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Driving Today's Mobility & Rehab Markets

Propulsion & Prevention

How Manual Wheelchair Technology & Client Best Practices Can Maximize Mobility

CMS Updates:

New HCPCS Codes,

HCPCS Code Updates Released

Added (New) Codes:

E2227: Manual wheelchair accessory, gear-reduction drive wheel, each.

g Essentials:

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Propulsion & Prevention

BY LAURIE WATANABE

What Are the Links Between Manual Wheelchair Propulsion & Pain? What Can Rehab Professionals Do to Help?

If you're a seating & mobility professional who works regularly with manual wheelchair clients who self propel, then statistics say you are working with people in pain.

The numbers are sobering: A 2005 Journal of Rehabilitation Research & Development report from the Department of Veterans Affairs estimated that more than two-thirds of spinal cord injury (SCI) patients using manual wheelchairs reported shoulder pain, and the prevalence of pain increased as time went on. By the time SCI patients were 20 years post injury (and therefore self propelling for nearly that entire time), that Veterans Affairs report said *all* of the patients in the study reported shoulder pain and/or paresthesias (skin sensations such as burning, itching or tingling).

Manual propulsion is a physical activity that helps prevent a lot of other co-morbidities

— Dr. Margaret Finley, University of Indianapolis

Wrist/hand pain and injuries are also commonly reported among manual wheelchair users. If these situations go uncorrected, manual chair users can end up with serious injuries that require significant rest, marked reduction or alterations to activities, medication and/or surgical intervention — all of which can lead to decreased mobility and loss of independence. SCI patients who end up having surgery face even greater immobility during recovery, which can put them in danger of pressure wounds, infections and other medical problems.

Yet despite the great discomfort and potential risk of living with pain, many manual wheelchair users continue to do so — perhaps because they think there is no other choice, or because they're concerned that the only "cure" is changing over to power mobility, which they don't want.

Is there a better way?

The Whys & Whens of Shoulder Pain

Margaret Finley (PhD, PT), now with the University of Indianapolis Krannert School of Physical Therapy, recently published with Mary M. Rodgers (PhD, PT) an article called "Effect of 2-Speed Geared

Manual Wheelchair Propulsion on Shoulder Pain and Function." The goal of the study was to examine "the impact of a manual two-gear drive wheelchair wheel (Magic Wheels) on shoulder pain and function in manual wheelchair users."

This independent study, conducted while Finley was at the University of Maryland, was just the latest example of Finley's research into manual wheelchair propulsion and shoulder function; her doctoral research focused on scapular kinematics during wheelchair propulsion and activities of daily living, and she's published dozens of papers on propulsion and end-user injuries.

In her years of research, Finley has worked with self-propelling manual wheelchair users with many types of mobility conditions, including post-polio syndrome, stroke, cerebral palsy, lower-extremity amputations, rheumatoid arthritis, Guillain-Barré Syndrome and SCI — but she's found they have shoulder pain in common.

In explaining the cause of shoulder pain in self-propellers, Finley says the shoulder is "a joint not made for the weight bearing. You get a sub-maximal load on your shoulder joint with every push because (users who self propel) are essentially walking on their hands — and the upper extremity was not designed for that, especially the shoulder, because it really has no bony connection to the body. It's held together with ligaments and tendons. A surgeon I used to work with called it a softball on a postage stamp. That's how you're trying to keep it together."

Consider the weight load that a shoulder has to bear every time the arm pushes on a manual chair handrim, then multiply that load by the number of "pushes" every day — an average of 2,500 per day, or 17,500 times per week, says Three Rivers' David Boninger. It's easy to see that the shoulders of a manual wheelchair user do an astounding amount of work. And that's in addition to the shoulders' everyday activities of facilitating eating, bathing, exercising, lifting and carrying, driving, etc. Consider also that a wheelchair user relies on shoulders, arms, wrists and hands to reach overhead and to transfer many times a day.

So a manual wheelchair user relies heavily on his or her shoulders to transfer, reach overhead and propel. But what specific attributes of propulsion take such a toll on the shoulders? Finley says that isolating the causes of shoulder pain and injury is difficult.

"For some people, it's the style, the way they release the wheel and catch back on," Finley says. "Is there one that's better, are the forces less (with certain propulsion techniques)? Is it the frequency of push, is it the magnitude of the load? No one really knows."

While common sense would suggest shoulder pain is caused by overuse, Finley says she's discovered that shoulder pain begins at different times for different manual chair clients. Her observations show that some clients develop pain immediately after they start using manual chairs because of the sudden increase in shoulder use, while others develop pain only after they've been propelling for a much longer time.

"One study showed that a lot of people developed (shoulder pain) in the first year, and then the other group (developed pain) over two years," Finley says. "It's a mix in there: the kind of conditioning that is required early on when you're first (propelling) versus over time, just the general degeneration that occurs.

"Some people will tell you they've always had shoulder pain since they started pushing. I actually had a group of about 20 people who didn't have any shoulder problems, and they'd been in their chairs for years."

Finley says it's still a bit of a mystery as to why some manual chair users are able to go so long without developing pain. "That's the big unknown, I guess, about any disorder: Why do some people get it and some people don't?"

Finley adds that studies have confirmed, however, that using a manual wheelchair does seem to directly lead to shoulder pain for most people.

"The big thing was the development of the shoulder pain after using the chair," she says. "These were not people that were in occupations where they worked overhead and already had shoulder pain, then had to go into a chair. What we studied were people where the pain began after they started using the chair."

So far, Finley says that manual chair propulsion research studies have been able to discover a couple of factors that universally seem to lead to more shoulder pain.

"The only two things that have been statistically and research associated is duration of use and body weight/body mass index," Finley reports. So the heavier a wheelchair user is, the more likely he/she is to experience shoulder pain. And the longer a user self propels, the greater the likelihood of injury and discomfort.

Prevention & Treatment

Finley stops short of saying that all new manual wheelchair users should automatically be encouraged to use propulsion aids such as power-assist devices or two-gear drive wheelchair wheels (i.e., Magic Wheels). But she does agree that getting help quickly for shoulder pain is key to prolonging a client's ability to stay in a manual wheelchair.

"Early intervention certainly helps," she says, "and it's up to the healthcare providers to be knowledgeable about what's out there."

So as a rehab or assistive technology supplier, what can you do to help your manual wheelchair clients stay healthy and independent?

- Teach them to pay attention to their pain. Shoulder pain (or pain in their arms, wrists, hands, necks or backs) may be related to propelling and should not be ignored. Pain is not normal, so clients in pain need to seek prompt, professional help.

- Give them hope — and tell them there are options. Reassure clients that shoulder pain is not an automatic decree to switch to

Preventive Measures: Emerging Propulsion Technology for Manual Wheelchairs

While early intervention is key to effectively treating pain experienced by manual wheelchair users, injury prevention is better still. Power-assist systems (such as Frank Mobility's e•Motion and Quickie's Xtender) for manual wheelchairs have been around for years, but they're not always an easy sell to either consumers or funding sources — just ask Johnson & Johnson's Independence Technology division, whose iGlide manual chair seemed to come and go in a power-assisted flash.

But power assist isn't the only preventive technology for manual chairs.

Magic Wheels created great buzz recently by landing a coveted new HCPCS code — E2227 ("manual wheelchair accessory, gear reduction drive wheel, each") — that went into effect on Jan. 1. This two-gear manual wheel was the subject of a five-month independent study to judge its effectiveness on reducing shoulder pain and improving function. Researchers Dr. Margaret Finley and Dr. Mary Rodgers said in an article on the study, "There were pain reductions two weeks after using the Magic Wheels, indicating a rapid response to the intervention. These findings indicate the potential for shoulder pain reduction with the use of a manual drive wheel during mobility, even in highly functional manual wheelchair users."

Another type of common complaint among manual wheelchair users — wrist and hand pain — is addressed by ergonomic wheelchair handrims designed by Natural-Fit. The handrim has two separately coated components — a smooth oval surface for the palm of the hand, and a higher-friction, contoured slot for the thumb — to provide separate surfaces for propulsion and braking. The handrim, says Dr. David Boninger of Natural-Fit/Three Rivers Holdings, "has been shown in published research to reduce pain in the hands and wrists of manual wheelchair users."

As for making manual chair users aware of such assistive technology, Boninger says, "There is absolutely no doubt that getting 'preventive' information out to end-users as soon as possible is a good thing to do — and yes, even before there is a problem, and even if they are young. Learning early on about getting the most appropriate equipment, making sure it's set up correctly and knowing 'best-use' techniques can all help to prevent and/or delay the onset of overuse-related pain and injury. And just so you don't have to take my word for it: The very first recommendation in the Consortium of Spinal Cord Medicine 2005 Clinical Practice Guidelines, available at www.pva.org, is all about education and prevention to help preserve upper-limb function in manual wheelchair users."

power mobility. "I've worked with many (manual chair users with shoulder pain), and I've treated their shoulders," Finley says. "It's an acute situation, and if you can head it off at the pass and treat it early and find out that it's a strength imbalance, (then) let's strengthen you, so you can tolerate what you have to do better. If it's early and we can find out that it's soft tissue, then we can work with it."

- Help them assess their overall lifestyle; there may be other ways to reduce shoulder pain and fatigue. Finley suggests, for instance, that clients tell their health-care providers about home and workplace environments and job demands to determine if they're

doing too much overhead reaching, lifting, etc., and to determine what changes can be made to help. Clients may also be able to adapt their transfers: "There have been several studies that have come out," Finley says, regarding research on safe and efficient transferring in and out of wheelchairs. For instance: "If they've got a problem in their left shoulder, they need to lead with their left shoulder, not trail with it. That was one of the pieces of (research) work I did."

- Check the seating system and wheelchair for proper fit. Maintaining optimal fit is a particular challenge with children and adolescents, Finley says: "They change so much, and you're dealing with their change in body size, and the cost to put them in wheelchairs that actually fit them as they grow is prohibitive. You can get them ideally set while they're younger, but they grow so quickly." Incidentally, Finley says those are some of the reasons that there have been few studies to date focusing on shoulder pain in children and adolescents who self propel.

- Encourage your clients to work with health-care providers who specialize in seating & mobility. "Most of these individuals who are using wheelchairs, the individuals with spinal cord injuries, they've got a family physician who treats people without disabilities," Finley says. "The first thing (patients are) told is 'Get out of that chair.' (General practitioners) are not knowledgeable." Tell clients that most physical and occupational therapists don't specialize in wheelchairs, either, so they should ask to work with a clinician with seating & mobility expertise.

Manual Chairs as Preventive Medicine

Despite the statistical likelihood that manual chair users who self propel will eventually experience shoulder pain, Finley believes manual chairs still offer the opportunity for users to be the most independent.

"Manual propulsion is a physical activity that helps prevent a lot of other co-morbidities," she says. "Being in a manual chair does allow (users) a lot more mobility because of the physical size and ability to get around. Once you get a power chair, there are additions of weight and width and other things that can be restrictive to their independence.

"I come from the mindset that I think their manual chair is their best option for overall mobility and general health," she says. "We've had individuals who've had cervical spinal cord injuries (and are) ugly propellers. They struggle with it, and they've got problems all over, but they would rather be in that manual chair than anything else." ●