Sensory Stimulation in Coma

Policy

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

RATIONAL

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 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 needed to validate this outcome. However, a review of the published medical literature failed to identify any controlled studies. The studies identified were limited to case series or descriptive technical studies of coma stimulation techniques (Davis, 1995; Hall, 1992; Wood, 1992). In 1991, Wood and colleagues 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 of coma stimulation. For example, Wood points out that the brain-injured individual is constantly exposed to sensory stimulation (skin care, range of motion exercises, bowel and bladder procedures, and ambient noise in an intensive care unit) aside from any specific program of sensory stimulation. 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).

Georgiopoulos et al (2010) 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. For this review, these researchers have agreed to include patients in VS or MCS having persisted for over 6 months in post-traumatic cases, and over 3 months in non-traumatic cases, before the time of intervention. Searches were independently conducted by 2 investigators between May 2009 and September 2009 in the following databases: Medline, Web of Science and the Cochrane Library. The electronic search was complemented by cross-checking the references of all relevant articles. Overall, a total of 16 papers were eligible for this systematic review. According to the 16 eligible studies, 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 have 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”. Moreover, the studies to-date had led to inconclusiveness. 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. Also, the American Occupational Therapy Association’s practice guideline on “Adults with traumatic brain injury” (Golisz, 2009) made no recommendation regarding the use of sensory stimulation or coma arousal programs. Furthermore, the National Institute of Neurological Disorders and Stroke’s “Coma information page” (NINDS, 2012) did not mention the use of coma stimulation as a therapeutic option.

Meyer and colleagues (2010) conducted a review of the literature from the years 1980 – 2008 regarding various techniques (dopamine targeting agents, sensory stimulation, and music therapy and median nerve electrical stimulation) used to promote arousal from coma following an acquired brain injury. With regard to sensory stimulation, the authors reported that stimulation strategies may vary from single stimulation of a single sense (unimodal stimulation) to stimulation of all senses using various stimuli (multimodal stimulation). However, there is some concern around the potential to over-stimulate unresponsive individuals which may result in a reduced awareness of certain stimuli. Some of the studies included in the literature review demonstrated a trend towards greater improvements in a

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7 https://www.guideline.gov/summaries/summary/50401
8 http://www.ninds.nih.gov/Disorders/All-Disorders/Coma-Information-Page
variety of measures following multimodal sensory stimulation (Hall, 1992; Mitchell\textsuperscript{10}, 1990; Wood, 1992), while other studies reported no change in similar parameters (Davis, 2003\textsuperscript{11}; Pierce, 1990\textsuperscript{12}). Therefore, the authors concluded that there is conflicting evidence regarding the benefit of sensory stimulation in arousing individuals from a coma.

Megha (2013)\textsuperscript{13} conducted a randomized controlled trial (RCT) to evaluate the effectiveness of multimodal coma stimulation in comatose individuals with traumatic brain injury (n=30). 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.

According to the American Occupational Therapy Association (AOTA) 2009 guideline for adults with traumatic brain injuries, a recommendation for or against sensory stimulation programs could not be made because, “evidence that the intervention is effective is lacking, of poor quality, or conflicting, and the balance of benefits and harm cannot be determined.” More studies are needed with a randomized-control design, sufficient sample size, long-term follow-up and a more broadly generalizable population sample.

\textsuperscript{13} 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