ROBOT SUPPORTING THERAPY HAS ADDED VALUE IN NEUROREHABILITATION BUT…..

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According to the World Health Organization (WHO), by 2050 the proportion of persons over 65 years old will increase by more than 70% in the industrialized countries and by more than 200% worldwide. This age group is particularly prone to cerebro vascular accidents, or strokes, whose relative incidence doubles every decade after the age of 55 years. Stroke is a leading cause of movement disability in the USA and Europe. Hemiparesis or hemiplegia with or without sensory or perceptual disorders is the most common outcome of stroke.

There are two basic approaches to rehabilitating sensorimotor disorders in hemiplegia or hemiparesis. These two approaches are: (1) the compensatory (2) the restorative approach also referred to the remediation approach. Although not exclusive of each other, they do reflect differing philosophies.

The Compensatory (adaptive) Approach: The goal of the compensatory approach towards treatment is not necessarily on improving motor recovery or reducing impairments but rather on teaching patients a new skill, even if it only involves pragmatically using the non-involved side. The aim is to teach an adaptive approach, one-handed if necessary, with a focus on improving activities of daily living. There is anecdotal evidence that the compensatory approach may suppress neurological recovery (Bobath 1978, 1980), a concept supported by evidence that the forced-use approach can enhance motor control in selected patients (Taub et al. 1993, Wolf et al. 1989).

The Restorative Approach: The restorative approach focuses on traditional physical therapy exercises and neuromuscular facilitation, which involves sensorimotor stimulation, exercises and resistance training, designed to enhance motor recovery and maximize brain recovery of the neurological impairment. Research utilizing new technology such as functional MRI has certainly demonstrated the potential of the central nervous system to at least partially recover in response to specific training and stimulation.

Regaining lost function in the upper extremities may be more difficult to achieve than return of normal function (ambulation) in the lower extremities.

There are several methods to enhance motor recovery.

Robotic devices have the potential to help automate repetitive training after stroke in a controlled fashion and my opponent is going to talk about it.

But robotics lack human touch and their cost effectiveness is more than other means.

Other therapies may be as restorative as using robots but are more accessible to patient worldwide.

Medications used following stroke to augment the rehabilitation process have mainly been examined for their potential benefit in terms of global recovery. A small group of studies that evaluated the efficacy of drugs for its effect on the upper extremity. These drugs include stimulants (amphetamines and, methylphenidate), levodopa and anti-depressants (citapopram and reboxetine). There is strong (Level 1a) evidence that a single dose of either a SSRI or NARI can enhance short-term manual dexterity in the affected hand following stroke. Stimulants and Levo dopa do not improve upper extremity impairment.

Constraint-Induced Movement Therapy (CIMT) refers to a new set of rehabilitation techniques designed to reduce functional deficits in the more affected upper extremity of stroke survivors. The two key features of CIMT are restraint of the unaffected hand/arm and increased practice /use of the affected hand/arm. Since stroke survivors may experience “learned non-use” of the upper extremity within a short period of time CIMT is designed to overcome learned non-use by promoting cortical reorganization (Taub et al. 1999).

There is strong (Level 1a) evidence of benefit of CIMT in comparison to traditional therapies in the chronic stage of stroke. Benefits appear to be confined to stroke patients with some active wrist and hand movements, particularly those with sensory loss and neglect.

The cost? Occupational therapists fees.

Mirror therapy is a technique that uses mirror visual feedback to improve outcome. Patient place a mirror beside the unaffected limb, blocking their view of the affected limb, creating the illusion that both limbs are working normally. The reflection of the unaffected arm in the mirror may act as a substitute for the decreased or absent propreoceptive input. There is limited body of evidence in its application to stroke rehabilitation. In two trials there was an improvement in motor function reported in one trial, but not the other.

The cost? Mirrors, occupational therapists and physiotherapies**.**

Virtual reality is a technology that allows individuals to experience and interact with three dimensional environments. Virtual rehabilitation gives therapists new tools to do their jobs more effectively and engages patients who may otherwise lack interest or motivation to complete normal exercise regimens

The cost? Variable from commercial games to specially designed equipment

Functional electrical stimulation (FES) refers to the application of Neuromuscular electrical stimulation to help achieve a functional task. FES is a technique that uses bursts of short electrical pulses to generate muscle contraction by stimulating motor neurons or reflex pathways.

There is strong (Level 1a) evidence that FES treatment improves upper extremity function in chronic stroke.

The cost? Variable, but less than robotics

Transcranial magnetic stimulation - the use of single or repetitive transcranial magnetic stimulation (TMS and rTMS) and transcranial direct-current stimulation (tDCS) to help improve motor recovery**.** There is moderate (Level 1b) evidence that motor cortex xtimulation can improve upper limb function following stroke.