

The Use of Manual Tilt-in-Space Wheelchairs in Stroke Rehabilitation



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Stroke Rehabilitation

Persons who have suffered strokes present with a wide array of functional deficits which indicate rehabilitation; some with needs for extensive rehab and others not as much. For many of these individuals the capability for independent mobility has been problematic, sometimes due to their own limitations, but in many cases the equipment available to them has proven to be at least one limiting factor.

In the case of manual wheelchairs, the technology available has heretofore offered less than optimal solutions to address the mobility needs of the stroke survivor. Most of these individuals are diagnosed with hemiplegia or hemiparesis. They may have some functional motor control of one side of their body; upper extremity, lower extremity, or both.

Stroke survivors commonly present with a high need for positioning, limited independent mobility and a limited ability to independently reposition themselves, and are therefore at risk of pressure injuries. They will benefit from a seating and mobility system which can provide pressure relief, postural support to counter the effects of hemiparesis and the ability to adjust seat angles to the optimum setting specific for certain activities, such as independent functional propulsion, optimized angles for transfers, eating and other ADLs. Additionally, they, or their caregivers, may benefit from a mobility system which is easy to maneuver and transport.

While adult manual tilt-in-space wheelchairs are appropriate for these types of seating and mobility needs, they are rarely prescribed for stroke survivors because they are not designed for independent mobility, especially foot propulsion. They are also difficult to transport without an accessible vehicle, especially for older caregivers.

Current Practice

Let's look at the equipment that is often issued to the stroke survivor with the potential for some functional independent mobility. Most stroke survivors are placed in lightweight manual wheelchairs (K0003) or high strength, lightweight manual wheelchairs (K0004). These chairs generally weigh 32 lbs. to 35 lbs., and as reimbursement for these chairs has declined, the chairs have become heavier and less capable. It is common that they are not well fit to the individual user, have fixed or minimally adjustable seat angles, rear axles and casters, all of which contribute to inefficient mechanics and the difficulty in

maneuverability. This all leads to greater energy expenditure by the user, poor body mechanics that put joints at risk, difficulty in maneuvering and transferring in and out of the chair and poor sitting postures that can lead to shear and an increased risk of developing pressure ulcers.

In a clinical trial on preventing pressure ulcers with wheelchair seat cushions, Brienza, et al concluded that skin protection cushions used with *fitted wheelchairs* lower pressure ulcer incidence for elderly nursing home residents and should be used to help prevent pressure ulcers. Moreover, in the context of their investigations they made the two following statements: “cushions cannot compensate for violation of basic principles of body mechanics in wheelchair fitting”, and “poorly fitting wheelchairs are likely to result in poor posture that will result in higher pressure and increased pressure ulcer risk”

Brienza’s research also noted the significance of being active and having some independent mobility. Investigators found that pressure ulcers occurred in only 5.8% of the 69 participants who were independent in their ability to propel their wheelchair, as compared to 19.0% of the 153 participants who were dependent for their wheelchair propulsion. In short, those with independent wheelchair propulsion experienced less than 1/3 of the incidence of pressure ulcers than did their dependent counterparts.

For many, these difficulties with independent mobility may serve to discourage them from being as active or as mobile as they can or might desire to be. If it is tough to do, many just resign themselves to sit still and only move around when absolutely necessary. This diminished activity can unfortunately prolong the duration or stifle the progress of a rehabilitation program. Conversely, a person who can be more active, and more mobile in between active rehabilitation therapy sessions is going to be more motivated, more engaged, and progress physically at an improved pace.

Another important consideration for the stroke survivor is the ability to integrate back into the home and community environment. The K0003 or K0004 chair can be folded, and thus is somewhat portable. However, transporting these chairs is not without difficulty. In many of these chairs, features and options that make them more compact are also the features and options that make for challenging maneuverability, poor mechanics and add weight.

Solution

These problems can be addressed by innovative product development; incorporating design elements into a chair with specific intent to address each problem. Ki Mobility has introduced a chair that does this very thing: Liberty FT, an adult tilt-in-space (E1161) that folds and has a transport weight less than 26 lbs. It can be configured with a more customized fit for the user in need of a manual wheelchair with the option of independent mobility. This configuration/fit capability allows for better balance of the system specific to the user and allows for better body mechanics for the independent propeller, reducing energy expenditure.

Instead of fixed or minimally adjustable seat angles, Liberty FT is a manual tilt-in-space chair that adjusts in a 20° active range, from -7° to 27°. For example; the seat angle can be actively adjusted from 0° to 20° or -5° to 15°. The ability to achieve such angles in a lightweight tilt-in-space now allows the chair to be set at various angles that are optimal for a variety of mobility related ADLs (MRADLs).

Very notably, the ability to set the seat angle appropriately for a foot propeller, without raising the front seat height, and thus the foot, means the foot propeller can now achieve functional independent mobility, without pulling their pelvis forward in the seat. Recall that in the K0003 and K0004 paradigm users tend to pull their pelvis forward into a poor and risky sitting posture which, aside from the poor mechanics, puts them at a significantly higher risk of developing pressure ulcers. The infinite adjustability of angles within the range also means the user can achieve the optimum angle to safely eat and swallow without an increased risk of aspiration. They can also bring the chair back up to level (it can even be set up for some anterior tilt) to facilitate easier transfers, either laterally, or in/out of the front of the chair.

Adjustability in axle position, both horizontally and vertically, allows for a more balanced chair with improved rolling efficiency and easier maneuverability. The difference in energy expenditure for someone in a better configured, better balanced chair is well established. By being more capable of individualized fit, Liberty FT can reduce risk to joints, maintain a safer posture, and result in a user who is more active in general. For those in an active rehab program, this level of activity can have a positive impact on the duration of and the gains made in their rehab plan.

The most notable and unique feature of Liberty FT is its ability to fold into a compact package ideal for transportation. With a transport weight less than 26 lbs., it can be placed into the trunk space of the most compact car, in sections that are easy to handle, even by frail caregivers. Liberty FT, from Ki Mobility, is finally the one wheelchair that offers true portability, enables independent propulsion and provides the benefits of various seat angles in a tilt-in-space chair.

Brienza D, Kelsey S, Karg P, Allegretti A, Olson M, Schmeler M, Zanca J, Geyer MJ, Kusturiss M, Holm M. A randomized clinical trial on preventing pressure ulcers with wheelchair seat cushions. *J Am Geriatr Soc.* 2010 Dec;58(12):2308-14. Epub 2010 Nov 10.