

Alpha-Stim AID for anxiety

Medtech innovation briefing

Published: 16 September 2019

www.nice.org.uk/guidance/mib193

Summary

- The **technology** described in this briefing is Alpha-Stim AID. It is used for treating anxiety, insomnia and depression. This briefing focuses only on anxiety.
- The **innovative aspect** is that the device has a patented electrical wave pattern that is transmitted to the brain using cranial electrotherapy stimulation.
- The **intended place in therapy** would be an alternative to or in addition to current treatment options for people with anxiety disorder. The device would be provided by primary care services and mental health outpatient services for use at home.
- The **main points from the evidence** summarised in this briefing are from 1 randomised trial and 3 observational studies including 318 adults and 30 children with anxiety disorders. They show that the Alpha-Stim AID is effective at reducing the level of anxiety and depression in patients diagnosed with anxiety disorders.
- **Key uncertainties** around the evidence are a lack of generalisability to the NHS and no evidence from randomised controlled trials on the long-term effect of the technology on treating people with anxiety disorders.
- The **typical cost** of a course of patient treatment with Alpha-Stim AID is £70. The company claims the technology could be resource releasing by reducing the need for medications and psychological interventions. There is no published evidence to support these claims.

The technology

Alpha-Stim AID (Electromedical Products International, Inc.) is an electrotherapy device for treating symptoms of anxiety, insomnia and depression. The technology was developed in 1981 in the US, and Alpha-Stim AID is the latest model. The device uses cranial electrotherapy stimulation, providing variable electrical microcurrent to the brain which stimulates alpha wave electrical activity. The current is applied by clips that attach to the ear lobes. The device has a pulse repetition rate of 0.5 hertz. The wave is composed of bipolar asymmetric rectangular waves in a cycle that repeats periodically at 10-second intervals.

The device is the size of a mobile phone and has a pair of small clips that can be wetted with a coating solution. When it is turned on, a small vibration is felt in the ears, like a mild electrical current. The strength of this can be adjusted. Alpha-Stim AID can be used for between 20 and 60 minutes every day, every other day, or on an as-needed basis. The higher the strength of the current, the shorter the time the patient needs to wear it. Alpha-Stim AID is battery powered, which allows users to be mobile when using it.

Innovations

Alpha-Stim AID generates a patented pattern of waves of microcurrents (0.5 hertz), which are transmitted to the brain. This repeats every 10 seconds. This is compared with the normal or beta waves which are 13 to 25 hertz and is the state that most people are in during the day. The company claims that alpha waves are thought to be associated with a feeling of relaxation similar to that of meditation.

Current care pathway

NICE's guideline on the [management of generalised anxiety disorder and panic disorder in adults](#) provides principles of care for people with generalised anxiety disorder (GAD). It also recommends a stepped-care model to organise service provision and to help people with GAD, their families, carers and practitioners to choose the most effective intervention. The stepped-care model includes interventions for identification and assessment of GAD (step 1), low-intensity psychological interventions (step 2), high-intensity psychological intervention (cognitive behavioural therapy [CBT]/applied relaxation) or drug treatment (step 3) and highly specialist treatment (step 4). The company notes that the product can be used as an alternative or as well as existing treatment options (interventions included in step 3) for anxiety disorders including medication and high-intensity talking therapies.

Population, setting and intended user

Alpha-Stim AID is for people with anxiety, insomnia and depression. The focus of this briefing is for people with anxiety.

The device would be provided by primary care services and mental health services for patients to use at home. Patients would be taught how to use the device by a healthcare professional. An information leaflet is also provided, so people can use the device unsupervised at home. Training is needed and would be given to all relevant staff. Training for patients and healthcare providers is included in the cost of the device. The company claims that there are few changes needed to the current mental health service set up. It states that the only change to existing care would be staff training at a local level (such as GP surgeries) to provide the device and show it to the patient.

Costs

Technology costs

The cost of an Alpha-Stim AID is £450 (excluding VAT) per device. The device can be re-used by multiple patients. For example, the company states typical usage based on an individual patient treatment of 10 weeks use (including additional staff time, postage and consumables cost, estimated at £40), per patient treatment cost is £70 (Morriss et al. 2019). There is a 5-year warranty. The company notes anecdotal data from users suggesting the cost per patient could be as low as £40 in primary care.

Costs of standard care

There was no estimate identified for the overall cost of existing standard care for anxiety disorder by the company. NICE advice on the [improving access to psychological therapies programme \(IAPT\)](#) for adults with general anxiety disorder provides the estimated costs for interventions, included in the stepped-care model depending on the intensity of interventions.

The cost of interventions for people with anxiety

Low-intensity psychological interventions:

- Non-facilitated self-help: £10 per person, 6-week course.
- Guided bibliotherapy: £110 per person, 5-session course.
- Psycho-educational groups: £29 per person, estimated 12 people in the group, 6-week course.

High-intensity psychological interventions (CBT, applied relaxation):

- Individual CBT: the total cost of either CBT or applied relaxation would cost £733 per person, 13-week course.
- Group CBT sessions: £93 per person, 11-week course.
- Pharmacological therapy: £75 per person, based on a minimum daily dose for 6 months, a course of a selective serotonin reuptake inhibitor.

Resource consequences

The device is currently used in 3 NHS trusts. If Alpha-Stim AID was adopted as an add-on treatment to existing interventions, the cost per treatment of anxiety disorder would increase by £70. The company claims that this could be offset if the device replaced or reduced the use of medication and intensive psychological interventions.

A recent published study using a cost minimisation model assessed the cost impact of Alpha-Stim AID in the NHS (Morriss et al. 2019). This study was sponsored by the company. It included a sample of 161 patients with GAD who were waiting for individual CBT. Results suggested that mean general anxiety disorder-7 (GAD-7) score significantly improved from 15.77 (standard deviation [SD]=3.21) at baseline to 8.92 (SD=5.42) and 8.99 (SD=6.18) at 12 and 24 weeks respectively ($p < 0.001$). There were 80 people (49.7%) who needed further individual CBT. Alpha-Stim AID provided an estimated saving of £540.88 per patient (95% confidence interval [CI] –£648.69 to –£327.12). This saving is compared with an 8-session standard care model of individual therapist-led CBT.

Training is needed for relevant staff. Few changes are needed to facilities or infrastructure to adopt the technology because it is designed to be used in patients' homes.

Regulatory information

Alpha-Stim AID was CE marked as a class IIa medical device in 2012.

A search of the Medicines and Healthcare products Regulatory Agency website shows no manufacturer field safety notices or medical device alerts for the technology.

Equality considerations

NICE is committed to promoting equality of opportunity, eliminating unlawful discrimination and fostering good relations between people with particular protected characteristics and others.

Generalised anxiety disorder (GAD) is a long-term condition and people with GAD feel anxious most days. This can cause both psychological and physical symptoms including feeling restless or worried, and having trouble concentrating or sleep. The condition can have a substantial effect on individuals' daily lives. This may mean someone is disabled if their anxiety disorder has a substantial and long-term effect on their ability to do daily activities. Disability is a protected characteristic under the Equality Act. People from certain socially excluded groups that would benefit from psychological interventions might be less likely to access them, such as black and minority ethnic groups; older people; those in prison or in contact with the criminal justice system; and ex-service personnel. Sex, age and family origin are all protected characteristics under the Equality Act 2010.

Clinical and technical evidence

A literature search was carried out for this briefing in accordance with the [interim process and methods statement](#). This briefing includes the most relevant or best available published evidence relating to the clinical effectiveness of the technology. Further information about how the evidence for this briefing was selected is available on request by contacting mibs@nice.org.uk.

Published evidence

There are 4 studies including 1 randomised trial and 3 before-after studies summarised in this briefing. The other relevant study ([Lu and Hu, 2014](#)) was excluded because its full text was not published in English. One trial ([Barclay and Barclay, 2014](#)) assessed the efficacy of the Alpha-Stim device in 115 people with anxiety disorder. Two observational studies ([Morriss et al. 2019](#) and [Bystritsky et al. 2008](#)) examined changes in anxiety scores in 173 adults with anxiety disorder before and after cranial electrotherapy stimulation (CES) treatment. [Chen et al. \(2007\)](#) examined the impact of CES treatment for 30 children with anxiety disorders.

[Table 1](#) summarises the clinical evidence as well as its strengths and limitations.

Overall assessment of the evidence

In general, the evidence from the trial shows that the Alpha-Stim device (Alpha-Stim 100) was associated with statistically significant improvements in anxiety and depression compared with

control interventions. Results of 3 observational studies were consistent with the findings reported in the trial. This suggests a significant decrease in patients' anxiety and depression score after treatment. However, there is little evidence from randomised controlled trials on the long-term effects of the device.

The evidence is limited in quantity; 3 of 4 included studies are not from the UK, which may limit the generalisability to the NHS. The device was developed in the early 1980s, and evidence from 3 studies are based on old models of the device (Alpha-Stim 100 and Alpha-Stim SCS). The company advised that included evidence is generalisable to the latest version of the Alpha-Stim device because the mechanism of the device remains the same, and the only change is inclusion of a LED screen.

Table 1 Summary of selected studies

<u>Morriss et al. (2019)</u>	
Study size, design and location	A before-after study of 161 patients with GAD. UK.
Intervention and comparator(s)	Alpha-Stim AID. No comparator.
Key outcomes	The 161 patients included had 60 minutes per day of Alpha-Stim AID for 6 to 12 weeks. Of these, 72 (44.7%) and 77 (47.8%) had remission on the GAD-7 scale at 12 and 24 weeks respectively. There were 122 (75.8%) who had at least 6 weeks CES. The mean GAD-7 score at baseline significantly improved from 15.77 (SD=3.21) to 8.92 (SD=5.42) and 8.99 (SD=6.18) at 12 and 24 weeks respectively ($p<0.001$). There were 80 (49.7%) patients who needed further individual CBT.
Strengths and limitations	This is a before-after comparative study, and there was no control group. 55.2% of patients lost to follow up. The study was funded by the company.
<u>Barclay and Barclay (2014)</u>	
Study size, design and location	A double-blind parallel trial of 115 people with anxiety disorder. USA.

Intervention and comparator(s)	Alpha-Stim 100. Sham CES devices.
Key outcomes	<p>At baseline, there were no statistically significant differences in mean of HAM-A and HAM-D₁₇ between the 2 groups measured, although scores were higher in the active CES group (scores increased with the severity of anxiety).</p> <p>After a 5-week study follow up, the active CES group had significant lower anxiety score on HAM-A and HAM-D₁₇ than the sham CES group from baseline to the end of the study. In the active CES group, 83% had a decrease of more than 50% in anxiety score (HAM-A) from baseline to the end of study follow up. The decrease in the HAM-A in the active CES group was 32.8%, which was more than 3 times the mean decrease seen in the same CES group (9.1%).</p> <p>In the active CES group, 82% had a decrease of more than 50% in depression score (HAM-D₁₇) from baseline to the end of the study. The average decrease of depression score was 32.9% in the active CES group compared with 2.6% in the shame CES group.</p>
Strengths and limitations	A double-blind study design. Short study follow up. The self-selected people joined the study by responding to the study announcement, and each person had to pay \$30 to enter. Both anxiety and depression were primary outcomes, but only 23 people had an anxiety disorder and comorbid depression.
<u>Bystritsky et al. (2008)</u>	
Study size, design and location	A before-after study of 12 patients with a diagnosis of GAD. USA.
Intervention and comparator(s)	Alpha-Stim SCS. No comparator.
Key outcomes	<p>Mean HAM-A score decreased significantly from 21.25 (SD=5.82) at baseline to 12.67 (SD=5.47) the end of the study (6 weeks, p=0.01). Six patients (50%) had a 50% decrease on HAM-A and a score of 1 or 2 on the Clinical Global Impression – Improvement scale and GAD was considered to respond to treatment. The FDADS-anxiety subscale score reduced significantly from 30.58 (SD=11.24) at baseline to 23.83 (SD=7.57) at the end of the study. Mean HAM-D score also changed significantly from 10.51 (SD=15.01) at baseline to 6.00 (SD=3.64) at week 6 (p=0.01).</p>

Strengths and limitations	Small sample size, and only 75% of people completed the treatment. Short study follow up.
<u>Chen et al. (2007)</u>	
Study size, design and location	A comparative study of 30 children aged between 8 and 16 years who were diagnosed with mixed anxiety and depressive disorder. China.
Intervention and comparator(s)	Alpha-Stim 100. Sham (the power supply for CES disconnected).
Key outcomes	Mean SDS scores were 49.60 (SD=7.03) in the experimental group and 47.23 (SD=5.86) in the control group before the treatment, but 34.08 (SD=7.79) and 46.83 (SD=10.35) respectively after the treatment. Mean SAS scores were 48.27 (SD=7.01) in the experimental group and 46.03 (SD=6.24) in the control group before the treatment, but 29.67 (SD=6.03) and 39.17 (SD=12.73) respectively after the treatment. Analysis of variance indicated changes in both SDS and SAS were significantly greater in the treatment group than in the control group ($p < 0.001$).
Strengths and limitations	Small sample size. A course of treatment lasted 5 days, and each child had 3 courses of treatment with a 2-day interval between treatment. The total study follow up was 19 days.
Abbreviations: CBT, cognitive behavioural therapy; CES, cranial electrotherapy stimulation; FDADS, four-dimensional anxiety and depression scale-anxiety subscale; GAD, generalised anxiety disorder; HAM-A, Hamilton Anxiety Rating Scale; HAM-D, Hamilton Depression Rating Scale; SAS, self-rating anxiety; SDS, self-rating depression; SD, standard deviation.	

Recent and ongoing studies

- CES in the treatment of post-traumatic stress disorder. ClinicalTrial.gov identifier: NCT 03757494. Status: recruiting. Indication: post-traumatic stress disorder. Intervention: Alpha-Stim. [29 November 2018, USA]
- Efficacy of CES in new mothers during the postpartum period. ClinicalTrial.gov identifier: NCT 03210155. Status: terminated. Indication: anxiety, depression, insomnia and sleep quality. Intervention: Alpha-Stim AID. [6 July 2017, USA]
- CES in reducing perioperative anxiety. ClinicalTrial.gov identifier: NCT 00928772. Status:

- terminated (lack of efficacy). Indication: anxiety. Intervention: Alpha-Stim AID. [20 April 2017, USA]

The company advised that 2 evaluation studies are planned in NHS trusts to assess the impact of Alpha-Stim AID for people with generalised anxiety disorder.

Specialist commentator comments

Comments on this technology were invited from clinical specialists working in the field and relevant patient organisations. The comments received are individual opinions and do not represent NICE's view.

Three experts were familiar with or had used this technology before.

Level of innovation

One expert thought that Alpha-Stim AID was a novel concept and its design was innovative compared with current treatment such as medications or psychological interventions. This expert noted that other technologies were available to the NHS such as cranial electrical stimulation, which uses different frequencies and the current is delivered through electrodes. The other 2 experts agreed that the technology was innovative compared with current standard care in the NHS. One thought that more evidence was needed on the acceptability of the technology from patients and clinicians' perspectives.

Potential patient impact

Potential patient benefits identified by experts included a moderate reduction in anxiety and depression symptoms. One expert noted that the potential benefit of Alpha-Stim AID was associated with the compliance of using the device at recommended currents daily for 20 or 60 minutes over 6 weeks. The expert stated that there was evidence suggesting the effect of Alpha-Stim AID could last for 3 months but such an improvement in anxiety and depression symptoms might not be sustained in the long term. Experts thought that the Alpha-Stim AID being designed for use at home was a benefit for patients. Two experts thought that using the device in patients' own homes could improve their compliance of using the device and their self-management of anxiety. Another expert considered that the device might improve people's access and choices for anxiety treatment. Two experts thought that Alpha-Stim AID would most benefit patients who were unwilling or unable to have some treatments including medications or psychological interventions.

Potential system impact

Potential system benefits identified by experts included a reduction in the need for psychological treatment and a reduction in the cost of care, including medication prescribing and admission for people with severe anxiety disorder. One expert thought that care for some people with anxiety or depression, or both, could be transferred from inpatient settings to outpatient clinics if Alpha-Stim AID was adopted. Experts agreed that minimal training was needed for healthcare staff, and there would be no extra staff or other equipment needed to adopt the device.

General comments

One expert thought the technology was more likely to be used in the NHS if it was used as an add-on to other interventions, and this would need little change in the care pathway. If this was an add-on treatment, more evidence would be needed to show the clinical and cost effectiveness of the combined intervention.

Patient organisation comments

Representatives from 3 patient organisations including Anxiety UK, Mind and Mental health for Self Help and the Big Life Group gave the following comments:

There is still significant stigma attached to seeking help for a mental health condition. Traditional therapy or medication treatment would prevent some people from seeking support. Alpha-Stim AID has the potential to be used for patients experiencing anxiety symptoms who do not wish to have pharmacological or psychological treatments.

Specialist commentators

The following clinicians contributed to this briefing:

- Cormac Doyle, mental health nurse, Henmore Health. Uses Alpha-Stim in private practice. Did not declare any interests.
- Karina Lovell, professor of mental health, director of research division of nursing, midwifery and social work, school of health science, faculty of biology, Medicine and Health, University of Manchester. Did not declare any interests.
- Richard Morriss, professor of psychiatry and community mental health, Faculty of Medicines and Health Sciences, University of Nottingham. Co-author of Morriss et al. 2019. The study

- was funded by the company.
- Chris Griffiths, senior research and evaluation fellow at Northamptonshire Healthcare NHS Foundation Trust, contributed to this briefing.

Representatives from the following patient organisations commented on this briefing:

- Mind.
- Mental health for Self Help and the Big Life Group.
- Anxiety UK.

Development of this briefing

This briefing was developed by NICE. The [interim process and methods statement](#) sets out the process NICE uses to select topics, and how the briefings are developed, quality-assured and approved for publication.

ISBN: 978-1-4731-3533-8