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Sensory Stimulation for Coma Patients

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Related Policies (if applicable)
None

Disclaimer

Carefully check state regulations and/or the member contract.
Each benefit plan, summary plan description or contract defines which services are covered, which services are excluded, and which services are subject to dollar caps or other limitations, conditions or exclusions. Members and their providers have the responsibility for consulting the member's benefit plan, summary plan description or contract to determine if there are any exclusions or other benefit limitations applicable to this service or supply. **If there is a discrepancy between a Medical Policy and a member's benefit plan, summary plan description or contract, the benefit plan, summary plan description or contract will govern.**

Coverage

Sensory stimulation for coma patients **is considered experimental, investigational and/or unproven**.

Policy Guidelines

None.

Description

Sensory stimulation is intended to promote awakening and enhance the rehabilitative potential of coma patients. Protocols may involve stimulation of any or all of the following senses:

- Visual,
- Auditory,
- Olfactory,
- Gustatory,

- Cutaneous,
- Kinesthetic.

Various stimuli may be used for each sense. Protocols may differ by who performs the stimulation and where it is performed. Professionals providing the stimulation may include:

- Nurses,
- Occupational therapists,
- Physical therapists,
- Speech-language therapists.

In some cases, family members may be trained in the techniques and are given primary responsibility for providing the therapy. Treatment may be delivered in the hospital, at home or a nursing home.

Sensory stimulation methods vary greatly, from one or two hourly sessions a day, to shorter sessions every hour for 12 to 14 hours a day.

Rationale

In 1991, Wood published a critique of coma stimulation that pointed out that the incomplete knowledge regarding information processing in the brain-injured state does not permit a scientific or theoretical basis for coma stimulation. For example, Wood points out that the brain-injured patient is constantly exposed to sensory stimulation (e.g., skin care, range of motion exercises, bowel and bladder procedures, ambient noise in an intensive care unit), aside from any specific program of sensory stimulation. In many cases, continual background stimulation may lead to habituation and thus, ultimately, undermine arousal. (1)

A 2002 Cochrane systematic review was conducted to assess the effectiveness of sensory stimulation programs in patients in a coma or vegetative state. The Cochrane review evaluated randomized control trials and non-randomized controlled clinical trials comparing any type of stimulation programs to standard rehabilitation in patients in a coma or vegetative state. Three reviewers independently identified relevant studies, extracted data and assessed study quality. Three studies (one randomized controlled trial [Johnson, 1993] and two non-randomized controlled trials [Kater, 1989; Mitchell, 1990]) with 68 traumatic brain-injured patients in total, met the inclusion criteria. The overall methodological quality was poor, and the studies differed widely in terms of study design and conduct. Also, due to the diversity in reporting of outcome measures, a quantitative meta-analysis was not possible. (2)

None of the three studies in the Cochrane review provided useful and valid results on outcomes of clinical relevance for coma patients. The study by Johnson did not report information on the main outcome measure, Glasgow Coma Scale, presenting instead data of questionable clinical relevance. While the Kater study reported a significant difference in outcomes in favor of the actively treated group, these results must be interpreted with caution since the study included

flawed statistical analysis in favor of the actively treated group. The Mitchell study reported a significant difference in the mean length of coma in favor of the experimental group, but the clinical relevance of this measure apart from any other functional indicators is questionable. The Cochrane researchers concluded that there is no reliable evidence to support or rule out the effectiveness of multisensory programs in patients in a coma or vegetative state. The researchers further stated that the need to improve knowledge in this field and the lack of effective treatments indicates that treatment interventions based on sensory stimulation should be provided only in the context of well designed, adequately sized randomized controlled trials. (2)

A 2017 review article from Eapen et al. noted that disorder of consciousness (DOC) is a state of prolonged altered consciousness, which can be categorized into coma, vegetative state, or minimally conscious state based on neurobehavioral function. The pathophysiology of DOC is poorly understood but recent advances in neuroimaging and advanced electrophysiological techniques may provide an improved understanding for the neural network involved with consciousness. The primary aim of DOC rehabilitation programs is to promote arousal while preventing secondary medical complications while providing education and training to families. Treatment interventions include both pharmacologic and nonpharmacologic programs, but there are currently no consensus treatment guidelines for individuals with DOC. (3)

Megha et al. (2013) conducted a randomized controlled trial to evaluate the effectiveness of multimodal coma stimulation in comatose individuals with traumatic brain injury (n=30). (4) Study participants were randomly assigned to one of three groups (group A received 20-minute multimodal coma stimulation sessions, 5 times a day, n=10; group B received 50-minute stimulation twice a day, n=10; group C acted as the control group and received conventional physiotherapy twice a day). Duration of treatment was 2 weeks in all three groups. Prior to coma stimulation, participants' level of consciousness was assessed using the Western Neuro Sensory Stimulation profile (WNSSP) and the Glasgow Coma Scale (GCS). Final results showed significant improvement in measures of consciousness levels in the respective treatment groups, A and B, when each was compared with the control group, C. Specifically, there was a statistically significant difference observed between group A and C in favor of group A for GCS ($p=0.000$). Similarly, there was a statistically significant difference observed between groups B and C in favor of group B for WNSSP ($p=0.002$). Despite these early positive findings, the study was characterized by several limitations, including its small size, lack of blinded assessments and lack of follow-up. Without an adequate follow-up period, it is not clear if the improvements in consciousness levels were durable beyond the 2-week treatment duration. Despite the statistically significant findings between groups, the study was also limited by the lack of generalizability and clinical heterogeneity in the baseline characteristics of study participants.

Padilla and colleagues (2016) published a systematic review that evaluates the effectiveness of sensory stimulation to improve arousal and alertness of patients in a coma or persistent vegetative state following a traumatic brain injury (TBI). From 2008 through 2013, a total of nine studies were published and included in this review. (5) The authors concluded that there is strong evidence for the effectiveness of multimodal sensory stimulation in improving the

clinical outcomes after a traumatic brain injury-induced coma or persistent vegetative state. In addition, “Moderate evidence was also provided for auditory stimulation, limited evidence was provided for complex stimuli, and insufficient evidence was provided for median nerve stimulation.” These studies reviewed grouped widely heterogeneous studies in terms of design, outcomes and populations and the clinical significance of the studies chosen for inclusion was not clear. In addition, the authors identified limitations that must be considered when evaluating the evidence. The limitations included small sample, short term intervention period with no long-term follow-up, incomplete description of procedures suggests heterogeneity in intervention, limiting the ability to compare studies. More research is needed to confirm the conclusions the authors have made from this review.

In 2017, Salmani et al. published a three-group double-blinded randomized controlled trial including 90 consecutive comatose patients with traumatic brain injuries and a GCS score of 5-8 to evaluate the effects of family-centered affective stimulation on the level of consciousness. (6) Affective stimulation intervention was provided to patients in the experimental group by their family members twice a day during the first seven days of their hospitalization. In the placebo group, a sensory stimulation program was implemented by a fixed trained person who was not familiar with the patients. The authors concluded that early family-centered affective stimulation is more effective than sensory stimulation in improving the level of consciousness among comatose patients with brain injuries.

In 2018, a randomized controlled trial study of 60 patients was conducted by Cevik and colleagues between August 2017 and February 2018. (7) For 10 days, patients received the voice of a male nurse twice a day in the morning and night shifts, recorded on MP3 and repeated at least 3 to 4 times. GCS scores were recorded by the researcher before and after auditory stimulation. The authors stated that auditory stimulation of patients who are unconscious is a nonmedical procedure. This study examines the effect of organized voice, performed by a nurse, on the state of consciousness of comatose patients in intensive care units. Auditory stimulation is associated with higher GCS in comatose patients; however, the authors noted that important limitations of this study included: small sample size, they could not control family members talking to the patient, and they did not work with a group of patients with the same diagnosis; in fact, the diagnoses of the patients in the study were very diverse. Therefore, more studies are recommended with larger sample sizes and groups with the same diagnosis, and longer follow-up periods.

In 2020, Li et al. performed a literature review on the progress of sensory stimulation to enhance coma arousal after traumatic brain injury. (8) The authors included all original studies published in English with patients presenting severe disorders of consciousness due to traumatic brain injury who had received sensory stimulation (SS) and whose behavioral/neural responses had been measured. The authors compared data on ten selected studies and analyzed the SS effects in comatose patient outcomes after TBI. The review outlines the role of SS in patients with TBI and provides guidance for its implementation in the clinical practice. It was concluded that the literature suggests the SS program improves coma arousal after TBI. However, high-quality clinical trials are needed to establish standard SS protocols.

In 2021, Zuo et al. published a systematic review with a meta-analysis to evaluate the effects of family-centered sensory and affective stimulation on comatose patients with traumatic brain injury and explore the factors that affect the outcomes. (9) Electronic databases including PubMed, Web of Science, Google Scholar, Cochrane Library, CINAHL, China National Knowledge Infrastructure, and WanFang were searched from October 2019 to May 2020. Two reviewers independently assessed eligibility of potential studies and extracted data. Quality of included studies was assessed according to the evaluation criteria of Cochrane Evaluation Manual 5.1.0. Outcome measures of the meta-analysis were the Glasgow Coma Scale scores, the Western Neuro Sensory Stimulation Profile scores, awakening time, and satisfaction rate. To explore whether there was a difference in the effect between variants of the intervention, variables as subgroups were time to start intervention, type of intervention, duration of each intervention, daily frequency of intervention, days of intervention, and patient's area. Seventeen randomized controlled trials were included in the review and meta-analysis. Most studies were of medium quality. The improvement of the Glasgow Coma Scale score is significantly greater with the intervention implemented within 24 hours compared to the intervention implemented 24 hours later (mean difference 3.91, 95% confidence interval 3.44-4.38 vs. mean difference 1.90, 95% confidence interval 1.69-2.12, respectively). The results of subgroup analyses show that auditory stimulation combined with tactile stimulation and multi-sensory stimulation are associated with better outcomes than a single use of auditory stimulation. Studies from Asia report more positive outcomes than those from America (mean difference 1.94, 95% confidence interval 1.73-2.16 vs. mean difference 0.44, 95% confidence interval -0.87-1.75). And the improvement of the Glasgow Coma Scale score with the stimulation performed by family members is greater than that with the stimulation implemented by nurses (mean difference 2.17, 95% confidence interval 1.67-2.66). The authors concluded that early family-centered sensory and affective stimulation is more effective than routine care and nurse-implemented sensory stimulation in improving the level of consciousness and cognition of comatose patients with traumatic brain injury, and multi-sensory stimulation is more effective than single stimulation. More studies with larger sample size and high quality in different countries are warranted.

Summary of Evidence

Effective treatment interventions for patients in a coma or persistent vegetative state are lacking. Sensory stimulation has been proposed as a method to promote emergence from coma and return to a higher level of functioning. There is insufficient evidence in the published medical literature to demonstrate that sensory stimulation improves the clinical outcome of patients in a coma or persistent vegetative state.

Practice Guidelines and Positions Statements

According to the American Occupational Therapy Association (AOTA) updated 2016 guideline "Recommendations for Occupational Therapy Interventions for Adults with TBI", recommendations were made specific to "Interventions to Improve Arousal and Alertness of People in a Coma or Persistent Vegetative State." (10) The guideline noted the following:

- Multimodal sensory stimulation to improve arousal and enhance clinical outcomes. (A)

- Auditory stimulation, especially when completed in a familiar voice, to increase arousal in the short term. (B)
- Increased complexity, rather than intensity, of stimulation to increase intervention effectiveness. (C)
- Median nerve stimulation to improve arousal and alertness. (I)

Strength of Recommendation

A. There is strong evidence that occupational therapy practitioners should routinely provide the intervention to eligible clients. Good evidence was found that the intervention improves important outcomes and concludes that benefits substantially outweigh harm.
B. There is moderate evidence that occupational therapy practitioners should routinely provide the intervention to eligible clients. There is high certainty that the net benefit is moderate, or there is moderate certainty that the net benefit is moderate to substantial.
C. There is weak evidence that the intervention can improve outcomes. It is recommended that the intervention be provided selectively on the basis of professional judgement and patient preferences. There is at least moderate certainty that the net benefit is small.
I. There is insufficient evidence to determine whether or not occupational therapy practitioners should be routinely providing the intervention. Evidence that the intervention is effective is lacking, of poor quality, or conflicting and the balance of benefits and harm cannot be determined.

Coding

Procedure codes on Medical Policy documents are included **only** as a general reference tool for each policy. **They may not be all-inclusive.**

The presence or absence of procedure, service, supply, or device codes in a Medical Policy document has no relevance for determination of benefit coverage for members or reimbursement for providers. **Only the written coverage position in a Medical Policy should be used for such determinations.**

Benefit coverage determinations based on written Medical Policy coverage positions must include review of the member's benefit contract or Summary Plan Description (SPD) for defined coverage vs. non-coverage, benefit exclusions, and benefit limitations such as dollar or duration caps.

CPT Codes	97139, 97799
HCPCS Codes	S9056

*Current Procedural Terminology (CPT®) ©2023 American Medical Association: Chicago, IL.

References

1. Wood RL. Critical analysis of the concept of sensory stimulation for patients in vegetative states. Brain Inj. 1991; 5(4):401-409. PMID 1786503
2. Lombardi F, Taricco M, De Tanti A, et al. Sensory stimulation for brain injured individuals in coma or vegetative state. Cochrane Database Syst Rev 2002. 2002; 2:CD001427. PMID 12076410

3. Eapen BC, Georgekutty J, Subbarao B, et al. Disorders of Consciousness. Phys Med Rehabil Clin N Am. 2017; 28(2):245-258. PMID 28390511
4. Megha M, Harpreet S, Nayeem Z. Effect of frequency of multimodal coma stimulation on the consciousness levels of traumatic brain injury comatose patients. Brain Inj. 2013; 27(5):570-577. PMID 23473238
5. Padilla R, Domina A. Effectiveness of sensory stimulation to improve arousal and alertness of people in a coma or persistent vegetative state after traumatic brain injury: A systematic review. Am J Occup Ther. 2016; 70(3):1–8. PMID 27089287
6. Salmani F, Mohammadi E, Rezvani M, et al. The effects of family-centered affective stimulation on brain-injured comatose patients' level of consciousness: A randomized controlled trial. Int J Nurs Stud. 2017; 74:44–52. PMID 28601692
7. Çevik K, Namik E. Effect of auditory stimulation on the level of consciousness in comatose patients admitted to the intensive care unit: A randomized controlled trial. J Neurosci Nurs. 2018; 50(6):375–380. PMID 30407969
8. Li J, Cheng Q, Liu FK, et al. Sensory stimulation to improve arousal in comatose patients after traumatic brain injury: a systematic review of the literature. Neurol Sci. Sep 2020; 41(9):2367-2376. PMID 32323082.
9. Zuo J, Tao Y, Liu M, et al. The effect of family-centered sensory and affective stimulation on comatose patients with traumatic brain injury: A systematic review and meta-analysis. Int J Nurs Stud. Mar 2021; 115:103846. PMID 33485101
10. Wheeler S, and A Acord-Vira. Occupational therapy practice guidelines for adults with traumatic brain injury. Bethesda (MD): American Occupational Therapy Association, Inc. (AOTA). 2016; 47 p.

Centers for Medicare and Medicaid Services (CMS)

The information contained in this section is for informational purposes only. HCSC makes no representation as to the accuracy of this information. It is not to be used for claims adjudication for HCSC Plans.

The Centers for Medicare and Medicaid Services (CMS) does not have a national Medicare coverage position. Coverage may be subject to local carrier discretion.

A national coverage position for Medicare may have been developed since this medical policy document was written. See Medicare's National Coverage at <https://www.cms.hhs.gov>.

Policy History/Revision

Date	Description of Change
11/15/2024	Document updated with literature review. Coverage unchanged. Reference 9 was added.
03/15/2023	Reviewed. No changes.
05/15/2022	Document updated with literature review. Coverage unchanged. Reference 12 was added, and some references removed.

02/15/2021	Reviewed. No changes.
04/15/2020	Document updated with literature review. Coverage unchanged. References 10-12 added and some references removed.
04/15/2018	Reviewed. No changes.
06/15/2017	Document updated with literature review. Coverage unchanged.
05/15/2016	Reviewed. No changes.
10/01/2015	Document updated with literature review. Coverage unchanged.
11/15/2014	Reviewed. No changes.
10/15/2013	Literature reviewed. No changes
05/15/2008	Policy reviewed without literature review, new review date only. This policy is no longer scheduled for routine literature review and update.
12/15/2006	Revised/updated entire document
11/01/2000	Revised/updated entire document
01/01/2000	Revised/updated entire document
11/01/1999	Revised/updated entire document
11/01/1997	Revised/updated entire document
09/01/1990	New medical document