

Robotic Rehab

Chicago PT wants to help stroke survivors learn to walk again

700,000 PEOPLE in the United States have strokes each year, and almost a third of those who survive lose the ability to walk on their own. The good news is that physical therapy can help many regain lost abilities and even walk again. The bad news is that government and private insurers have recently cut support for therapy. From 1994 to 2001, the duration of rehabilitation stays for stroke survivors decreased by a third, and Joel Stein, chief medical officer of Boston's Spaulding Rehabilitation Hospital, says this trend continues. A prototype robot built by Evanston, Ill., startup Chicago PT may speed up patients' progress, allowing more of them to walk before the window for therapy closes.

The robot was designed to help therapists resolve a conundrum. A therapist's first priority is safety, but especially in the case of reteaching a patient to walk, safety can get in the way of progress. Walking requires throwing yourself off balance with one leg and catching yourself with the other; making mistakes in the process and adapting to them is an important part of encouraging a stroke victim's brain to rewire itself around its injury. But such mistakes can be dangerous for some stroke survivors. According to Chicago PT cofounder Dave Brown, a physical therapist and professor at Northwestern University, since therapists don't want their patients to get hurt—and don't want to injure themselves in attempts to catch them—they err on the side of ensuring that patients don't fall.

Chicago PT's robot allows patients to make mistakes safely. The wheeled machine uses arms and a harness to give patients different degrees of support and guidance as their ability to walk improves. At first the robot might support all of a patient's weight and slowly move straight forward, while the therapist rides along

A robotic aid frees a physical therapist to use her hands more intelligently.



COMPANY:
Chicago PT

HEADQUARTERS:
Evanston, Ill.

AMOUNT INVESTED:
\$1.85 million

LEAD INVESTORS:
Rehabilitation Institute of Chicago, National Institute of Standards and Technology

KEY FOUNDERS:
Edward Colgate, Michael Peshkin, David Brown

TECHNOLOGY:
Robots for rehabilitation

in a wheeled chair, guiding the patient's legs through walking motions. Freed from having to support patients, therapists can "be really intelligent with their hands rather than being just a clamp to keep a person from falling over," according to Brown.

As patients get stronger and more coordinated, a therapist can program the robot to let them bear more weight and move more freely in different directions, walking, kicking a ball, or even lunging to the side to catch one. The robot can follow the patient's lead as effortlessly as a ballroom dancer, its presence nearly unde-

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tectable until it senses the patient starting to drop and quickly stops a fall. In the later stages of physical therapy, the robot can nudge patients off balance to help them learn to recover.

Brown and Michael Peshkin and Ed Colgate—both colleagues of Brown's at Northwestern—founded Chicago PT in 2005, using seed money from the Rehabilitation Institute of Chicago and the National Institute of Standards and Technology's Advanced Technology Program. The company's hands-on system marked a departure in the growing field of rehabilitation robotics. Previously, rehab robots mainly assisted patients in the performance of repetitive exercises, with little therapist involvement. A device available since 2001 from Hocoma of Volketswil, Switzerland, for example, suspends patients over a treadmill and uses a robotic exoskeleton to move their legs through walking motions.

The earliest clinical trials of any rehabilitative robot involved an arm therapy robot developed at MIT by a group led by mechanical engineers Neville Hogan and

A hospital gets the same reimbursement for a therapist's time whether the therapist is using a robot or a rubber band.

HERMANS
Hermano Krebs. Using sensors embedded in their robot, the researchers have since 1994 gathered data about the progress of more than 250 patients. Their first results showed that "the patients who were doing the robot training improved twice as much" as those who were undergoing nonrobotic therapies, according to Krebs.

Chicago PT will need to demonstrate that its more hands-on approach is also effective. The company is entering a critical phase, during which it aims to place robots in multiple hospitals and possibly a

model clinic where therapists, engineers, and patients will collaborate on design improvements and simplifications.

In the short term, Chicago PT will need to demonstrate that the robot works and win the support of major therapeutic centers. In the long term, its success, and that of other companies developing rehab robots, will likely depend on changing the reimbursement landscape. Currently, a hospital gets the same reimbursement for a therapist's time whether the therapist is using a "robot or a rubber band," Brown says.

In addition to proving its machine works and getting funding, Chicago PT will have to brace itself for competition as more and more groups develop robots for walking therapy. The MIT group, for instance, recently unveiled one robot that aids stroke victims with ankle therapy and is working on another that more closely resembles Chicago PT's. **Kevin Bullis**

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