



KAISER PERMANENTE[®]
Mid-Atlantic States

**Functional Electrical Stimulation (FES)
Neuromuscular Electrical Stimulation (NMES)
Medical Coverage Policy**

Utilization *ALERT*

- Prior to use of this MCP for evaluation of medical necessity, benefit coverage **MUST** be verified in the member's EOC or benefit document.
- For Medicare members, please refer to CMS guidelines through Medicare Coverage Database requirements.
- Note: After searching the Medicare Coverage Database, if no NCD/LCD/LCA is found, then use the policy referenced above for coverage guidelines

I. Procedure: Functional Electrical Stimulation (FES), Neuromuscular Electrical Stimulation (NMES)

II. Specialty: Neurology, Physical Medicine and Rehabilitation, Orthopedics

III. Coverage and Indications

- A.** NMES are covered for muscle disuse atrophy due to an immobilized extremity when the following criteria are met:
1. Intact nerve supply to the muscle; **and**
 2. Contractures due to burn scarring; **or**
 3. Prolonged immobilization due to casting or splinting; **or**
 4. Total knee replacement with failure to respond to physical therapy; **or**
 5. Recent hip replacement surgery before PT begins only
- B.** NMES for walking (FES) will be limited to spinal cord injury patients who do not have any of the contraindications as listed in section IV of the policy and meet **ALL** the following criteria:
1. Member has intact lower motor units (L1 and below, both muscle and peripheral nerves); **and**
 2. Member has joint stability to bear weight and upper and lower extremities; and has balance and control to maintain an upright posture independently; **and**
 3. Member demonstrated brisk muscle contraction to neuromuscular electrical stimulation and has sensory perception of electrical stimulation sufficient for muscle contraction; **and**
 4. Member has the cognitive ability to use such devices for walking and is highly motivated to use the device long term; **and**
 5. Member can transfer independently and stand for at least 3 minutes; **and**
 6. Member possesses hand and finger function to manipulate the controls; **and**
 7. Member is at least 6 months post recovery of spinal cord injury and restorative surgery; **and**
 8. Member does not have hip and knee degenerative disease and has no history of long bone fracture secondary to osteoporosis; **and**
 9. The member has successfully completed a training program, which consist of at least 32 physical therapy sessions with the device over a three-month period; **and**



10. The patient demonstrates a willingness to use the device long term.

- C. Replacement of a FES for walking is medically necessary when the following are met:
1. The original FES has met the criteria as medically necessary; **and**
 2. The original FES is no longer under warranty and cannot be repaired.

IV. Contraindications

FES and NMES are contraindicated in patients with the following:

- A. Autonomic dysreflexia; **or**
- B. Individual with cardiac pacemaker; **or**
- C. Presence of irreversible contracture; **or**
- D. Presence of skin disease or cancer at area of stimulation; **or**
- E. Severe osteoporosis; **or**
- F. Severe scoliosis

V. Exclusions

All other uses of NMES remain non-covered. These uses are considered experimental or investigational as they are not identified to be widely used and generally accepted for the proposed use, as reported in nationally recognized peer reviewed medical literature published in the English language.

- A. **ERGYS, RT200 Elliptical, RT300 FES cycle ergometer** (also referred to as a FES bicycle) or the **RT600 Step and Stand Rehabilitation Therapy System** for stationary exercise to prevent or reduce muscle atrophy in upper and lower extremities in individuals with hemiplegia or quadriplegia; **or**
- B. **NESS H200 Handmaster NMS1 system** used for upper limb paralysis or hemiplegia; **or**
- C. **NESS L300 Foot Drop System or the NESS L300 Plus System** used for foot drop, in children and adults, because of cerebral palsy, multiple sclerosis, traumatic brain injury, stroke or an incomplete spinal cord injury; **or**
- D. **Walkaide or ODFS Dropped Foot Stimulator** used for foot drop because of cerebral palsy, multiple sclerosis, traumatic brain injury, stroke, or an incomplete spinal cord injury.



VI. References

1. Bioness Functional Electrical (Peroneal Nerve) Stimulators for Foot Drop SCPMG. January 2017 accessed from INTC 12/15/2017.
2. Bioness Upper Extremity Functional Electrical Stimulation SCPMH January 2017 accessed from INTC 12/15/2017.
3. CMS National Coverage Determination (NCD) for Neuromuscular Electrical Stimulation (NMES). (160.12) accessed 12/10/2017
4. Northwest Kaiser DME Clinical Criteria for NMES. accessed 12/15/2017.
5. Kaiser Permanente California DME Formulary: Functional Electrical Stimulator, transcutaneous stimulation of nerve and/or muscle groups, any type, complete system, not otherwise specified Category: Functional Electrical Stimulator accessed 12/15/2017.
6. Meng L; Porr B; Macleod CA; Gollee H, A functional electrical stimulation system for human walking inspired by reflexive control principles.(English); Abstract available. Proceedings of The Institution of Mechanical Engineers. Part H, Journal of Engineering In Medicine [Proc Inst Mech Eng H], ISSN: 2041-3033, 2017 Apr; Vol. 231 (4), pp. 315-325; Publisher: Sage; PMID: 28332444, Database: MEDLINE
7. Springer, Shmuel; Khamis, Sam.Review article: Effects of functional electrical stimulation on gait in people with multiple sclerosis – A systematic review . *Multiple Sclerosis and Related Disorders*. April 2017 13:4-12 Language: English. DOI: 10.1016/J.MASARD.2017.01.010, Database: Science Direct.
8. Salazar, Ana Paula; Pagnussat, Aline Souza; Pereira, Gabriela Alves; Scopel, Gabriela; Lukrafka, Janice Luisa. Systematic Review: Neuros muscular electrical stimulation to improve gross motor function in children with cerebral palsy: a meta-analysis *Brazilian Journal of Physical Therapy*. August 2018. Language. DOI: 10.1016/j.bjpt.2019.01.006. Database: Science Direct.
9. Gomes da Silva, Claudia Ferreira; Lima e Silva, Felipe Xavier de; Vianna, Karoline Baptista; Oliveira, Gabriel dos Santos; Vaz, Marco Aurelio; Baroni, Bruno Manfredini. Original Research: Eccentric training combined to neuromuscular electrical stimulation is not superior to eccentric training alone for quadriceps strengthening in healthy subjects: a randomized controlled trial *Brazilian Journal of Physical Therapy*. November-December 2018 22(6): 502-511 Language: English. DOI: 10.1016/j.bjpt.2018.03.006, Database: Science Direct.
10. Chou, C.H.; Hwang, Y.S; Chen, C.C.; Chen, S, C.; Lai, C. H.; Chen, Y.L. FES for abnormal movement of upper limb during walking in post-stroke subjects. *Technology & Health Care*. 2014, Vol. 22 Issue 5, p751-758. 8p DOI: 10.3233/THC-140836., Database: MEDLINE.
11. CMS National Coverage Determination (NCD) for Neuromuscular Electrical Stimulation (NMES) (160.12) Publication # 100-3. Manual Section # 160.12. Accessed 01.12.2020
<https://www.cms.gov/medicare-coverage-database/details/ncd-details.aspx?NCDId=175&ncdver=2&DocID=160.12&clickon=search&bc=gAAAAAgAAAAAA%3d%3d&>
12. CMS National Coverage Determination (NCD) for Electrical Nerve Stimulators (160.7) Publication # 100-3. Manual Section # 160.7. Accessed 01.12.2020



<https://www.cms.gov/medicare-coverage-database/details/ncd-details.aspx?NCDId=240&ncdver=1&DocID=160.7&clickon=search&bc=gAAAAAgAAAAAA%3d%3d&>

13. Miller-Renfrew, L, Lord, A; Warren, J; Hunter, R. Evaluating the Effect of Functional Electrical Stimulation Used for Foot Drop on Aspects of Health-Related Quality of Life in People with Multiple Sclerosis. [Int J MS Care](#). 2019 Jul-Aug; 21(4): 173–182. doi: 10.7224/1537-2073.2018-015. Accessed 01.12.2020
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6709571/>
14. Andreopoulou G, Mercer TH, Van der Linden ML. Walking measures to evaluate assistive technology for foot drop in multiple sclerosis: A systematic review of psychometric properties. *Gait Posture*. 2018 Mar; 61:55-66. doi: 10.1016/j.gaitpost.2017.12.021.
15. Medrinal C, et al. Functional electrical stimulation-a new therapeutic approach to enhance exercise intensity in chronic obstructive pulmonary disease patients: a randomized, controlled crossover trial. *Archives of Physical Medicine and Rehabilitation* 2018;99(8):1454-1461. DOI: 10.1016/j.apmr.2018.02.002.
16. Gorgey, A. S., Khalil, R. E., Davis, J. C., Carter, W., Gill, R., Rivers, J., Khan, R., Goetz, L. L., Castillo, T., Lavis, T., Sima, A. P., Lesnefsky, E. J., Cardozo, C. C., & Adler, R. A. (2019). Skeletal muscle hypertrophy and attenuation of cardio-metabolic risk factors (SHARC) using functional electrical stimulation-lower extremity cycling in persons with spinal cord injury: study protocol for a randomized clinical trial. *Trials*, 20(1), 526. <https://doi.org/10.1186/s13063-019-3560-8>
17. Kapadia, N., Moineau, B., & Popovic, M. R. (2020). Functional Electrical Stimulation Therapy for Retraining Reaching and Grasping After Spinal Cord Injury and Stroke. *Frontiers in neuroscience*, 14, 718. <https://doi.org/10.3389/fnins.2020.00718>
18. Liu, M., Luo, J., Zhou, J., & Zhu, X. (2020). Intervention effect of neuromuscular electrical stimulation on ICU acquired weakness: A meta-analysis. *International journal of nursing sciences*, 7(2), 228–237. <https://doi.org/10.1016/j.ijnss.2020.03.002>
19. Alamer, A., Melese, H., & Nigussie, F. (2020). Effectiveness of Neuromuscular Electrical Stimulation on Post-Stroke Dysphagia: A Systematic Review of Randomized Controlled Trials. *Clinical interventions in aging*, 15, 1521–1531. <https://doi.org/10.2147/CIA.S262596>
20. Uwamahoro, R., Sundaraj, K., & Subramaniam, I. D. (2021). Assessment of muscle activity using electrical stimulation and mechanomyography: a systematic review. *Biomedical engineering online*, 20(1), 1. <https://doi.org/10.1186/s12938-020-00840-w>
21. Pring, E. T., Gould, L. E., Malietzis, G., Lung, P., Bharal, M., Fadodun, T., Bassett, P., Naghibi, M., Taylor, C., Drami, I., Chauhan, D., Street, T., Francis, N. K., Athanasiou, T., Saxton, J. M., Jenkins, J. T., & BiCyCLE Research Group (2021). BiCyCLE NMES-neuromuscular electrical stimulation in the perioperative treatment of sarcopenia and myosteatosis in advanced rectal cancer patients: design and methodology of a phase II randomised controlled trial. *Trials*, 22(1), 621. <https://doi.org/10.1186/s13063-021-05573-2>
22. Gorgey, A. S., Lai, R. E., Khalil, R. E., Rivers, J., Cardozo, C., Chen, Q., & Lesnefsky, E. J. (2021).



Neuromuscular electrical stimulation resistance training enhances oxygen uptake and ventilatory efficiency independent of mitochondrial complexes after spinal cord injury: a randomized clinical trial. *Journal of applied physiology* (Bethesda, Md.: 1985), 131(1), 265–276.

<https://doi.org/10.1152/jappphysiol.01029.2020>

23. Burgess, L. C., Venugopalan, L., Badger, J., Street, T., Alon, G., Jarvis, J. C., Wainwright, T. W., Everington, T., Taylor, P., & Swain, I. D. (2021). Effect of neuromuscular electrical stimulation on the recovery of people with COVID-19 admitted to the intensive care unit: A narrative review. *Journal of rehabilitation medicine*, 53(3), jrm00164. <https://doi.org/10.2340/16501977-2805>
24. Johnston, Therese E. PT, MSPT, PhD, MBA*; Keller, Sarah PT, DPT, NCS; Denzer-Weiler, Caitlin PT, DPT, NCS; Brown, Lisa Brown, PT, DPT, NCS*. A Clinical Practice Guideline for the Use of Ankle-Foot Orthoses and Functional Electrical Stimulation Post-Stroke. *Journal of Neurologic Physical Therapy* 45(2): p 112-196, April 2021. | DOI: 10.1097/NPT.0000000000000347
25. Nevisipour, M., & Honeycutt, C. F. (2022). Investigating the underlying biomechanical mechanisms leading to falls in long-term ankle-foot orthosis and functional electrical stimulator users with chronic stroke. *Gait & posture*, 92, 144–152. <https://doi.org/10.1016/j.gaitpost.2021.11.025>
26. Marquez-Chin, C., Popovic, M.R. Functional electrical stimulation therapy for restoration of motor function after spinal cord injury and stroke: a review. *BioMed Eng OnLine* 19, 34 (2020). <https://doi.org/10.1186/s12938-020-00773-4>
27. Lago AF, Basile-Filho A, de Oliveira AS, de Souza HCD, dos Santos DO, et al. Effects of physical therapy with neuromuscular electrical stimulation in acute and late septic shock patients: A randomised crossover clinical trial. *PLOS ONE* (2022) 17(2): e0264068. <https://doi.org/10.1371/journal.pone.0264068>
28. MCG 28th edition. Copyright 2024. MCG Health Care guideline. Ambulatory Care ACG: A-0507 (AC). Electrical Stimulation, Functional and Neuromuscular Accessed: 12/15/2023
29. Functional Electrical Stimulation for Drop Foot of Central Neurological Origin. NICE Interventional Procedure Guidance IPG 278 [Internet] National Institute for Health and Care Excellence. Accessed: 1/4/2024. <https://www.nice.org.uk/guidance/ipg278/resources/functional-electrical-stimulation-for-drop-foot-of-central-neurological-origin-pdf-1899865584562885>
30. Pool, D., Valentine, J., Bear, N., Donnelly, C. J., Elliott, C., & Stannage, K. (2015). The orthotic and therapeutic effects following daily community applied functional electrical stimulation in children with unilateral spastic cerebral palsy: a randomised controlled trial. *BMC pediatrics*, 15, 154. <https://doi.org/10.1186/s12887-015-0472-y>
31. Novak, S., Guerron, G., Zou, Z., Cheung, G., & Berteau, J. P. (2020). New Guidelines for Electrical Stimulation Parameters in Adult Patients With Knee Osteoarthritis Based on a Systematic Review of the Current Literature. *American journal of physical medicine & rehabilitation*, 99(8), 682–688. <https://doi.org/10.1097/PHM.0000000000001409>



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Approval History

Effective June 01, 2016, state filing is no longer required per Maryland House Bill HB 798 – Health Insurance – Reporting

Date approved by RUMC*	Date of Implementation
05/29/2018	05/29/2018
05/28/2019	05/28/2019
05/14/2020	05/14/2020
05/04/2021	05/04/2021
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*The Regional Utilization Management Committee received delegated authority in 2011 to review and approve designated Utilization Management and Medical Coverage Policies by the Regional Quality Improvement Committee.

Note: Kaiser Permanente Mid-Atlantic States (KPMAS) include referral and authorization criteria to support primary care and specialty care practitioners, as appropriate, in caring for members with selected conditions. Medical Coverage Policies are not intended or designed as a substitute for the reasonable exercise of independent clinical judgment by a practitioner in any particular set of circumstances for an individual member.

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