new or first diagnosis of tennis elbow. Participants were randomized to TENS once a day for 45 minutes over 6 weeks or until resolution of pain plus primary care management (consultation with a general practitioner followed by information and advice on exercise) vs primary care management alone. Both groups saw large (>25%) within-group improvements in pain intensity, with the greatest improvement during the first 6 weeks of treatment. Intention-to-treat analysis revealed no difference in improvement of
pain (-0.33; 95% CI, -0.96 to 0.31; p=0.31) between the 2 groups at 6 weeks, 6 months (-0.20; 95% CI, -0.81 to 0.42; p=0.526), or 12 months (0.45; 95% CI, -0.15 to 1.06; p=0.139). However, adherence to exercise and TENS was very poor, with only 42 (35%) meeting a prior adherence criteria. Per-protocol analyses only showed a statistically significant difference in favor of TENS at 12 months (p=0.030).

**Section Summary: Acute Pain**

The evidence for the use of TENS from high-quality trials remains inconclusive for most indications of acute pain. A Cochrane review of TENS for acute pain (eg, cervical laser treatment, venipuncture, screening flexible sigmoidoscopy, postpartum uterine contractions, rib fractures) found some evidence that TENS reduces pain intensity over and above that seen with placebo, but the high risk of bias made definitive conclusions impossible. For the treatment of pain after total knee arthroplasty, 2 large RCTs found no benefit of TENS compared with sham TENS. For the prevention of migraine headaches, a small RCT reported a greater proportion of patients achieving at least 50% reduction in migraines with TENS than with sham placebo; the RCT also reported modest reductions in the number of total headache and migraine days. This manufacturer-sponsored trial needs corroboration before conclusions can be made about the efficacy of TENS for preventing migraine headaches. For the relief of pain during office-based hysteroscopy, an RCT found decreased pain and higher patient satisfaction in patients receiving TENS compared with placebo or control.

**Summary of Evidence**

For individuals who have chronic pain (eg, musculoskeletal, neuropathic, and mixed pain conditions) who receive TENS, the evidence includes numerous RCTs and systematic reviews. Relevant outcomes are symptoms, functional outcomes, quality of life, and medication use. The overall strength of the evidence is weak. The best evidence exists for treatment of chronic, intractable pain. Available evidence indicates that TENS can improve chronic intractable pain in some patients, and there is support for its use in clinical guidelines by specialty societies. To best direct TENS toward patients who will benefit, a short-term trial of TENS is appropriate, with continuation only in patients who show an initial improvement. The evidence is sufficient to determine that the technology results in a meaningful improvement in the net health outcome.

For individuals who have acute pain (eg, surgical, musculoskeletal, labor, and mixed pain conditions) who receive TENS, the evidence includes RCTs and systematic reviews. Relevant outcomes are symptoms and medication use. Overall, evidence for the use of TENS from high-quality trials remains inconclusive for most indications. A Cochrane review of TENS for acute pain (eg, cervical laser treatment, venipuncture, screening flexible sigmoidoscopy, postpartum uterine contractions, rib fractures) found some evidence that TENS reduces pain intensity over and above that seen with placebo, but the high risk of bias made definitive conclusions impossible. For the treatment of pain after total knee arthroplasty, 2 large RCTs found no benefit of TENS compared with sham TENS. For the prevention of migraine headaches, a small RCT reported a greater proportion of
patients achieving at least 50% reduction in migraines with TENS than with sham placebo, and modest reductions in the number of total headache and migraine days. This manufacturer-sponsored trial needs corroboration before conclusions can be made about the efficacy of TENS for preventing migraine headaches. For the relief of pain during office-based hysteroscopy, an RCT found decreased pain and higher patient satisfaction in patients receiving TENS compared with placebo or control. The evidence is insufficient to determine the effects of the technology on health outcomes.

**Supplemental Information**

**Clinical Input From Physician Specialty Societies and Academic Medical Centers**

While the various physician specialty societies and academic medical centers may collaborate with and make recommendations during this process, through the provision of appropriate reviewers, input received does not represent an endorsement or position statement by the physician specialty societies or academic medical centers, unless otherwise noted.

**2011 Input**

In response to requests, input was received through 3 physician specialty societies and 5 academic medical centers while this policy was under review in 2011. Input was generally in agreement with a 30-day trial to determine the efficacy of transcutaneous electrical nerve stimulation (TENS) for refractory chronic pain. However, the input did not agree that TENS should be considered not medically necessary for chronic low back pain.

**2009 Input**

In response to requests, input was received through 4 physician specialty societies (5 reviewers) and 3 academic medical centers (4 reviewers) while this policy was under review in 2009. Input was generally in agreement that TENS is investigational for the management of acute pain and for other conditions such as dementia. Input was for the most part in agreement that TENS is a generally accepted treatment modality and can be beneficial for the management of chronic pain in some patients. A trial period, similar to Medicare coverage guidelines, was recommended by some.

**Practice Guidelines and Position Statements**

**European Headache Federation**

The European Headache Federation (2013), citing concerns about an ineffective sham procedure for transcutaneous electrical nerve stimulation (TENS) in headache methodology studies and the overall limited level of evidence, recommended that there was insufficient evidence for the use of TENS in headache prophylaxis and to abort an acute headache.60
**Osteoarthritis Research Society International**
Guidelines from the Osteoarthritis Research Society International (2014) recommended that TENS was not appropriate for use in patients with multijoint osteoarthritis; moreover, the guidelines suggested that TENS has an uncertain value for the treatment of knee-only osteoarthritis pain.  

**National Comprehensive Cancer Network**
National Comprehensive Cancer Network guidelines on adult cancer pain (v.2.2017) indicate that nonpharmacologic interventions, including TENS, may be considered in conjunction with pharmacologic interventions as needed (category 2A).  

**National Cancer Institute**
National Cancer Institute (2014) guidelines on pain stated that noninvasive physical and psychosocial modalities can be used concurrently with drugs and other interventions to manage pain during all phases of cancer treatment. Moreover, the Institute suggested that patients with mild-to-moderate cancer pain may benefit from a trial of TENS to see if it is effective in reducing pain. TENS is a low-risk intervention.  

**North American Spine Society**
The North American Spine Society (2011) clinical guidelines on the diagnosis and treatment of cervical radiculopathy from degenerative disorders discussed the role of ancillary treatments such as bracing, traction, electrical stimulation, acupuncture, and TENS in the treatment of cervical radiculopathy from degenerative disorders. A consensus statement from the Society recommended that ozone injections, cervical halter traction, and combinations of medications, physical therapy, injections, and traction have been associated with improvements in patient-reported pain in uncontrolled case series. Such modalities may be considered, recognizing that no improvement relative to the natural history of cervical radiculopathy has been demonstrated.  

**American Academy of Neurology**
In 2010, the American Academy of Neurology published an evidence-based review of the efficacy of TENS for the treatment of pain in neurologic disorders. The Academy did not recommend TENS for the treatment of chronic low back pain due to lack of proven efficacy (level A, established evidence from 2 class I studies), and that TENS should be considered for the treatment of painful diabetic neuropathy (level B, probably effective, based on 2 class II studies).  

**American Society of Anesthesiologists et al**
The 2010 practice guidelines from the American Society of Anesthesiologists and American Society of Regional Anesthesia and Pain Medicine recommended that TENS be used as part of a multimodal approach to management for patients with chronic back pain and may be used for other pain conditions (eg, neck and phantom limb pain). The American Society of Anesthesiologists’ 1997 guidelines on chronic pain management recommended that an office or home trial of TENS
should be considered as an early management option or as an adjunctive therapy because of its low complexity and low risk.\textsuperscript{66}

**National Institute for Health and Care Excellence**
The National Institute for Health and Care Excellence (NICE) 2009 guidance on low back pain indicated that, despite the long history of use of TENS for back pain, the quality of research studies is poor.\textsuperscript{67} This guidance did not recommend TENS as a treatment due to lack of evidence of efficacy.

NICE 2008 guidance on osteoarthritis care and management in adults indicated that:

"[T]here is evidence that TENS is clinically beneficial for pain relief and reduction of stiffness in knee osteoarthritis, especially in the short term. However, this was not shown in a community setting. There is no evidence that efficacy trails off over time, or that periodic use for exacerbations is helpful.... People with osteoarthritis should be encouraged to experiment with intensities and duration of application if the desired relief of symptoms is not initially achieved. This enables patients’ control of their symptoms as part of a self-management approach. A further follow-up visit is essential in allowing the health professional to check patients’ usage of TENS and problem solve. No adverse events or toxicity have been reported with TENS."\textsuperscript{68}

NICE 2008 guidance on intrapartum care indicated there is high-level evidence that TENS was not an effective analgesic in established labor, and there was no high-level evidence on the analgesic effect of TENS in the latent phase of labor.\textsuperscript{69} NICE recommended that TENS not be offered to women in established labor.

**American Congress of Obstetricians and Gynecologists**
American Congress of Obstetricians and Gynecologists (ACOG) 2007 guidelines for women’s health care state that methods of neurostimulation, such as TENS, acupuncture, and massage, were based on the gate theory of pain control.\textsuperscript{70} These treatments can be useful for pain control, particularly when the pain is severe. The guidelines recommended that because different methods of treatment work by different mechanisms (eg, relaxation techniques, TENS, physical therapy, vocational rehabilitation, biofeedback), the use of multiple treatment modalities in synergy should be considered.

The 2004 ACOG guidelines on chronic pelvic pain found that clinical trials evaluating the efficacy of acupuncture, acupressure, and TENS therapies had been performed only for primary dysmenorrhea, not for nonmenstrual pelvic pain.\textsuperscript{71} The guidelines recommended that acupuncture, acupressure, and TENS therapies be considered to decrease the pain of primary dysmenorrhea.

The 2017 ACOG guidelines on labor and delivery found that TENS may “help women cope with labor more than directly affect pain scores.”\textsuperscript{72}
American College of Physicians
The American College of Physicians published guidelines on noninvasive therapies for acute and low back pain in 2017.\textsuperscript{73,74} No recommendations for TENS were made; the panel concluded that “evidence was insufficient to determine the effectiveness” of TENS and that there was no long-range data.

European Federation of Neurological Societies
The European Federation of Neurological Societies (2007) published guidelines on neurostimulation for neuropathic pain.\textsuperscript{75} The guidelines task force did not make conclusive recommendations, with only approximately 200 patients with different diseases, based on studies using different parameters and comparators, and having variable results. The task force concluded that standard high-frequency TENS is possibly (level C) better than placebo and probably (level B) worse than acupuncture-like or any other kind of electrical stimulation.

U.S. Preventive Services Task Force Recommendations
Not applicable.

Medicare National Coverage
The Centers for Medicare & Medicaid Services currently have the following national coverage decisions on TENS.\textsuperscript{76-80} The different coverage decisions address the use of TENS in the treatment of chronic intractable pain, noncoverage of TENS for chronic low back pain except to conduct research for said indication, and coverage for acute postoperative pain.

Ongoing and Unpublished Clinical Trials
Some currently unpublished trials that might influence this review are listed in Table 1.

Table 1. Summary of Key Trials

<table>
<thead>
<tr>
<th>NCT No.</th>
<th>Trial Name</th>
<th>Planned Enrollment</th>
<th>Completion Date</th>
</tr>
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<tbody>
<tr>
<td>Unpublished</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>NCT01641471\textsuperscript{a}</td>
<td>Prospective Evaluation of Transcutaneous Electrical Nerve Stimulation (TENS) for Pain Relief Following Total Knee Arthroplasty (TKA)</td>
<td>116</td>
<td>Jun 2015 (completed)</td>
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<tr>
<td>NCT01875042</td>
<td>Does Transcutaneous Electrical Nerve Stimulation (TENS) Affect Pain and Function in Patients With Osteoarthritis of the Knee? ETRELKA, a Randomised Controlled Trial</td>
<td>220</td>
<td>Aug 2015 (completed)</td>
</tr>
</tbody>
</table>

NCT: national clinical trial.
\textsuperscript{a} Denotes industry-sponsored or cosponsored trial.

References
2. Blue Cross and Blue Shield Association Technology Evaluation Center (TEC). TENS or PENS in the treatment of chronic and postoperative pain. TEC Assessments. 1996;Volume 11, Tab 21. PMID


**Billing Coding/Physician Documentation Information**

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<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>64550</td>
<td>Application of surface (transcutaneous) neurostimulator</td>
</tr>
<tr>
<td>A4556</td>
<td>Electrodes, per pair</td>
</tr>
<tr>
<td>A4557</td>
<td>Lead wires, per pair</td>
</tr>
<tr>
<td>A4558</td>
<td>Conductive paste or gel</td>
</tr>
<tr>
<td>A4595</td>
<td>TENS supplies, 2 leads per month</td>
</tr>
<tr>
<td>A4630</td>
<td>Replacement batteries for TENS</td>
</tr>
<tr>
<td>E0720</td>
<td>Tens, two lead, localized stimulation</td>
</tr>
<tr>
<td>E0730</td>
<td>Tens, four lead, larger area/multiple nerve stimulation</td>
</tr>
<tr>
<td>E0731</td>
<td>Form fitting conductive garment for delivery of tens (with conductive fibers)</td>
</tr>
<tr>
<td>E0762</td>
<td>Transcutaneous electrical joint stimulation device system, includes all accessories</td>
</tr>
<tr>
<td>L8679</td>
<td>Implantable neurostimulator, pulse generator, any type</td>
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**ICD-10 Codes:**

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<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>G89.21-</td>
<td>Chronic pain, not elsewhere classified, code range,</td>
</tr>
<tr>
<td>G89.8</td>
<td>Chronic pain syndrome</td>
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<tr>
<td>G89.4</td>
<td>Complex regional pain syndrome I (CRPS I), code range,</td>
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<td>G90.50-</td>
<td>Pain in joint, code range</td>
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<td>G90.59</td>
<td>Radiculopathy, code range</td>
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<td>M25.50-</td>
<td>Cervicalgia</td>
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<tr>
<td>M25.579</td>
<td>Sciatica, code range</td>
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<td>M54.10-</td>
<td>Lumbago with sciatica, code range</td>
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<td>M54.81</td>
<td>Pain, unspecified</td>
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<tr>
<td>M54.89</td>
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</table>
TENS units may be covered for Ford and BPU members when prescribed by a physician. Electrical stimulation (97014 or 97032) provided in the office setting is a covered benefit for Ford and BPU members.

97014, 97032 and G0283 may be billed, but are not correct for TENS.

There is no specific coding for the Cefaly device. It would most likely be reported with the miscellaneous durable medical equipment code E1399.

**Policy Implementation/Update Information**

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>10/1/88</td>
<td>New policy added to DME section. Considered medically necessary for chronic refractory pain and acute postoperative pain with criteria. Investigational for other indications.</td>
</tr>
<tr>
<td>1/1/01</td>
<td>No policy statement changes.</td>
</tr>
<tr>
<td>1/1/02</td>
<td>Policy statement revised to require a one month trial period when used for chronic refractory pain.</td>
</tr>
<tr>
<td>1/1/03</td>
<td>No policy statement changes.</td>
</tr>
<tr>
<td>3/1/04</td>
<td>Policy statement revised to indicate TENS is investigational for the management of chronic or postoperative pain and to relieve pain of labor and vaginal delivery is considered.</td>
</tr>
<tr>
<td>8/1/04</td>
<td>Policy revised to indicate TENS used in the office setting is considered investigational. A considerations statement added indicating TENS units may be covered for Ford members when prescribed by a physician.</td>
</tr>
<tr>
<td>10/1/04</td>
<td>Consideration section updated to add coverage for BPU members. Also included electrical stimulation provided in the office would be a benefit for Ford and BPU members.</td>
</tr>
<tr>
<td>3/1/05</td>
<td>Policy statement revised to include the use of TENS for the treatment of dementia as investigational.</td>
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<td>9/1/05</td>
<td>No policy statement changes.</td>
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<td>3/1/06</td>
<td>No policy statement changes.</td>
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<td>9/1/07</td>
<td>No policy statement changes.</td>
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<td>9/1/08</td>
<td>Policy statements revised to differentiate acute and chronic pain conditions; remains investigational; updated with literature review; older rationale updates condensed; references reordered and new references added.</td>
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<tr>
<td>9/1/09</td>
<td>Policy statement revised; TENS may be medically necessary for chronic pain if effective during a therapeutic trial; other uses of TENS considered investigational. This change is made retroactive to 7/9/09. However, benefit language on most contracts would exclude this service.</td>
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<td>9/1/10</td>
<td>No policy statement changes.</td>
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<td>9/1/12</td>
<td>No policy statement changes.</td>
</tr>
<tr>
<td>9/1/13</td>
<td>No policy statement changes.</td>
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<tr>
<td>9/1/14</td>
<td>Last policy statement revised to specifically list use of TENS in prevention of migraine headaches as investigational.</td>
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State and Federal mandates and health plan contract language, including specific provisions/exclusions, take precedence over Medical Policy and must be considered first in determining eligibility for coverage. The medical policies contained herein are for informational purposes. The medical policies do not constitute medical advice or medical care. Treating health care providers are independent contractors and are neither employees nor agents Blue KC and are solely responsible for diagnosis, treatment and medical advice. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, photocopying, or otherwise, without permission from Blue KC.