



Integrating Robotic Technologies into Neurorehabilitation: The iWalk Program

The iWalk Program from Sheltering Arms Physical Rehabilitation Centers utilizes technology to restore function and enhance walking recovery

BY JOANNA MOORE, PT, DPT

As a physical therapist and manager of therapy services within Sheltering Arms Physical Rehabilitation Centers, based in Richmond, Virginia, I know gait impairment is a primary functional limitation that physical therapists treat in rehabilitation facilities. The rehab staff members of Sheltering Arms strive to help clients regain the maximum amount of function and achieve the best outcomes. For the majority of clients, the goal is to improve walking, whether a client is affected by deficits caused by stroke, multiple sclerosis, traumatic brain injury, Parkinson's disease, or other neurologic injury or disease.

In response to this consistently observed need, a group of Sheltering Arms physical therapists — the iWalk team — explored the motor learning literature and new work published about innovative technologies designed to enhance walking recovery. The result was the iWalk clinical practice guideline (CPG), used as a clinical decision-making tool to suggest the intervention most likely to be effective for a specific patient based on individual attributes and functional level. In short, the CPG helps incorporate the most recent evidence into practice. The iWalk team used the



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principles of neuroplasticity and motor learning as a guide. The team members wanted to incorporate devices that allowed clinicians to enhance repetition, task specificity, intensity, and salience to further engage clients in their rehabilitation.¹ The team also wanted to include devices that could feasibly be used in the facility's clinics. The goal was, and continues to be, to allow the technology to enhance the care therapists already provide.

ROBOTIC GAIT TRAINING: WALKING WITH THE LOKOMAT

The iWalk team appreciated the need to incorporate a robotic-assisted gait training device to best serve the gait rehabilitation needs of the severely impaired population the team serves. After evaluating several different devices, Switzerland-based Hocoma's Lokomat was chosen as the best option for clients and for therapists who work hands-on with the device. The Lokomat incorporates a body weight support system with robotic orthoses and augmented feedback. It takes the client through a preprogrammed gait sequence over a treadmill. It allows the therapist to further challenge the client by decreasing the amount of body weight support, increasing the freedom the client has during gait, and incorporating a virtual environment.

The initial setup of the device takes a significant amount of time. However, after the initial session, the orthoses are set and the client can be assisted into the device and quickly begin walking. Clients who could normally walk only a few steps with the assistance of several clinicians and technicians can now walk hundreds or thousands of steps in a single session. The Lokomat allows the therapist to enhance the walking repetition for the client in a safe environment, while appropriately grading and encouraging participation.

SAFETY AND FUNCTION: ZERO G TRAINING SYSTEM

The iWalk team researched many body weight support devices and concluded that the ZeroG from Aretech LLC of Ashburn, Va, was the best fit for its needs. Team members had used static body weight support devices in Sheltering Arms clinics for many years, but needed a technology that was more progressive and versatile. The team's goal was to incorporate a device that allowed the performance of dynamic activities, permitted the patient to have the most realistic gait experience, provided a safe environment, and was user-friendly.

The ZeroG is the most widely used device within Sheltering Arms' clinics because it can be used with clients who range from very low level to very high level, depending on the goal of treatment. It allows therapists to take clients over ground, stairs, obstacles, and over a treadmill. All of these activities, and more, can be performed in a free environment that allows clients to experience error, while keeping them safe from falls.

From the therapist's perspective, the ZeroG is extremely easy to use. It can be adjusted from a touch computer screen, iPod, or iPad. It also allows the therapist to increase the focus on hands-on treatment rather than attempting to hold the patient upright. Because the ZeroG can be used over a treadmill, the therapist is able to get down to the level of the lower extremities and perform hands-on techniques to promote recovery.

TECHNOLOGY FOR NEUROREHABILITATION

Along with the Lokomat Pro and the ZeroG, the decision was made to

incorporate functional electrical stimulation (FES), robotic exoskeletons, split belt treadmills, and pressure mapping to provide the best tools for therapists and clients.

Among FES devices used in the program are the Bioness L300 offered by Bioness, Valencia, Calif, and the RT300 Leg Cycle by Restorative Therapies, Baltimore. These units are designed to help reanimate weak or paralyzed limbs. A number of fitness companies manufacture and sell split-belt treadmills. The split belt treadmills used for neuro

gait rehabilitation within the iWalk program are from Woodway USA, Waukesha, Wis. Within the iWalk program the robotic exoskeleton used in addition to the Lokomat is the AlterG Bionic Leg.

Pressure mapping can also be helpful in restoring the ability to walk. The iWalk program chose to use the GAITRite System by CIR Systems, Sparta, NJ. The instrumented GAITRite mat is designed as a portable walkway that can quickly provide gait data for objective analysis.

OTHER TOOLS FOR BALANCE ASSESSMENT

Though not incorporated into the iWalk CPG, which is specifically for gait recovery, another tool that can be helpful in neurorehabilitation is the NeuroCom SMART Balance Master, from Natus Medical Inc. This device is used as a tool for the diagnosis and treatment of balance disorders and provides assessment and retraining capabilities with visual biofeedback. The NeuroCom SMART Balance Master provides a way for therapists to accurately pinpoint and treat underlying issues that are affecting a patient. Therapists can control the surface where the patient stands and the patient's visual environment while assessing the components of balance control. The SMART Balance Master measures center of gravity position and postural control, and a dynamic visual surround measures the patient's use of visual information to maintain balance. Overall, this device is ideal for a comprehensive balance program.

Product Resources

The following companies offer products and devices for gait and balance rehabilitation:

Allard USA

www.allardusa.com

APDM

www.apdm.com

Aretech LLC

www.aretchllc.com

Clarke Health Care Products

www.clarkehealthcare.com

Endorphin Corp

www.endorphin.net

GAITRite/CIR Systems

www.gaitrite.com

Hocoma

www.hocoma.com

HydroWorx

www.hydroworx.com

In-Step Mobility Products Inc

www.ustep.com

M.A.S.S. Rehab

www.rehabharness.com

Micromedical Technologies Inc

www.micromedical.com

Mobility Research

www.litegait.com

NeuroCom by Natus Medical Inc

www.natus.com

Ottobock

www.ottobockus.com

Solo-Step

www.solostep.com

Tekscan

www.tekscan.com

IWALK FOR THE FUTURE: MOVING AHEAD FOR OUTCOME IMPROVEMENT

The aforementioned devices are all complementary to one another and are integral parts of the iWalk program, which has been in operation in Sheltering Arms' hospitals and clinics for nearly 2 years. The iWalk team has served a wide variety of patients because of its well-trained therapists who have access to these technologies. We are currently collecting standardized outcomes on every client taken through the iWalk program. This data is being compared to pre-iWalk data to determine whether the clinical practice guideline (CPG) and use of technology are improving the outcomes of clients. Overall, the trends are very favorable to the iWalk approach. The iWalk team continues to refine the clinical plan, CPG, based on the results of the data analysis. The team now does things very differently from in the past, and is seeing excellent results. **PTP**

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INTERACTIVE EDITION EXCLUSIVE

Our January digital edition features more information about gait and balance rehabilitation. Reference available online.

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