

Los Amigos Research and Education Institute State of the Science Conference on Manual Wheelchair Propulsion

By Douglas Glenn Clark

An international group of experts has warned that without a bold new initiative it may be impossible to meet the growing needs of people who live in wheelchairs.

Failure to pursue further research and development now may mean that within a decade the therapeutic community will be overwhelmed by the health demands of the spinal cord injury (SCI) population, group members say.

In a consensus statement developed at a conference in 2005 the group defined a list of priorities that are now being circulated throughout the broader SCI community.

Priorities include:

- Expand the assessment of the upper extremity function. And learn more about the mechanics of injury so that wheelchair users and clinicians can be better trained.
- Assess the attributes and abilities of wheelchair users. This must include but not be limited to age, gender, time since injury, and level of SCI.
- Scrutiny of wheelchairs - seat height and width, axle position, and wheel size - is also needed, as well as more information about the interface of rider and chair.
- Improved measurement techniques to further understand how to address rotator cuff injuries and carpal tunnel syndrome in persons with SCI

This elite meeting of minds occurred in September 2005 at the *State of the Science Conference on Manual Wheelchair Propulsion*. The conference was sponsored by Los Amigos Research and Education Institute, Inc., (LARIE), of Rancho Los Amigos National Rehabilitation Center in Downey, CA.

The event was funded by the National Institute on Disability and Rehabilitation Research (NIDRR) as part of *Keep moving: RERC on Technologies to Enhance Mobility and Function for Individuals with Spinal Cord Injury*.

Those who participated - more than 20 physicians, researchers, engineers, and wheelchair activists - represent a veritable *Who's Who List* in the field of SCI. LAREI officials say this is why the work done at the conference is significant.

"This was an authoritative group, an international effort of the experts representing the majority of leading labs doing research on wheelchair use," said Dr. Robert Waters, (your title here).

The need for a new initiative is not, experts say, an indication that earlier SCI research has failed the population. In fact, the opposite is true.

In the past thirty years there have been many improvements in the design and function of manual wheelchairs. Advances include adjustable axle position and a wider variety of manufacturing materials.

And innovative equipment designs have allowed many men and women confined to wheelchairs to participate in sporting events, such as marathons, downhill skiing and tennis. As a result, many with SCI are now able to live 25 to 50 years after injury.

Yet studies show that manual wheelchair use of 20 years or more creates two major problems that hinder quality of life: more pain and fatigue; and upper body deterioration triggered by rotator cuff and carpal tunnel problems.

Push Comes to New Initiative Demand

Experts are concerned that while the past decade has seen some focused research activity, not enough is being done.

For example, the objective measurement methods used to improve understanding of how human beings walk have been applied to manual wheelchair propulsion. Even so, the effort is still in its infancy when compared to progress made in human walking research.

Meanwhile, experts say demand increases each day for evidence that might drive clinical practice in the area of

manual wheelchair propulsion. Solid evidence is needed to build new guidelines.

And these guidelines are not just needed for product design and clinical practice. They are also necessary to convince health insurance companies to expand payment coverage. For while preliminary studies show that wheelchairs with suspension systems may provide users with a faster, more comfortable ride, these improvements also bring a higher price tag.

Also, experts said that despite the attention paid in recent years to upper extremity impairments, there remained a multitude of other concerns that require research.

For example, more information is needed about the interface of rider and chair. This would require further scrutiny of wheelchairs - seat height and width, axle position, and wheel size. And participants said more data was needed in the areas of propulsion mechanisms, stroke frequency, length of stroke, and various stroke patterns.

Another need revealed at the conference is improved measurement techniques to further understand how to address rotator cuff injuries and carpal tunnel syndrome in persons with SCI. For example, it was agreed that labs using dynamometers should calibrate the devices on a regular basis and report the results of calibration.

And for kinematic studies, the group agreed that sufficient markers per segment were needed to permit calculation of rotational displacement in the three orthogonal planes. For the hand this would require a single marker on the third metacarpal if the wrist were identified with markers on the radial and ulnar styloid processes.

Major Priorities, Intricate Needs of Wheelchair Users

The conference consensus statement was derived, in part, from real-life experiences of wheelchair users, some of whom have become leaders in the community.

John Box, who has lived in a wheelchair for 24 years, is the founder of Colours N' Motion, now considered a leader in the design of innovative active wheelchairs. Box said that he had rotator cuff problems due to playing sports,

but he had no intention of slowing down. As a result, he suggested further studies of bladder and kidney standards.

Other wheelchair users revealed personal struggles as well as secondary medical issues, such as hygiene of hands for manual propulsion and the development of lower-back pain.

Peter Axelson, a wheelchair user of thirty years is the founder of Beneficial Designs, which develops assistive and adaptive technology, and performs rehabilitation research. Axelson said that while he must continually adapt to his situation, most of his injuries are caused by transfers. For example, being moved from a chair to a bed.

As a result, conference participants named transfers and reaching as top priorities for future research, along with wheelchair propulsion in natural environments.

Other issues of concern included the environment, duration and frequency of activities, and barriers encountered by wheelchair users.

Preserving upper-body strength during non-propulsion activities such as sex, driving a car, exercising and bathing was also deemed a key area in need of research.

Face the Future

The priorities established at the 2-day conference were reached through a consensus process that included international participants, such as Luc van der Woude, PhD., of the Institute for Fundamental and Clinical Human Movement Sciences, Vrije Universiteit, The Netherlands.

Among the thirteen organizations represented were the Mayo Clinic College of Medicine, of Rochester, MN., University College London - Aspire Foundation, and the Kessler Medical Rehabilitation Research and Education Corporation, of South Orange, NJ.

Members of this elite group hope that the work done in 2005 will help guide the therapeutic community in its quest to meet the future fully prepared. Failure to do so will mean the gains enjoyed in the last twenty years by the growing SCI population will stall, possibly creating a health crisis that could be far more costly than the expense of new research.