NEWS > HEALTH

Illinois clinic one of first places in the country to offer new device to spinal cord injury patients

Physical therapist Mary Jones, left, assists Shane Callahan, center, while neuro-adaptive exercise specialist Creighton Goss helps to move and guide Calahan's feet as he takes steps with the help of an ARC-EX device and use of a body-weight support system at Next Steps Chicago in Willow Springs, Feb. 6, 2025. (Antonio Perez/Chicago Tribune)

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With electrodes stuck to different parts of his back along his spine, Shane Callahan practiced walking on a recent day — with help from an exercise specialist and a harness that helped hold him upright.

Callahan has a spinal cord injury, so he wasn't supporting all of his own weight or moving his legs by himself. But something had changed. He had a little bit of sensation in his feet.

"It's pretty strange," said Callahan, 22, of Lockport, who was injured as a passenger in a car accident 1 1/2 years ago. Since he started using the device with the electrodes, he said, he can feel his feet touching surfaces, though they still can't feel pain or temperature. "I think there's definitely noticeable progress."

The device, called the ARC-EX, delivers electrical pulses to his spine during his sessions at Next Steps Chicago, a neurological rehabilitation clinic in Willow Springs. The device was approved by the U.S. Food and Drug Administration in December, with some experts hailing it as a milestone in therapy for people with spinal cord injuries. Next Steps is one of the first two clinics in the country offering it.

"It's pretty miraculous," said Mary Jones, a physical therapist and director of operations at Next Steps Chicago. "I spent my career working toward this and to see it come to fruition is nothing short of amazing."

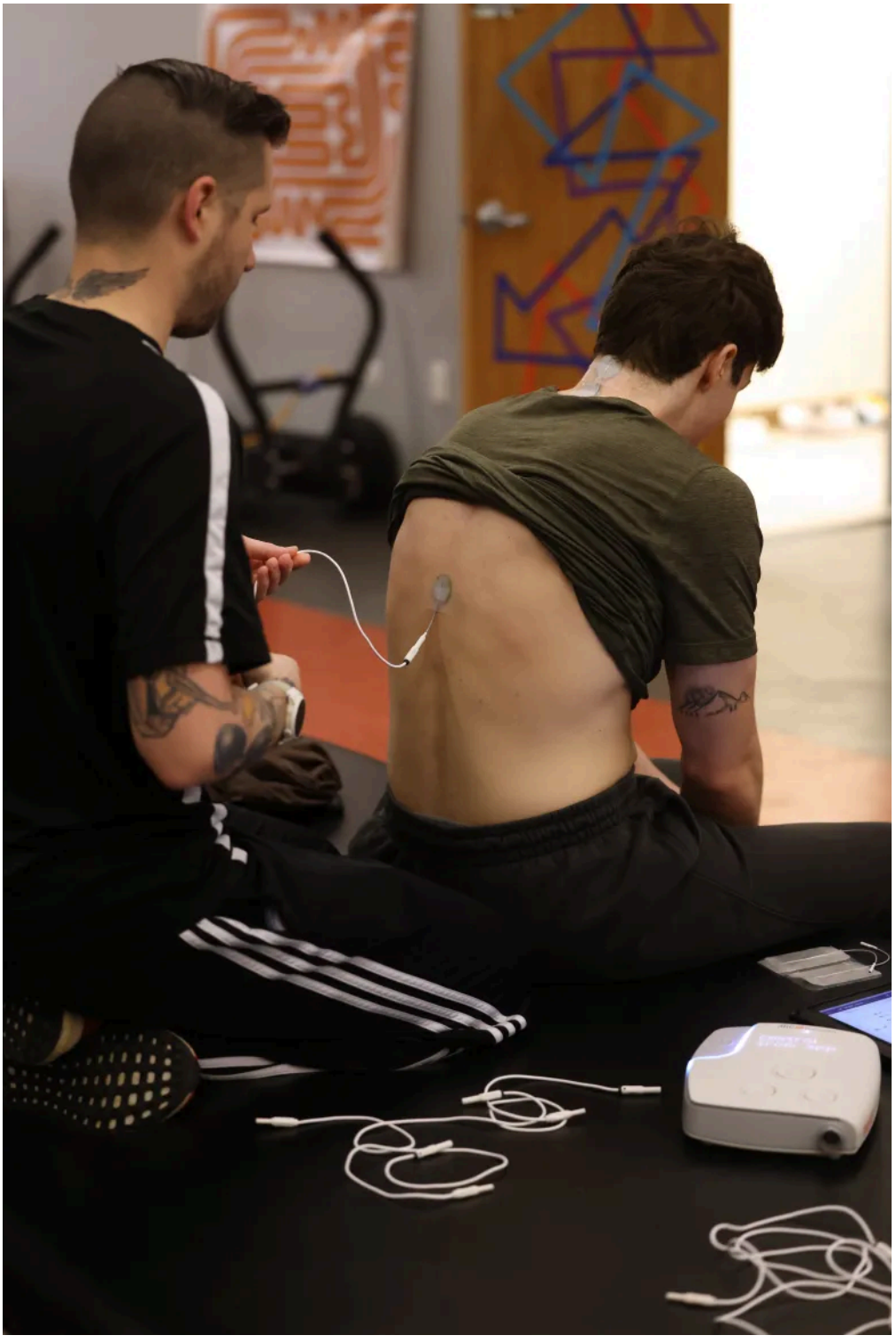
Now, during Callahan's appointments at Next Steps, neuro-adaptive exercise specialist Creighton Goss attaches electrodes to the back of Callahan's neck along his cervical spine and then midway down his back, near his thoracic spine. Thin electrical cables connect the electrodes to the ARC-EX device, which delivers continuous electrical pulses throughout Callahan's appointment.

The stimulation doesn't hurt, but "It definitely wakes you up," Callahan said with a smile.

The ARC-EX is not the first device to deliver electrical stimulation through the skin to help people with spinal cord injuries. But unlike other commercially available devices, the ARC-EX delivers stimulation directly to the spine, rather than to other parts of the body that a person wishes to move, such as to an arm or a leg. The idea is to restore hand strength and sensation even when stimulation is no longer used.

The device is supposed to be used for up to an hour a day, alongside therapy or training, to help improve hand strength and sensation for people with incomplete spinal cord injuries. About two-thirds of people with spinal cord injuries in the U.S. have incomplete injuries, meaning that though their movement may be extremely limited, their spinal cords have not completely lost the ability to transmit messages to and from the brain.

"Some instruction from the brain gets through but not enough to create a movement, so we're providing an amplification of that signal from the brain," said Dave Marver, CEO of Onward Medical, the company that sells the device.



Neuro-adaptive exercise specialist Creighton Goss attaches electrodes to Shane Callahan's back at Next Steps Chicago in Willow Springs on Feb. 6, 2025. (Antonio Perez/Chicago Tribune)

Dr. Arun Jayaraman, executive director of the Technology & Innovation Hub at Chicago rehabilitation hospital Shirley Ryan AbilityLab, who is not involved with Next Steps, called the device "an additional tool" that can be used to improve spinal cord signals to the limbs. He said it's the first device of its kind to be FDA-approved and available for everyday use by clinicians, rather than just for research purposes. The AbilityLab has an agreement to use the device for its research studies in stroke and other medical conditions later this year.

The device's FDA approval is "huge" for the spinal cord injury community, said Marco Baptista, chief scientific officer with the Christopher and Dana Reeve Foundation, which helped support the device's development with an investment in Onward. Philanthropic venture fund SCI Ventures, which was co-founded by the foundation and other nonprofits, now holds that investment, and any revenue received from the investment will go toward supporting more research, Baptista said.

"One, this can be a device that can help people, and, two, it provides this path forward that other therapies can then follow," Baptista said.

Next Steps Chicago, a standalone nonprofit, helped test an earlier version of the device and has always felt it's important to bring cutting-edge technologies into the community, Jones said.

"This is a catastrophic lifelong condition," Jones said of spinal cord injuries. "To make somebody's life a little bit easier, to give them 10% improvement, that's a big deal for someone who hasn't moved their arm or is dependent on someone else for round-the-clock care."

The device costs clinics about $40,000, Marver said — not a small price tag, but also not the most expensive piece of equipment a clinic like Next Steps uses.

In a study funded by Onward and published in May in the peer-reviewed journal Nature Medicine, 72% of participants saw improved strength and function in their hands and arms after using the device. The FDA specifically approved the device to be used to improve hand sensation and strength.

Trainer Creighton Goss works with Shane Callahan at Next Steps Chicago on Feb. 6, 2025 in Willow Springs. The two worked on supportive exercises, including leaning, balance, weight-shifting and reaching ability. (Antonio Perez/Chicago Tribune)

Improving hand function is a priority for many people with spinal cord injuries, Marver said, sometimes even more so than regaining the ability to walk.

“They need their hands to get through activities of daily living, to feed themselves, to clothe themselves, to go to the bathroom,” Marver said. “These are all things that introduce independence, dignity, quality of life.”

The device doesn’t work for everyone, but so far Next Steps has seen about a dozen patients have positive results, including Callahan, Jones said. Though Callahan still has hand function, the device has helped with other areas of his body, Jones said.

Callahan said he’d been a patient at Next Steps for about a year when Jones asked him if he wanted to try the ARC-EX device.

“She was explaining the research behind it and the possible benefits of using it, and it seemed it was applicable to my injury, so I thought why not,” Callahan said.

Callahan uses a wheelchair and is paralyzed from the diaphragm down. After his accident, he spent about two months as an inpatient at AbilityLab and then another six months doing outpatient rehab with the AbilityLab.

Now, he goes to Next Steps about three times a week, for two hours at a time, where he practices movement in the treatment gym. At a recent appointment, Goss had him kneel in front of a low table, which he used to brace himself, using his arms. Goss then slowly helped Callahan move his legs back and forth, an exercise designed to help him practice shifting weight from one leg to the other.

Callahan isn't sure how much strength, movement or sensation he'll ever regain. Everyone and every injury is different. "Nothing is guaranteed," Callahan said, but he's trying to recover as much as he can.

"It would definitely improve my quality of life, not just for me, but for my family," Callahan said of the prospect of regaining more function.

"We're hoping you walk in one day and say, 'Peace out, I'm done,'" Goss said. "That would be the goal."

"That would be the goal," Callahan agreed.

2025 › March › 7