Coverage Guidelines

Neuromuscular Electrical Stimulation (NMES)

Disclaimer:
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For self-funded plans, consult individual plan documents. If there is a conflict between this policy and a self-funded plan document, the provisions of the plan document will govern. In addition, coverage for Medicare Advantage members may differ. This is a result of applicable coverage statements by the Center for Medicare and Medicaid Services (CMS). The National Coverage Determinations, Local Coverage Determinations, and Local Medical Review Policies may be found at the CMS website, http://www.cms.gov. Please note that for all plans, the member’s health plan benefits that are in effect on the rendered date of service must be used in coverage determinations.

DEFINITION

Elderly patients and patients with advanced progressive or chronic disease often experience muscle weakness, which can impact adversely on their ability to be independent and diminish their quality of life. In those patients who are unable or unwilling to undertake whole-body physical therapy or exercise programs (e.g., patients who are critically ill in an intensive-care environment or suffer difficult debilitation from severe chronic disease) neuromuscular electrical stimulation (NMES) may be an alternative treatment to enhance muscle strength. In some institutions NMES has earned an adjunctive role in muscle strengthening in the post-operative setting following certain orthopedic procedures (e.g., total knee arthroplasty [TKA]).

Conversely, NMES also abets an advantage to hospital or clinic-based techniques of physical rehabilitation because it is inexpensive and transportable. Used in the home, NMES has the potential to impact the rate of falls and patient injury in the domestic setting, a major cause of morbidity and mortality among all age groups. NMES may also have a role as an adjunct to certain nerve paralysis therapies in treating aspects of muscle spasticity in adults and children.
COVERAGE CRITERIA

Baptist Health Plan considers the use of NMES to be clinically proven and, therefore, medically necessary when any of the following criteria are met:

- Indication of thermal burn injury (e.g., contractures), or
- Indication of complete joint replacement (e.g., prior to rehabilitative physical therapy), or
- Indication of prolonged immobilization or disuse (e.g., prolonged casting).

Baptist Health Plan considers the use of a NMES form-fitting conductive garment to be clinically proven and, therefore, medically necessary when any of the following criteria are met:

- Conventional placement of NMES is contraindicated (e.g., severe dermatologic condition precluding fixation of electrodes to the skin), or
- Difficulty exists to fixation of NMES (e.g., plaster of paris cast), or
- Extent, duration or number of treatment sites precludes conventional NMES placement.

All other uses of NMES are considered clinically unproven and investigational, and therefore not medically necessary.

The type of NMES that is used to enhance the ability to walk of spinal cord injury (SCI) patients is commonly referred to as functional electrical stimulation (FES) and its practice is not addressed in this policy. The use of NMES devices to enhance the ability to walk of spinal cord injury patients is limited to devices falling into the category of FES devices and is not addressed in this policy.

MEDICAL BACKGROUND

A systematic review evaluated the medical evidence on the effect of lower limb NMES as a training technique for healthy elderly rehabilitation. Training programs either used NMES alone or NMES associated with voluntary muscle contraction (NMES+). Therapy targeted at calves or thigh muscles and training length and intensity were heterogeneous, but all studies noted positive effects of NMES on the elderly's functional status. NMES improved functional and molecular muscle physiology, and led to better gait and balance performances (especially among less active elderly). Given the association between gait, balance and the risk of falls among the elderly, future research should focus on the efficiency of NMES to reduce the high fall rate among this population.

A Cochrane review evaluated the effectiveness of NMES on quadriceps muscle strength in 933 adults with advanced disease (i.e., chronic respiratory disease, chronic heart failure, cancer, or HIV/AIDS) with regard to the safety and acceptability of NMES, and its effect on peripheral muscle function (strength or endurance), muscle mass, exercise capacity, breathlessness, and health-related quality of life. Most studies had a risk of bias arising from a lack of participant or assessor blinding and small study size. The quality of the evidence was low for quadriceps muscle strength, moderate for occurrence of adverse events, and very low to low for all other secondary outcomes. A common pitfall in the studies was inconsistency among study findings and imprecision regarding estimates of effect. The included studies reported no serious adverse events and a low incidence of muscle soreness following NMES.
The authors noted that NMES led to a statistically significant improvement in quadriceps muscle strength as compared to the control (12 studies; 781 participants; SMD 0.53, 95% confidence interval (CI) 0.19 to 0.87), equating to a difference of approximately 1.1 kg. An increase in muscle mass was also observed following NMES, though the observable effect appeared dependent on the assessment modality used (eight studies, 314 participants). Across tests of exercise performance, mean differences compared to control were statistically significant for the 6-minute walk test (seven studies; 317 participants; 35 m, 95% CI 14 to 56), but not for the incremental shuttle walk test (three studies; 434 participants; 9 m, 95% CI -35 to 52), endurance shuttle walk test (four studies; 452 participants; 64 m, 95% CI -18 to 146), or for cardiopulmonary exercise testing with cycle ergometry (six studies; 141 participants; 45 mL/minute, 95% CI -7 to 97). The authors concluded that NMES may be an effective treatment for muscle weakness in adults with advanced progressive disease, and could be considered as an exercise treatment for use within rehabilitation programs.

A systematic review and meta-analysis evaluated NMES for 276 patients with moderate to severe chronic obstructive pulmonary disease (COPD) who also experienced skeletal muscle dysfunction. The authors posited that for those patients who are unable or unwilling to undertake physical training VMES may provide an alternative method of rehabilitation. NMES contributed to statistically improved quadricep strength (standardized mean difference 1.12, 95% confidence interval [CI] 0.64-1.59, I2=54%; P<0.00001) and exercise capacity, including longer exercise distance (weighted mean difference 51.53, 95% CI 20.13-82.93, I2=90%; P=0.001), and longer exercise endurance (standardized mean difference 1.11, 95% CI 0.14-2.08, I2=85%; P=0.02). There was no significant difference in St George’s Respiratory Questionnaire scores (weighted mean difference -0.07, 95% CI -2.44 to 2.30, I2=56%; P=0.95). The authors concluded that NMES appears an effectual means of enhancing quadricep strength and exercise capacity in moderate-to-severe COPD patients.

A systematic review assessed the proposition that NMES is efficacious as a method of training in congestive heart failure (CHF) and could be performed in patients unable to participate in standard exercise training. 13 studies met the study criteria. Neuromuscular electrical stimulation resulted in improvement in peak oxygen uptake O2 (4.86 mL·kg ·min; 95% CI, 2.81-6.91), 6-minute walk test (6MWT) distance (63.54 m; 95% CI, 35.81-91.27), muscle strength (30.74 N; 95% CI, 3.67-57.81), flow-mediated dilatation (2.67%; 95% CI, 0.86-4.49), depressive symptoms (-3.86; 95% CI, -6.46 to -1.25), and global quality of life (0.89; 95% CI, 0.55-1.24). Nonsignificant differences in O2 peak, 6MWT, and quality of life were found for participants in the exercise group compared with NMES. The authors concluded that NMES improved peak O2, 6MWT distance, quality of life, muscle strength, endothelial function, and depressive symptoms in patients with HF and should be considered for inclusion in cardiac rehabilitation for selected patients.

A systematic review evaluated whether swallow treatment with NMES is superior to that without this modality of treatment, and whether NMES alone is superior to swallow therapy. Eight studies were identified.5 For the comparison "swallow treatment with neuromuscular electrical stimulation vs. swallow treatment without neuromuscular electrical stimulation," the authors found a significant standardized mean difference (SMD) of 1.27 (95% confidence interval (CI) = 0.51-2.02, P = 0.001) with significant heterogeneity (I(2) = 85%). The meta-analysis for the comparison of neuromuscular electrical stimulation alone and swallow therapy demonstrated a non-significant SMD of 0.25 (95% CI = -0.16-0.65, P = 0.23) without significant heterogeneity (I(2) = 16%). They concluded that swallow treatment with NMES seems to be more effective than that without NMES for post-stroke dysphagia in the short term. Evidence was insufficient to indicate that NMES alone was superior to swallow therapy.
A prospective study of 50 patients with a prognosticated prolonged stay of at least 6 day ICU stay administered twenty-five minutes of simultaneous bilateral NMES of the quadriceps femoris muscle 5 days per week (Monday-Friday). Effective muscle stimulation was defined as a palpable and visible contraction (partial or full muscle bulk). In 50% of the patients, an adequate quadriceps contraction was obtained in at least 75% of the NMES sessions. Univariate analysis showed that lower limb edema (P<.001), sepsis (P=.008), admission to the medical ICU (P=.041), and treatment with vasopressors (P=.011) were associated with impaired quadriceps contraction. A backward multivariate analysis identified presence of sepsis, lower limb edema, and use of vasopressors as independent predictors of impaired quadriceps contraction (R2=59.5%). Patients responded better to NMES in the beginning of their ICU stay in comparison with after 1 week of ICU stay. There was no change in any of the safety endpoints with NMES. The authors concluded that critically ill patients having sepsis, edema, or receiving vasopressors were less likely to respond to NMES with an adequate quadriceps contraction, but that in many critically ill patients, NEMS is a safe intervention to be administered in the ICU.

Another systematic review and meta-analysis evaluated NMES in the critical care setting, when compared with usual care, under all domains of the World Health Organization, International Classification of Functioning, Disability and Health (ICF) framework. Twelve full-text articles, eleven RCTs and one case-control trial indicated the potential of NMES to preserve muscle mass and joint range of motion, improve outcomes of ventilation, and reduce activity limitations. Meta-analysis from three RCTs supported NMES to preserve muscle strength using a fixed-effects model [n = 146; standardized mean difference 0.93 (0.51, 1.35) P = 0.0002]; however, significant heterogeneity was recorded. No outcomes evaluated the effect on participation restrictions. The authors concluded that NMES, as an adjunct to current rehabilitation practices in critically ill patients, may maintain muscle strength.

A systematic review assessed whether electrical stimulation (ES), when used in conjunction with a standard treatment, can reduce levels of functional impairment, edema, and pain compared to a standard treatment alone, in patients following a lateral ankle sprain. Four RCTs examined NMES and high-voltage pulsed stimulation were the only two ES modalities utilized. Effect sizes and 95% confidence intervals (CI) were estimated using Cohen’s d for comparison between treatment groups. Three of four effect sizes for function had 95% CI that crossed zero. Twenty-four of the thirty-two effect sizes for edema had 95% CI that crossed zero. All effect sizes for pain had 95% CI that crossed zero. The authors concluded that the use of ES is not recommended as a means to improve function, reduce edema, or decrease pain in the treatment of acute lateral ankle sprains.

A long-term case study evaluated the cumulative deficits in quadriceps femoris muscle strength and impaired muscle activation in an individual status post TKA. The authors sought to implement a NMES treatment protocol in conjunction with an intense weight-training program, with the aim of reversing persistent quadriceps muscle impairments after TKA. The patient was a 62-year-old male cyclist 12 months following simultaneous, bilateral TKA with impairments in left quadriceps strength and volitional muscle activation. His left quadriceps strength was 26% weaker than his right and central activation ratio (CAR) of his left quadriceps was 13% lower than his right quadriceps CAR. NMES to the left quadriceps was implemented for 6 weeks, in addition to an intense volitional weight-training program with emphasis on unilateral lower extremity exercises. The patient demonstrated a 25% improvement in left quadriceps femoris maximal volitional force output following 16 treatments of combined NMES and volitional strength training over a 6-week period. The patient's volitional muscle activation improved from a CAR of 0.83 before treatment to 0.97 after treatment. At discharge from physical therapy and at his 18-month postoperative follow-up, the patient's left quadriceps strength was only 4%
lower than his right quadriceps strength. At the 24-month follow-up, the patient’s left quadriceps strength was 6% stronger than his right quadriceps strength. The authors concluded that 6 weeks of NMES and an intense strengthening program may have the potential to reverse persistent strength-related impairments following TKA.

A systematic review assessed the effectiveness of NMES as a means of improving quadriceps strength before and after total knee replacement.¹⁰ Only two studies were included in the review. Neither study presented results in a form suitable for meta-analysis. The authors of both studies were contacted to obtain the raw data but they were no longer available. No significant differences were reported in either study for maximum voluntary isometric torque or endurance between the NMES group and the control group but significantly better quadriceps muscle activation was reported in the exercise and NMES group compared with the exercise group alone in the second study. This difference was significant at the mid training (six week) time point but not at the twelfth week post training time point. Further analysis of both studies was not possible due to the absence of raw data scores. Mean values were not given for strength, endurance, cross sectional area or quality of life. Pain outcomes, patient satisfaction or adverse effects were not reported in either study. The authors felt that the data does not permit any conclusions to be made about the application of NMES for the purposes of quadriceps strengthening before or after total knee replacement.

A systematic review of nine RCTs sought to assess NMES as adjunct to botulinum toxin-A (BTX-A) in treatment of adult muscular spasticity.¹¹ The authors posited that NMES boosts neuroparesis activity and that the combination of BTX-A and NMES is more effective than BTX-A alone in reducing spasticity in adults. Trials varied in methodological quality, size, and outcome measures used. No study investigating BTX-A plus TENS was included in the review. BTX-A plus ES produced significant reduction in spasticity on the Ashworth Scale (AS) and on the modified AS in seven studies, but only four showed high quality on the PEDro scale. Significant reduction in compound muscular action potential (CMAP) amplitude was detected after BTX-A plus ES in two studies. The authors concluded that ES as an adjunctive therapy to BTX-A may boost BTX-A action in reducing adult spasticity, but ES variability makes it difficult to recommend the combined therapy in clinical practice.

A systematic review of the impact of different injection-guiding techniques on the effectiveness of BOTX-A for the treatment of focal spasticity and dystonia found strong evidence that instrumented guiding (ultrasonography [US], electrical stimulation [ES], electromyogram [EMG]) was more effective than manual needle placement for the treatment of spasmodic torticollis, upper limb spasticity, and spastic equinus in patients with stroke, and spastic equinus in children with cerebral palsy.¹² Three studies provided strong evidence of similar effectiveness of US and ES for upper and lower limb spasticity in patients with stroke, and spastic equinus in children with cerebral palsy, but there was poor evidence or no available evidence for EMG or other instrumented techniques. The authors strongly recommended instrumented guidance of BOTX-A injection for the treatment of spasticity in adults and children.

REGULATORY INFORMATION

Kentucky – No legislative mandates were found for coverage of NMES for muscular re-education.

Indiana – No legislative mandates were found for coverage of NMES for muscular re-education.

Tennessee – No legislative mandates were found for coverage of NMES for muscular re-education.
education.

The Center for Medicare and Medicaid Services (CMS) has issued a National Coverage Determination (NCD) regarding NMES. The directive addresses use of NMES in situations of muscle atrophy:

“Coverage of NMES to treat muscle atrophy is limited to the treatment of disuse atrophy where nerve supply to the muscle is intact, including brain, spinal cord and peripheral nerves, and other non-neurological reasons for disuse atrophy. Some examples would be casting or splinting of a limb, contracture due to scarring of soft tissue as in burn lesions, and hip replacement surgery (until orthotic training begins).”

The use of NMES to enhance the ability to walk of spinal cord injury patients is limited to practices and devices falling into the category of FES and is not addressed in this policy.

### COVERAGE DETAIL

For self-funded plans, consult individual plan documents. If there is a conflict between this policy and a self-funded plan document, the provisions of the plan document will govern.

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<thead>
<tr>
<th>CPT Codes</th>
<th>Description</th>
<th>Coverage Information</th>
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<th>HCPC Codes</th>
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<td>A4556</td>
<td>Electrodes (e.g., apnea monitor), per pair</td>
<td>Medically necessary when criteria are met</td>
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<td>A4558</td>
<td>Conductive gel or paste, for use with electrical device (e.g., TENS, NMES)</td>
<td>Medically necessary when criteria are met</td>
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<tr>
<td>A4595</td>
<td>Electrical stimulator supplies, 2 lead, per month, (e.g., TENS, NMES)</td>
<td>Medically necessary when criteria are met</td>
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<tr>
<td>E0731</td>
<td>Form-fitting conductive garment for delivery of TENS or NMES (with conductive fibers separated from the patient’s skin by layers of fabric)</td>
<td>Medically necessary when criteria are met</td>
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<tr>
<td>E0744</td>
<td>Neuromuscular stimulator for scoliosis</td>
<td>Not medically necessary and/or experimental/investigational</td>
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<tr>
<td>E0745</td>
<td>Neuromuscular stimulator, electronic shock unit</td>
<td>Medically necessary when criteria are met</td>
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ICD.9® Procedure Codes | Description | Coverage Information
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No codes identified

REFERENCES


12. Grigoriu AI, Dinomais M, Rémy-Néris O, Brochard S. Impact of Injection-Guiding Techniques on the Effectiveness of Botulinum Toxin for the Treatment of Focal