PMG
POSTURE & MOBILITY GROUP

POSTURE & MOBILITY

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this issue...

Looking forward to London 2012 – Journals 28:2 & 29:1

In the next 2 issues of the PMG journal, we will continue to feature articles about active users.

If you have an article or case studies you would like to share with the rest of the PMG membership, please get in touch. An article could cover any of the following elements:

- service provision – assessment, supply criteria, set-up of chairs, training of users
- links between rehabilitation technology and assistive technology
- health, fitness and injuries of active users
- wheelchair sports
- and, if you have something related to the 2012 Paralympics, we would love to hear from you

However, we always welcome articles on any topics of interest to PMG members, so don't hold back! If you want to discuss your ideas with one of the editorial team, please contact Olwen in the first instance: **Email: olwen.ellis@pmguk.co.uk or Tel: 0845 1301 764**

Articles submitted can be between 500 and 2,000 words.

We look forward to hearing from you!

Front Cover: Front cover: Paralympian archer Mel Clarke winning her bronze medal at the Beijing Olympics in 2008. See article on page 10 describing Mel's collaboration with Consolor as part of her preparations for London 2012. With thanks to Consolor for sponsoring the purchase of the photograph.

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PMG will be 20 next year!

Come and join the birthday celebrations at the 2012 National Training Event in Warwick Arts Centre

11th to 13th April 2012

To help us promote the event, please display one of the enclosed Call for Papers flyers in a prominent space at work, and/or request for one to be displayed in another relevant establishment. Thank You!

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Editorial

In the process of gathering articles focussing on the active user, some questions have arisen around the use of this term. What is an 'active' user? Is it someone who requires the use of a wheelchair for mobility, but otherwise leads a fairly "normal" life? Is active the same as independent? Does it include powered as well as manual wheelchairs?

For able-bodied people, the image of an 'active' person is someone who has an active job, who gets outside, plays a sport, walks, runs, goes to the gym – basically someone who doesn't sit down all day. All of our clients spend most of their days sitting, and so it is up to us to enable our clients to be as active as they are able to be, and as they want to be.

But we must maintain a reasonable perspective of what we are aiming for with individual clients. There are some for whom eating, listening, and looking, whilst being fully supported, is as active as can be expected. For more able people, support that improves the function of the head and upper limbs is appropriate. And you can read about catering for the needs of even more able people in this edition of the journal.

In the next 2 issues of the journal we will continue to focus on the 'active' user in the wider sense, and we would love to include your articles, short or long, describing how equipment has enabled people with disability to become more active (or not!).

Carolyn Nichols, Editor

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Letter from the Chair

Well, whaddaboutya? I hope you all enjoyed the fabulous weather at Easter and had some well-deserved R&R. I can't help wondering whether it's a sign of getting older or simply incredible busy-ness when time passes so quickly. No answers on a postcard thank you, I prefer to think of it as the latter!

Some of you will have joined us in Warwick in April for our fantastic NTE. Thanks to Kirsty-Ann Cutler and the NTE Group, Olwen, Simon and Hayley, as well as countless others who worked so hard to make it possible. The PMG Executive Committee continues to work in the background after this hugely successful event, sorting out the finances and, believe it or not, planning already for NTE 2012.

Speaking of NTE, my letter is taking a slight change of tack for this edition. I head off soon for a three week visit to Asia, delivering workshops in Korea, Australia and New Zealand. By the time the copy is needed for print, I will be away. Therefore, rather than leaving the editorial team with an empty space to fill, I am shamelessly cheating and using an abbreviated, but updated version of my AGM report.

PMG Priorities for 2010-2011

1. **Strengthening our base**
   - Dr Linda Marks is our first ever External Advisor.
   - The constitution is updated to reflect the changing needs of PMG.
   - All voting Executive Committee members to have Trustee status.
   - Olwen Ellis is formally employed by PMG.

2. **Website**
   - Our new website is underway and we are aiming for "go-live" this summer.
   - Active link with Posture24 to be established www.posture24.com.

3. **National Training Event**
   - Established as the single biggest event in PMG's calendar.
   - Plans underway for 2012.

The rest of PMG...

The other sub groups continue to work on their tasks, feeding into the strategic priorities on behalf of PMG.

Executive committee changes

This year sees the end of office for a number of our Executive Committee members. Many thanks to Donna Cowan, Helen Hislop, Jo Jex, Dave Long and Henry Lumley who are leaving the committee. Don't worry though, we still have their numbers! We also extend a very warm welcome to our brand new members - Helen Critten-Rourke, Richard Earl and Gail Russell - and see a much appreciated return to the fold for David Porter and Monica Young.

Changing people brings changes in dynamics, ideas and how things are done. This breathes new life into PMG and helps to ensure we don't become complacent or lose focus about what's important.

And finally...

On that note, once again a huge thank you to all the executive and sub-committee members who continue to give their time and effort to PMG. We truly appreciate it.

See you later,

Clare Wright, PMG Chair, May 2011

PMG Executive Committee 2011/12:

Jane Chantry
Helen Critten-Rourke
Kirsty-Ann Cutler
Richard Earl
Craig Egglestone
James Foy
James Hollington *(Vice-chair)*
Alison Johnston
Carolyn Nichols
David Porter
Gail Russell
Nigel Shapcott
Rakesh Shukla *(Hon Treasurer)*
Clare Wright *(Chair)*
Monica Young

External Advisor: Dr Linda Marks

A Power of Good

Martin Hutchins

Abstract: *How using a tricycle has brought fun and healthy exercise to someone who has had a stroke.*

Keywords: *stroke, tricycle, exercise, fun and health, production trike.*

As I cycled past a couple of people, one said to the other, "Did you see that! What a wonderful machine!"

I have to agree. And what's more, it's doing me a power of good too!

It all started when Lucy (my wife) started researching recreational ideas in Devon. She found a bicycle shop which rented trikes on the Tarka Trail, near Barnstaple. We rented a Greenspeed trike for a day, and I cycled for miles. It wasn't set up for me very well, but it was only a hire trike…

Following this success, we set about finding a trike on the internet. Well, I never thought there would be so many to choose from. We live down a very rough track, in the countryside, so it had to have some suspension. Eventually, we settled on a trike made by Inspired Cycle Engineering of Falmouth. We went down to see them, and Neil (of ICE) spent a whole afternoon explaining the advantages of trikes, and how their machine could be altered to suit my particular disability. I should explain that a few years ago I had a brainstem stroke, which left me without speech, virtually no strength in my left leg and arm, and with reduced strength in my right arm and leg. So, all the hand controls had to be operable from the right hand.

"Not a problem" said Neil. We ordered a trike that same day, and in around five or six weeks Neil emailed us to say that it was ready for collection. It was perfect, nothing had to be altered, and the next day I took it out to the Exe path to test drive. The 'Big Apple' tyres gave an extremely plush ride and, together with the rear suspension (standard), I needed a lot of persuading to get off! The modifications that had been done on the trike were minimal, and all just involved fitting standard parts, which meant that they were quite cheap. Starting with the brakes, the only change was to operate both front brakes with one hand lever. The ICE system of neutral steer at the front (no effect on steering when braking) works very well indeed, and the machine pulls up straight with minimal hand pressure. The brakes are Sturmey-Archer hub brakes. You can 'upgrade' to disc brakes, but with brakes as good as the Sturmey-Archers, who would want to? The rear hub is an 8-speed Shimano Alfine, which is excellent for me, as I have the bad habit of stopping in any old gear, which means that I would have problems starting off again. With the Alfine, I can just select bottom gear and get away with no trouble at all!

Both front and rear gears are operated by controls on the right-hand handlebar. The rear hub is controlled by a grip-shift on the vertical section of the u-shaped bar. Just below it there is a stub handlebar, with a second grip-shift changer for the front derailleur.

A handlebar bag is used to store oddments, and that sits just below the right elbow. The seat is a standard ICE design, the mesh ensuring that you keep cool when it's hot (assuming that we might have some hot summers!).

ICE recommend Shimano clip-in pedals for foot security

Shimano 8 speed hub gear

The height of the seat (just over 12 inches) makes the trike easy to board, even with my limited mobility.

Well, that was at the beginning of October 2009. A bonus is that as I am busy cycling, I can go out on frosty days and keep warm! I am now planning several long distance rides, and getting stronger all the time. In fact, if anyone feels like joining a team with me, do get in touch via the editor!

Acknowledgement

The original article was first published in Velovision*, and we are grateful for their permission to publish a slightly revised version here.*

Setting off for wide open spaces; flag is standard equipment to alert other road users to trike

Going Beyond the Standard in Manual Wheelchairs: Choice of Frame Material Matters

David S. Boninger, PhD, Vice President, Communication Three Rivers Holdings, LLC (a subsidiary of TiSport, LLC), 1826 W. Broadway Rd. Suite 43, Mesa, Arizona, 85202, USA

Abstract: *Therapists have an important role to play in ensuring that clients know what their options are in wheelchair frame materials. Aluminium and titanium frames are two of the most common options and there are important differences between the two. Whatever the choice is, it should be a thoughtful choice, informed by an awareness of the available options. Manufacturers, for their part, serve clients and therapists best by offering both these options. This will leave the choice right where it should be – in the hands of clients and therapists.*

Keywords: *manual wheelchairs, wheelchair frame materials, titanium, aluminium*

Too often we take the path of least resistance. In the area of assistive technology, and especially in the area of manual wheelchairs, this means going with what is considered "standard." Unfortunately, what is considered standard is not always what is best for the client. This is because what becomes the standard is often determined by what is most likely to receive funding rather than by the intrinsic qualities of any given technology. What is best for the client should be determined by the client and his or her therapist. Yet, if options are limited by funding or by too quickly defaulting to what is considered standard, then the thoughtful process of choosing what is right for the client gets undermined.

Within the area of manual wheelchairs, one of the best examples of this is the choice of material for the frame of the wheelchair. Less expensive chairs, made of aluminium, are what typically get funded and are considered the standard. For some people, the choice of aluminium may be the best choice for them; however, for many others it may not be. Yet, if alternatives are not even considered, the ability to truly make the "best choice for a given client" is hindered.

Frame Material

Material selection is a central pillar of wheelchair design, along with function and aesthetics. Materials matter because materials are different. Different frame materials have different properties, different ride characteristics, and they interact differently across varying designs and environments. The wheelchair industry, like the bicycle and aerospace industries, recognizes this fact and has offered a choice of materials to meet individual preferences and needs.

When the pursuit of lighter weight wheelchairs took off almost 3 decades ago, lightweight aircraft grade aluminium quickly became the dominant material because of its wide availability, its user-friendly characteristics with respect to bending and shaping, and because of its low cost. As the demand for better

performance, better durability, and even lighter weight frames increased, titanium was introduced. The unique properties of titanium make it an ideal material for premium wheelchair frames, but because titanium is difficult to refine and requires expertise and precision in welding and bending, it is a more expensive material.

Despite some price differences (and differences in likelihood of funding), therapists have an important role to play in ensuring that clients know what their options are in frame materials. Someone might ask if the "average" wheelchair user even cares about, or can tell the difference, between frame materials. But who is average? Am I average? Are you average? Assumptions about what may not matter to the "average client" are dangerous because in the end we may end up settling for less because the best options get underplayed or overlooked entirely. We don't want to shoot for "average" – we want to offer all the best options. Choices such as frame material really matter. Consider that wheelchair users push on their handrims an average of 2000-3000 times a day and every push and every movement in the wheelchair is impacted by the design and material of the chair.

Advantages and Benefits of Titanium

Titanium has three critical advantages that have driven strong demand for it for more than a decade. First, titanium has unparalleled strength and a high strength-to-weight ratio (Donachie, 1988; Boyer R et al, 1994; Holt & Ho, 1996). This means that less titanium material can be used while still building a stronger frame. Using less material leads to a lighter frame. For instance, in the case of TiLite, which makes frames in both aluminium and titanium, their titanium frames are typically just over a kilo lighter than their aluminium frames. Thus, titanium frames are stronger *and* lighter. Importantly, because less material is used, material expenses are reduced and the price difference between titanium and aluminium is reduced as well.

Second, titanium has unique dampening qualities (Wolf et al, 2007) so that less vibration is transmitted to the user. The resulting smooth ride benefits the rider by minimizing bumps and jolts, reducing fatigue, and increasing comfort. This benefit is important for active, long term wheelchair users – any reduction in vibration on a daily basis over years of use is desirable.

Finally, titanium is a very durable material. It does not rust or corrode; and its strength, toughness, and fatigue resistance means that a titanium frame can withstand a pounding without failing. While other metals start to fatigue with repetitive use, titanium does not show signs of wear even after years of use.

For all of these reasons and more, researcher and professor Dr. Rory Cooper listed the "expanded use of titanium" as #2 in his "Top 10 Advances" in manual wheelchairs over the past decade (Cooper, 2005). If you prefer titanium's strength, ride, and durability, these unique qualities directly translate into value and cost-effectiveness.

Why Aluminium is Still a Very Important Option

With all the advantages of titanium, there are still important reasons why someone may choose aluminium. Aluminium is a lightweight material – and because it is easy to work with, it lends itself to frame design and construction. Aluminium can be bent and welded in a variety of shapes. Thus, some may prefer the fit they get from aluminium.

Also, while titanium is an excellent dampening material, some may still prefer the ride characteristics of aluminium. Because aluminium is a stiffer material, it results in a stiffer ride that some people find to their liking. In fact, many would consider a stiffer ride to be an advantage when rolling over or climbing up smooth terrain.

And then of course there is price. As noted above, chairs with aluminium frames are less expensive and, although prices vary widely, the difference is often more than 20%. For some, even if they are aware of alternatives, price can be a key factor that drives a preference for aluminium. It is tricky to generalise about therapists' choice of equipment as it relates to price and reimbursement. Yet the experience of wheelchair manufacturers and their distribution channels suggest that therapists working in wheelchair services do often opt for aluminium as opposed to titanium because of price differences. This anecdotal evidence suggests that the perception of the cost of titanium wheelchairs often takes them out of consideration, though this tendency appears to be changing slowly.

Going Beyond the Standard: Offer Choice

There are only a handful of studies that directly compare aluminium and titanium chairs and these studies are generally inconclusive (e.g., Liu et al, 2008; Liu et al, 2010). Comparison studies are complex because to truly compare aluminium to titanium would require that

everything else about the chair be identical – including design, manufacturing quality, and more. What we know, however, is that there are important differences as outlined above – and given those differences, making the right choice for the client is important.

Whatever the choice, it must be a thoughtful choice informed by an awareness of the available options. When choices are taken away because what gets funding or what is considered standard are the only options, it's like letting someone else decide for us. For decisions as critical as these, it is surely worth going beyond what has been considered the standard. Manufacturers for their part will serve clients and therapists best by offering these options. This will leave the choice right where it should be – in the hands of clients and therapists.

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Precision Seating for a Paralympian Archer

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Abstract: *In April 2010 Consolor was approached by 2008 Paralympic Bronze Medal winner in archery, Mel Clarke. Mel and her coach wanted to improve her shooting and, with their sights set on a Gold Medal at London 2012, they felt that the wheelchair and seating set-up were probably where improvements and efficiency savings could be found.*

Keywords: *archery, Paralympics, seating, sport.*

Already a wheelchair user and archer, Mel contracted Lyme disease in 2003 from an infection caused by a tick bite. Despite the setbacks and being told by doctors that she would never shoot again, two years later she became world champion!

Mel has excelled in her sport of archery, winning, along with her Paralympic Bronze Medal, a Gold in the European Championships in 2002. In 2003 she became the first disabled archer in Europe to be included in a national able-bodied team and gained two 1st world champion places in individual and team competitions (Fig.1).

Fig 1 Mel Clarke

Despite this impressive CV, Mel and her coach felt that there was still room for improvement, and a necessity for upping her game, to improve her chance of winning the Gold Medal in 2012. Mel found Consolor when we were exhibiting at Naidex, attracted by the seating systems that we were showing there. She hoped we might be able to come up with a better, more supportive and stable seat and back support system…

I went to one of her training/coaching sessions to watch her shoot, trying to become acquainted with the usual biomechanics involved in archery for able-bodied people. Mel's technique by comparison was biomechanically different: she's sitting; she has no feeling from her abdomen down (abdominal core stability is necessary for holding the bow in the correct and steady position); she doesn't have sight in her right eye, which should be her shooting eye.

Mel's wheelchair is a Quickie Helium, a very lightweight (6.5 kg) rigid active user chair. She had a J3 back support for everyday use and swapped this for a custom-made back support, which utilized the J3 mounting hardware, for shooting. This was a rigid aluminium shell with a 1" evazote layer, but with a 4" wide gap down the middle. This gave two semi hard edges which didn't really support her laterally, but helped to give her reference points so she knew where to position herself when shooting. Mel doesn't sit on a cushion and was using only the integral straps and canvas of the wheelchair. There were also various wedges used, lateral and medial to the legs. The main problems highlighted by Mel and her coach were lack of stability and reference points. It was also noted that the rules that apply to Mel's physical ability grouping mean that thoracic lateral supports cannot be deeper than half the depth of the trunk. Also straps, including pelvic belts, cannot be used.

Fig 2 Mel about to shoot

I observed that when Mel drew back the bow (Fig.2), which requires a great deal of strength, her pelvis tilted down on her left by about an inch. Using the reference points of the back support, she would make slight adjustments to her trunk to gain the optimum position for shooting the arrow. She used the reference points to adjust the trunk forward/backward and laterally. After the arrow was fired, her pelvis gradually returned to a level position.

Using a bean bag, I moulded Mel in her wheelchair for a base cushion. I made the moulding of the bag very firm, tight and slightly undercut to lock her in position, and shaped the mould underneath to limit the dynamic pelvic obliquity. Mel tried shooting and instantly felt more stable. I took the mould back to the workshop and we made a very firm carved foam cushion in a plastic shell, which fitted to Mel's chair with a drop hook interface. The finished cushion provided greater stability and Mel tried shooting with it for a few weeks. Unfortunately the same wheelchair is used for every day and for shooting (this is due to lack of funding for competing, with the athletes not being allowed to take a second wheelchair with them). As a full time athlete, Mel does shooting practice four times a day, so that removing the straps and canvas from the chair to then fit the custom contoured cushion was impractical. Back to the drawing board!

We improved on the wedges that Mel was previously using. These were a pommel wedged very tightly in place, plus wedges which were very firm evazote, backed with a stiff plastic to keep their shape and to help slide them into place lateral to the thighs and hips. We also used an active user 10" high MaTRx Elite back support which we fitted to the Helium in place of the J3.

Fig 3 Elite back in use with no padding and reference points in place

Fig 4 Mel in top form

When Mel first sat back into the wheelchair she was amazed by the improved stability that the back provided, even though the mounting hardware still allowed removal of the back. Additionally the standard 1" foam cover was removed and replaced with a 0.5" thick evazote layer; this characterized the back for stability rather than comfort. The finishing touches were the new reference points – two solid plastic cylinders, rounded at the end, were bolted to the inside of the back support (Fig.3) and holes were cut through the evazote layer to allow the reference points to poke through. These points were high enough for Mel to feel precisely where she needed to be in every plane before firing an arrow. That weekend Mel shot 11 points higher than she had ever scored before! After that she made further modifications herself by removing the 0.5" evazote layer (Fig.3) to make the reference points even more severe, and she added two more points for additional physical prompting and accurate shooting. (Fig.4)

In summary, I applied the same approach and theories that we apply every day when we see clients with seating and postural problems – it's just that the solutions were more extreme and rigid. The outcome was instant improvement in function. We wish Mel all the best for London 2012 and her dream of Gold.

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SPIDER-Y

Andrew Gardner, Chairman, SPIDER-Y, 22 Camborne Way, Keighley, BD22 6NE

Abstract: SPIDER-Y Ltd *(Sport Promoting Inclusion for the Disabled and Equal Rights in Yorkshire) currently supports two activities:*
1. A wheelchair basketball club, Leeds Spiders WBC*, which meets weekly for training on Wednesdays, 8-10 pm, at* Morley Leisure Centre*.*
2. Road show events which aim to introduce able-bodied youngsters to disability sport and raise awareness.

Keywords: *basketball, sport, inclusion, disabled, equal rights, Yorkshire*

The work of our charity has two aspects:

1. Leeds Spiders Wheelchair Basketball Club

This club was formed in September 2007 and members meet weekly for training in Morley, Leeds. The original membership of ten has grown to thirty, almost all of whom live in Leeds or Bradford. A training session was

The Senior Team

featured in December 2008 by *Yorkshire TV* on their *Calendar* programme. Four teams take part in the *British Wheelchair Basketball* second, fourth and junior leagues and members have represented Yorkshire in the national junior championships. Our senior squad will play in the

The Junior Team

first and third division next season as we have successfully won the second division North. The club is entirely run by volunteers.

2. Road Show Programme in Schools

After gaining charitable status in September 2008, we have been able to give more attention to this second phase of the charity. We have obtained funding to enable us to purchase 10 sports wheelchairs and a crew vehicle, which is used both for this programme and for the *Leeds Spiders WBC*. Since January 2009 our qualified wheelchair basketball coaches have delivered more than seventy 2 to 4 hour sessions of training to primary schools, high schools, and clubs, funded through

Road Show in action

education money; more are planned for the future. These events have all taken place in urban schools in North/West Yorkshire, Bradford and Leeds. Contact has been established with several extended school co-ordinators which we expect to result in further school visits, as well as future partnerships with up to 5 high schools in West Yorkshire. The aim of the programme is to provide an experience of wheelchair basketball to those who are able-bodied, with a view to developing greater understanding of their disabled peers. In the process, we also make contact with children who are disabled and invite them to join our wheelchair basketball club. While many of those who are disabled, especially members of our club, may not see their

disability as a disadvantage, we recognise that their disability does disadvantage them in reality. By helping to foster a more positive attitude towards their disabled peers in those who are able-bodied, we are helping to address this disadvantage. This approach can also be adapted for commercial businesses for their team building workshops, and help increase employees' understanding of disability and inclusion.

We strongly believe that what we are doing is of significant benefit to the disabled youngsters who are members of the *Leeds Spiders WBC*, and to their families who benefit from the supportive attitude of other parents. We are equally confident that our programme in schools is of educational and social benefit to all the students. It is difficult to quantify these benefits, but we expect to work with up to a hundred children a week once the programme is fully operational.

At a recent visit to a primary school we received this commendation from the school's head teacher:

"It was fabulous. It certainly raised the awareness of our children towards disability, gave them a real opportunity to experience a Paralympic sport and to learn the value of teamwork and strategic play. We invited the parents to watch the closing minutes and all were so impressed with the quality of delivery and the efforts of our children. We have also used this experience as part of the children's literacy lessons on journalistic writing where they will be reporting back to their respective classes as well as showing the photographs, etc." *(Ruth Leech, Hothfield Street School, Silsden, February 2009)*

Aiming high!

The WBC is now financially viable, thanks to voluntary contributions and fund-raising activities by our members' parents. We secured funding for ten sports wheelchairs for the road shows, for a laptop and printer, and a suitable vehicle with help from the *Lord's Taverners*, the *Lady Taverners* and *Awards for All.*

Monitoring

Visits to schools include pre-visit and post-visit questionnaires to the students which aim to identify learning outcomes. We invite comments from staff in schools, some of whom do follow-up work with their students to help them benefit fully from our visits and to address the issue of inclusion. Our staff report on these visits at monthly *SPIDER-Y* committee meetings. Requests for return visits will be analysed.

Future Projects

Following the success of the WBC we are now turning our sights to other sports programmes such as wheelchair rugby league and powerchair football. We have had encouraging meetings with the *Rugby Football League* and *Leeds Rhinos* from which we hope to build partnership working, and we already have taster sessions booked. We are awaiting formal discussions with *Leeds United* about a similar partnership involving powerchair football.

We will be playing in the *British Wheelchair Basketball Association's* first division next season where we will be up against contenders for the GB sides for London 2012. Very exciting times ahead!

So, if you fancy playing, or know anyone that might, or would like to help out with coaching, please check our website for all training and match day dates – www.leedsspiders.org.uk – or, if you want to book a school road show go to www.spider-y.org.uk/roadshows to check availability

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Propulsion efficiency and upper extremity longevity – A review of alternative propulsion methods and pushrim options

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Abstract: *Scientific evidence and clinical experience suggest that informed use of the ever increasing varieties of propulsion methods and handrim options can result in reduction in upper extremity pain and increased efficiency. However, the choices available are not without their drawbacks and disadvantages. Practitioners should familiarise themselves with the odds and evens of these options, and increasingly utilise them to benefit the right client, in order to help minimise the long-term negative consequences of using inappropriate propulsion interfaces.*

This article has been modified from a free paper presented at the PMG NTE 2011.

Keywords: *pushrim, handrim, propulsion, wheelchair, propulsion efficiency*

The assistive technology industry has come a long way in the past few decades. In active wheelchair use particularly there has been a significant increase in the opportunity to get around more efficiently with reduced risk of secondary complications. Increasingly we are practising in a preventive manner by supplying people with equipment such as pressure relieving cushions, light/ultra-lightweight wheelchairs, fitted seat and frame shapes and configurable wheelchairs.

Yet people are still exposed to the risk of secondary complications. Studies estimate the prevalence of chronic upper extremity pain (UEP) and injuries amongst manual wheelchair users to be as high as 73% (Subbarao et al 1995). These consist of a mixture of shoulder, elbow, and wrist injuries, such as rotator cuff injuries and carpal tunnel syndrome. The underlying cause of these (apart from transfers, lifting, and overhead reach) is likely to be propulsion, for which the upper extremities are not designed. The effect can be devastating for the individual's lifestyle, as well as their work and leisure capabilities.

Considering the amount the average wheelchair user pushes in a day, if we could increase propulsion efficiency by just 10%, what might that mean? Ten percent less users developing UEP? People able to push 10% longer before they develop their UEP? Or maybe it's just that a 10% reduction in force needed to propel will reduce demand to below injury threshold, thus helping to avoid the pain altogether. It is difficult to predict, but logic and experience suggest that increasing propulsion efficiency will have a significant preventive benefit. Experimental research studies of alternative propulsion methods have focused primarily on force and physiological demand reduction, leaving the estimation of long term outcomes to be derived from logic and experience, as well as self-reported survey studies.

To help reduce the occurrence of upper extremity pain and injuries, manufacturers and research laboratories have developed and investigated a variety of interfaces. These interfaces can be categorised according to their aim(s):

- To reduce the number of strokes needed (pushrim activated power assisted wheels)
- To reduce the strength needed (geared hubs, power assisted wheels)
- To change the pattern of excursion of the upper extremities (lever type devices)
- To improve grip efficiency (coated handrims, thumb grips)

Other targets and means of achieving efficiency, or hybrid solutions, either commercialised on a small scale or still in research phase, are beyond the scope of this article.

Power assisted wheels seek to reduce the strength, the impact force, and the number of strokes required to propel. Through their use, higher velocity and distance travelled can be achieved with similar input as for regular rims. Users have reported improved quality of life and reduced pain using such devices (Cooper et al 2001). Multiple settings can help to accommodate a variety of environments. In addition to funding concerns, their primary trade-off is weight, which makes it harder to take them apart and load into vehicles. They also need more care, both in daily maintenance (i.e. charging), as well as long term technical maintenance.

Geared hubs provide a mechanical advantage, reducing the force required to go uphill, or to brake downhill. They are available with roll-back stops, and can help reduce the occurrence of hand burns when going downhill. As they are purely mechanical, they weigh less then power assisted wheels but more than regular wheels, still increasing the difficulty of loading them into cars. Their cost is also a limiting factor, and their presence on the market is still limited.

Lever drive systems have been in development for decades, yet we are only just starting to see them gain significant commercial presence. Through entirely changing the upper extremity movement pattern, their goals are:

- to reduce the force needed to move about
- to reduce the hand/finger dexterity needed
- to improve hygiene through avoiding contact with dirt
- to improve posture

Research studies have found significant improvement in efficiency and physiological factors (Veeger et al 1992) such as delayed fatigue and improved quality of life.

As well as considering the increased complexity of vehicle loading and whether the levers will compromise environmental access and transfers, thorough assessment should include propulsion habits and preferences, and aesthetics (as levers are bulkier than regular handrims).

Projection handrims were developed to enable manual propulsion when manual dexterity is limited. It provides a rather slow means of moving about and, with other technologies emerging, their use nowadays is decreasing. However, they are still often used in residential facilities for clients with cognitive or behavioural impairment, where power mobility is not a viable option.

Coated handrims. The car industry is able to offer a huge variety of steering wheel covers to suit every taste and budget in both leather and synthetic materials, apparently with high customer satisfaction.

However, it is not that simple when it comes to wheelchairs, as our challenges are more complex. We want a soft grip to minimise impact force during initial grasp, yet we want a hard grip to improve efficiency, so that most of the force goes into the movement of the wheelchair. We want a high friction surface to keep hands on when pushing, yet we want low friction to avoid hand burn when braking. We want good thermo-distribution properties to disseminate heat collected during braking, but we also want to avoid seams and create a uniform surface. The material should not attract dirt, should withstand daily cleaning with chemicals, and be easy to clean. It should be strong, not just for pushing, but also when being thrown around during transport or when bumping into things. It must function in extremes of weather – heat, cold, or humidity. It needs to attach to multiple wheel types, and obviously must have a good price to durability ratio.

With the above in mind, various handrims have been developed, all with advantages and disadvantages. Rubber varies in price and quality. Simple vinyl heats up, therefore resulting in sweaty hands, but it is a cost-effective way to provide patterns for personal aesthetic taste. Leather is nice to the touch, but is expensive, especially if it is to be mounted without seams. Plastic is the most widespread material as it has a decent mix and trade-off of the required characteristics; it is a cost-effective solution, yet has the potential to heat up, and varies in quality. Foam, depending on type and build, often offers a larger grip area and a softer grasp, as well as decent heat distribution. However, through reducing impact it also reduces efficiency, and its longevity is less than many of the above options. Many other materials have been developed and commercialised across the world.

Oval shape handrims were developed with the aim of increasing the contact surface with the rim at the palm area, thereby providing increased ergonomics. Research shows significant improvement for people who use such ergonomically shaped handrims. As many as 70-80% of the study subjects felt a reduction in hand and wrist pain (Koontz et al 2006), and a 16% reduction in grip for the same propulsion output (Dieruf et al 2008).

Thumb grips may complement either oval or round hand rims. They have several goals, which include decreasing the need to grip on the rim, improving hygiene, increasing grip surface through use of the thumb area, and improving efficiency. Their disadvantages are that they add to the weight of the chair and increase cost, and some people who prefer a minimalistic appearance may find them visually unappealing.

Finally, **proper fit** will always be of primary concern. Whatever the handrim solution, it will only be of benefit if the axle position and the rest of the wheelchair are

properly fitted to the client. The prescribing practitioner should therefore visit the need from a variety of angles. For one, assessing if the physical need warrants the use of an alternative propulsion interface (in which joint the problem occurs, grip efficiency, etc) as well as its potential to act as a preventive tool. There needs to be a thorough review of environmental and maintenance issues (how the wheelchair is being transported, is it taken apart by the user, etc). Selection of such devices must also consider their trade-offs, such as higher weight, difficulties with disassembly, and increased maintenance requirements.

With a well fitted wheelchair, alternative propulsion solutions and handrims can reduce the risk of upper extremity injuries to many users. At present we consider using such devices if propelling with a regular handrim is compromised, for example as a result of weakness in the upper body or reduced grip strength or dexterity. It is hoped that, in the future, we will consider them on a larger scale and use them as a preventive intervention.

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Bursar Reports from NTE 2011

Bursar Report: Advanced Powered Wheelchair Control Systems Part 1

Presenters: Jim Lucas, Dynamic Europe Ltd
Geoff Harbach, Department of Health Care Sciences,
West Midlands Rehabilitation Centre, Birmingham
Reporting Bursar: Helen Starkie, Occupational Therapist, Wheelchair Service,
Artificial Limb and Appliance Centre, Rookwood Hospital, Fairwater Road, Cardiff, CF5 2YN

During my career as an Occupational Therapist I have always tried to enable clients and service users to be as independent as possible. It was during my time spent working at the Spinal Rehabilitation Unit at Rookwood Hospital that I became interested in advanced powered wheelchair control systems, hoping they would enable clients with very limited function to become more independent in their mobility and other activities of daily living. Working for the wheelchair service for the past few years has developed this interest further and enabled me to work with these systems more closely, and see the possibilities that they provide to clients.

The first presentation of Parallel Session 3 at NTE 2011, by Jim Lucas of Dynamic Europe Ltd, was on access to special controls for powered wheelchairs. Jim focused on the company's range of products and how they can be used with powered wheelchairs to enable clients with limited hand function (using a joystick) to no hand function (using specialist input device) to control a powered wheelchair.

An exciting development that they currently offer is the the iportal. The iportal allows wheelchair users to control an iphone, ipod touch or ipad via their wheelchair joystick or input device. For the client to access this they must use either the DX or DX2 Dynamic control systems.

The iportal enables users to browse their apple device, browse the internet, make telephone calls, play their music, use assistive speech apps without touching their device. It also enables users to read e-books, send text messages, write emails and take notes, all with the use of their joystick or specialist input device.

The second presentation by Geoff Harbach, from the Department of Health Care Sciences, West Midlands Rehabilitation Centre, was on practical aspects of bespoke switching for powered mobility. Geoff highlighted that even though such custom control systems are intended to make a client/service user more independent, it is important that the people making them have the appropriate knowledge and skills.

Geoff also emphasised how important it is for the person creating bespoke custom switches to have the appropriate background and in-depth knowledge of the regulations connected to this area. It is essential that the person also has knowledge of high reliability electrical and mechanical engineering techniques, the properties of materials and small scale manufacturing methods.

Without all this, unsafe systems may be created for our clients and, as Geoff pointed out, could in extreme instances result in death.

This presentation reminded everyone of the importance of documentation methods such as risk assessments and the need to have the appropriate knowledge and skills before attempting to produce bespoke custom switching systems.

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Bursar Report: Transportation of People Seated in Wheelchairs

Presenters: John Tiernan, Enable Ireland, Sandymount Ave, Sandymount, Dublin 4
Julianna Arva, Ti – Lite Manager of Sales and Education, Europe
Bob Appleyard, Technical Advisor, Unwin Safety Systems, England
Reporting Bursar: Gareth Daley, Trainee Rehabilitation Engineer,
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91 Oak Tree Lane, Selly Oak, Birmingham, B29 6JA

Introduction

The aim of the session was to finalise and approve the Best Practice Guidelines on the *Transportation of People Seated in Wheelchairs*. These have been in development since August 2009, with the second draft presented at the International Seating and Mobility Conference in Glasgow in June 2010. Delegates had been requested to read the 4th draft version before attending the session at NTE 2011.

Previous Experience and Knowledge

I have been a trainee RE since October 2009. I was interested in attending this parallel session as, in my role, I see many wheelchair users but have limited knowledge of the regulations relating to transporting people seated in a wheelchair within a vehicle.

My general knowledge and experience covered by the presenters included the following:

- Appropriate tie downs, as specified by the wheelchair or tie down manufacturers, should be used
- The correct rating of tie down should be used (user weight rating)
- Wheelchair users should have access to a head rest during transport
- Brakes should be on and power turned off if the chair is powered
- The client should be restrained in the chair
- The chair should have transportation labels in a visible position
- Clients should either be facing forwards or backwards but not in recline.

Comparison of Knowledge and Key Learning Points

My existing knowledge did not differ greatly from the facts presented; however in-depth information was given about the guidelines and provided me with many more factors to think about. There were issues raised that I had not yet considered, or come across during my training. One such issue was in the 'Vehicle Categories' draft section 6 (page 27):

'...some rear wheel drive powered wheelchairs have rear castors that are not in alignment with the other four wheels, and can therefore not access vehicles using channel or track ramps'.

I have not been involved in many mid-wheel drive (MWD) powered wheelchair handovers and have not come across this problem as yet, so it is useful to be forewarned.

Points Raised in the Presentation Which I Disagreed With

There was a point in the 'Wheelchair Tie-down and Occupant Restraint System' draft section 7 (page 20), that I did not agree with. It stated that *'...where tie-down points are not indicated on a wheelchair frame, and occupied transport must occur, this must be documented in a risk assessment'.*

Even with a risk assessment, I believe that transport drivers should not be expected to make this judgement, and the audience at the session as a whole thought that it was fundamentally wrong to include this statement in the draft.

Controversial Points Raised by the Presenter

In the 'Seating Systems' draft section 4 (page 15) the following statement *'The back support should be no lower than the shoulder height'* was strongly opposed and not approved by the presenter, as he and quite a few audience members believed that some systems such as the Jay 3 back are a few inches below shoulder height.

It was decided that the Best Practice Guidelines could not be finally approved until the height information for the various back systems was investigated further.

Concluding, the most important message that I will bring back into my practice is to follow the guidelines

thoroughly and not to assume anything. The guidelines can be accessed via www.pmguk.co.uk/2011/abstracts/additional%20doc %20ps1.pdf

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Bursar Report: Heads First

Presenter: Steve Cousins, Director, Matrix Seating Ltd
Reporting Bursar: Scott Baker, Clinical Technologist, RREMS, Freeman Hospital, Newcastle upon Tyne, NE7 7DN

I work as a clinical technologist in the rehabilitation engineering team for the Regional Rehabilitation Engineering and Mobility Service (RREMS) which is part of the Regional Medical Physics Department. One of my key roles within RREMS is working with the wheelchair service and the service users themselves, so I was interested to see what Matrix Seating were offering as an alternative to the current head supports available on the market. I therefore attended their wake-up session on the Friday morning of conference.

Matrix Seating's head support, Heads First, offers similar benefits to a custom-made head support, and a range of frames and extension pieces can be configured to suit the individual's clinical needs. This unique design allows each head support to be re-configured and adapted, which means costs are kept down, but the client still receives the quality of care that they would hope for from the service. This type of head support will not only allow the therapist/engineer to make additional adjustments after the initial assessment, but also enables the therapist to review the client at a later date. If necessary, adjustments can be made and additional extensions purchased to allow the patient to have the support they require.

The head support also has removable covers, which are an excellent solution for infection control and general hygiene; these can also be purchased separately if they need replacing. As the covers can be removed, the steel brackets can be re-used for other clients, which also helps in reducing costs. The head support is manufactured out of a relatively thin ductile material, enabling the therapist/engineer to shape the frame/extensions to suit the individual's clinical needs.

From an engineering viewpoint, this flexibility within the head support may be regarded as a disadvantage because, after installation, the material could flex/bend out of shape and result in a deterioration in the support to the client. Although the fasteners that are used to attach the frames and extension pieces together are relatively flat, if the client has a lot of head movement, the foam covers that go over the steel support will eventually compress, and the fasteners could start to protrude and cause discomfort.

However, there are advantages in using this type of head support: the flexibility of the concept offered by Matrix Seating, and the fact that the product enables the therapist to move away from custom-made head supports towards an off-the-shelf product which is configurable and re-useable. Heads First is a more cost effective alternative to custom-made solutions, but it is by no means a total solution for all clients who require head support.

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Coming Soon...

As some of you will know already, the new PMG website is under construction and will be launched shortly. We must thank James Hollington and his team for the immense grit and endeavour that has gone into bringing this major project to life. Thanks also, yet again, to Paul Hewett, whose webcasts of the 2011 NTE will be unveiled on the new website. Those of you who could not attend the conference this time will be able to view several of the parallel sessions, as well as the inspirational opening plenary speech by Diego F. Soto-Miranda, and the wonderful 2011 Aldersea Lecture given by Rosalind Ham. You can also catch up on PMG business by tuning into the AGM! Look out this summer for ebulletins giving details about the launch of the new website.

Bursar Report: What Does Lying Mean for Sitting and How Can I Help?

Presenter: Dave Long Clinical Scientist & Claire Finch Physiotherapist, Nuffield Orthopaedic Centre, Oxford

Reporting Bursar: Ruth Cooper, Clinical Specialist Occupational Therapist (Continuing Healthcare), OT & Wheelchair Service, St Mary's Hospital, Newport, Isle of Wight, PO30 5TG

The importance of total posture management, both to minimise risks and to promote maximum function, is highlighted when working with clients who have multiple complex needs. Part of my role within continuing care is to assess for seating in both static chairs and wheelchairs. Six months into a newly established post, it is clear that for some clients their journey could have been different, if there had been a greater awareness of the impact of poor positioning/posture earlier.

The key message of the session was the importance of posture management in lying as well as sitting, considering clients can spend up to two thirds of their time in bed, and as gravity remains operational in this position. It was highlighted that sustained postures in lying can lead to tissue damage and contractures, which in turn affects the individual's ability to sit functionally. The aim of intervention is to maintain the client's current level of ability and reduce the speed of deterioration. It was also useful to note which precautions to consider when providing support in lying, as well as the indications for these. The practical session was very helpful, demonstrating the use of items to hand such as rolled towels or pillows to support and maintain position rather than specialist kit. This showed the benefits of simple solutions before considering complex sleep systems.

The audience raised issues around communication, whether that was with family members, carers at home, or in nursing/residential care, but specifically with carers' ability to accurately replicate lying postures with the client. Finding a key person, such as a family or staff member, to assist with reinforcing messages was suggested. Different types of sleep systems were then discussed - for example some have markings to assist replicating positioning, although audience members reported varying levels of success with these. The importance of joint working across skill mix was discussed, especially in relation to tissue viability.

Attendance at this session affirmed the importance of lying posture which is a message taken back to those I work with. The clients have an improved outcome if this is considered early on, when initial deterioration or changes occur.

In terms of addressing my learning needs, lying posture is something I need to explore further, as well as expanding my knowledge of sitting posture. Both presenters are involved in the post graduate posture management courses run in Oxford. Some audience members had already attended the four day course and spoke of its relevance, and I shall be attending the course this year.

I am now reconsidering how information is communicated and shared for maximum benefit of the client. A majority of my clients are in nursing placements, where the staff members attending to each client can change daily. Restrictions on staff time means that despite the best of intentions, not all staff will read therapy notes or changes to care plans. Making sure information is shared during staff handovers has been more effective. Part of my role is in training and education. Sharing skills and information gained from this session and the 4 day course will be of great benefit. I hope to highlight the importance of comprehensive postural management, using a multi-disciplinary approach.

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Bursar Report: Service Provision – Positioning Beyond Wheelchairs

Presenters: Lisa Ledger, Wheelchair Service Team Leader, South Staffordshire District Wheelchair Service
Gail Russell, Clinical Manager, Stockport Wheelchair Service
Reporting Bursar: Nicole McDowell-Haastrup, Wheelchair Therapist-Physiotherapist, Bowley Close Rehabilitation Centre, Farquhar Road, London, SE19 ISZ

Firstly, a word of appreciation to PMG for supporting my attendance at NTE 2011. I am a junior therapist working for Bowley Close Wheelchair and Special Seating Service which has recently integrated with Guy's and St Thomas' NHS Foundation Trust.

Attending the parallel session by Lisa Ledger and Gail Russell provided me with an insight into new innovations and developments in wheelchair provision, and has inspired me to implement changes within my own practice and service.

The main aim of the seminar was to highlight some of the major challenges facing service provision, including financial constraints and the proposed changes to the commissioning of wheelchair services. The seminar focused on examining current practices and offered the opportunity to discuss how these potential changes may affect the delivery of wheelchair services. In addition, we were asked to consider the impact of future service provision for clients with more complex postural needs.

With the introduction of the White Paper *Liberating The NHS* (DOH 2010) we have already seen proposals for transferring the commissioning power to GP consortia. For many wheelchair services the implications for service provision remains unclear. In addition NHS provider services are faced with extensive cut backs and efficiency savings, and are being forced to make critical decisions to streamline departmental overheads.

The impact of these measures on service provision is extensive, and many of you will recognise these strategies from your own services. Within my group of four in the seminar, two services had recently been put out to tender, one service is being managed privately, and the other is under consultation.

Positioning beyond wheelchairs: What does it mean for service provision?

As part of the seminar, we were asked to consider how provider services could expand beyond their current provision, to think about the services already provided and how they could be extended to improve provision for users with complex postural needs.

Discussions centred on the current provision within wheelchair services of:

- assessment and provision of basic manual wheelchairs
- adult and paediatric assessments for postural and seating support systems
- special seating systems with pressure mapping technology
- powered wheelchair assessments
- tilt in space wheelchair assessment – varying and fixed tilt
- power packs
- providing support and advice to community health professionals in postural management equipment

The focus of the seminar *Positioning beyond Wheelchairs* was that we should recognise service capabilities for provision beyond basic wheelchairs, and to acknowledge that many services already prescribe complex postural and special seating systems. Services must therefore promote the established good practices of

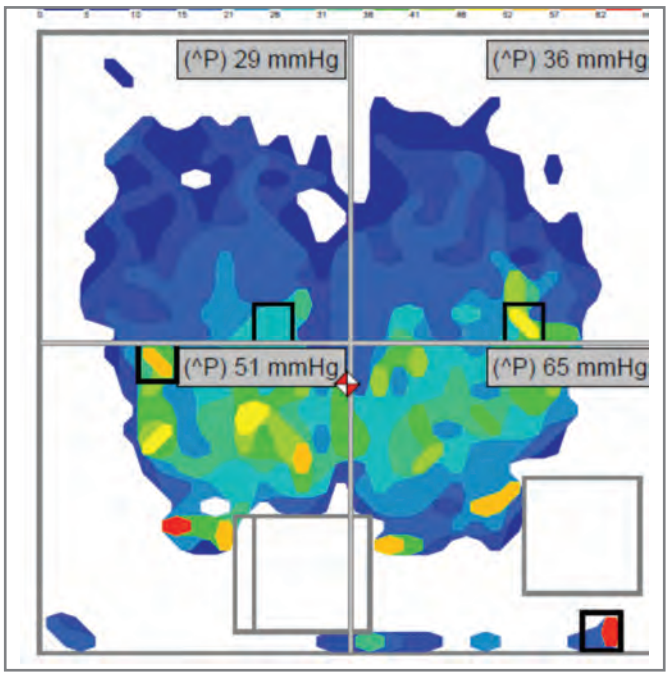

Fig 1 – pressure map images demonstrating areas of high and low pressures whilst seated. The colours and numbers correspond to pressure readings expressed as millimetres of mercury.

the specialist services they provide. We should document outcomes and share with each other the results achieved for service users. Ogden (2011) highlights the importance of dialogue between clinicians and other allied health professionals as a prerequisite for sustaining service provision in the present climate.

The document *Healthcare Standards for NHS Commissioned Wheelchair Services (2010)* makes recommendations for services to explore opportunities for collaboration across organisational boundaries. Many wheelchair services are completing substantive postural and seating assessments, and prescribing postural and pressure relieving equipment. But other primary care services such as district nursing, tissue viability, paediatric specialists and social care agencies are also involved in the provision of functional seating systems. Special seating prescribing may provide an opportunity for collaborative working and joint funding of equipment.

Fig 2 – Carved foam seating system with custom made dimensions

In attending this seminar, I was challenged to consider current provision and the future for wheelchair services. One way forward is to establish links with social care services and the other primary care services in order to share information and minimise duplication of clinical assessments and equipment provision.

Wheelchair services must embrace opportunities for collaborative working and innovative enterprise, and seek to promote the specialist services that many already provide.

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Apology

The Helping Hand Company would like to apologise unreservedly to Fiona Collins for the incorrect presentation of a Starlock case study at the recent PMG 2011 National Training Event Warwick Arts Centre.

In no way would we wish for this incorrect marketing communication to cause a detrimental effect on Fiona's professional reputation, integrity and standing within the industry. The content and presentation was not as agreed and does not support any endorsement to the product in question by Fiona. The case study had been undertaken as a collaboration between Helping Hand and Fiona, who was acting on behalf of the charity 'Romania Connect' with no financial exchange made between parties.

An Outcome Measure in a Wheelchair Service

John Fitzpatrick, Clinical Lead Occupational Therapist,
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Abstract: *Measuring outcomes in wheelchair services is often considered to be fairly arduous. It is difficult to see the benefits, and even when they can be seen, do they outweigh the costs to the service in terms of time and financial expense?*

In Cardiff, it became essential to define and describe the efficiency of the wheelchair service when the Welsh Assembly Government initiated a review of the service. This article describes the process of choosing and using an outcome measure within a wheelchair service.

The wheelchair service in Cardiff forms part of the Artificial Limb & Appliance Service (ALAS). Although the service is hosted by Cardiff and Vale University Health Board, it is provided to all local health boards in South Wales. There are 60,000 clients registered with the service.

The service is currently under review by the Welsh Assembly Government (WAG). Part of this review has been an in-depth investigation into the efficiency of the service. This has centred on staffing and financial resources, as well as the expectations placed on the service by its users and other agencies. To be able to describe to reviewers the pressures placed upon the service it was essential to emphasise the differences between the resources required for a complex case and those required for a standard case. This was done rather simply – a standard case required no clinical input and was completed entirely by an administrative team. What was more difficult to achieve was to explain the differences between a complex case which takes a few hours of clinician time, and one taking many, many hours. Why, for example, would one client take two hours to assess, prescribe, and fit their equipment, when another would take 20 or 30 hours?

Experienced wheelchair users can make the benefits of a goal setting exercise even less clear, as they often present with clear expectations of what they want to achieve, which may take some of the decision-making responsibility away from the clinician.

A method of evaluating the perceived difficulty of each service user was required.

A second challenge faced by the wheelchair service during the WAG review was to describe the clinical effectiveness of the equipment provided. There was no measure of how well the equipment and seating met the service users' needs or the clinician's goals.

An evaluation of a number of outcome measures was completed by several staff members. The major difficulty faced during this phase was finding a measure that was appropriate for the extremely wide range of ages, diagnoses, and abilities seen by a wheelchair service. Some measures were very biomechanical and did not take into account perceptions of comfort. Other measures were a purely subjective account by the service user and did not include a clinical evaluation by the clinician. The very specific goals of active users were most difficult to include. Measures of a client's ability to transfer themselves and their wheelchair to a motorised quad-bike for example, or the ability to operate a fishing rod from a wheelchair were not included in any published outcome measure.

One outcome measure that could be adapted to individual need was Goal Attainment Scaling (GAS) (Turner-Stokes, 2009; Turner-Stokes & Williams, 2009). The GAS is a method of assigning an attainment value to the achievement (or non-achievement) of individual goals. An overall GAS score for that period of intervention is then calculated by comparing the expected against the actual outcomes.

Using the S.M.A.R.T. format (specific, measureable, achievable, realistic, timely) of goal setting ensures that a goal can be accurately evaluated. This was the most difficult phase of introducing GAS into the wheelchair service. Most of the confusion surrounded the issue of specificity – how specific does a goal need to be? Is a goal such as *to be able to complete independent transfers to the wheelchair* sufficiently specific? Probably not. There is no indication of how well the client must complete the transfer, what he/she is transferring from, or if he/she can transfer **from** the wheelchair. A more specific goal might be *to be able to*

complete safe, independent wheelchair transfers to and from the toilet, bed, car and floor.

Using S.M.A.R.T. goals as the basis of an outcome measure allows flexibility and customisation. Almost anything can then be evaluated. For the more extreme user a goal such as *to be able to complete a 5 minute hand stand from the wheelchair whilst rear wheel balancing* could be measured and evaluated.

Most goals are set jointly between client and clinician. This gives the client a sense of ownership of the process and also allows them to voice their opinion in terms of the importance of the goal to them, and how difficult they perceive the goal is to achieve. Measures of both importance and difficulty are the next step of the GAS process. They are both measured on scales of 0-3, with 0 being not at all important/difficult, 1 being a little important/difficult, 2 being moderately important/difficult and 3 being very important/difficult.

Negotiation often needs to take place between client and clinician to agree on both importance and difficulty. Goals such as those centred on providing pressure relief may not be important for some clients, yet rate high in the clinician's priorities. Although some goals may be relatively simple for the clinician to provide, they may be very difficult for the client to achieve because they require a lot of practice. In these cases, an average of the two difficulties is taken.

The scores for each goal's importance and difficulty are then multiplied to produce the goal's weighting score. The weighting is on a scale from 0-9. A goal that is very important and very difficult to achieve would score a 9. A goal that is not at all important, and not at all difficult to achieve would score a 0.

The fitting of wheelchairs and seating is usually completed by a clinician in a clinic or at the client's home. It is usually at this time that evaluation of the goals is completed, although it can also be completed at a later date, if a post-fitting review of the intervention is scheduled. It is essential that the evaluation of goals is completed with the patient. This provides them with an opportunity to raise issues about the equipment that aren't quite right, and also allows them to realise when they or their equipment are performing beyond expectation.

Goal evaluation within GAS involves scoring the client's attainment of each goal. A score is given on a scale from -2 to +2. A score of -2 is used when an outcome achieves much less than expected, -1 is somewhat less than expected, 0 is as expected, +1 is somewhat more than expected, and +2 is much more than expected. It is important to note that zero scores should be expected. Although scores deviating from zero can indicate an outcome more or less than expected, they can also indicate that the goal was initially set too high or too low. A period of experience and learning for the clinician is expected to improve the goal setting skills. The attainment value is multiplied by the weighting to produce the goal's outcome value.

A fairly complex formula is then used to combine the various weights of the goals with their respective outcome values. This produces a single figure that conveys a general picture of whether an intervention produced the expected outcome, or deviated above or below expectation. If all of the goals were attained as expected, an outcome figure of 50 would be achieved. A value below 50 depicts a general outcome that is less than expected, and a value above 50 depicts a general outcome greater than expected.

A Microsoft Excel spreadsheet was created to record and simplify the data entry and calculation of the GAS. This

SMART Goal (copied from Complex Clinical Assessment form)	Importance 0 - not at all 1 - a little 2 - moderately 3 - very	Difficulty 0 - not at all 1 - a little 2 - moderately 3 - very	Weighting	Goal Achievement +2 much more than expected +1 somewhat more than expected 0 as expected (meets the goal) -1 somewhat less than expected -2 much less than expected	Date Achieved	Outcome
Provide safe independence for all mobility indoors for the next six months	3	2	6	0	01/02/2011	0
Minimise the likelihood of the development of pressure areas	2	2	4	0	01/02/2011	0
Allow the client to sit comfortably for up to 3 hours	2	2	4	0	01/02/2011	0
Meet the above goals within 8 weeks	2	2	4	2	01/02/2011	8
				Overall GAS Score		56.41

Fig 1 – GAS Spreadsheet

was stored within the existing electronic patient record system. The goals were copied and pasted into the GAS spreadsheet from the standard electronic assessment form used by the wheelchair service. The spreadsheet automated the calculations, thus reducing the time spent recording and scoring the GAS to several minutes. This was well received by all clinical staff. Figure 1 is an example of the main scoring section of the spreadsheet. In this case, the overall GAS score is higher than 50 because the intervention was provided sooner than the expected 8 weeks.

Returning now to the problem of identifying the difference between users who take a few hours of clinical time and those who take many more hours, it was quickly established that those who took a long time were those who raised additional goals after a period of intervention was complete; an end point could not be achieved because the goalposts kept being moved. The process of completing and evaluating the goals with the patient enabled them to voice and record all the problems they were experiencing. It also allowed the clinician to take all the client's goals into account when prescribing equipment. An episode of care was deemed complete once all the goals had been achieved. This meant that additional goals raised by clients following a period of intervention needed to be dealt with in a different episode of care. In Cardiff, this meant re-referral to the service.

Although its use was still in its infancy at the wheelchair service in Cardiff, the GAS was being used as an indication that the equipment being provided was fit for purpose, was doing the job intended by the clinician, and was being accepted by the clients. The spreadsheet used to quickly record and calculate the GAS scores meant good uptake of the outcome measure by staff. The argument that it wasted time was therefore no longer valid. Although not yet completed, long term analysis of the entire service's clinical outcomes can be provided by looking at the overall GAS scores of a large number of clients.

The GAS is a very flexible measure that can be adapted to any client, setting or situation. It relies on accurate goals being set and uses a numerical scoring system to describe the attainment of each goal as well as the overall process. It can be used to document and prove the effectiveness of interventions, and also to further involve clients in the assessment and evaluation processes.

Copies of the GAS Spreadsheet can be obtained by emailing the author.

References:

Turner-Stokes L. 2009. Goal attainment scaling (GAS) in rehabilitation: A practical guide. *Clinical Rehabilitation*. Vol 23, 362-370.

Turner-Stokes L, Williams H. 2009. Goal attainment scaling: A direct comparison of alternative rating methods. *Clinical Rehabilitation*. Vol 24, 66-73.

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NTE 2011 GALA DINNER RAISES £1,000!

This year, PMG decided to have an after-dinner speaker at the NTE Gala Dinner. Former Paralympian Mike Brace CBE came highly recommended, and turned out to be the star turn of the whole conference! If you weren't there, you can find similar speeches by Mike on YouTube to get a flavour of what you missed.

Instead of a speaker fee, Mike requested that a donation be made to his charity, Vision 2020 UK; executive committee members Linda Marks and Carolyn Nichols duly gathered the collection envelopes from each dinner table. The guests were clearly moved by Mike's fascinating story, as they donated just over £1,000!

Mike has asked us to thank the PMG members present that night for their immense generosity, as well as for the warm welcome he received. He enjoyed his time at NTE enormously. If you are interested in reading about the work done by Vision 2020, or wish to donate to the charity, you can do so by visiting the website:

www.vision2020uk.org.uk

National Training Event (NTE) Call for Papers

Warwick Arts Centre, University of Warwick
11th to 13th April 2012

Abstracts are invited for Free Papers (for both platform and poster presentations)

Deadline for submissions 31st December 2011

Details of the abstract submission process will be notified in ebulletins to PMG members, and posted on the new website over the summer

www.pmguk.co.uk

Contact PMG via pmgadmin@btintenet.com Tel: 0845 1301 764

Please display the enclosed flyers in prominent places at relevant places of work. Thank you!

3rd European Seating Symposium Dublin

7th to 10th November 2011

www.seating.ie

NHS Evidence has now changed

On 10 May 2011 a new version of NHS Evidence – the service which provides health and social care professionals with access to quality-assured, best-practice information – went live.

NHS Evidence now provides access to a broadened range of relevant and high quality information including the latest guidelines, high quality patient information, research uncertainties and other selected information across a wide range of conditions and specialties.

Through regularly accessing NHS Evidence, you will be supported in your drive to deliver best practice and to maintain, improve and broaden your own knowledge and professional development.

www.evidence.nhs.uk

The National Spinal Injuries Centre Stoke Mandeville Hospital

Posture and seating for adults with Spinal Cord Injury

Friday 23rd September 2011

This is a one day basic/intermediate course for anybody interested in assessing for seated posture. Although the examples used in this course will be drawn from a spinal cord injured population, many of the principles can be applied to clients with other neurological pathologies.

The morning session will concentrate on the principles of posture, physical assessment and 24 hour positioning. The afternoon session will be dedicated to matching the assessment findings to possible solutions. This will include discussion about the use of interface pressure mapping, wheelchair set-up and selection of appropriate cushion and backrest.

Course Leaders: Lone S Rose, Clinical Specialist – PT, Michelle Clarke, Senior OT

Wheelchair Masterclass

Saturday 24th September 2011

This one-day course is aimed at any professional involved in the education of and provision for the adult wheelchair user.

The course aims to provide the delegate with:

- Instruction in the various ergonomic features of lightweight and high performance wheelchairs and how to relate these to function.
- Practical sessions on basic and more advanced wheelchair skills, including ways to teach these skills to the user. There will be a session dedicated specifically to car transfers.

For further information on course content, please contact Rachel Harrison: Rachel.Harrison@buckshealthcare.nhs.uk

Course Leaders: Lone Rose, Clinical Specialist – PT, Rachel Harrison, Specialist PT

Cost: £110 per day, including lunch and refreshments

Places will be limited to 20 for each day

To reserve a place, contact Sally Scott, Medical Education Co-ordinator, NSIC, Stoke Mandeville Hospital, Aylesbury on 01296 315821 or at sally.scott@buckshealthcare.nhs.uk

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