

NESS H200 Neuroprosthetic and Rehabilitation System Comes to HealthSouth

Functional Electrical Stimulation Therapy Helps Activate the Neuromuscular System with Low-Level Electrical Impulses

By Kathryn J. Siranosian, M.S.

These days, 60-year-old Charlie Curran is practicing diligently to accomplish the kind of everyday grasping movements that most of us take for granted. Lifting a coffee cup, combing his hair, tying his shoes, putting toothpaste on a toothbrush — all of these sorts of ordinary tasks have become more difficult, if not impossible, since a right MCA stroke caused his left hemiparesis last year.

Fortunately, Charlie says, he's been participating in an innovative type of neurorehabilitation at HealthSouth Braintree Rehabilitation Hospital. Both his inpatient and outpatient therapy regimens have included the NESS H200, a state-of-the-art device that utilizes functional electrical stimulation to help patients improve hand function and reduce spasticity. Charlie credits the NESS H200 for helping him regain much of his grasping ability — and, for this retired Scituate Fire Department chief, that means he has regained his independence, too.

“The H200 has helped tremendously with my hand function, and, as I continue with outpatient therapy, it's just been getting better and better,” he says. “Just a simple thing like unscrewing my aftershave bottle, I couldn't do that before, but now I can. There's been a huge improvement, and that's allowed me to regain my independence around the house.”

The NESS H200, developed by Bioness, Inc. of Santa Clarita, CA, is a soft-plastic neuroprosthesis that fits over a patient's hand and forearm. Five surface electrodes are embedded in the splint-like device, and they can be programmed to deliver mild, synchronized electrical stimulation to nerves in the arm. The stimulated nerves activate the muscles, causing the fingers to

open while practicing functional, patient-driven tasks. Therapists at HealthSouth Braintree have seen dramatic results as patients like Charlie train with the device, eventually re-establishing neurological pathways and improving voluntary movements.



PHOTO BY DEBRA TROYANGS

At HealthSouth Braintree, patients with upper extremity impairment following a stroke, or other central nervous system injury, can receive therapy with the NESS H200 multiple times a day, maximizing their recovery during the acute stage of rehabilitation. Then, HealthSouth Braintree therapists integrate the device into outpatient rehabilitation sessions. Remarkably, patients with chronic upper-extremity impairment can make significant gains after they restart outpatient therapy with the NESS H200.

While there's nothing new about the concept of electrical stimulation to retrain neurological pathways, the H200 allows patients to use this type of rehabilitation more easily and effectively than ever before. For instance, NESS H200 therapy

Douglas Katz, M.D., is the Brain Injury Program medical director for HealthSouth Braintree Rehabilitation Hospital and an associate professor of neurology at Boston University School of Medicine.



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can be customized for each patient, since therapists can easily reposition the electrodes, and then reprogram them using the handheld microprocessor.

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—Douglas Katz, M.D., Medical Director of the Brain Injury Program, HealthSouth Braintree Rehab

In fact, because the NESS H200 is so compact, portable and “user-friendly,” some patients are even choosing to rent or purchase the device, so that they can continue their rehabilitation at home. Braintree therapists work directly with families to establish home-based programs, so patients can utilize the modality while performing functional tasks. Ultimately, the repetition of these types of functional movements can help retrain the brain to accomplish them voluntarily.

“In the typical recovery of stroke patients, often the proximal part of the arm recovers first, and the isolated movements of fingers recover later,” says neurologist Douglas Katz, M.D., neurologist at HealthSouth Braintree Rehabilitation Hospital. “One advantage of the NESS H200 is that it gives us a way to add to the movement that the patient is developing already during their recovery. It allows patients to do a more natural kind of functional movement, and that, in turn, allows them to practice more natural movements using the whole arm. We think it’s that kind of functional, natural movement that enhances the process of brain reorganization during recovery.”

Over the past few decades, neurologists have learned that the central nervous system is able to remodel itself throughout a person’s lifetime, even after a brain injury or stroke. This so-called neuroplasticity is a normal function of learning and a normal function of brain recovery after damage, Dr. Katz says. It’s no different, he explains, than an adult learning new motor skills, like how to play tennis. With enough practice, the brain actually reorganizes itself, so that serving the tennis ball and stroking through a backhand become “second nature.”

“By enhancing practice for a motor skill, we can actually change how the brain is physiologically organized, how it recovers and how plasticity occurs,” Dr. Katz says. “Now we know that is normally the case for our brains. Our brains normally change and adapt to learning and changes in our environment. Our brains are always able to reorganize to enhance function, as we get better at a particular



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skill. Eventually, with enough practice, the skill becomes internalized. These days, neurologists consider this a normal part of recovery, and even though there are limits, some patients can make functional gains long after a stroke — because their recovery involves this same sort of learning, these same sorts of changes.”

Within the past few years, there’s been a lot of interest and enthusiasm about new rehabilitation methods (like therapy with the NESS H200) that enhance a patient’s ability to practice normal and functional movements, Dr. Katz explains. What makes the NESS H200 particularly exciting, he continues, is that therapists at HealthSouth Braintree can now combine the device with other rehabilitation strategies to further enhance plasticity in the brain.

For instance, a recent study with stroke patients demonstrated that there was a significant advantage when functional electrical stimulation was used in combination with constrained induced movement therapy. During constrained induced movement therapy, therapists restrict movement of the patient’s “good” arm and hand, thereby encouraging the use of the other, impaired arm and hand. At HealthSouth Braintree, now patients can train with the NESS H200 on their unrestricted (but impaired) arm, and this combination of therapies may lead to even greater functional gains.

“There are two theories at work here,” Dr. Katz explains. “First, by making the patient use their paralyzed arm, we’re avoiding its disuse. We know that the less someone uses their arm, the more their arm becomes deconditioned and the greater the chance that brain reorganization may actually inhibit function of the affected arm. So it’s just better to have that arm moving, to have those muscles being conditioned. The other part of the

With the NESS H200, patients can become active participants in their recovery — and that can help maximize results.



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Constraint Induced Movement Therapy

Constraint induced movement therapy (CIMT) is an innovative neurorehabilitation treatment technique for patients with hemiplegia. Often patients will regain strength in their hemiparetic arm but fail to use it for daily functional tasks. Habitual use of their less affected limb to perform functional tasks may lead to learned nonuse. Research has demonstrated that patients with hemiparesis can improve function of their hemiparetic arm when they are forced to use their more affected upper extremity during functional activities.

HealthSouth Braintree Rehabilitation Hospital has successfully implemented a CIMT program. The objectives of the program are to assist the patient to perform goal-driven, task-specific training. Therapists encourage the use of the more affected upper extremity.

Utilizing the functional test for the hemiplegic/paretic upper extremity, clinicians categorize patients based on their level of impairment, leading to the development of an individualized CIMT program. For example, a patient with mild impairment may have adequate fine motor control to manipulate objects of various sizes during unilateral tasks.

A hand mitt may be utilized on the less affected limb, forcing the use of the more affected limb. As opposed to a patient with severe impairment, they may use their affected extremity as a gross assist during bilateral activities; therefore, not wearing a mitt.

Patients are given the opportunity to perform upper-extremity functional tasks during individual therapy sessions, group circuit sessions, activities of daily living, and as homework activities during the evening. Amount of practice is a critical factor for motor recovery and improvement in function. Participants in the CIMT program practice goal-oriented tasks for up to six hours per day. The activities are modified incrementally by therapists in order to challenge the patient appropriately.

Braintree Rehab, collaboratively with Boston University-Sargent College of Health and Rehabilitation Sciences, has created a successful CIMT program in order to treat a broad range of hemiparetic patients. Through participation in the Constraint Induced Movement Therapy Program at HealthSouth Braintree Rehabilitation Hospital, patients with hemiparesis have demonstrated tremendous improvements in motor recovery and functional ability.

theory now is that by using the paralyzed arm more and more, by practicing in a good way, practicing functional movements — the movements that are going to be useful and advantageous to a person — recovery can be enhanced even more by neuroplastic changes in the brain.”

What’s great about the NESS H200 is that it gets the patient involved and excited about their therapy, right from the start. It’s not very exciting for the patient to have their arm lifted and manipulated by a therapist. But, when a patient puts on the NESS H200, and then sees that the hand that they couldn’t move is actually starting to open and close — well, then, that patient becomes interested and engaged in the therapy.

—Dan Parkinson, PT, Director of Clinical Services, HealthSouth Braintree

“The NESS H200 allows us to easily combine functional electrical stimulation with other rehabilitation approaches.”

HealthSouth Braintree’s Stephen Koelbel, M.D., is using the NESS H200 in combination with injections of botulinum toxin to enhance wrist and finger movement in stroke patients with spasticity.



PHOTO BY DEBRA TROYANOS

HealthSouth Braintree is also using the NESS H200 in combination with injections of botulinum toxin to enhance wrist and finger movement in stroke patients with spasticity. Stephen Koelbel, M.D., says botulinum toxin is routinely used to reduce spasticity when it interferes with a patient’s

ability to make progress, especially during the initial months of recovery. The medication works by decreasing the spasticity of the wrist and finger flexors. Adding the NESS H200, which stimulates the contraction of wrist and finger musculature, may enhance movement even more.

“Some research now indicates

that using botulinum toxin and the NESS H200 in combination may be more effective than either one alone, and the hope is that would enhance motor recovery,” Dr. Koelbel says. “We are seeing very nice improvements, even in patients who have supposedly plateaued in their motor recovery. Using botulinum toxin in conjunction with the NESS H200 is a new, exciting option for our patients.”

HealthSouth Braintree is one of only two facilities in Massachusetts currently offering neurorehabilitation with the NESS H200, and according to Daniel Parkinson, P.T., M.B.A., director of clinical services, therapists at the hospital are eager to incorporate the innovative device into their therapy regimens.

“As therapists, we’re always struggling to find different modalities and different techniques we can use with our patients, especially in the acute stages of rehabilitation, when there’s often no movement at all in the arm,” he explains.

Before, therapists would begin rehabilitation with these patients by manually lifting the paralyzed arm and manipulating the shoulder and elbow. While effective for increasing circulation and moving muscles, it was often difficult to get patients interested and engaged in this type of therapy. By contrast, when rehabilitation includes the NESS H200, patients can become active participants in their recovery — and that can help maximize results.

“What’s great about the NESS H200 is that it gets the patient involved and excited about their therapy, right from the start,” Mr. Parkinson says. “It’s not very exciting at all for the patient to have their arm lifted and manipulated by a therapist. But, when a patient puts on the NESS H200, and then sees that the hand that they couldn’t move is actually starting to open and close — well, then, that patient becomes interested and engaged in the therapy. We’re really thrilled to have the opportunity to offer this new modality to our patients.”

For more information about the NESS H200, please call Braintree at (781) 348-2107 or visit www.braintreehospital.org. ■