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Are Robots any better in stroke rehabilitation?

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Robot-Assisted Therapy for Long-Term Upper-Limb Impairment after Stroke Veterans Affairs (VA) Robotic-Assisted Upper-Limb Neurorehabilitation in Stroke Patients study,

Why is this study of clinical importance?

One of the leading causes of long-term disability in the world is Stroke. This disability is often associated with persistent impairment of an upper limb. Despite development in rehabilitation programmes; the re-effectiveness in improving functional status and quality of life for patients with deficits more than 6 months after a stroke, has not been definitively shown. There is a potential to deliver high intensity, reproducible therapy with Robot assisted rehabilitation. Advances in robotics and an increased understanding of the latent neurologic potential for stroke recovery, led to robotic rehabilitation to help functional recovery of deficit.

This study was done to determine whether robotic assisted upper limb rehabilitation could lead to improve our functioning and quality of life of stroke survivors with long-term upper-limb deficits.

Who were the participants?

Two hundred patients were screened, of whom 127 underwent randomization: 49 to robot-assisted therapy, 50 to intensive comparison therapy, and 28 to usual care. Patients were veterans recruited from four participating VA medical centers who were 18 years of age or older and had long-term, moderate-to-severe motor impairment of an upper limb from a stroke that had occurred at least 6 months before enrollment.

What was the intervention?

This was a multi-center, randomized, controlled trial. Patients were randomly assigned to receive robot assisted therapy, intensive comparison therapy, or usual care with the use of a permuted-block design that was stratified according to site. Robot assisted therapy was administered for a maximum of 36 sessions over a period of 12 weeks (up to 14 weeks to allow for missed sessions).

The robotic system consisted of four modules which were used for different movements. Modules were used separately and in combination to perform high-intensity, repetitive, task oriented movements (1024 per session on

average), directed by video screens. Training targeted isolated proximal, distal, and integrated movements of the upper limb. The robot provided assistance if patients were unable to initiate or complete a movement independently. Intensive comparison therapy consisted of structured protocol using conventional rehabilitative techniques, such as assisted stretching, shoulder-stabilization activities, arm exercises, and functional reaching tasks. This therapy matched robot-assisted therapy in schedule and in the form and intensity of movements.

The usual-care group received customary care available to all patients (i.e., medical management, clinic visits as needed, and in some cases rehabilitation services), which was not dictated by the protocol.

What was the outcome?

The primary outcome was a change in the Fugl-Meyer score at 12 weeks, as compared with the baseline value. Secondary outcomes were changes in the score on the Wolf Motor Function Test and in the score on the Stroke Impact Scale, version 3.0, at 12 weeks, as compared with baseline values.

At 12 weeks, the mean Fugl-Meyer score for patients receiving robot-assisted therapy was better than that for patients receiving usual care (difference, 2.17 points; 95% confidence interval [CI], -0.23 to 4.58) and worse than that for patients receiving intensive comparison therapy (difference, -0.14 points; 95% CI, ?2.94 to 2.65), but the differences were not significant. No serious adverse events were reported.

What were the conclusions?

In patients with long-term upper-limb deficits after stroke, robot-assisted therapy did not significantly improve motor function at 12 weeks, as compared with usual care or intensive therapy. In secondary analyses, robot-assisted therapy improved outcomes over 36 weeks as compared with usual care but not with intensive therapy.

How does this impact us?

In developing nation like Pakistan there is doubt about the feasibility of Robot assisted rehabilitation due to financial and technical constrains. Intensive rehabilitation has shown to be better than robot assisted rehabilitation. Intensive and focused

rehabilitation programmes should be developed and implemented to improve the quality of life and functional status of impaired limb in stroke patients. Intensive and aggressive rehabilitation will help in reducing the disability burden of stroke.

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D43TW008660 from the Fogarty International Center and the National Institute of Neurologic Disorders and Stroke. The content is solely the responsibility of the authors and does not necessarily represent the official views of the Fogarty International Center or the National Institutes of Health.

Recommended Reading

1. Albert C. Lo, Peter D. Guarino, Lorie G. Richards et al Robot-Assisted Therapy for Long-Term Upper-Limb Impairment after Stroke. N Engl J Med 2010; 362: 1772-83.