Contents

1. PROGRAMME

The conference programme is subject to change at the discretion of PMG.

Registration Desk and Exhibition Open Times

	Monday 14 July	Tuesday 15 July	Wednesday 16 July
Registration Hall 3 Foyer	13:00 – 19:00	08:00 – 19:00	08:00 – 14.30
Exhibition Hall 3	Exhibitors set up only until 17:00 Welcome Reception 17:00 – 19:00	08:00 – 17:00	08:00 – 14:30
Conference Proceedings	14:00 – 17:00	09:00 – 17:00	09:00 – 13:00

Exhibition Hall 3

See the separate Exhibition Catalogue for all the organisations that are exhibiting at PMG2025. In addition, at the rear of Hall 3, you will find the Go Kids Go Zone, which provides an area for you to practise and improve your own wheelchair skills. Also at the rear of the hall is the inclusive sport demo area. This year we welcome Boccia: go and have a go!

BREAKOUT SESSIONS CHART

Breakout sessions take place on Tuesday and again on Wednesday. Choose one breakout to attend from column A and one from column B for each day. You can attend 4 in total. Space may be limited in some rooms so attendance is on a first-come first-served basis.

Breakout A	Breakout B	
B1 ***Exhibition viewing***	**B1** ***Exhibition viewing***	**Hall 3**
B2.A A collaborative approach to specialist equipment provision ***Helen Nelson, Dimitri Scarlett and Eoin Egan,*** *Provide Equipment Hub*	**B2.B** A MDT Bespoke Headrest Solution ***Helen Nelson****, Provide Equipment Hub and* ***John Walker****, Contour 886*	**Ironbridge 1**
B3.A 'Keep on Trying' When technology evolves you might just get there. ***Lynda Pearce and Bex Oakes****, Oxford University Hospital NHS Foundation Trust*	**B3.B** The Blue Peter approach to seating ***Rebecca Hindle****, Guys & St Thomas NHS Foundation Trust and* ***Paul Dryer****, King's College Hospital NHS Foundation Trust*	**Ironbridge 3**
B4.A Team work actually does make the dream work! Providing powered mobility for double upper limb amputation. A case study. ***Nick Brown and Josh Williams****, Cardiff and Vale NHS Trust*	**B4.B** CoMoveIT Smart: How Can AI Empower Independent Mobility for people with severe movement disorders? ***Prof. Elegast Monbaliu,*** *Rehabilitation Sciences*	**Coalport**
B5.A Active self-propelling and custom moulded seating: A case study ***Faith Brown****, Sunrise Medical*	**B5.B** Adding life to years: Custom Seating Strategies for Older Adults with Congenital Disabilities ***Daniella Giles****, Sunrise Medical*	**Wenlock**

CONFERENCE PROCEEDINGS

<table>
<tr><th colspan="4">Monday 14 July</th></tr>
<tr><td>TIME/LOCATION</td><td colspan="3"></td></tr>
<tr><td>SESSION 1
14:00 – 15:00

Ironbridge 1</td><td colspan="3">14:00 WELCOME TO PMG2025 Opening Address by PMG Chair
14:10 PITCH YOUR POSTER!
14:20 OPENING PLENARY
PL1 The Cerebral Palsy Integrated Pathway and how it can improve the care of children and young people with CP
Stephen Cooke, Orthopaedic Surgeon, University Hospitals Coventry and Warwickshire NHS Trust and Alex Gill, Physiotherapist, Sheffield Children’s NHS Foundation Trust.</td></tr>
<tr><td></td><td colspan="3">Break (10 mins)</td></tr>
<tr><td>SESSION 2
15:10 – 16:00

Ironbridge 1</td><td colspan="3">15:10 Free Papers
FP1 A Case Study on Designing a Supine Wheelchair for Safety and Transport
Jacob Redwood-Thomas, Swansea Bay University Health Board

FP2 Exploring the development of rearward facing wheelchair and occupant restraint systems for passengers with complex posture.
Bob Appleyard, Mobility Support Services Ltd

Update on Wheelchair Stability BPG</td></tr>
<tr><td></td><td colspan="3">Break (10 mins)</td></tr>
<tr><td rowspan="2">SESSION 3
16:10 – 17:00</td><td colspan="3">Parallel Sessions. Choose from:</td></tr>
<tr><td>Ironbridge 1

PS1 Enhancing Pressure Ulcer Prevention and Management through Multidisciplinary Collaboration
Danielle Base, Pearce Brothers Mobility and Eva Harris, Swindon Community Services</td><td>Ironbridge 3

PS2 Impact of custom-contoured wheelchair seating on scoliosis progression for children with neurologic and neuromuscular disorders
Dr Jonathan Hosking,
Cardiff and Vale University Health Board</td><td>Coalport

PS3.A Wheelchair Skills for Clinicians - an Open Secret
Holly Pulham, North Bristol Trust

PS3.B SWIFT Provision: How far have we come, where are we going, how do we get there?
Sarah Dowie, National Spinal Injuries Centre and Emma Linley, London Spinal Cord Injury Centre</td></tr>
<tr><td>17:00 – 19:00</td><td colspan="3">Welcome Reception in Exhibition Hall</td></tr>
</table>

Tuesday 15 July	
TIME /LOCATION	
08:00 – 8:50 **Hall 3**	**BREAKFAST and Exhibition**
SESSION 1 **09:00 – 10:30** **Ironbridge 1**	**09:00 Good Morning from PMG Chair** **09:10 Pitch your Product** **09:50 PLENARY** **PL2** Inclusive & Collaborative Approaches to Postural Management in Mexico: Insights from Instituto Nuevo Amanecer and Therapies Unite ***Martin Seabrook**, Rehabilitation Engineer / Designer, Medict*
10:30 – 11:30	***MORNING BREAK and REFRESHMENTS*** **Exhibition - poster viewing – Boccia - wheelchair skills** **Speakers' Corner Sessions: 10:45 and 11:05**
SESSION 2 **11.30 – 12:45** **First floor rooms**	**BREAKOUT SESSIONS (repeated on Wednesday) or visit Exhibition** **See Breakout session chart for options** **11.30 Breakout A** **12.10 Breakout B**
12:45 – 13:45 **Hall 3**	***LUNCH*** **Exhibition - poster viewing – Boccia - wheelchair skills** **Speakers' Corner Sessions: 13:00 and 13:20**
SESSION 3 **13:45 – 15:00** **Ironbridge 1**	**13:45 Free Papers** **FP3** Enhancing Wheelchair Services through Joint Funding ***Louise Viner**, Occupational Therapist* **FP4** An overview of Custom Contoured Seating (CCS) provision in the NHS Grampian Wheelchair Service ***Katie Henderson,** NHS Grampian* **FP5** Improving service efficiency and quality - issuing a manual tilt-in-space wheelchair on first contact to service users ***Amie James and Rhian Davies**, South Wales Posture and Mobility Service*
15:00 – 16:00 **Hall 3**	***AFTERNOON BREAK and REFRESHMENTS*** **Exhibition - POSTER PRESENTATIONS Q&A - Boccia - wheelchair skills** **Speakers' Corner Sessions: 15:15 and 15:35**
SESSION 4 **16:00 – 17:00** **Ironbridge 1**	**PLENARY** **16:00 PL3** A new qualification in assessing for wheelchairs and seating ***Clare Barber**, Director and OT, Trusted Assessing and Care Training* **16:30 PL4** Assistive Technology doesn't just happen: innovating from idea to commercial reality ***Laura Finney**, Marketing and Clinical Director, Leckey* End of day's Conference proceedings

19:00 – 01:00 **Ludlow Suite**	**Dinner** **19:00 Pay bar open** **19:45 Dinner** For ticket holders only. Smart casual dress code (no jeans or trainers please).

Wednesday 16 July	
TIME/LOCATION	
08:00 – 08:50 **Hall 3**	**BREAKFAST and Exhibition**
SESSION 1 **09:00 – 10:00** **Ironbridge 1**	**09:00 Good Morning from PMG Chair** **09:10 Free Papers** **FP6** Effectiveness of a four-week powered wheelchair training intervention in children and young people with severe cerebral palsy ***Prof. Elegast Monbaliu,*** *Rehabilitation Services* **FP7** The Role of the Rehabilitation Engineer in Pressure Ulcer Care ***Pearl Read,*** *Swansea Bay University Health Board* **FP8** User Feedback on Wheelchair Evaluation: Insights from the Wheelchair Check Tool ***Dr Linda Valent****, Heliomare Rehabilitation Centre*
10:00 – 11:00 **Hall 3**	**MORNING BREAK and REFRESHMENTS** **Exhibition - poster viewing - wheelchair skills** **Speakers' Corner Sessions: 10:15 and 10:35**
SESSION 2 **11:00 – 12:10** **First floor rooms**	**BREAKOUT SESSIONS (repeated from Tuesday) or visit Exhibition** **See Breakout session chart for options** **11.00 Breakout A** **11.40 Breakout B**
	Break
SESSION 3 **12:15 – 13:00** **Ironbridge 1**	**PLENARY** **12:15 PL5** Posture and Mobility: Does spasticity even matter? ***Dr Anton Pick****, Rehabilitation Medicine Consultant, Clinical Lead, Oxford Centre for Enablement* **12:45 PRIZE GIVING** **Best Free Paper & Best Poster at conference** **13:00 Close of Conference proceedings**
13:00 – 14:30 Hall 3	**LUNCH** **Exhibition - poster viewing - wheelchair skills**
14:30 – 15:30	**Collab Space available for meetings**

2. WELCOME FROM CHAIR OF CONFERENCE

Welcome to the 2025 PMG Conference!

It's a pleasure to have you with us as we come together once again to learn, connect, and grow. Over the past year, we've reflected deeply on your feedback — what you value, what could be improved, and what changes you'd like to see. That feedback has not only been heard, but it has also driven real action.

This year's conference marks a new chapter, shaped by your voices and a shared desire to keep improving. We've embraced change with purpose to create a better, more responsive experience for everyone. From the layout and flow of the conference to the variety of networking opportunities, these changes are designed with you in mind.

Our exhibitors and delegates remain a vital part of the PMG community, and I want to acknowledge how integral you are to this conference. We hope the changes made this year, including efforts to give you more choice in how you engage, reflect our commitment to enhancing your experience. These improvements are a direct response to your feedback, and we hope you will see and feel the benefits throughout. Thank you for your continued support.

Behind the scenes, a huge amount of work has gone into making these changes happen. A heartfelt thank you to the entire Conference, Education, and Communications (CEC) Committee, and the Executive Committee. A special shoutout must go to Lisa Thompson. Lisa's dedication, energy, and outstanding organisational skills have been transformative. Lisa, your impact has been felt at every stage of planning, and we are so grateful for all you've done.

More than anything, this conference is about community. PMG continues to grow as a space where those working in posture and mobility can come for guidance, support, and shared purpose. We are building something together: a network, a resource, a home for professional connection. Your presence is what makes it thrive.

As always, your input is welcome, during and after the conference. It's how we learn, adapt, and evolve — together.

Thank you for being part of PMG. We hope this year's conference leaves you informed, inspired, and proud to be part of this amazing community.

Warm regards,

Bicky Ho (CEC Chair)
July 2025

3. IMPORTANT INFORMATION (A-Z)

ALCOHOL: Only the venue is licenced to provide alcohol at this event. If any attendee is found consuming alcohol not provided by the venue, or providing alcoholic drinks for others at the event, they will be asked to leave.

ATTENDANCE BADGE: You must wear your attendance badge throughout the event – without it you will be refused entry to the exhibition and conference proceedings.
Please note: you will also not be admitted to the Gala Dinner without your badge.

ATTENDANCE CERTIFICATES: these will be provided after the event, only for those attending conference proceedings.

BREAKFAST: Breakfast on Tuesday and Wednesday mornings will be available for all attendees from **08.00 to 08.45** within the exhibition in Hall 3.

BUSINESS FACILITIES: The following services are available from the TIC Reception office (charges apply): internet and e-mail access; printing and copying; laminating; secretarial work.

CONFERENCE PROCEEDINGS: All conference proceedings take place on the first floor. The plenary sessions and free paper presentations are in Ironbridge 1. Room allocations for parallel and breakout sessions are shown on the conference programme. The abstracts of proceedings are published in this book, see Contents page 3.

CONTACT NUMBERS:
Lisa Thompson, PMG Manager: + 44 (0)7471 459820
TIC reception: + 44 (0)1952 281500

EVACUATION PROCEDURES: In the event of an emergency evacuation, please follow instructions from TIC staff. They will direct you to the assembly point and assist anyone with accessibility requirements who may need extra support.

EVENING DINNER: The Tuesday Evening Dinner will be in Ludlow Suite on the Ground Floor on the evening of **Tuesday 15 July** from 19:45, followed by an after-dinner quiz. There is a pay bar which will be open from 19.00.
The Evening Dinner is for ticket holders only, if you have a full event ticket the dinner is included. You MUST bring your badge with you for scanning at the entrance. The dress code is smart casual, and the Conference Committee kindly request that no jeans or trainers are worn.

EXHIBITION: The Exhibition Hall is open for the Welcome Reception on Monday from 17:00 to 19:00. The exhibition is then open from 08:00 – 17:00 Tuesday 15 July and 08:00 – 14:30 Wednesday 16 July.

FIRST AID: First aid assistance is available onsite. Should first aid be required, a TIC team member will attend immediately and, if not first aid trained, will radio for the duty manager.

LOST PROPERTY: Lost property should be handed into the TIC Reception office.

LUNCH & REFRESHMENTS: Lunch and refreshments will be **served in the exhibition during break times** on Tuesday 15 July and Wednesday 16 July. Catering points are clearly marked on the Exhibition Floor Plan (see Exhibition Catalogue).

PARKING: The venue has an onsite car park, with over 1,500 spaces, including disabled bays close to the entrances to the venue. If you require accessible parking, you are advised to use Gate B, car park CP4 and entrance E4. Parking is free of charge for PMG2025 attendees, and there is no height restriction. There is also some parking available at the onsite hotels.

POSTER PRESENTATIONS: The posters are located within the exhibition. Poster presenters will be available for Q&A next to their posters during the afternoon break at **15:00 – 16:00 on Tuesday 15 July.**

PRAYER ROOM and QUIET ROOM: A Prayer Room and a Quiet Room are located in the Pattingham Suite on the Ground Floor, just before Hall 3.

SMOKING: TIC is a *No Smoking* venue, and this includes the use of e-cigarettes. There is a designated area for smokers outside the main entrances E2 and E3.

TAXIS: TIC reception staff are happy to book taxis for you. Pick-up is from outside the main entrance E1 or E2.

WELCOME RECEPTION: A free Welcome Reception is taking place on **Monday 14 July from 17.00 until 19.00** in the exhibition in Hall 3.

WI-FI: Free Wi-Fi is available during the event. Access details are **Username:** TICUK
No password is required

4. INVITED SPEAKERS – PLENARY SESSIONS

4.1 PL1 MONDAY 14 JULY 2025

The Cerebral Palsy Integrated Pathway and how it can improve the care of children and young people with CP

Stephen Cooke, Orthopaedic Surgeon, University Hospitals Coventry and Warwickshire NHS Trust and Alex Gill, Physiotherapist, Sheffield Children's NHS Foundation Trust

The Cerebral Palsy Integrated Pathway (CPIP) started in Scotland in 2013 and is based on very similar pathways in use elsewhere in Europe, particularly the CPUP program in Scandinavia. It was introduced in England in 2016 and has spread across the UK and Republic of Ireland. Data is collected by clinicians at the point of care making it of extremely high quality and as of Q4 2024 there were over 13,000 children on the CPIP database representing approx. 40% of all children with CP in the UK.

CPIP is backed up by an online database, the core of which is a dataset collected by paediatric physiotherapists. Other forms have been developed to record information such as hip x-ray data, surgery, gait analysis, occupational therapy assessments and fractures. Work is ongoing to develop CPIP with additional forms expanding the database, for example a Cerebral Palsy Registry aligning with the Surveillance of Cerebral Palsy in Europe (SCPE) data set. There is no reason at all why forms for use by wheelchair services and/or orthotics/surgical appliances could not be developed.

Data collected and entered into CPIP can be viewed by all clinical teams involved in a particular person's care. An orthopaedic surgeon can see the physiotherapy assessment and therapists can see surgeons' entries for example, facilitating joined up care and MDT working. The data can be used for audit, research and service development with appropriate consent. NHS England are planning to incorporate CPIP within their core data set and a new publication, "Integrated Care System framework: commissioning services for children and young people living with cerebral palsy" has been distributed to ICFs around the country. This can be used to encourage ICFs to fund and support CPIP.

The widespread adoption of CPUP in Scandinavia has resulted in a reduction of hip dislocation in CP from 10% to 1% and an overall reduction in lifetime risk of orthopaedic surgery from 40% to 15%. Early detection of musculoskeletal problems in CP allows preventative management strategies including physiotherapy, postural management, medical treatment of tone and 'early' surgery (e.g. botulinum toxin, selective dorsal rhizotomy, guided growth).

In this presentation we will discuss: -

- CPIP as it is currently used in the NHS.
- The anatomy and pathophysiology of hip problems in CP.
- The evidence for postural management programs.
- Surgery for the hip in CP, indications and contra-indications.
- Guidelines to support practice.
- How MDT working improves care

Email: stephen.cooke@uhcw.nhs.uk; alex.gill5@nhs.net

Inclusive & Collaborative Approaches to Postural Management in Mexico: Insights from Instituto Nuevo Amanecer and Therapies Unite

Martin Seabrook, Rehabilitation Engineer / Designer, Medict

In early 2025, I spent five weeks in Mexico focusing on postural management for children with cerebral palsy, supported by MEDICT, a UK charity with a long-standing relationship with Instituto Nuevo Amanecer (INA) in Monterrey. INA is a nonprofit organisation offering a holistic, inclusive model of care, with a strong emphasis on family involvement, functional ability, and education. Historically enriched by international input - particularly from UK practitioners - INA is now keen to rebuild and strengthen these connections.

Working alongside therapists and rehabilitation engineers, I helped assess INA's existing postural management processes and identify practical improvements in equipment design, clinical practice, and resource use. Together, we updated procedures and adapted equipment to improve adjustability and effectiveness, aiming for better outcomes for children and families, even within tight resource constraints. This collaborative process also created opportunities for continued knowledge exchange and skills development beyond the duration of the visit.

I also spent time in Puerto Vallarta working with Therapies Unite, a smaller charity dedicated to improving rehabilitation services for children in underserved areas. They are currently partnering with INA on a pilot project supporting four children with complex postural needs. My role included joint assessments and redesigning equipment to accommodate growth, changing postural needs, and the limitations of the local infrastructure and workshop facilities.

This presentation will explore the value of inclusive, family-centred postural care in resource-limited settings and reflect on the importance of collaborative working. It will highlight the roles of organisations like MEDICT and Therapies Unite in enabling sustainable impact and knowledge exchange and consider how UK clinicians and engineers can contribute meaningfully through mutual learning and support.

By sharing these experiences, the session invites discussion on strengthening international partnerships and learning from innovation, born out of necessity.

Email: martinseabrook@outlook.com

A New Qualification in Assessing for Wheelchairs and Seating

Clare Barber, Director and OT, Trusted Assessing and Care Training

Clare Barber is an OT and Director at Trusted Assessing and Care Training (TACT). In this talk she will provide an update on the project to develop a Trusted Assessor national qualification designed to enable a range of roles to undertake assessments for wheelchairs and seating to and know when to refer on more complex cases. The project was initiated by The Wheelchair Alliance and TACT have consulted with a range of stakeholders in both public and commercial provision. Clare will review progress on the course content, pilots due to run in June and prospects for accreditation.

Email: Clare@trustedassessing.com

Assistive Technology doesn't just happen: innovating from idea to commercial reality

Laura Finney, Marketing and Clinical Director, Leckey

Innovative ideas can seem deceptively simple—but turning them into effective, safe, and viable products is a complex journey. In this talk, I'll share the development stories behind two innovative products for children: a deep-squat toilet seat and a growable contoured seating system. I'll highlight the technical, design, and clinical challenges we faced, and how to make cross team collaboration—engineering, clinical insight, and even animal biomechanics—a key to success. This session will explore the gritty reality of product innovation: where creative sparks meet frustration, iteration, and teamwork.

Email: laura.finney@leckey.com

Posture and Mobility: Does spasticity even matter?

Anton Pick, Rehabilitation Medicine Consultant, Clinical Lead, Oxford Centre for Enablement

Dr Pick will explore how spasticity and other central movement impairments contribute to disability. He'll review both well-established and novel treatment options, including cryoneurolysis. The historical context of these treatments will be offered along with real-world case examples.

Email: Anton.Pick@ouh.nhs.uk

5. PITCH YOUR PRODUCT TUESDAY 15 JULY 2025

A: LCS Ltd – WheelAir Cushion

Titled '3D custom cushion, is this the future of seating?', our interactive course discusses the journey of an active wheelchair user from off-the-shelf to a custom 3D printed seat. This case study explores the evolution of a custom 3D printed seat using programmable foam. Detailing programmable foam properties and how custom 3D printed seating is accomplished, and also analysing the science of the interaction of programmable foam.

This case study was presented at the International Seating Symposium in Pittsburgh, PA in March 2025.

B: Spex – New Manta Back Support Systems

Spex is pleased to unveil its latest innovations at PMG2025, featuring the refreshed Manta Back Support and the all-new contourable Manta, designed for users with asymmetries and spinal deformations.

We listened! Developed in response to clinician feedback, these enhancements deliver superior postural support, comfort, and adaptability. Our pitch will showcase client case studies and clinical reasoning, demonstrating the real-world benefits of these advancements.

Key Innovations

- Integral Swing-Away Lateral Option – Enhances safety and ease of transfers.
- Special Cover Design – Secures harnesses in place.
- 180° Invertible Design – Enables precise lateral positioning.
- Asymmetrical Contouring – Advancement in personalizing contouring where it’s needed and can be changed over time.

Efficiency & Cost-Effectiveness

- Sustainable & re-issuable, saving NHS resources and money.
- Reduces clinician time with intuitive setup.
- Built to last, minimizing replacements.

With strong clinical validation, the Manta sets a new standard in wheelchair seating.

C: HomeBraceGermany - MyECC Pupil

MyEcc Pupil Prop is an alternative power wheelchair controller developed and designed specifically for people who can only move their eyes.

It is a pair of glasses with a camera that tracks eye movement and uses this movement to drive the wheelchair in the direction the person is looking. MyEcc Pupil Prop allows people with conditions such as ALS, SMS and Muscular Dystrophy to move their wheelchair independently in every direction and stop it by closing their eyes.

What makes MyEcc Pupil Prop absolutely unique is that it is the only eye-controlled assistive device for power wheel chairs that works outdoors and in bright sunlight.

D: Etac – R82 Chilla

The Chilla is a new buggy which offers a high level of seating and postural support, a headrest adaptor bracket to facilitate fine-tuning of head positioning, and easy swapping between forward and rearward facing. It incorporates 45 degrees of tilt and a lie-flat recline, as well as a lightweight base with easily removable seat for ease of use by parents. For more complex children, there's the option to fit an X:Panda or Shape seating system. There's loads of growth build-in to the seat across the 2 size options, which is easily adjustable via allen bolts or hand knobs. The Chilla base also has the option of built-in suspension with 3 settings, making it easily adjustable for parents wanting to take the equipment over rougher terrain. The Chilla is our latest offering to provide postural seating on an aesthetically-pleasing base, whilst keeping the cost in line with NHS provision.

E: Sunrise Medical – RIDE Custom Backrest & Cushion

RIDE Designs introduces a revolutionary approach to custom-moulded wheelchair seating by incorporating principles from orthotic design. Utilizing a patented, evidence-based support mechanism, RIDE enhances postural stability and functional performance while significantly reducing harmful pressure and shear forces on vulnerable bony prominences.

The RIDE Custom Backrest represents a major innovation in wheelchair seating through the integration of 3D printing technology. This custom-moulded solution provides a truly individualized fit for each user, offering the benefits of traditional seating systems with greater efficiency. By streamlining the fabrication process, RIDE significantly reduces time and effort for clinicians and services—delivering high-quality clinical outcomes without compromise.

This is being introduced and will be available for the UK market through Sunrise Medical in Summer 2025.

F: FormAlign – Sprint Hybrid Cushion

The Woven Air Sprint Cushion is an exceptionally lightweight cushion designed specifically for active users. Its innovative air/foam hybrid construction provides outstanding stability, ensuring maximum energy is directed into propulsion. Strategically placed air tubes in the ischial region help reduce the risk of pressure injuries, while the low lateral contouring aids with transfers. With a sealed, maintenance-free design, the air tubes require no inflation. The slim 65mm profile beneath the thighs helps to lower the centre of gravity for enhanced performance.

G: RMS – Virtus Dynamic Seating System

The Virtus Dynamic Seating System is a novel application of dynamic postural support, specifically designed to stabilise the pelvis and accommodate fluctuating muscle tone. Trialled with a 10-year-old girl with GMFCS Level 5 quadriplegic cerebral palsy, the Virtus significantly improved seating tolerance from under one hour to up to three hours per day. Clinical observations noted improved symmetry, comfort, and safer feeding. Staff reported reduced physical strain during positioning and transfers, easing workload and enhancing Amy’s participation in classroom activities. Customisable elements such as the dynamic footplate and bespoke headrest contributed to more tailored support. Compared to previous equipment, the Virtus minimised the need for ongoing reassessment, suggesting greater efficiency and long-term cost-effectiveness. While formal research is pending, the

successful trial has led to its consideration in other cases, indicating strong potential for wider use across the posture and mobility population.

H: Boccia

Boccia is a precision ball sport, similar to bowls, designed specifically for athletes with physical disabilities affecting motor skills. Played indoors on a similar size to a badminton court. It's a game of strategy, skill, and accuracy, where players aim to land their leather balls closest to a white "jack" ball. Boccia is inclusive, accessible, and highly competitive, featured in the Paralympic Games.

Boccia England is the national governing body for the sport in England. Its mission is to promote, develop, and support boccia from grassroots to elite levels. Through competitions, coaching, and club development, Boccia England empowers individuals of all abilities to participate and excel. The organisation champions inclusion, offering a supportive community and pathways for all players, whether playing for fun or aspiring to represent their country. Boccia England is transforming lives through sport, and we believe that it is the most inclusive sport in the world!

6.1 PS1

Enhancing Pressure Ulcer Prevention and Management through Multidisciplinary Collaboration: A Joint Approach Between Tissue Viability Nurses (TVNs) and Occupational Therapists (OTs)

Danielle Base, Clinical Director, Specialist Occupational Therapist / Moving and Handling Practitioner, Pearce Brothers Mobility and Eva Harris, Tissue Viability Nurse Specialist, Swindon Community Tissue Viability Team Lead, HCRG and SW Regional Wound Care Lead NHS England SW

Pressure damage in healthcare settings costs the NHS over £3.8 million daily (NHS England, 2018). Although evidence supports the effectiveness of a multidisciplinary team (MDT) approach to pressure ulcer prevention and management (Ray Samuriwo, 2012), the level of collaborative support between Tissue Viability Nurses (TVNs) and therapists remains inconsistent. While NICE (2018) guidelines provide clear directives for pressure care, there is limited research on joint clinical practice for individuals with complex needs, particularly the integration of TVNs and OTs in 24-hour pressure care.

Guest et al cohort study evaluating pressure ulcer management in the community suggested that only 21% of patients who develop a category 4 pressure ulcer which is characterised as a full thickness skin and tissue loss with exposed or directly palpable fascia, muscle, tendon, ligament, cartilage and or bone in the ulcer (National Wound Care Strategy Programme 2024) go on to heal in 12 months. Patients with complex postural need are far more at risk of significant harm therefore proactive collaboration is essential to prevent skin damage.

This research aims to explore how the sharing of knowledge and skills through joint working between TVNs and OTs can significantly reduce the risk of pressure ulcers and expedite the healing process, especially for individuals with complex needs.

Key areas of focus include postural assessment, contracture management, repositioning strategies, this can often be seen as responsibility of the OT or Physiotherapist, however this collaborative approach is essential to ensure skin integrity issues such as moisture associated skin damage (MASD) and pressure ulcer wound management has been considered and incorporated into care planning.

Mobilisation versus bed rest is often another area that varying clinical goals can be observed. Bed rest can frequently be prescribed for a patient with sacral pressure damage which may not always be in the patient's best interest for their quality of life or long-term function if maintaining posture is a priority (Norton & Sibbald 2004), this common situation can be observed in many community settings, ensuring a collaborative approach ensures the patient and all clinicians involved work together enabling discussion of benefits and risk to different approaches as well as safety netting to ensure all a patients needs are met and best outcomes are achieved.

Other areas which should be considered from the MDT include continence and the impact this will have on skin integrity and corresponding increased risk for pressure damage, the use of appropriate moving and handling equipment to prevent sheer and friction on the skin, as well as effective seating provision that meets the patients postural and pressure care needs.

A holistic, client-centred approach is crucial in preventing and managing skin injuries. Both TVNs and OTs play vital roles in assessing optimal positioning, advising on appropriate use of pillows or

positioning systems, and determining the timing and method of repositioning to reduce shear and friction. Furthermore, decisions regarding mobilisation and bed rest, which can impact both skin health and long-term function, require close collaboration to ensure the best outcomes.

The research emphasises the importance of communication and sharing knowledge and skills between professionals, particularly in the context of postural management and equipment provision, such as beds, seating, positioning systems, moving and handling and toileting and bathing equipment as well as the timely prescription of pressure-relieving devices, for example mattresses, cushions, medical grade silicone gel for seating, bathing slings and contractures.

Joint case studies demonstrate that working collaboratively within the community setting enhances patient care, improves communication, and empowers both TVNs and OTs to make informed decisions. This MDT approach has shown to improve confidence and clinical skills, leading to more effective pressure ulcer prevention and management.

In conclusion, while pressure care has traditionally been viewed as a role primarily managed by TVNs and nursing staff, and equipment provision the domain of the OT, a more integrated approach involving OTs and TVNs is essential. This collaborative model not only reduces the financial burden on the NHS but also significantly improves patient outcomes by reducing pain and discomfort associated with pressure ulcers by ensuring all patients have the most appropriate care for their individual needs. A review of frameworks, education, and funding allocation is necessary to equip all professionals with the skills, knowledge, and authority needed to provide comprehensive postural and pressure care solutions.

Keywords: Pressure ulcers, multidisciplinary team, tissue viability nurses, occupational therapists, postural management, prevention, patient care, collaboration, NHS.

The research focusses on professional collaboration and clinical practice. Company and product names have not been specified, but may be discussed in the case studies as part of the prevention/treatment process with other products and intervention strategies.

References

NHS England, 2018 Available at: https://www.england.nhs.uk/pressure-ulcers-revised-definition-and-measurement-framework/ (Accessed: 12 January 2025).

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6.2 PS2

Impact of custom-contoured wheelchair seating on scoliosis progression for children with neurologic and neuromuscular disorders

Dr Jonathan Hosking, Clinical Scientist, Rehabilitation Engineering Unit, Cardiff and Vale University Health Board

Summary: This study explores the clinical effectiveness of custom-contoured seating (CCS) for wheelchair users with neurologic and neuromuscular disorders (NMDs).

Category - Audit/Research

Aims and Objectives

The first aim of this project was to gain further understanding of the clinical effectiveness of CCS for persons with neurologic and NMDs from existing published literature.

The second aim of this project was to explore the relationship between CCS and scoliosis progression for children with neurologic and NMDs.

The objective of the study was to synthesise information from the existing literature, inform current practice, and identify knowledge gaps for further experimental investigation.

Background, Technique, Standards, Clinical Detail, Results and Testing

To date, CCS has received little attention in the research literature. Despite its widespread use, the clinical effectiveness of CCS for individuals with neuromuscular disorders remains unclear. This study set out to gain a better understanding of its clinical effectiveness and to investigate its comparative impact versus alternative seating on progression of scoliosis deformity.

Firstly, a scoping review was conducted exploring the efficacy of CCS for:

(1) posture and musculoskeletal deformity,

(2) quantitative measures of body structure and functions including cardiopulmonary and upper limb function, motor control and tissue integrity, and

(3) qualitative perceptions, opinions and quality of life indicators including comfort and satisfaction.

A total of 17 studies met the inclusion criteria. This review highlighted the lack of literature exploring the impact of CCS on cardiopulmonary function, pressure injury management, and upper limb function; although, there was no indication that risk is increased compared to alternative seating and it performed well in terms of perceived user satisfaction, comfort, and function. The findings also demonstrated immediate benefits to postural alignment, although, the longitudinal effect on progression of musculoskeletal deformity compared to alternative seating was more ambiguous.

Secondly, a longitudinal, retrospective cohort study was conducted for a convenience sample of 75 paediatric wheelchair users with neurologic and neuromuscular disorders (NMDs) prescribed CCS or modular wheelchair seating (MWS) by the South Wales Posture and Mobility Service. Of the 75 participants enrolled, 51% had cerebral palsy. Fifty were issued CCS and 25 were issued MWS. In the study, a generalised least squares (GLS) model was used to estimate the comparative impact of each seating system on Cobb angle over time and to determine predictors for scoliosis progression. The GLS model demonstrated that seat type ($\chi2$ =52.5, P<.0001), time since intervention ($\chi2$ =122, P<.0001), and baseline scoliosis ($\chi2$ =41.6, P<.0001) were predictive of scoliosis progression. Condition was not a strong predictor ($\chi2$=9.96, P=.0069), and sex ($\chi2$ = 5.67, P =.13) and age at

intervention ($\chi 2$ =4.47, P=.35) were not predictive. The findings showed paediatric wheelchair users with neurologic and neuromuscular disorders prescribed CCS showed greater mitigation of scoliosis progression over time compared to those issued MWS, although, scoliosis deteriorated regardless of intervention.

Discussion

This study has provided the first comprehensive assessment of the clinical effectiveness of CCS and has provided a deeper insight into its comparative impact on scoliosis progression for children with neurologic and NMDs. It is anticipated that this information can be used to develop seating guidelines and assist clinicians in prescribing targeted seating interventions. Overall, this study strengthens the idea that CCS is beneficial in mitigating scoliosis progression and improving postural alignment, and it is clinically effective at improving comfort and user satisfaction.

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6.3 PS3.A

Wheelchair Skills for Clinicians – an Open Secret

Holly Pulham, North Bristol Trust

Do you show your client's how to use their wheelchair when you issue it? Do you consider wheelchair skills as part of your assessment and prescription?

Have you ever received any formal wheelchair skills training?

Are you confident to train clients in wheelchair skills such as carrying drinks, moving sideways, negotiating a kerb?

Wheelchair skills in NHS services has been described as an 'open secret' whereby we know we should be using them, but we just don't have the training, time or physical resources to incorporate them into our practice. Few of us even know where to signpost client's to for private/charitable wheelchair skills training.

This presentation explores: what is meant by wheelchair skills in our context, what provision there currently is and the possible solutions for how we meet even the minimum WHO guidelines for wheelchair skills.

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6.4 PS3.B

SWIFT Provision: How far have we come, where are we going, how do we get there?

Sarah Dowie, National Spinal Injuries Centre and Emma Linley, London Spinal Cord Injury Centre

Discussion between the London Spinal Cord Injury Centre, Stanmore, the National Spinal Injuries Centre at Stoke Mandeville Hospital and AJM Healthcare highlighted the need for:

- improved timelines
- improved quality of provision

of wheelchairs for spinal cord injury (SCI) individuals being discharged from their first episode of rehabilitation. It was recognised that changes in current practice were overdue.

The aim of the pilot project was:

To provide a mid-term, manual wheelchair or powered wheelchair (dependent on user need to include posture and seating requirements), in readiness for discharge from the user's first episode of SCI rehabilitation.

In order to achieve this, the pathway process needed to be streamlined to improve the timing of prescription identification, support direct ordering, and provide delivery to the SCI centres for set up before the person's discharge.

A new pathway was devised whereby a representative from the Wheelchair Services preferred equipment provider and the SCI therapist carried out a joint assessment with their SCI patient and completed a wheelchair and seating prescription. The prescription was drawn up from a pre-determined list of preferred equipment used by each Wheelchair Service to ensure maintenance could be carried within the Wheelchair Services Approved Repairers contract. A formalised prescription was identified by the senior seating therapist on the day of assessment. This was sent to the Wheelchair Service, along with the referral for direct ordering, with delivery to the SCI centre for set-up prior to patient discharge.

The pilot project was presented at last year's PMG conference and won best free paper.

The authors would like to actively engage with the PMG audience and propose:

- a brief overview of the project
- provide an update on outcomes
- identify ongoing barriers
- presentation of a success story
- allow service user participation
- develop trust and establish agreed competencies
- to engage commissioners
- development of a national working party

Following this, the authors invite an open and frank discussion allowing alternative perspectives to be shared. It is hoped that stimulating discussion will generate a desire for collaborative working and the impetus to find solutions to this complex challenge.

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The value of a wheelchair, December 2023, Revealing Reality and Frontier Economics for The Wheelchair Alliance

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7. BREAKOUT SESSIONS TUESDAY 15 and WEDNESDAY 16 JULY 2025

7.1 B1

BREAKOUT SESSIONS take place on Tuesday and again on Wednesday.

Choose one breakout to attend from column A and one from column B for each day. You can attend 4 in total. Space may be limited in some rooms so attendance is on a first-come first-served basis.

Exhibition Viewing

The exhibition remains open for delegates who would like to spend more time viewing products and speaking to exhibitors.

7.2 B2.A

A Collaborative Approach to Specialist Equipment Provision

Helen Nelson, Dimitri Scarlett and Eoin Egan, Provide Equipment Hub

This case study outlines the iteration of equipment used by a 42-year-old gentleman with MND whose wish is to retain as much independence for as long as possible in order to spend quality and memorable time and experiences with his young family and friends.

This case study aims to share knowledge and experience of a number of different state-of-the-art technologies and how multidisciplinary teams, manufacturers and charities can work together to achieve this.

During the 4.5 years since being diagnosed with MND, our client's mobility and functional movement has gradually deteriorated. He has always been motivated to retain as much independence for as long as possible and this has been achieved through provision of a range of communication aids, specialist switches and state-of-the-art powerchair driving control systems.

Whilst initially working independently, our Wheelchair Service and the regional AAC Service started working together towards the end of 2023 to investigate alternative means of switch input. Our client's functional movement was rapidly deteriorating and both services needed to find alternative switch inputs to allow our client to retain independent use of his communication aid and powered wheelchair.

Due to the rapid deterioration, both teams have had to work hard and fast to secure funding for the specialist equipment and we have been grateful for the financial support of a number of charitable organisations. (MNDA, Challenging MND) Due to the nature of the disease, once a solution is found, it is often not in place for long before a further deterioration in function demands yet another change in equipment. (Brenan, Gardiner and Narasimhan 2022) He has progressed from simple buddy buttons to ultra-light switches and further to Electromyography (EMG) and gyro-tilt switches. Joystick choice started with a standard shaped knob, but was soon replaced with switch control, then the Vigo headset and more recently the Ability Drive eyegaze system. This happened within a period of 18 months.

There have been other challenges along the way which have influenced how the client was able to access these switches, having implications for both communication and powerchair equipment choices.

For example, the full-time use of a BiPAP machine, restricted switch and headrest placement, and an elective tracheostomy, which whilst benefiting the client with his breathing, meant he no longer had forwards/backwards movement of his head.

The current setup includes the following equipment

- TDX Powerchair (powered tilt, recline, lift, ELRs) [Invacare Ltd]
- Ability Drive (Rahana Life)
- Tellus i6 Communication Aid with Mind Express Software [Jabbla]
- G-Click switch [Celtic Magic]

Introducing new pieces of equipment into the Wheelchair Service has involved multiple risk assessments, working closely with manufacturers and other health professionals and completing many Linx programming changes.

Through each iteration of the control system, the risk assessment was reviewed and the client's driving skills re-evaluated to ensure safe driving around his home, whilst also maintaining the ability to use his communication device to communicate effectively with his family and carers and access computer control.

The client reports that the current setup with the Ability Drive software has enabled him more freedom and ease of driving in his home, in his garden and in the local community. Driving the wheelchair now uses less energy and exertion meaning he can stay seated longer in his chair and socialise with his family.

This journey has shown how quickly equipment needs change with progressive conditions, and the importance of specialist services working collaboratively and promptly to ensure provision is client-centred, time-appropriate and funding options explored thoroughly.

Our client commented that he wishes he accessed alternative switches sooner than he did; with lots more options in our arsenal and an increased awareness of available options on the market, we will now be better equipped to support future clients with similar complex needs.

Whilst the initial costs were high, we are confident that these setups will be used many times over and would advise other Wheelchair Services to make the investment now to benefit this group of clients.

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7.3 B2.B

A MDT Bespoke Headrest Solution

Helen Nelson, Provide Equipment Hub and John Walker, Contour 886

This case study describes the development of a bespoke foam carve head support to achieve optimal head position in a 14-year-old with acquired tracheal stenosis following long term intubation as a neonate.

A number of head supports had been trialled previously, but none were able to orientate and hold his head in a position to optimise his airway. The desired position was a bilateral jaw lift and thrust forward which was not possible with off-the-shelf solutions.

The most common cause of benign acquired tracheal stenosis is mucosal injury from endotracheal intubation. (Aslıer, Yıldırım and Coşkun 2022) Additional tissue can form in the airway, reducing the size of the already small airway lumen. (Mok 2017) This results in the individual presenting with stridor, apnoea and difficulty managing secretions.

The client was referred to the wheelchair service in 2023 for assessment for an alternative headrest. The speech and language therapy (SALT) team specifically wanted to optimise head position to improve swallow for secretions and open the airway more for breathing.

A multi-disciplinary team (MDT) assessment was arranged by the Wheelchair Service with Contour 886, school physiotherapists, occupational therapists, speech and language therapists, residential carers and school staff. It was important to have all these professionals involved in the assessment to ensure all aspects of the client's posture and medical needs were considered.

At the second appointment, a mould was taken using a template headrest bracket and the therapy team working together to hold the moulding bag in position to achieve the desired jaw position.

Considerations for the manufacture included:

- A swing-away option as the required contours of the headrest around the jaw would interfere with hoisting. Choice of material for this to consider hinges to be potentially operated multiple times a day.
- Composition of foam to be strong enough to maintain the required shape.
- Bracketry to mount to existing seating system and allow easy interchange with the existing headrest.
- Headrest cover to take into account excessive sweating.

Further mid-fit appointments allowed us to identify the most suitable position for the swing-away hinges, and the precise contouring of the headrest around the jawline to achieve the necessary jaw position. Further refinement of the contouring of the headrest were also made at a subsequent appointment to further optimise the position.

Challenges faced included dystonic movements, changes to seating and ease of repeatable positioning. A number of different types of headrest bracket were also trialled in order to find a solution that would withstand the client's strong dystonic movements whilst also ensuring that the desired jaw position was maintained.

Risk assessments were developed and discussed with the MDT to ensure everyone was happy with implementation of the headrest.

The final shape of the headrest showed visible improvements of the position of the tongue and audible reduction of stridor, together indicating that secretions were reduced, swallow effectiveness improved and airway relaxed.

This case study demonstrates the importance of multi-disciplinary collaboration across medical, educational, social and therapeutic teams working together in order to find the best outcome for our client.

An iterative approach to the design was vital to ensure that the final shape and composition achieved the desired lift of the chin to optimise breathing and reduce stridor. It was also important to build methods of adjustability into the design so that modifications could be made post manufacture.

It is anticipated that the position and shape of the headrest will need to be modified as the client continues to grow.

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7.4 B3.A

'Keep on Trying' - When Technology Evolves You Might Just Get There

Lynda Pearce and Bex Oakes, Oxford University Hospital NHS Foundation Trust

Summary

A case study: A client with MD and complex postural/respiratory presentation. Problem solving her wheelchair seating and bed positioning using custom made solutions. Sharing how new technologies were embraced. The role of the client and her perspective will be shared demonstrating collaborative working, to incorporate her ideas, achieving her goals.

Aims and Objectives

To share a case study which demonstrates an evolving process where the scope for intervention increased as technology developed.

To discuss challenges experienced and share design developments.

To consider the role of involving the client in the development process when they can and where it is appropriate.

To highlight the importance of positioning throughout the 24-hour period and to consider the impact of nighttime support on seating.

Clinical Detail

The client has been known to the service for 10 years and has had three sets of custom seating made during this time and more recently custom bed positioning equipment.

She has Congenital Muscular Dystrophy and has a very complex postural presentation. She is a full-time wheelchair user, using respiratory support for most of the time. She leads an active lifestyle working from home with an adapted workstation. She lives in an adapted flat with a live in carer and has a supportive family.

Historically she has always wanted greater support for her trunk to improve comfort, function and respiration. She has craved greater lift whilst also requiring an upright posture for active functional use and vision for driving. She has also always had pain in her hips and recently head and neck pain.

Due to the support needs for her spine, we have been challenged to provide the required lift without being able to offer anterior support because of the effect on her breathing. In addition, it has not been possible to counteract the adverse effects of gravity due to her need to be upright.

Due to her complexity, custom contour wheelchair seating has been the only viable solution but there have been significant limitations to achieve her goals. Prior to the most recent intervention numerous modifications, inserts, straps and adjustments were trialled and some worked for short periods of time and offered optimal support within what was available at that specific time.

At the PMG conference 3 years ago, the team became aware of a new product (Spex removable and swing away lateral support bracket) that the Rehab Engineer involved felt may be used to modify custom seating provision to offer the additional anterior lateral support without impacting her breathing. This breakout session will go through the detail of this journey from the conceptualisation of an idea through to issue of her new seating and her feedback.

Positioning in bed was considered equally important to the client and therapists in terms of her long term postural and respiratory management. This presentation will also discuss the challenges around achieving very specific bed positioning support when standard equipment does not give enough support.

Discussion

This case study demonstrates what can be achieved when you are prepared to accept a challenge and re-visit when equipment solutions evolve. It will share a positive outcome and highlight the value of the client's involvement in problem solving with the clinical team.

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7.5 B3.B

The Blue Peter Approach to Seating

Rebecca Hindle, Guys & St Thomas NHS Foundation Trust and Paul Dryer, King's College Hospital NHS Foundation Trust

Clinical review of a client as their current equipment is obsolete. The client is very dependent on their powered wheelchair provision for day-to-day living both at home and work. They have complex postural needs but a high level of functional ability and unique strategies to manage comfort, positioning and activities of daily living.

Our objective was to provide comfortable, supportive seating whilst updating the powered wheelchair base to ensure on-going support for the longer term with regards to spare part accessibility. There was a clear aim to ensure that while supporting the client's posture we were not compromising their functionality in any way and inadvertently disabling rather than enabling them.

The client clearly identified key parameters for the equipment setup that were critical and potential deal breakers. These included aspects such as having a particular seat to floor height, the angle and height of the back support and arm support height to list a few. The controller position, angle and drive parameters were also key in terms of functionality and comfort for driving.

The client had been utilising existing equipment for a long time with very few issues clinically or from a maintenance perspective. Both the client and we as the clinical team were fully aware that introducing new and or alternative equipment would present challenges despite having a current working solution as a reference point due to subtle equipment differences.

Following the clinical assessment and discussion of potential options with the client it quickly became apparent that the solution was very much likely to be a "Christmas Tree" of solutions that would be an amalgamation of off the shelf products or components from a variety of sources, together with some customised / custom made elements.

As part of the journey from assessment to provision we made a number or errors along the way. Some were oversights by the client and ourselves such as 1inch wider seat width which had a significant clinical impact. Others were perhaps trying to go with "standard" provision of the equipment in an attempt to simplify the end solution. As the provision evolved it also became clear that even a small element of change had a significant effect on our client's comfort and ability to function and with the realisation that for a small group of individuals millimetres really do matter.

From the initial assessment to eventual final handover the client's clinical needs were changing in respect of their transfer methodology. Where historically they had been managing to undertake a standing transfer in certain circumstances this was becoming more challenging for them. From the start of the provision process standing transfers were a key requirement compared to the final set up where hoist transfers needed be accommodated instead.

There were elements of the seat support surfaces that were well established. These had been functioning for many years with no issues clinically or functionally. There was a recognition that if it wasn't broken there wasn't a need try to fix it for the sake of it.

The client had a real desire to keep the solution simple, but also adaptable as with their previous provision of posture and mobility equipment. It was key that we listened to this to ensure that the outcome worked for the client both in the short and longer term. Listening to the client and working collaboratively also helped to build a good working relationship with the client.

Listening to the clients' requests, trying to understand their needs and working with these with what we observing and could provide was key to the successful outcome of this case. Whilst the overall solution was not necessarily what some might consider to be pure custom seating, it was customised non custom seating that had our client's views and opinions very much incorporated into the final provision which we believe resulted in the eventual successful handover.

Having the resources of therapy staff and a rehabilitation engineer, combined with an engineering workshop and skilled technical staff allowed some lateral thinking and being able to consider solutions that might seem a little left field.

Along the path from assessment to provision there were some errors that were made, where some of the details that were planned for didn't necessarily work as intended. Being able to be openly admit that some of the elements that were provided were not right first time was key to achieving the final outcome and building a trust with the client.

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Teamwork Actually Does Make the Dream Work! Providing Powered Mobility for Double Upper Limb Amputation. A Case Study.

Nick Brown and Josh Williams, Cardiff and Vale NHS Trust

Summary

This is a case study looking at the story of getting Rob, who lost both arms following an electrical accident, into a powerchair that he could operate and access his community. It shows how teamwork, expertise, organisation and enjoyment in your work can ultimately lead to a successful outcome.

Aims and Objectives

The effects on Rob's life following the loss of his arms were not just physical. The isolation and mental struggles were significant. Our aim was to provide a powerchair that Rob could use independently with his remaining upper arm. Myself and Josh had to make it as safe and as practical as possible. A suitable aid needed to be devised that consistently gave Rob the control to operate the chair at the level required for issue. The on/off, tilt and functions also had to be incorporated in a way that Rob could use independently. We needed help from other departments.

Background and Case Study

In 1998 Rob was working on a substation and exposure to live wires meant a 33,000-volt explosion leading to horrific injuries and then sepsis. This led to both arms being amputated mid humerus. After many years of living his life a mild CVA meant we received a referral for potential powered mobility to allow Rob, who was feeling more and more isolated, to access the community.

The standard powered process was undertaken to assess eligibility. This was followed by a triage and then a very amusing but essential driving test with a powered chair crudely adapted to establish potential driving ability. These were both passed. A suitable chair was ordered then we set about adapting it. Any form of head control was dismissed due to client needing to access the chair independently and also out of personal preference.

The first approach was to the workshop team through Josh to make bracketry to get the chairs controller in a position to give us a chance of success. After getting the height and position of the controller correct it quickly became apparent a joystick alone could not be used by client's arm accurately or safely enough so something had to be devised to connect the arm to the joystick to provide the control needed.

This led us to contacting the Swansea limb service and in particular head of prosthetics Peter McCarthy. Peter had dealt with Rob post-accident and was very keen to help us find a solution. An MDT assessment was set up and the limb workshop team were asked to come up with a "passive terminal device" that attached to the joystick from a compliant liner attached to Rob's arm. Following a number of appointments, in which there were equal amounts of success and failure, a device was made and then successfully trialled. The next issue was the mounting of the functional buttons around the chair to allow Rob to switch on/off as well as changing speeds and seat position. This also had its challenges but by enlisting the expertise of the electrical engineering team a solution was found after a number of trials.

The limb service also employed an OT who also worked with Rob advising on home adaptations to improve access inside and outside the home and make Rob's driving experience safer and easier.

The result of all this work was that Rob can now access his home and local community independently in a way he couldn't previously. He now spends time in his kitchen, garden, local community and most importantly his local football team he used to play for and manage. His family have much more peace of mind and much more of Rob.

Discussion

As therapists, engineers, scientists, technicians etc. we all have high levels of expertise but we also have a lack of knowledge in many areas. This case study shows that working together, asking for help and making our jobs enjoyable we can achieve some amazing results. Obviously, this is not always possible and there can be many obstacles to this but this case study saw Rob go from being stuck in an armchair to getting out and about in the community and getting his life back. Workwise it created a number of professional relationships and a lot of much needed enjoyment.

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7.7 B4.B

CoMoveIT Smart: How Can AI Empower Independent Mobility for People with Severe Movement Disorders?

Prof. Elegast Monbaliu, Sotirios Gakopoulos and Saranda Bekteshi, Rehabilitation Sciences

Summary

This session will showcase the scientifically underpinned development, validation, and clinical impact of CoMoveIT Smart, a novel head-foot steering system for individuals with severe complex movement disorders. Experts from engineering and rehabilitation fields will offer a comprehensive view, from development phases to real-world clinical applications. A young adult with lived experience, one of the first CoMoveIT Smart users, will highlight the benefits and challenges associated with independent mobility as a pillar of improved quality of life.

Abstract

Worldwide, an estimated 18 million people are diagnosed with cerebral palsy, one of the most prevalent childhood-onset disabilities. Within this population, around 5.4 million manifest with complex movement disorders that severely impact motor control and coordination. Consequently, the vast majority cannot steer a powered wheelchair using conventional control devices such as joysticks, chin steering, or mechanic switches. Fortunately, the existing basal control of the head and (potentially) of the foot renders the possibility of independent mobility for people with complex movement disorders.

CoMoveIT Smart is a unique wheelchair steering system that utilizes Artificial Intelligence to empower individuals with complex movement disorders through independent mobility. Developed from collaborative research at KU Leuven, Belgium, in 2017, CoMoveIT addresses the significant challenges faced by many individuals diagnosed with severe cerebral palsy who struggle with conventional methods of wheelchair control. CoMoveIT Smart, which features head-only or head-foot steering, was developed by integrating scientific insights and evidence in close collaboration with users. It has received high praise from therapists and users for its usability and functional impact. With its adaptive algorithm, which filters out the fragmented, uncontrolled involuntary movements and translates them into a smooth driving, and personalized configurations, CoMoveIT Smart offers a controlled driving and therapeutic driving experience, promoting symmetry and independence while facilitating societal participation.

Proposed schedule and topics

Introduction of speakers.

Introduction and statement of the problem of mobility in complex movement disorders.

Instrumented sensor evaluation of wheelchair driving performance and adaptive wheelchair control.

Clinical evaluation of wheelchair driving performance and training.

A lived experience using powered wheelchair drive input devices.

Interactive discussion with the audience about their experiences, challenges and approaches on mobility for individuals with complex movement disorders.

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7.8 B5.A

Active Self-Propelling and Custom Moulded Seating: A Case Study

Faith Brown, Sunrise Medical

Summary

Clients who use active self-propelled manual wheelchairs have changing needs over their lifespan. This case study examines the use of a novel custom moulded seating solution for a 50-year-old female with spina bifida and postural deterioration over time, as well as a recent acute systemic skin inflammation condition.

Objectives

Despite the postural advantages of custom moulded seating, this type of system can be impractical to use on a rigid frame wheelchair. The objective of this case study was to provide a practical seating solution for that would enable maximum self-propulsion efficiency, improve central stability for daily tasks and protect her highly vulnerable skin. This had to be accomplished by a system that preserved her current fully independent transfer methods and did not increase the width of her wheelchair, which could interfere with environmental access.

Background

Spina bifida is a congenital neurological condition in which the spinal cord does not fully form from the neural tube during foetal development. Is often associated with the development of postural problems like neuromuscular scoliosis, particularly in clients with limited walking ability. (Murphy, Mooney 2019; Cacioppo et al, 2023). Poorly supported postural difficulties in this population are associated with difficulties with sitting balance for functional tasks. (Khoshbin et al, 2014) The combined effects of underlying postural problems and aging (Hinrichs et al, 2016) are known to impact functional tasks, but in the case of active self-propellers, any postural supports must meet practical goals for freedom of movement, transfer independence and transport.

Less well known are the impacts of acute febrile neutrophilic dermatosis, or Sweet's syndrome. This relatively rare autoimmune condition generally presents in women in middle age, resulting in a fever and neutrophils (a type of white blood cell) depositing in the dermis, leading to skin inflammation, blisters, and in severe cases associated peripheral nerve damage. (Driesch, 1994)

This client is an active self-propel wheelchair user who had been discharged from hospital following a bout of medication-induced acute febrile neutrophilic dermatosis. Prior to hospitalisation she was showing negative postural tendencies of scoliosis and pelvic obliquity and pelvic rotation. The wheelchair service as well as the client herself reported her postural alignment worsened during her illness, which required long periods of bedrest to manage severe skin ulcers. At the time of clinic review she continued to experience hand weakness along the ulnar nerve dermatome distribution and was still not fully at premorbid levels of strength, although she had started to return to work part-time. The client was using a rigid frame wheelchair with adjustable solid backrest at time of assessment for custom moulded seating, but this was no longer giving sufficient support. Additionally, she was experiencing difficulties with heat and moisture management on her current seat cushion.

Methods

A custom moulded seating system was provided by her local NHS as part of her care. The moulding process took place in her own rigid frame wheelchair, using a pre-shaped base under moulding bags to facilitate shaping.

The seating system utilised a thin 3-D printed backrest shell with removable hardware to facilitate transfers and management of the wheelchair in and out of her car. The cushion was constructed out of a firm closed-cel foam with air channel to facilitate ventilation and stability. The custom moulded shape was altered digitally prior to fabrication to alleviate pressure to high-risk areas using a technology designed to relieve ischial tuberosities, trochanters and sacrum. (Crane, 2016) At time of submission of this abstract, delivery is planned in a few weeks, at which time there will be initial skin checks after 30 minutes and again at one hour. The client will continue to retain her previous seat cushion whilst she acclimatises to the new seating, as a backup measure due to high degree of both skin risk and seating system novelty. A further review with pressure mapping is planned for one month in April 2024, with results to be available at time of the Posture and Mobility Group conference.

Outcome and discussion

Preliminary results in the completed mould suggested improved postural stability and retained ability to reach wheelchair wheels for propulsion. The client demonstrated intact fine motor and gross motor upper limb reach. The client reported subjective comfort despite the fully firm moulding bags, although she required more assistance to transfer out of the mould than out of her current seating. Position within the active user wheelchair, stability, transfers, skin condition and wheelchair tolerance duration are to be reviewed at fitting and follow up.

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7.9 B5.B

Adding Life to Years: Custom Seating Strategies for Older Adults with Congenital Disabilities

Daniella Giles, Sunrise Medical

Summary

This clinical practice workshop explores specific strategies for custom seating systems for adults with highly complex postures arising from congenital conditions. Using several case studies we will address how your assessment, fitting and carer interactions can support success.

Objectives

After this session, participants will be able to:

- Outline 3 elements of the assessment process that contribute to successful outcomes.
- Describe 2 solutions to improve outcomes in a multiple caregiver environment.
- Analyse two methods to determine if custom moulded seating is successful at time of delivery.

Clinical detail

This workshop will highlight distinctive considerations in the evaluation and implementation of custom moulded seating to individuals in their 4th and 5th decade of sitting. We will outline fundamental characteristics of orthotic and prosthetic science, how to apply the principals to this population and the importance of its impact. Attention will be given to intrinsic, extrinsic and environmental barriers to participation. We will discuss techniques to mitigate these factors throughout the service provision process. Case studies will be used to outline all major concepts and standardised outcome measures.

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8. FREE PAPERS

8.1 FP1 MONDAY 14 JULY 2025

A Case Study on Designing a Supine Wheelchair for Safety and Transport

Jacob Redwood-Thomas, Swansea Bay University Health Board
(Bob Appleyard, Dave Long, Dr Mark Bowtell and Dr Lorna Tasker)

Swansea's Rehabilitation Engineering Unit (SREU) received a challenging referral - to assess and potentially prescribe a wheelchair to a user with little-to-no hip flexion. This individual is currently using an ambulance stretcher as their main form of mobility equipment. This presentation will highlight the challenges around designing such a system and the approach to ensuring risk is managed, especially in terms of stability and vehicle transportation.

The aim of this case study is to highlight how SREU approached such a case and to generate discussion about the different approaches other services may have taken. It is also the aim of this presentation to support the production of guidance about transporting individuals who may have to be positioned in a more supine position due to postural limitations.

The individual has a diagnosis of Spina Bifida and has an estimated 20 degrees of hip flexion. This meant that a "standard" wheelchair wasn't suitable due to the absence of off-the-shelf wheelchairs and postural supports that could accommodate this individual's reduced hip range. The service user currently uses an ambulance stretcher as their mobility equipment, which includes both in-vehicle transportation and a member of his care team pushing the stretcher and the individual from A to B. Community therapists referred the individual to SREU for a wheelchair prescription as he has outgrown his ambulance stretcher and is no longer comfortable. Designing and prescribing such a system carries significant potential risks, especially around vehicle transportation and stability, therefore careful considerations of the benefits and accepted risks were undertaken. Several appointments took place with the service user and care team, over an 18-month period, who was fully engaged from the start as the possibility of having some independence was very important to this individual. This new system would allow the introduction of powered wheelchair controls, which he had not previously had been given this opportunity.

The design development and consideration of risks was supported by a process obtaining peer review and expertise in vehicle transportation and on how best to approach an engineering solution in wheeled mobility.

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Exploring The Development of Rearward Facing Wheelchair and Occupant Restraint Systems for Passengers with Complex Posture

Bob Appleyard, Mobility Support Services Ltd, and Jacqui Best and Terry Best, St George's University Hospitals NHS Foundation Trust

Transport for persons seated in wheelchairs and seating systems who possess complex postural needs provide frequent challenges to transport providers. This case study continues the development of low-risk transport solutions for wheelchair seated passengers by demonstrating the concept of a rearward facing wheelchair securement and an integrated occupant restraint harness in a combined 'restraint station' for use in minibus type vehicles, such as those used in 'Home to School' or 'Patient Transport Service' operations.

The work also includes measures to safely secure life supporting medical devices usually attached to the wheelchair, by means of a vehicle anchored device carrier.

It is anticipated that the development of a suitable device with basic adjustments could provide a transport solution for a number of wheelchair and passenger profiles, and potentially avoid the need for stretcher-based ambulance transport services and bring increased opportunities for leisure-based, inclusive activities.

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Enhancing Wheelchair Services Through Joint Funding

Louise Viner, Occupational Therapist

Introduction

Access to appropriate wheelchairs is essential for mobility, independence, and overall quality of life. However, funding pathways are often complex, fragmented, and unclear, creating barriers to timely and suitable provision.

Joint Funding is a collaborative approach where costs are shared between multiple organisations, such as health services, social care/local authorities, charitable bodies, and private contributions. This model can address funding gaps and ensure individuals with complex needs receive essential equipment that might not be achievable through a single funding source.

In an era of increasing demand and constrained budgets, NHS wheelchair services face significant challenges in meeting diverse service user needs. Joint funding offers a collaborative solution, combining resources to deliver appropriate, timely, and personalised mobility solutions.

In an East London Borough, the Wheelchair Service and Social Care jointly fund seating solutions where this is the most suitable option. The initial project was in partnership with the local authority and this relationship has continued. This was presented at PMG in 2016. The pilot has since continued and developed.

This presentation will look at why joint funding, who is involved and the collaborative work that occurs, how joint funding works within the service as well as the benefits to the service users and the other stakeholders. We will look at how this has developed to offer service effectiveness and efficiencies over time and present the challenges of joint funding as well as the benefits through case studies.

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An Overview of Custom Contoured Seating (CCS) Provision in the NHS Grampian Wheelchair Service

Katie Henderson, NHS Grampian

Summary
Custom Contoured Seating (CCS) can be costly to a Wheelchair Service in both time and expense. This audit highlighted a role for CCS use in managing the impact of moderate/severe neuromuscular deformity (NMD), or mild NMD with significant tonal abnormality, on the seated position. Through CCS use improvements in functional, comfort and skin integrity goals were observed.

Aims
CCS is often used in wheelchair seating as a solution when modular systems are either inadequate or ineffective in meeting the user's needs (Pope, 2007). Evidence to support its use, however, is limited (Osbourne et al, 2023; Hosking, 2023).

In NHS Grampian CCS is supplied to 1% of wheelchair users, but utilises 12% of the non-pay budget. This audit aimed to review the current CCS service to evaluate its role in terms of patient selection, outcome success and long-term effectiveness.

Objectives

1. To identify the goals of CCS, and whether these have been achieved.
2. To evaluate the relationship between the severity and scope of NMD, and the seating problems identified.
3. To evaluate the impact of tonal presentations on CCS provision

Background
101 patients (adult and paediatric) issued with CCS between 2017 and 2024 were identified and their wheelchair notes retrospectively analysed in terms of CCS goals, postural presentations, and outcome of interventions.

Results
Goals
Improving the seated posture was the main goal raised (90%), however it was rarely the only concern. For the vast majority it was a combination of functional improvements (47%), managing skin integrity (41%), and seating tolerance (56%) that were the primary goals.

Postural presentations
92% of patients had one or more moderate to severe fixed contractures preventing them from achieving normal anatomical sitting (as defined by Pope et al, 2013).

All patients who were falling/leaning to the side had a fixed coronal or transverse limitation in the pelvis and/or spine, or an asymmetrical limitation in hip range. Similarly, all those who fell forwards in their trunk, had a fixed moderate/severe enhanced kyphosis or posterior rib prominence. 78% of those who presented with sliding forwards in the chair, or desired a functional upright posture, had fixed limitations in their hip flexion range.

Tone
In addition to the severity of deformity, there were patients who presented with mild limitations yet were still requiring CCS. This audit identified that such patients either had extremely low truncal

tone or severe high tone presentations (spastic or dystonic). The low truncal tone population were predominantly people with advanced MS, over half of whom also had an implanted ITB device.

Goal attainment

Short-term outcome

Of those who had taken delivery of their CCS at the time of this audit, 67% reported short-term resolution of their goals. A further 27% required some additional in-house modification to achieve their goals. 3% required more substantial changes, some of which required re-casting. The remainder were unresolved or died before completion.

Long-term outcome

Of the 101 patients who were issued with CCS between 2017 and 2024, eighteen are now deceased. Of the remaining 83 patients, 68% still have their original CCS in use. 35 patients have required a new or replacement CCS. The main reason has been a general move to using carved foam instead of thermoplastic materials, however issues such as growth, disease progression and postural interventions (ITB/orthopaedic surgery) have also necessitated a new seat. Only four patients have stopped using CCS.

Discussion

A series of recent systematic reviews have concluded that there are immediate effects of adaptive seating in improving postural alignment (Toohey et al, 2024; Acharya et al, 2023; Hosking, 2023); however, the evidence is limited in their long-term benefits in prevention of NMD. These studies did, however, observe a potential theme of improvement of functional goals with CCS use.

This audit evidences that CCS plays a role in managing the consequences of moderate to severe NMD on effective seating. There is also evidence that supports CCS use with challenging tonal presentations, stabilising the seated position and reducing equipment failure. Through identification of key postural limitations, and subsequent moulding of a patient in relation to these, this audit demonstrated goals of increased seating tolerance, reducing focal pressure areas, and optimisation of function can be achieved.

These functional benefits are also seen in the longer term with 96% of people in this audit still using CCS to manage their wheelchair needs. This supports previous observations of high patient and carer satisfaction (Hosking, 2023), and improved quality of life indicators (Neilson et al, 2001) with CCS use.

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Improving Service Efficiency and Quality - Issuing a Manual Tilt-In-Space Wheelchair on First Contact to Service Users

Amie James and Rhian Davies, South Wales Posture and Mobility Service

Summary

Wheelchair therapists piloted a new way of working to improve the quality and efficiency of wheelchair provision for adult service users by fitting manual tilt-in-space wheelchairs directly at assessment if deemed clinically appropriate.

Aims and objectives

Primarily, aims were focused on improving the quality of service delivery experienced by wheelchair users across South Wales.

Proposed benefits of receiving equipment on first contact:

- Faster delivery of equipment solutions
- Improved quality of service delivery for service users
- Reduced number of clinic appointments/community visits (time and fuel savings)
- Reduced risk of development of secondary complications - subsequent financial and health related quality of life issues experienced by service users, carers and healthcare providers resulting from poor seated position.

Method

Background

When referrals indicate a manual tilt-in-space wheelchair is required, therapists list for a complex postural assessment, for which there is a waiting list. These assessments are conducted via clinic appointment or home visit due to the large geographical area covered across South and West Wales. Following assessment, the clinician would then place the order. Once the equipment was received it would be placed onto the waiting list for fitting. This process for ordering and delivery could add up to another 2-3 months onto an episode of care and results in the service user experiencing waiting times for both the assessment and issue of equipment.

Technique

In 2023, the screening process was streamlined where clinicians screened the referral and if it was deemed that a manual tilt-in-space wheelchair was likely to be suitable, an assessment was still raised but a wheelchair was also taken to the appointment and fitted if clinically appropriate on first contact.

Results and testing

During this pilot phase 98% (n=104) of service users were successfully issued a wheelchair at assessment within the 26 weeks referral to treatment key performance indicator (KPI) This is the time between point of referral to point of delivery of complex chair with a target of 90% of complex wheelchairs to be delivered within the terms of referral to treatment standards.

Following the success of this pilot, a designated stock of manual tilt-in-space wheelchairs with an agreed specification have been stored at the Posture and Mobility Centre to be taken and issued at

assessment by a therapist. This has become known as the “Grab and Go” scheme which was implemented in April 2024 and a service evaluation was undertaken in January 2025 to establish its effectiveness.

Results showed that between 1st April and 31st December 2024, 156 wheelchairs were issued at assessment/first contact. (This included 30 rapid response cases issued to service users with palliative diagnoses).

Further analysis showed that for 69% of these service users (n=108) all intervention was completed at assessment with no additional follow-up visit required.

This saved an estimated total of 151 hours of travel time - the equivalent to 4 weeks of 1 FTE post, and 5260.9 miles travelled with an estimated total average fuel cost saving of £597 (calculations based on return journeys to service users’ home addresses).

The remaining 31% (n=48) of service users required additional wheelchair accessories retrofitted such as an alternative pressure redistributing cushion, or there were social /environmental barriers at time of assessment, preventing the fitting of the chair. Follow-up visits were generally allocated to Technicians.

Discussion

This process is now embedded within clinical practice with a designated storage area and stock monitored.

Benefits include:

- Equipment provision at first face-to-face contact. Saving up to 2-3 months wait for order and prevent further deterioration from unmet seating need
- Improved Referral to treatment time (KPI)
- Increased convenience for service users
- Time and fuel saving for organisation

Challenges encountered:

- Risk of 'over prescribing'.
- Storage issues
- Monitoring the supply of wheelchairs and accessories
- Additional time required at the assessment.

Future service improvement is focused on increasing the range of equipment which can be identified at referral and issued at assessment.

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Effectiveness of a Four-Week Powered Wheelchair Training Intervention in Children and Young People with Severe Cerebral Palsy

Prof. Elegast Monbaliu, Rehabilitation Services

Introduction

This study aimed to investigate the effectiveness of a 4-week structured powered wheelchair training program on mobility skills and mobility-related participation in children and young people with cerebral palsy (CP). A structured training program based on the Wheelchair Skills Training Program is hypothesised to improve powered wheelchair skills and subsequently positively affect daily life participation.

Patients and Methods

A one-group repeated-measures study design with a baseline, intervention and retention phase of four weeks each was used. Inclusion criteria: age 6-21-years, diagnosis of CP, and GMFCS III-V. Exclusion criteria: profound intellectual disabilities. Participants received 12 powered wheelchair training sessions of 45 minutes, 3x per week. Wheelchair skills were assessed four times using the Wheelchair Skills Test at pre-baseline, pre-intervention, post-intervention, and follow-up. Mobility-related participation was assessed with the Canadian Occupational Performance Measure (COPM). Descriptive statistics were reported using medians and interquartile ranges (IQR). To compare pre-post intervention differences, the Wilcoxon signed-rank test ($p < 0.05$) and effect sizes (ES) were used.

Results

Nine participants (mean age 16y7m, range 10-20y; all GMFCS IV) participated in the study. Statistical analysis showed improved Wheelchair Skill Test scores post-intervention (81%, [IQR 60%–88%]) compared to pre-intervention (65%, [IQR 61%–78%]; $p = 0.008$; ES = 0.57). Moreover, improvements in the COPM-performance scale (ES = 0.53; $p = 0.012$) and the COPM-satisfaction scale (ES = 0.52; $p = 0.014$) were found following the intervention.

Conclusions

Powered wheelchair mobility skills and mobility-related participation improved after a 4-week wheelchair training intervention. Thereby, the Wheelchair Skills Training Program is a promising programme to improve powered wheelchair training in children and young people with CP.

(Original research)

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The Role of Rehabilitation Engineering in Pressure Ulcer Care

Pearl Read, Dr Mark Bowtell and Dr Lorna Tasker, Swansea Bay University Health Board

Summary/Aims and Objectives

Pressure ulcer prevention is everyone's responsibility and requires collaboration from a range of healthcare professionals. This presentation explores the role of Rehabilitation Engineering in pressure ulcer care and how the routine collection of service metrics is essential in evaluating the changing needs of our population in relation to pressure ulcer prevention and intervention. A retrospective review of the data set from 10 years will be summarised with specific reference to the posture and mobility needs of the patients assessed during this period.

Background/ Method

The Pressure Ulcer Prevention and Intervention Service (PUPIS) hosted in the Rehabilitation Engineering Unit, Swansea, was established in 2005. Rehabilitation Engineers (Healthcare Scientist or Practitioner) work alongside Clinical Nurse Specialists to provide a unique, multi-disciplinary, holistic approach to pressure ulcer prevention, management and education. The service receives referrals from the local community where local management is not effective and specialist input is required.

The engineer's role within a PUPIS initial assessment is to assess the patient's postural support and pressure relief in existing equipment which could include; wheelchair, armchair, mattress and shower chair. Following this assessment, bespoke equipment may be designed, manufactured and prescribed to promote management or healing of pressure ulcers where off-the-shelf equipment is insufficient. It is well established that Rehabilitation Engineering has a role in education during clinical visits and to the wider healthcare profession. Bi-monthly in-house training sessions are open to local healthcare professionals, including nursing, therapies and residential and nursing care home staff. Since 2018, over 500 colleagues have attended PUPIS training. A range of educational materials have been developed over the last 10 years of patient assessment, including videos, leaflets as well as the All Wales Best Practice Guidelines in Seating and Pressure Ulcers (PUPIS & AWTVNF, 2019).

In 2015, a database was developed to capture initial assessment data and primary service metrics were devised to provide knowledge of service efficacy including; wound details, sitting times, frequency of care/nursing involvement and dressing information. Since the launch of the database (January 2015 – December 2024), data for approximately 1300 initial assessments have been captured and analysed.

Results

PUPIS provide intervention predominantly for those with Category 4 and unstageable pressure ulcers. Common wound sites include ischial tuberosities, sacrum/coccyx, spine and heels. Approximately 52% of the patients are nursed in bed. In contrast 7% of the patients sit out for 24 hours a day and do not go to bed.

Approximately 70% of the population seen by PUPIS are over the age of 70 years. 40% of the population are hoisted with 13% able to self-transfer.

2019 audit indicates that 15% of patients had spinal-related conditions/injuries and 22% had dementia noted on assessment. Further analysis of the populations' primary diagnoses is being carried out and will be presented.

The database identified that 58% of initial assessments had a Rehabilitation Engineer in attendance.

The review has highlighted the increasing demand to the service and in particular the complexity of the patients. This is evidenced by the increase in bespoke in-house manufactured medical devices issued to support the patient's goals in managing and preventing pressure ulcers. Since 2021, post-COVID, the increase in requests for in-house manufacturing input has doubled when compared to 2018-2020 data.

Discussion

Patients with pressure ulcers present a difficult challenge to health services and experts in posture and mobility are regularly challenged by how best to support people with existing pressure ulcers or those at high risk. The challenge is heightened by the fact that pressure risk goes beyond seating alone. Complexity of patients appears to have increased post COVID-19 due to deconditioning, paused care and reduced therapy input as well as decreased levels of activity and social isolation (Welsh Government, 2021).

This review has demonstrated the important role that the Rehabilitation Engineer has in working alongside Clinical Nurse Specialists, using a problem-solving approach to pressure ulcer care, as well as applying biomechanical knowledge in design and manufacture of bespoke devices and provision of education. The evaluation of the data from 10 years has highlighted the importance of this multidisciplinary working and suggests the diversity of the role of the Rehabilitation Engineer, considering the wider aspects of 24-hour pressure management in posture and mobility.

This review has allowed for further refinement in the service metrics collected for 2025 onwards. The service has transitioned from manual database entry to a Microsoft Forms platform, for both referrals and initial assessments. This will improve efficiency and accuracy of ongoing data collection and analysis.

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User Feedback on Wheelchair Evaluation: Insights from the Wheelchair Check Tool

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Background

User feedback on wheelchair fit, posture, and mobility is key to preventing wheelchair-related health issues. The screening tool www.wheelchaircheck.com helps users identify specific wheelchair issues and needs across a range of domains, and enables users to communicate these to healthcare professionals and wheelchair providers. The tool is also linked to an online database that supports research on challenges faced by wheelchair users. The Dutch version has been available for nearly five years and, due to its success, has been translated into English, Dutch, German, Spanish and Norwegian (with French and Greek versions underway).

Project aims

The goals of the Wheelchair Check initiative are: 1) improve individual outcomes regarding wheelchair fit and use, 2) empowering wheelchair users worldwide, 3) establishing a global index for wheelchair quality from the user's perspective, and 4) use these data to help improve wheelchair provision systems.

Objectives of session

To explain the tool and to demonstrate how the insights gained can help improve an individual's wheelchair-set-up. The potential of this international screening tool for wheelchair users, health professionals, and researchers is also showcased by highlighting a small selection of findings from the Dutch database.

Method

We will report the main characteristics (diagnosis, age, biological sex, wheelchair types and duration of use) of those individuals that completed the Dutch tool and agreed for their data to be used for research purposes.

The answers to the following questions were dichotomized into two categories: 0 = positive rating and 1 = negative rating.

"How would you rate the sitting position in your wheelchair?" (Excellent, Good, Reasonable = 0, Moderate and Poor = 1).

"How would you rate the sitting position in your wheelchair?" (Excellent, Good, Reasonable = 0, Moderate and Poor = 1).

"Do you find sitting in the wheelchair, in general, tiring?" and

"Do you find sitting in your wheelchair, in general, painful?" (Never, Sometimes = 0 and Regularly, Often and Always = 1) and

"Are you stable 1) while sitting, 2) performing activities, and 3) using the wheelchair" (yes (or fairly) = 0 and no, e.g. falling forward and/or sideways = 1). Questions from Wheelchair Check were derived from earlier research. (Valent et al., 2019) We present prevalence of issues (%) and use chi-square to test for associations between these issues.

Preliminary results

The Dutch database includes 933 wheelchair users who agreed to the use of their data for research purposes, and eight diagnosis groups with n>40: Spinal cord injury (SCI): Tetraplegia (TP) n=99, Paraplegia (PP) n=295; Spina Bifida (SB) n=42; Cerebral Palsy (CP) n=52; Leg Amputee (LA) n=48; Acquired Brain Injury (ABI) n=54; Multiple Sclerosis (MS) n=110; Muscular Disease (MD) n=121; Ehlers-Danlos Syndrome (EDS) n=112. Mean age: 47 yrs (range 5-99 yrs), Gender: 47% men, 53% women, Wheelchair type: 74% hand rim, 20% electric, 6% other. Years using a wheelchair; mean 12 yrs (range: 0-72 yrs), 17% < 1 year.

Dissatisfaction with sitting posture (Moderate or Poor ratings) within diagnosis groups: TP: 21%, PP: 22%, LA: 26 %, SB: 27%, CP: 34 %, MD: 35%, MS: 38%, ABI: 47%, and EDS: 54%.

Notably, across all diagnosis groups significant ($p<0.05$) associations were observed for dissatisfaction with sitting position and instability 1) while sitting, 2) performing activities, and 3) using the wheelchair. Dissatisfaction was also frequently linked to experiencing significant pain (localized to the back, buttocks, etc.), and in half of the diagnosis groups, fatigue during sitting was linked to dissatisfaction.

Discussion

Preliminary results highlight a high proportion of dissatisfied Dutch wheelchair users especially among those with EDS, ABI, MS, MD and CP, and to a lesser extent among individuals with SCI, SB, and LA, suggesting a need for further investigation. The confined selection of reported wheelchair-related health problems demonstrates that user feedback, combined with clinical observations (Alm et al., 2003), may help HC professionals focus on what matters most for wheelchair users. We encourage clinicians to have clients fill out the tool and bring their completed version to their clinical appointment. As the database grows, it will enable comparison of satisfaction with quality of wheelchair provision wheelchair-user matching across different funding systems, wheelchair types, and countries. These insights could help improve wheelchair provision systems globally.

Please contact us if you're interested in collaborating with the Wheelchair Check initiative.

Summary

The Wheelchair Check tool collects user feedback on wheelchair fit, posture, and mobility to prevent health issues. Available in multiple languages, it helps users identify misfits and aids communication with healthcare professionals. The example of the Dutch database reveals dissatisfaction with sitting posture and significant instability, highlighting the need for further research and also for collaboration to evaluate the quality of the wheelchair provision globally.

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9. POSTERS View in Exhibition Hall

9.1 P1

Good Vibes Only: Does Using In-Wheel Suspension Help to Reduce Neck and Back Pain Over Time?

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The natural and built environment causes significant levels of whole-body vibration and shock (WBV) to manual wheelchair users (MWUs). Surfaces such as sidewalks, gravel, pavement, curb-cuts, grass, and thresholds are often unavoidable and propelling over them can cause significant levels of WBV. When exposed to high levels of WBV for long periods of time, MWUs may develop back and neck pain and increased levels of fatigue. Efforts to mitigate WBV exposure through various seating systems and cushion characteristics have yielded mixed results. Some systems have been found to amplify harmful vibrations due to cyclic vibrations, particularly those occurring within the frequency range most detrimental to human health. Wheelchair suspension systems have been developed to address the discomfort caused by prolonged wheelchair riding and WBV. While studies have shown that these suspension systems can reduce some aspects of shock and vibration, particularly when traversing obstacles, they have limitations. Novel in-wheel suspension systems have recently been developed to help mitigate the limitations of current designs. This study examined the effects of in-wheel suspension systems on neck/back pain, fatigue, participation and whole-body vibration (WBV) exposure among MWUs. Twenty-four MWUs participated in a 12-week intervention using Loopwheels Urban suspension wheels. An accelerometer measured average distance, time during propulsion, and community levels of WBV for about two weeks midway into the intervention period. A battery of surveys were administered at baseline and post intervention, with the aim to determine changes in specific domains of pain and fatigue and community levels of participation. Results demonstrated a significant reduction in median fatigue scores (0.25 out of 3), reduction in median neck pain scores (1.5 out of 10), median weekly pain interference decrease (2.5 out of 10), and a 1.5 decrease in median pain problems (all $p < 0.05$). Furthermore, participants reported a smoother ride over bumpy surfaces and improved shock absorption compared to traditional wheels. Moreover, community WBV levels fell below hazardous thresholds defined by International Standard Organization (ISO) 2631 for an average daily propulsion time of two hours. MWUs were exposed to an average of 0.29 ± 0.14 m/s^2 root mean square (RMS) vibration and 8.67 ± 4.07 m/s^1.75 vibration dose value (VDV) while propelling in the community, representing a 35% reduction in vibration and a 50% reduction in shock compared to previous community-based studies. In-wheel suspension systems show promise in improving health outcomes and reducing WBV exposure for MWUs.

Learning Objectives

1. Participants will be able to list the negative effects of whole-body vibrations on manual wheelchair users.
2. Participants will be able to differentiate between different measures of whole-body vibration and determine what levels are safe versus detrimental.
3. Participants will be able to describe elements of the suspension wheels that allow for reducing vibration and shock over surfaces.

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9.2 P2

The Effectiveness of Using Adaptive Device on Improving QOL for a Child Receiving Palliative Care in Home Care Setting: Case Study

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Purpose/ objective

The study was to investigate the impact of using assistive technology (Headpod device) on improving QOL with palliative patient in home setting.

Background

Proper positioning of the head and neck is essential when using a wheelchair and assistive technologies like head control systems. A stable and appropriate head position is crucial for effectively carrying out everyday tasks that involve the upper body [1]. This is mandatory for patients who are severely physically disabled. Head stability is important for providing a steady point of reference for vision, which is necessary for moving around without assistance [2]. It is also necessary for respiration, feeding, and swallowing. Moreover, it enables the user to participate in social interaction and communication [3]. Studies have indicated that an improper head posture can hinder socializing with others and result in issues such as difficulty swallowing and breathing, malnutrition, and fatigue. Failure to address the issue can result in misalignment causing posture issues and restricted movement in the head [4]. Numerous individuals who use wheelchairs struggle with stabilizing and positioning their heads [11-13]. This could happen due to a reduction in muscle strength needed to maintain the head up against gravity. Wheelchair Headpods are utilized to maintain the head in the intended position and enable rotational movement as a solution for the lack of head neck muscles' strength.

Methods

A single subject research was performed. The subject was a nine-year-old boy with diagnosis of TMX2 gene mutation with Gross Motor Function Classification System Level V. Video recorded before and after 6 months of Headpod use for 60 minutes on a daily basis. Head control without Headpod was measured by active time child could hold head upright and number of head bobs in 5 minutes and parent’s interview.

Results

The child's posture alignment improved when using the Headpod assistive tool compared to his previous condition. The device is placed in the headrest, supporting the patient's head in an upright position while permitting head rotation and limiting side and back head movement. There was an increase in the average time spent engaging in activity, coupled with a decrease in the average number of head bobs. Significant improvements were seen in the time spent being active. The interview indicated advancements in positioning and social engagement, with no alterations noticed in eye-hand coordination. There was an increase in the average amount of time spent in a wheelchair while using the Headpod. The child was able to be more active in the afternoon and evening. In addition, parents were able to improve their capacity to work and take care of their child on their own.

Conclusion

Utilizing assistive technology (AT) is imperative for improving the quality of life for palliative children during different home tasks. Using the Headpod device for 60 minutes daily for 6 months significantly improves active head control and enhances quality of life when at home. Interviews with parents showed improvements in ADL and engaging with family members.

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9.3 P3

A Comparison of Temperature Regulating Wheelchair Cushions

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Summary

This research project aims to determine the effectiveness of wheelchair seat cushion technologies that are marketed as being effective at regulating temperature. A method of measuring temperature at the user-seat contact surface was developed and applied to cushions prescribed by the North Wales Posture and Mobility Service (PAMS), in order to understand how useful these technologies are.

Aims and Objectives

The aim of this study was to evaluate and compare technologies used within commercially available and custom wheelchair cushions to regulate temperature at the user-seat interface.

To achieve this, the following objectives were set:

- Develop and define a method to measure temperature at the cushion/user interface.
- Apply this method to commercially available seat cushions that are commonly prescribed within PAMS and marketed as being temperature regulating.
- Apply this method to custom contoured foam carve cushions, manufactured to service standard and modified to improve temperature regulation.

Background, Method, and Results

Overheating is often prevalent among wheelchair users with neurological conditions, and can have a number of adverse effects (WheelAir, no date b). In particular, a 1°C increase in sacral skin temperature contributes approximately 14 times as much to the risk of developing a pressure ulcer as a 1mmHg increase of pressure (Zeevi, Levy and Gefen, 2017). Whilst other interventions, such as antibiotics, skin creams, and frequent clothing changes, may be used to regulate temperature, microclimate control at the seating surface should be considered when prescribing a cushion (WheelAir, no date *a*, WheelAir, no date *c*). The main driver for this project is that whilst many wheelchair cushion manufacturers claim that their products regulate the microclimate at the user contact surface effectively, the cushions currently prescribed at PAMS have not historically been quantitatively compared.

Five commercially available wheelchair cushions were tested and compared. These included the Jay Balance Cryo Fluid with microclimate cover, the Jay Climazone with CoolOver cover, the Recare Supracor Stimulite Classic with standard cover, and the Vicair Adjuster O2 with standard cover. The aforementioned cushions are all marketed as having temperature-regulating properties (Helping Hand Pressure Care, no date; Invacare, no date; Recare, no date; Sunrise Medical, no date). The JAY LowZone+, which is not marketed as having an effect on user-seat interface temperature, was also tested as a comparator cushion. Two custom contoured foam carve seat cushions were tested. One of these custom cushions was manufactured to service standard, and another was modified with the aim of increasing airflow.

Two temperature probes were used to measure the skin temperature at left ischial tuberosity (IT) and left mid-thigh of one healthy 24-year-old female volunteer. The participant sat on each test cushion, set up as per manufacturer's guidance on the same Rea Azalea wheelchair base, for a total sitting period of 2 hours. Skin temperature was measured and recorded at both anatomical

landmarks every 5 minutes. Paired t-tests were conducted to compare the final temperature, total change in temperature, and the time to 50% total temperature change at mid-thigh and IT. Logarithmic regression was used to fit models to the time series data gathered from each sensor on each cushion.

A statistically significant difference was discovered between the maximum temperature measured at the IT and mid-thigh, as well as between the time to 50% temperature change at the IT and mid-thigh. This was across all cushions. Due to study size, it was not possible to determine the statistical significance of the differences in maximum temperature across the commercially available cushions. Despite this, a difference of 3.1°C and 1.9°C in maximum temperature, at the IT and mid-thigh respectively, was measured across the different commercially available cushions. This could be clinically relevant when considering an increase in pressure ulcer risk. An air ventilation channel in the modified custom contoured seat appeared to increase the skin temperature at the IT, although this difference was minimal.

Discussion

The temperature measured at the mid-thigh was consistently higher than that at the IT across all cushions. Whilst some manufacturers place cooling material beneath users' ITs, this finding suggests that a cushion designed to lower skin temperature at the mid-thigh may be beneficial. This study also found that an air ventilation channel may not be an effective method of limiting temperature build-up in custom contoured seating. In future work, the differences in skin temperature at the user-seat interface of different commercially available cushions should be further explored. Such work should include enough participants so that statistical significance may be determined.

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9.4 P4

Printing The Future: An Iterative Process for Medical Device Management

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3D printing has become an increasingly popular and accessible technology in manufacturing, particularly for prototyping and producing components for medical devices. The ease of access to 3D printers, combined with a growing knowledge base and an expanding range of aftermarket parts, has led to innovations in the production of items such as cushions. However, incorporating 3D printing into the manufacturing process of medical devices poses some specific challenges, particularly in terms of process control and documentation. Historically, our industry has outsourced manufacture to print farms, which was both costly and limited in terms of control. This prompted the acquisition of an in-house printer for the service. While this transition has provided greater flexibility, particularly for prototyping, it has come with a learning curve. A solid understanding of CAD systems and 3D printing principles has been essential in overcoming these challenges, enabling better print quality and material properties/selection. Failures are part of the iterative prototyping process, as well as our growth as 3D printing manufacturers. These have included; issues with build plate adhesion, material feed, nozzle clogging, print surface quality, and catastrophic failure of the printers. Through ongoing experimentation and upgrades to the printers, we have been able to implement a framework for quality improvement towards a reputable and reliable manufacturing process that has helped us to reduce the frequency of these failures, improve performance and overall print reliability.

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9.5 P5

Development and Evaluation of a Smart Water-Cooled Cushion for Adaptive Temperature Regulation

Sam Powell, Sussex Community NHS Foundation Trust - Chailey Clinical Services

This project focuses on the development of a smart water-cooled cushion as a technical innovation to aid thermoregulation in wheelchair users. It addresses discomfort and health risks from prolonged sitting and heat accumulation, particularly for individuals with conditions causing involuntary movements or spasms.

Implementation of the smart cushion will effectively mitigate issues associated with prolonged sitting and heat buildup on foam seats by regulating temperature at the body-support interface, resulting in lower skin temperatures, reducing associated risks, and maintaining comfort.

Prolonged sitting, particularly on foam seats, presents challenges in managing temperature effectively, leading to discomfort and potential health risks (Couzens, 2024). Foam seating systems, while providing support and comfort, inherently possess poor thermal conductivity, leading to heat buildup and inadequate heat dissipation (Ferguson-Pell, 1990). Limited airflow and foam insulation properties exacerbate inefficiencies and result in localised heat at the body-support interface. Excessive heat can lead to skin irritation and increased perspiration, further compromising user comfort and well-being (Finestone, 1991). Increased skin temperature occurs when skin contacts a support surface, leading to heat accumulation, and when combined with pressure loading and moisture, heightens the risk of pressure ulcers and skin maceration (Hsu, 2018). Equally, multiple scoliosis (MS) patients are often impacted by challenges in maintaining temperature sensitivity, resulting in temporary worsened symptoms following changes in body temperature, presenting challenges in maintaining physical activity levels (Christogianni, 2018). Along with heat generated from dystonic movements and spasms, wheelchair users may experience significant thermal strain, further exacerbating discomfort and increasing the risk of secondary complications. Effective cooling strategies and heat management techniques, as highlighted in research on Paralympic athletes, can play a crucial role in mitigating these issues by improving thermal comfort and performance (Griggs, 2020).

In order to help manage temperature at the body-support interface, a smart water-cooled cushion will be developed and evaluated as a proof of concept for aiding individuals with thermoregulation issues or as a result of prolonged seating and their condition. Development will involve three stages: material selection, through comparative thermal conductivity testing and pressure mapping, temperature monitoring feedback loop, for measuring the temperature at the body-support interface, and a water-cooling system, to provide cooling to the user. Material selection will involve thermal and pressure testing of materials used for seating systems to find the most suitable for the smart cushion. The temperature monitoring will use sensitive temperature sensors, to detect the small changes in temperature, and selectively placed to ensure constant contact and minimal influence from the water-cooling loop. This will be powered and used by a controller, most likely an Arduino or Raspberry Pi, that will contain code to activate the water-cooling system when the temperature recorded reaches a certain threshold. This water-cooling system will involve a pump, reservoir, radiator and tubing, that could range from soft plastics to metals, depending on what material is used from the material selection stage.

This smart cushion isn't looking to adhere to any standards or guidelines, but instead a proof of concept, to show potentials for cooling wheelchair users.

The development of this smart cushion aims to address a gap in adaptive seating solutions by providing a practical method for temperature management, particularly for individuals with conditions that exacerbate heat accumulation. The programmable controller will allow the system to dynamically activate the water-cooling mechanism, ensuring efficient energy use and targeted cooling. Although this project is a proof of concept, it shows the potential for innovations in thermoregulation technologies for wheelchair users, potentially improving comfort, reducing the risk of pressure ulcers, and enhancing overall well-being for individuals with complex needs. Testing will be done using a manufactured test rig mimicking real-life conditions and situations through controlled temperature. Early thermal conductive testing shows EV50 foam to be the most suitable material, with the greatest temperature difference so far, more testing on other materials to follow. Components for temperature monitoring and water-cooling have been identified. Shaping of cushion will most likely be a ramped cushion, due to manufacturing capabilities.

The smart water-cooled cushion demonstrates potential for improving thermal management in wheelchair users. By addressing the discomfort and health risks associated with heat buildup, this innovation could enhance user comfort and reduce complications such as skin irritation, maceration, or pressure ulcers. Future work should explore clinical applications, long-term usability, and integration with existing wheelchair designs. There are no conflicts of interest to declare for this project.

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Can ISO 16840 Testing Inform About Evidence-Based Wheelchair Cushion Selection?

Nienke Conijn, Vicair BV

Summary

This study leverages ISO 16840 tests to transform wheelchair cushion selection into an evidence-based process. By objectively assessing cushions for immersion, stability, pressure mapping, and other metrics, clinicians can better align choices with individual user needs. Results highlight significant variation in cushion performance, enabling tailored solutions to the users' needs.

Aims and Objectives

This study aims to advance evidence-based clinical practices for wheelchair seating by incorporating ISO 16840 tests to guide cushion selection. The objective is to bridge the gap between subjective clinical assessment and objective, evidence-based evaluation to optimize user-specific outcomes. The ISO tests help to objectively identify the characteristics (like skin integrity and stability) of a wheelchair cushion and rank the degree of a characteristic. Which helps making an informed choice for the best suited wheelchair cushion for a client, based on objective data. The different characteristics/performance aspects (ISO tests) and clinical relevance of the characteristics will be explained.

Background

Wheelchair cushions are integral to seating systems, serving functions such as posture support, skin protection, and comfort (De Jonge, 2007; Brienza et al., 2010; Uehara and Larson, 2019). Historically, cushion selection has been clinician-driven, without robust evidence to validate decisions. The ISO 16840 standards now enable systematic testing of cushion characteristics (The International Organization for Stadardization (ISO), 2018). The Rehabilitation Engineering Research Center (RERC) at the University of Pittsburgh conducted these tests on approximately 50 commercially available cushions, including the Vicair Vector O2 and Vicair Adjuster, offering a foundation for evidence-based decision-making (Pittsburgh University).

Technique

Nine ISO 16840 tests were performed to evaluate cushions, each test assesses specific performance characteristics, such as:

- (Envelopment) Immersion/Loaded Contour Depth: is defined as the depth a person sinks into the cushion. A higher loaded contour depth indicates more immersion into the cushion and a better distribution of pressure on the soft tissue.
- Pressure Mapping: A test that utilizes interface pressure measurements to assess the magnitude and distribution of pressure on a loaded cushion (51kg).
- Envelopment: To evaluate a cushion’s ability to conform to the contour of the body (i.e. immerse and envelop the buttocks) for effective pressure distribution. Off-loading is measured by an envelopment pressure test and evaluates a cushion’s ability to distribute the load of the seated individual.
- Horizontal Stiffness: This test measures how resistant the cushion is to horizontal forces, which results in sliding, a need for repositioning after sliding and loss of posture.
- Lateral Stability: This test characterizes the cushion’s ability to stabilize a user when leaning to the side.

- Impact Dampening: Measures how well a cushion absorbs and reduces the force from an impact, basically the amount of shock absorption.
- Hysteresis: is a measure of the energy lost to the cushion during a cycle of loading and unloading. Or it indicates how well the cushion retains its shape and provides consistent support after being loaded and unloaded.
- 10% Force Deflection: is a test to evaluate a cushion's ability to "cushion" or elastically deform by measuring the force necessary to produce a deflection of 10% of the cushion thickness.

Standards/guidelines

All tests adhered to ISO 16840 standards, ensuring reliability and consistency. Clinical relevance is emphasized through alignment with user needs: Skin protection, stability, comfort, off-loading (if necessary), a base of support to move in and out of for functional activities, and ideal seated position.

For instance, envelopment tests evaluate a cushion's ability to distribute pressure evenly, crucial for skin protection. Horizontal stiffness tests mitigate sliding, ensuring user security. Impact damping tests address shock absorption, enhancing comfort and stability during dynamic activities.

Results and Testing

Testing revealed diverse performance across cushion types: High immersion correlated with superior pressure distribution and reduced tissue stress. Cushions with high horizontal stiffness minimized sliding and postural adjustments. Superior lateral stability was demonstrated by cushions with lower tilt angles. Optimal impact damping ratios reduced force transfer, enhancing comfort. Consistent hysteresis results indicated better shape retention and durability.

The Vicair Vector O2 and Vicair Adjuster O2 cushions exhibited strong performance across multiple tests, offering balanced support for various clinical priorities.

Discussion

The integration of ISO 16840 test results into clinical decision-making enhances evidence-based practices in wheelchair seating. These tests provide objective metrics to align cushion characteristics with individual user needs, supporting optimal outcomes in posture, comfort, and functionality. Clinicians are encouraged to adopt these tools to improve care quality. Future studies should explore correlations between test metrics and long-term clinical outcomes.

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9.7 P7

Comparing Commercial 3D Scanning Processes for Custom-Contoured Seating Provision

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Summary

Seating services use 3D scanning technology to capture a patient's best corrected posture. The Regional Posture and Mobility Service (RPMS) at West Midlands Rehabilitation Centre (WMRC) uses a range of external seating manufacturers, each with their own scanning process. This technical project aims to identify a scanning process independent of suppliers.

Aims and Objectives

Using multiple scanning processes results in practical limitations and the need to determine the desired manufacturer at the point of scanning. The aim of this project is to identify a technical methodology and to compare the geometric accuracy and measurement uncertainty of the scanners, with the intention of identifying a versatile scanning process to allow flexibility in manufacturer selection.

The project will inform service development by guiding scanning selection, and the development of technical methodology relating to the verification of 3D mesh capturing could inform future work to develop a method to review manufacturing outputs.

Background

Custom contour seating is used for patients with complex postural needs which cannot be met by off the shelf or modular seating options. When a custom contour seat is prescribed, casting bags are used to create a negative of a patient's best corrected posture. 3D scanners are used for capturing the complex topography from the casting bag (Tasker, Shapcott and Holland, 2011). The cast shape is scanned using an infrared or white light scanner and replicated using computer aided manufacture methods to produce foam carved cushions, and moulded seat inserts.

Technique

Currently there is no known technique for comparing the technical accuracy of commercial scanners within custom seating. However, 3D digital model surface verification does exist across several fields, including intraoral procedures and orthopaedic surgery (Lee et al., 2020).

Surface verification maps the mesh surface to the solid model using point cloud alignment, then calculates the relative displacement of corresponding points with the solid structure as a reference.

Current literature uses surface analysis to compare commercial scanners (Michelinakis et al., 2020) or scanned objects with replicated models (Rudari et al., 2024). Rudari et al. (2024) assessed mesh differences of 3D scanners against a gold standard by comparing scans of a real and replicated hand using paired mesh software, producing colour maps and statistical values. Surface validation applies colour map analysis to paired meshes by converting one to a solid model and calculating displacement with the solid as a reference. However, errors can occur during the best-fit alignment process due to the nature of surface models being contoured sheets without a defined volume.

Methodology

A paired surface analysis was developed based on Rudari et al. (2024) research, but with an emphasis on comparing the similarities between digital mesh models. This technique was applied to evaluate and compare the mesh surface scans produced by the multiple scanners currently utilized by RPMS.

A seated neutral posture cast was formed in a neutral lit room and the surface structure scanned using each scanner. To ensure consistency, an experienced clinician conducted scans of the same cast using all three scanners.

Each scan was post-processed to reduce mesh holes and reduce the file size for each scan. The three surface comparisons were completed in pairs using Zeiss Inspect Optic 3D (ZEISS, 2023), which calculated the geometric distance deviations and presented the results using colour map analysis. For each comparison, the two surface models were aligned using a best-fit algorithm.

Results

For analysis a discrepancy of <10mm for surface distance deviation was assigned. The threshold accounted for errors from the best fit pre-alignment algorithm in addition to correlating to the 10mm tolerance identified in Dr Taskers research (Tasker, 2008).

Errors resulting from deviation in the best fit pre alignment algorithm were less than 4mm per result. The average mean distance deviation was 1.09 mm ± 4.22 mm, with higher deviations observed in the outer regions due to differences in post-processing. For each comparison scan, approximately 70% of surface deviations ranged from -2 mm to 4 mm.

Discussion

The results from the colour map analysis indicated that the discrepancies between scans were sufficiently small to be considered clinically insignificant, despite the inherent errors introduced by the pre-alignment best-fit algorithm. Most surface deviations were below the 10mm threshold, indicating that a supplier-independent scanning process would not be restricted by the scanner manufacturer. Additional scans of irregular seated postures could further contribute to addressing the initial research question.

Future work could involve evaluating pre- and post-manufactured scans to assess quality differences between manufacturers and examine quality outcomes at various stages of the custom seat production timeline.

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9.8 P8

South Wales Posture and Mobility Service, Clinical Team: Case Study

Rhian Davies, South Wales Posture and Mobility Service

Summary

12-year-old with Cerebral Palsy referred back into the service as needs no longer being fully met. Main issues reported as poor head position and leaning over time, also not tolerating very long in the seating, indicating reduced comfort. Exploration of suitable equipment, its provision and ongoing issues once prescribed.

Aims and Objectives

- Share a case study and the approach taken to address various needs, including posture, comfort and practical use.
- Share the challenges encountered and what worked well, including equipment choice and internal process considerations.
- Share the challenges that remained/developed and what other options were explored.

Background

On assessment:

- Change in presentation, no longer extending at hips with increased tone.
- Low tone.
- Reduced head control, further exacerbated by limitations of head position due to concern over aspiration on saliva.
- Family and carers opting to encourage head slightly forwards which is then falling forwards.
- No independent sitting balance.
- Posterior pelvic tilt, mostly correctable.
- Significant kyphosis, flexible.
- Very heavy to correct pelvic and trunk deviations.
- Confusion by multiple care providers regarding set up of seating, as previously seat cushion has been found to be fitted back to front.

Analysis/considerations

- Good position not always being maintained when in use at home and in school.
- Comfort is not provided in current seating.
- Requirement to keep head in very slightly forwards position is extremely difficult to maintain.
- Complex headrest with facial pads ruled out due to risks associated with seizures.
- Rollercoaster headrest trialled but although initially successful, head continued to fall forwards.
- Moulded seating requested by community physiotherapist. This had been discussed at single point of referral and reviewed jointly with a Clinical Scientist. Agreed that moulded seating was not suitable to provide solution for head position and would be difficult to adjust to accommodate growth.
- Due to very heavy lean, increased support to lateral trunk with maximal surface area contact would be advantageous.
- Increased trunk support may also help head position and stability.

- Fairly new type of backrest V-Trak was off contract but would potentially offer increased trunk support and strong posterior pelvic block.
- V-Trak backrest is segmented therefore middle segment can be adjusted to support lumbar lordosis and encourage trunk extension.

Trial

- V-Trak backrest fitted to Rea Azalea transit base.
- RMS seat cushion working well therefore transferred across.
- Achieved increased lateral trunk support, less likely to lean over the lateral aspect.
- Achieved effective posterior pelvic block and enhanced support of lumbar region, encouraging extension of trunk.
- Type G Headrest transferred across, continues to offer support posteriorly and laterally.
- A referral to be made to orthotics to request a bespoke collar that can be used as required (e.g. in transport or over uneven terrain) as the Hensinger collar is too low.
- Increased support to trunk had positive impact on head position and the slightly forwards position was achieved and maintained.
- Education to family and carers on importance of not pushing head too far forwards and utilising tilt-in-space feature to help maintain position against gravity.
- V-Trak backrest does not require any adjustment therefore will be easy for all care providers to use consistently.
- Extremely successful trial, added pelvic belt and shoulder harness. Able to issue the wheelchair, V-Trak backrest and accessories on the same day.

Follow up

- Positioning guidelines provided.
- Link person for complex headrest.
- Follow up call with mum and residential home indicates that the seating is working well.
- 12-month review listed.

Discussion

Learning/future considerations

- Same day provision of wheelchair is optimal for our service users.
- Having stock of wheelchair and accessories enabled same day provision.
- Completing trial and issue of wheelchair in same appointment required more time for the appointment, but saved a future appointment being needed for fitting.
- Education and guidelines for carers/family is important.
- Regular input/review is helpful for certain service users.
- At times referral to other services such as orthotics should be considered.
- Forces being placed through equipment must be considered for ongoing use.

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The Gift of Time

Clare Moylan, London Spinal Cord Injury Centre

Introduction

The needs of the spinal cord injury (SCI) patient are not fully understood outside of spinal cord injury centres.

The standards for Specialist Rehabilitation of Spinal Cord Injury (September 2022) state that all patients who have a SCI should have a lifetime of personalised care that is guided by a spinal cord injury centre (SCIC).

Lifelong follow up is necessary due to the ongoing impacts of their SCI, which inevitably dictates change in circumstance and presentation, as well as the impact of ageing with a SCI.

Whilst those who are admitted to a SCIC for their first episode of rehabilitation, receive posture and seating support not all SCI patients are able to access this service. At the London Spinal Cord Injury Centre (LSCIC) there are a number of other pathways for patients to access in- and out-patient services. For inpatients, these include two-week readmission beds for those who have already had SCI rehabilitation and between one and three week admissions for those having their first rehabilitation from home. Outpatient services are also available.

Within this cohort, the patient's Wheelchair Service has often provided a wheelchair and seating system. However, in many cases, the patient's abilities and/or function have changed since initial provision or were not captured due to pressures of time to provide for discharge.

Aims

The aim of this case study is to demonstrate the benefit of utilising seating therapists in SCICs to provide lifelong specialist SCI seating intervention. This includes trialling alternative provision over an extended period of time where daily review allows optimisation of postural alignment, skin integrity and function.

Methods

A case study design is used to demonstrate the benefits of assessment and review by SCI seating therapists.

Results

Three users were admitted into dedicated readmission beds for daily (Monday to Friday) therapy input. In all cases a posture and seating review was identified as a goal of their admission.

In each case, it was identified that changes were required to the configuration of the provided wheelchair and/or seating system, with alternative wheelchairs and/or seating systems required to optimise posture, sitting stability and independence:

- Patient 1: Wheelchair did not enable any independent mobility (attendant-propelled tilt-in-space).
- Patient 2: Interim wheelchair given but did not provide postural alignment, adequate pressure relief nor have adjustability to enable configuration for increased comfort and sitting stability. Patient was re-admitted to LSCIC eight months later still using this wheelchair.

- Patient 3: Set up with an appropriate powered wheelchair to facilitate independence, however, reported back pain, sliding forward and restricted upper limb movement.

During the readmission of these patients, alternative seating systems/wheelchairs were trialled and effects monitored in real time. Solutions which did not have a positive effect could be disregarded and the most appropriate equipment identified and trialled:

- Patient 1: Set up in Action 3 with Jay 3 deep contour backrest and Jay balance cushion. With improved postural alignment, he was able to self-propel independently indoors and outdoors and able to transfer independently into wheelchair - reducing carer requirement and facilitating independence in the community.
- Patient 2: Set up in Action 3 wheelchair, with tension-adjustable backrest and Jay Union cushion. Improved postural alignment, reduced pain and reduced seat-to-ground height which facilitated a sit-to-stand transfer.
- Patient 3: Identification of a Jay 3 deep contour backrest and Jay 3 cushion for improved postural alignment and increased sitting stability, as well as facilitating improved ability to utilise upper limbs resulting in increased function.

Conclusion

Therapists at the LSCIC see inpatients on a daily basis. This affords them the ability to observe effect of input in real time and continue to make adjustments and trial products throughout the admission allowing the opportunity to enhance their health and reduce secondary complications whilst also enhancing skills relating to use of a wheelchair, thus improving mobility and quality of life.

The utilisation of this service is an opportunity for Wheelchair Services to save time and resources, whilst providing patients with the best possible service.

References

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10. CPD REFLECTION SHEET

Use this page to help reflect on the conference sessions you have attended

Sessions attended
What did I hope to learn when booking to attend PMG2025?
How do the sessions that I attended fit into my training needs/CPD?
Key learning points achieved
What is the most important outcome from attending PMG2025 in terms of addressing current and future learning needs?
How will my learning influence or change my clinical practice?

11. PERSONAL NOTES