

Focus on

Rehabilitation

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Robotics bring new treatments for stroke rehabilitation

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New robotic systems and devices are changing the world of stroke rehabilitation. Recent advances in technology include upper-body therapy systems for motor re-education and/or improvement in muscle tone and range of motion. Lower-extremity “exoskeletons” help patients relearn how to walk.

Many devices are based on one principle: Continual repetition of active and engaged motion results in cortical reorganization, a process through which neural pathways can be retrained.

These new treatment tools can be used by diverse patient groups. If a patient has no motor function, his or her affected limb is moved passively. If an individual has partial mobility, movement is initiated or guided by the device.

Restoring upper-extremity function

Increasingly, robotic technology is being evaluated and incorporated as a component of comprehensive rehabilitation programs. New devices include the Reo™ Therapy System (Motorika Ltd.), a

neuromuscular retraining system for stroke patients designed to improve shoulder and elbow function. Under evaluation at Kessler Institute for Rehabilitation and other sites, the technology is used by patients who have function, as well as by those who do not. It can automatically maneuver the arm, allow the patient to control the movement or assist the individual in making fluid repetitive motions.

To initiate assisted treatment, the therapist programs the unit to carry out specific arm movements at designated speeds and for a certain number of repetitions. The device is attached to the patient’s arm via a wrist/hand brace. A ball handle assists the patient in following movement patterns that appear on a computer screen, much like operating a joystick or computer mouse. The guided repetitive motion is therefore combined with visual interaction on the computer screen. The unit measures and records each session’s progress.

Inpatients generally use the Reo daily; outpatients use the system during their regular regimens of two or three sessions a week.

Repetitive exercise is also accomplished using devices such as the InMotion² Shoulder-Elbow Robot® (Interactive Motion Technologies, Inc.). It uses video games to help patients engage in specific movements, assisting the individual in moving his or her hand toward a target on the monitor. These activities increase motor abilities and reduce pain in the paretic arm. Other devices in trials or in use at rehabilitation centers assist with more complex

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hand functions and sweeping arm movements.

Assisting in complex lower-extremity movements

Robotics have also improved treatment for patients with motor impairments in the lower extremities. In traditional systems, an overhead harness supports the patient during exercise on a treadmill while therapists maneuver the individual's legs through repetitive walking motions.

The innovative Lokomat® (Swiss Federal Institute of Technology) hugs the patient's body like an exoskeleton and controls the walking movement, allowing for a more consistent and precise motion than was previously available. The Lokomat also sets hip and knee joint movements electronically to achieve correct stepping and walking motions. Sensors



in the motor-driven joints indicate the amount of effort generated by the patient. The device lessens the manual labor needed for therapy,

allowing longer training sessions with more repetitions.

Innovations for targeted treatment

Robotic devices offer new options to improve outcomes for a wide range of patients, from those without muscle function to individuals who are achieving full recovery. By targeting specific areas of the body, they allow for the precise repetition and controlled movements. Because of the great potential offered by these treatments, it's likely that an ever-increasing array of new robotic products to aid in stroke rehabilitation will be introduced.

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