Corporate Medical Policy
Sensory Stimulation in Coma

Description of Procedure or Service
Coma is an alteration of consciousness in which a person appears to be asleep, cannot be aroused, and shows no awareness of the environment. Coma is therefore the most profound degree to which the two components of consciousness, arousal and awareness, can be diminished. Less profound states of impaired consciousness (stupor, lethargy, obtundation) preserve one or more of these components to some degree (NINDS, 2019).

Sensory stimulation or coma stimulation is a therapeutic technique intended to enhance the rehabilitative potential of brain-injured individuals in a coma or vegetative state. Protocols may involve stimulation of any or all of the following senses: visual, auditory, olfactory, gustatory, cutaneous and kinesthetic.

Benefit Application
This medical policy relates only to the services or supplies described herein. Please refer to the Member’s Benefit Booklet for availability of benefits.

Policy Statement
GEHA considers sensory stimulation (Coma Stimulation) in the treatment of coma and/or persistent vegetative states experimental.

Background
Sensory stimulation is intended to enhance the rehabilitative potential of brain-injured individuals in a coma or vegetative state. Protocols may involve stimulation of any or all of the following senses: visual, auditory, olfactory, gustatory, cutaneous and kinesthetic. Various stimuli may be used for each sense. Protocols may differ with respect to who performs the stimulation and where. Professionals providing this service may include nurses, occupational therapists, physical therapists, and 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, the patient’s home, or a nursing home. It has been proposed that comatose individuals treated with intense and repeated stimulation following very precise protocols could awaken earlier from coma and return to a higher level of functioning.

Controlled trials comparing usual care with and without sensory stimulation programs are limited in current literature. In 2002, a review from the Cochrane Database reported that there was no reliable evidence to support, or rule out, the effectiveness of multisensory programs in subjects in coma or vegetative states (Lombardi, 2002). Georgiopoulou et al (2010) also performed a systematic review of the proposed medical or surgical treatments in patients in chronic vegetative state (VS) or minimally
conscious state (MCS), as well as of their mechanisms of action and limitations. According to the eligible studies in this review, medical management by dopaminergic agents (levodopa, amantadine), zolpidem and median nerve stimulation, or surgical management by deep brain stimulation, extra-dural cortical stimulation, spinal cord stimulation as well as intra-thecal baclofen were shown to improve the level of consciousness in certain cases. The authors concluded that the treatments proposed for disorders of consciousness have not yet gained the level of “evidence-based treatments” and thus were inconclusive. They stated that the published therapeutic responses must be substantiated by further clinical studies of sound methodology.

The American Academy of Neurology’s practice parameters on “Assessment and management of patients in the persistent vegetative state” (AAN, 2006) did not mention the use of coma stimulation as a treatment modality. The American Occupational Therapy Association’s practice guideline on “Adults with traumatic brain injury” (Wheeler, 2016) is one of the few sources that does endorse the use of sensory stimulation or coma arousal programs. Furthermore, the National Institute of Neurological Disorders and Stroke’s “Coma information page” currently does not reference the use of coma stimulation as a therapeutic option.

Meyer, MJ. et. al. (2010) conducted a multi-part review of acute management of acquired brain injury. Part III of the study reviewed the interventions used to promote arousal from coma. A literature search of multiple databases (CINAHL, EMBASE, MEDLINE and PsycINFO) and hand searched articles covering the years 1980-2008 was performed. Peer reviewed articles were assessed for methodological quality using the PEDro scoring system for randomized controlled trials and the Downs and Black tool for RCTs and non-randomized trials. Levels of evidence were assigned and recommendations were made. Research into coma arousal has generally focused on the stimulation of neural pathways responsible for arousal. These pathways have been targeted using pharmacological and non-pharmacological techniques. This review reports the evidence surrounding agents targeting dopamine pathways (amantadine, bromocriptine and levodopa), sensory stimulation, music therapy and median nerve electrical stimulation. Each of these interventions has shown some degree of benefit in improving consciousness, but further research is necessary. Despite numerous studies, strong evidence was only found for one intervention (Amantadine use in children) and this was based on a single study. However, each of the interventions showed promise in some aspect of arousal and warrant further study. More methodologically rigorous study is needed before any definitive conclusions can be drawn.

Cheng et. al. (2018) performed an experiment examining the impact of sensory stimulation programs on consciousness recovery. In this study, treatment-related changes were assessed using time-series design in patients with disorders of consciousness (i.e., vegetative state—VS and minimally conscious state—MCS). A withdrawal design (ABAB) was used. During B phases, patients underwent a SSP (3 days a week, including auditory, visual, tactile, olfactory, and gustatory stimulation). The program was not applied during A phases. To assess behavioral changes, the Coma Recovery Scale-Revised (CRS-R) was administered by an independent rater on a weekly basis, across all phases. Each phase lasted 4 weeks. In a subset of patients, resting state functional magnetic resonance imaging (fMRI) data were collected at the end of each phase. Twenty nine patients (48 ± 19 years old; 15 traumatic; 21 > a year post-injury; 11 VS and 18 MCS) were included in our study. Higher CRS-R total scores (medium effect size) as well as higher arousal and oromotor subscores were observed in the B phases (treatment) as compared to A phases (no treatment), in the MCS group but not in the VS group. In the three patients who underwent fMRI analyses, a modulation of metabolic activity related to treatment was observed in middle frontal
gyrus, superior temporal gyrus as well as ventro-anterior thalamic nucleus. The results suggest that SSP may not be sufficient to restore consciousness. SSP might nevertheless lead to improved behavioral responsiveness in MCS patients. The results show higher CRS-R total scores when treatment is applied, and more exactly, increased arousal and oromotor functions.

In a study by Megha et. al. (2013), it was discovered that there was a difference in the frequency of multimodal coma stimulation, however, the study was limited to 30 patients with no indication of long term outcomes.

In a study by Pape et. al. (2015), an investigation of neurobehavioral and neuropsychological effects related to sensory stimulation were measured. A double-blind randomized placebo-controlled trial where 15 participants in states of disordered consciousness (DOC), an average of 70 days after TBI, were provided either the Familiar Auditory Sensory Training (FAST) or Placebo of silence. Global neurobehavioral functioning was measured with the Disorders of Consciousness Scale (DOCS). Arousal and awareness were measured with the Coma-Near-Coma (CNC) scale. Neurophysiological effect was measured using functional magnetic resonance imaging (fMRI). It was concluded for persons with DOC 29 to 170 days after TBI, FAST resulted in CNC gains and increased neural responsivity to vocal stimuli in language regions. The trial was limited to 15 participants and no long term follow up was conducted.

While there may be sound theoretical principles that would seem to support the use of sensory stimulation modalities in the setting of a comatose patient, there is a paucity of evidence that effectively demonstrates a consistent, reproducible and positive impact on health outcomes.

**Regulatory Status**

There are several FDA approved devices that serve as sources of neurostimulation; however, there are no identified devices specifically indicated for the purpose of sensory stimulation in coma.

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<td>S9056</td>
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**Scientific references**


Policy implementation and updates

Feb 2018    Revised clinical policy format and language. No significant alteration of coverage guidance.

Jan 2019    Reviewed. No changes were made to the content of this coverage policy.

Jan 2020    Content addition to background. Formatting updates. No changes in coverage.

Jan 2021    No changes to policy.