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Cranial Electrotherapy Stimulation: A Safe Neuromedical Treatment for Anxiety, Depression, or Insomnia

To the Editor: The Institute of Medicine's *To Err is Human* made headlines by estimating that medical errors account for between 44,000 and 98,000 deaths annually in the United States. Together with the subsequent quality dimension report, *Crossing the Quality Chasm*, the Institute of Medicine has brought patient safety into the spotlight.¹ The greatest variance of adverse events in medicine probably is due to medication errors. Today's primary care physician has a multitude of electronic devices such as personal digital assistants, software, and newsletters designed to help minimize medication error and promote safe medication practices.² Electronic therapeutic devices can actively reduce the number of medication errors by reducing the amount of medication needed to treat anxiety, depression, insomnia, and pain. Among the electromedical devices available to the ordinary office practice of general medicine is the cranial electrotherapy stimulation (CES) device. CES is the noninvasive application of low levels of microcurrent (less than 1 milliam-

per) stimulation applied transcutaneously to the brain for therapeutic purposes. Physicians associate these devices with pain treatment centers and the management of chronic, severe pain, but CES can be efficacious for other conditions.

CES is a treatment modality that has been neglected by mainstream medicine for the treatment of anxiety, depression, or insomnia. Selective serotonin reuptake inhibitors (SSRIs) are known as the gold standard for the treatment of depression. However, CES is now more relevant because of recent government warnings on SSRIs [<http://www.fda.gov/cder/drug/antidepressants/AntidepressantSTPHA.htm> and <http://www.cnn.com/2004/HEALTH/03/22/antidepressant.warning.ap/index.htm>]. Thus far, CES has not demonstrated any of these adverse effects. There is no shortage of antidepressant research, but today's peer-reviewed literature has a relative dearth of CES reports. The companies that produce these devices are small and as yet unable to support high-budget standards of double-blinded, randomized, institutional review board-controlled studies. A surprising number of CES studies in the peer-reviewed literature have been done without funding.

CES in the United States has received Food and Drug Administration marketing clearance for the treatment of anxiety, depression, and insomnia. CES devices are sold over the counter in Europe and other parts of the world. Mood-disordered alcoholics have shown increased activity of the enzyme MAO-B in the spinal fluid after 20 CES treatments.³ Patients with treatment-resistant depression have shown significant ($P < 0.0089$) elevations in plasma serotonin.⁴ Increases in cerebrospinal fluid levels of β -endorphins up to 219%, plasma endorphins up to 98%, and cerebrospinal fluid serotonin up to 200% have been demonstrated in normal volunteers receiving 20 minutes of CES.⁵ A recent annotated bibliography of CES by Kirsch⁶ details 126 human and 29 experimental animal studies of CES conducted over the past 40 years. More than half the studies cited are

from the peer-reviewed literature. The majority of the studies were double-blinded and conducted at major American universities. In aggregate, there were 6,007 patients treated under varying research conditions, with 4,541 actually receiving CES treatment. One hundred twelve (89%) of the studies reported positive outcomes. Seventeen studies followed up the patients to assess any continued results after 1 week to 2 years, and all the patients showed at least some residual effect after one or a series of treatments.

CES is both noninvasive and considerably less expensive. Neurosurgical implantation techniques of deep brain-stimulating electrodes and vagal nerve stimulators that are currently used and studied for the treatment of affective disorders are more expensive. However, CES requires continuing medical assessment and supervision. The same caveat is true of all antidepressants and other medications in today's *Physician's Desk Reference* for the treatment of anxiety, depression, and insomnia. The patient safety movement and burgeoning Internet resources are working to increase the number of patients more actively involved in their own care. CES deserves to be a modality in the armamentarium not only for chronic pain but for reducing or occasionally replacing the amount of medication necessary in the treatment of anxiety and depression. CES is not a miraculous modality, but it's definitely worth a try.

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