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## Neuronetics Uses Magnetism to Lift Depression

Pennsylvania startup Neuronetics has commercialized the treatment of depression with electromagnetic pulses. The FDA has approved

By [Jennifer L. Schenker](#)

Fans of *The Sound of Music* will remember the scene in which Liesl, the eldest Von Trapp daughter, radiantly sings: "I am 16, going on 17." In real life, actress Charmian Carr, who played the teenager in the 1965 movie, hasn't felt radiant for decades. Now a grandmother, Carr has suffered from severe clinical depression. Medications not only failed to help, but produced debilitating side effects. "People thought I had Parkinson's disease because I shake so much from all of the medicines," the actress explains in a June [YouTube video](#) made about her case by the UCLA Depression Research & Clinic Program.

Despite major advances in treating depression, nearly 30 percent of patients don't benefit from drug therapy. More than half report side effects—including tremors, sexual dysfunction, weight gain, and sleep disorders—that lead to noncompliance with medication regimes. Now Carr and a growing number of patients who fail to improve with antidepressant drugs say they're finding relief via a electromagnetic therapy called Transcranial Magnetic Stimulation.

TMS uses magnetic pulses to stimulate nerve cells in an area of the brain linked to depression. The stimulation increases brain activity and releases neurotransmitters known to elevate mood. Although TMS has been studied for 25 years as a means of treating depression, Malvern (Penn.)-based [Neuronetics](#) was first to build a clinical system with reproducible results—and first to receive U.S. Food and Drug Administration approval for the technology. Neuronetics is one of 31 companies named on Sept. 1 by the Geneva-based World Economic Forum as Tech Pioneers that offer new technologies or business models that could have a positive impact on peoples' lives.

### SIMPLE, BRIEF, OUTPATIENT PROCEDURE

Neuronetics licensed a family of patents from Emory University in 2003 and completed the largest clinical trial ever performed using TMS. Today its TMS Therapy system is being used in 200 hospitals and doctors' offices throughout the U.S., including 7 of the country's top 10 psychiatric hospitals.

TMS is a 40-minute outpatient procedure performed under the supervision of a psychiatrist. No anesthesia or sedation is required. Patients sit in what looks like a reclined dental chair with a headrest. The psychiatrist then fits a treatment coil on the patient's head. It emits magnetic field pulses aimed at the left prefrontal cortex, an area of the brain that has been demonstrated to function abnormally in patients with depression. (The magnetic fields are the same type and strength as those used in magnetic resonance imaging [MRI] machines.) Once inside the brain, the pulses activate regional neurons and their corresponding circuits, a process thought to correspond with the release of neurotransmitters such as serotonin, norepinephrine, and dopamine.

A typical course of outpatient TMS therapy involves a total of 20 to 30 such sessions, occurring five days a week over a four-to-six-week period. The cost varies from \$300 to \$600 per session, depending on who administers the treatment and where it takes place. Some U.S. insurance companies, employers, and universities are starting to cover the care, says Dr. Linda Carpenter, chief of the mood disorders program at Butler Psychiatric Hospital in Providence, which has been using Neuronetics' device to treat patients since January 2009. Brown University's health care insurance, for example, now covers TMS therapy for students who need treatment for depression, says Carpenter, who also serves as an associate professor in the school's Psychiatry and Human Behavior Department.

### BOOSTER TREATMENTS PROVED EFFECTIVE

Some 78 percent of patients at the Butler Hospital clinic reported feeling significantly better after receiving TMS therapy, she says. A recently published study by the U.S. National Institute of Mental Health involving four U.S. university hospital clinics that use Neuronetics' system also gave high marks to TMS therapy. The study, conducted on 190 patients not being treated with antidepressant drugs, concluded that daily left-prefrontal TMS therapy safely and effectively treats major depression disorder.

In a Neuronetics clinical trial, about one-third of people showed some slippage after six months, but 84 percent of those patients said their depression went into "remission" after booster TMS treatments.

In the June video made by UCLA's Depression Clinic, actress Carr said that thanks to the TMS therapy she received there, she is able to function without antidepressants for the first time in more than 20 years. Carr is again taking up dancing. "To have another alternative has been wonderful, not only me, but for my family and my grandchildren," she said.

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