PMG

POSTURE & MOBILITY GROUP

National Training Event 2014

7th - 9th July 2014
Motorpoint Arena, Cardiff

Conference Book Sponsored by

SUMED®

www.sumed.co.uk

NATIONAL TRAINING EVENT JULY 2014
WELCOME FROM THE NTE CHAIR

CROESO I GAERDYDD!

Welcome to Cardiff and to PMG's National Training Event 2014.
I just wanted to say a brief welcome as the new chair of NTE and to thank each and every one of you for supporting this year's annual conference and exhibition, whether it's your first attendance or your 22nd! I wonder how many people reading this have actually attended all twenty two? Please let us know if you have!

If this is your first attendance, we are always happy to welcome new faces and hope the conference is useful and informative for your learning and career; but most of all we hope it's enjoyable, and a place for networking with other professionals working in the demanding world of posture and mobility. We have worked hard on the NTE committee to provide this conference - we always aim to bring high quality seminars that will appeal to as wide an audience as possible, catering for the most experienced clinicians, yet meeting the needs of the less experienced. Believe me it is quite a tall order. We think we have got the balance just right, and hope you agree.

The PMG exhibition is the only dedicated NHS focussed exhibition in the UK; on the stands the company representatives will share with you their knowledge about their products. As an exhibitor myself I can say this is one of the most important weeks in a company's calendar: we really do value how difficult a challenge it now is for all clinicians who work in the field of posture and mobility. I am sure there will be many new and exciting products showcased here, so please make time for the exhibition. We are grateful to all companies who have supported the event again this year.

The conference is also about letting our hair down at night and socialising as a group, creating great memories that will keep us all going through those long winter months ahead. Let's hope we have an enjoyable time at the Welcome Bar-B-Q at Techniquest, kindly sponsored by Leckey; at the drinks reception on Tuesday evening, kindly sponsored by Quantum; and then enjoy the Gala dinner that has been made extra special this year with the sponsorship of wine and decorations by S.O.S. I cannot stress enough how important and valued this sponsorship is to PMG, and I personally want to thank all the companies who have helped, through their generous support, to make this NTE a success.

Cardiff is a fantastic city and I hope you all agree that Motorpoint is a great venue. I spent three very enjoyable years in Cardiff as an OT student some 23 years ago now, so it's a place very close to my heart.

I can't end without saying that it has been a pleasure to work with the NTE committee - such a dedicated team of volunteers - although steering this ship has been a hard act to follow on from Kirsty-Ann Cutler, and I would not have managed this role at all if not for the expert guidance of Olwen Ellis and Nick Hunt who make an almighty team. Please let us know if there is anything we can do better or differently - we are always seeking feedback.

Diolch yn fawr

Joanne McConnell
Chair PMG NTE committee

CONTENTS

EXHIBITION CATALOGUE

EXHIBITING COMPANIES

ACTIVE DESIGN LTD

STAND 21

68K Wyrley Road

Birmingham

B6 7BN

Tel: 0121 326 7506

Fax: 0121 327 8807

Email: sales@activedesign.co.uk

Website: www.activedesign.co.uk

We manufacture products based on a sound knowledge of the theoretical and practical requirements of the management of posture. This year we can update you with developments to our dynamic backrests, and we have some great new headrests – fully adjustable, modular, and designed to accommodate head switches.

AMILLY INTERNATIONAL LTD

STAND 53

88 South Street

Stanground

Peterborough

PE2 8EZ

England, UK

Tel: 01733 344930

Fax: 01733 552757

Email: steve@amilly.co.uk

Website: www.amillyinternational.co.uk

Amilly International has been the exclusive importer of the Convaid range of buggies for over 30 years. The Convaid range is easy to fold and transport, and comes in a range of bright colours. On show will be the latest Cruiser, Rodeo Tilt in Space, Ez Rider and new Metro models.

BARTRAM ASSOCIATES LTD

STAND 50

Unit 50, Lancaster Way Business Park

Ely

CB6 3NW

Tel: 01353 653757

Fax: 01353 662 973

Email: sales@bartrams.net

Website: www.bartrams.net

Bartrams manufacture and supply the popular and clinically proven Gem Stone range of cushions and also bespoke, client specific cushions. Whether it`s paediatric, bariatric or bespoke made to measure, we can provide what you need. We are also NHS approved repairers of wheelchairs. We welcome you to stand No. 50

BES REHAB

STANDS 15-16

131 South Liberty Lane

Ashton Vale

Bristol

BS3 2SZ

Tel: 0845 1300 237

Fax: 0845 1300 238

Email: info@besrehab.net

Website: www.besrehab.net

BES Rehab offers market-leading services and assistive technology for specialists to improve the quality of life of carers, and individuals with disabilities.

At PMG (Stand 15-16) we are showcasing some new and exciting products added to our range of head to toe positioning. We are also offering excellent training programmes, free of charge for your service. Visit us to sign up for your free training course.

BLATCHFORD CLINICAL SERVICES

STAND 34-37

11 Atlas Way

Sheffield

S4 7QQ

Tel: 0114 263 7900

Fax: 0114 263 7901

Email: sales@blatchford.co.uk

Website: www.blatchford.co.uk

Blatchford Clinical services deliver specialist rehabilitation for private and government healthcare organisations including the NHS, Ministry of Defence, private clinics and insurance companies.

With over 130 clinicians representing prosthetics, orthotics, physiotherapy, occupational therapy, nursing, rehabilitation, specialist seating, Blatchford staff look after individual patient needs.

CHUNC WHEELCHAIRS

STAND 47

Unit 416, Tarsmill Court

Rotherwas

Hereford

HR2 6JZ

Tel: 01432 377 512

Fax: 01432 377 516

Email: sales@chunc.co.uk

Website: www.chunc.com

Paediatric attendant controlled wheelchairs.

- Tilt 45 Chunc
- Recline & Tilt Chunc
- Wheelbase Chunc Adapt
- Spica chair – post operative mobility

CONSOLOR LTD

STAND 45

188 – 194 Spring Road

Bournemouth

Dorset

BH1 4PXBH31 6BB

Tel: 01202 827 650

Email: marketing@consolor.co.uk

Website: www.consolor.co.uk

Consolor provide posture, seating & mobility assessment services to NHS wheelchair services and private clients across the UK. The safety, comfort and quality of our client's lives are the most important factors in the provision of all products & services.

CUSTOMIZED COVERS LTD

STAND 23

Manor Road

Marston Trading Estate

Frome

BA11 4BN

Tel: +44 (0) 1373 474069

Fax: +44 (0) 1373 474130

Email: enquiries@customizedcovers.co.uk

Website: www.customizedcovers.co.uk

Customized Covers (Sue Harrison) was founded in 1995. Our main business is to manufacture first class quality removable covers for any specialist wheelchair seating system. We also manufacture accessories to customer's specific needs, from harnesses, belts, footstraps, armrest supports to traypads and footbox covers, and much more.

ETAC

STAND 8

29 Murrell Green Business Park

London Road

Hook

Hampshire

RG27 9GR

Tel: 01256 767181

Email: info@etacuk.com

Website: www.etacuk.com

ETAC UK offer some of the most versatile and advanced electric wheelchairs on the market. All products are designed and manufactured to the highest standards, and can be customised to the specific needs of customers. ETAC UK will be exhibiting products from the Balder & E800 ranges.

FELGAINS

STAND 52

33 Knightsdale Road

Ipswich, Suffolk

IP1 4JJ

Tel: 01454 285 071

Fax: 01454 314 504

Email: mail@felgains.com

Website: www.felgains.com

Felgains are passionate about providing solutions to meet the needs of physically challenged people through innovative products in the seating, moving and handling field. Felgains provide the tools which impact on efficiency within care provision and therapist caseloads.

GEL OVATIONS EUROPE

STAND 10-11

2 Stover Road

Yate

Bristol

BS37 5JN

Tel: 01454 285 071

Fax: 01454 314 504

Email: info@gelovationseurope.com

Website: www.gelovationseurope.com

Gel Ovations Europe continue to provide a high quality range of instant solutions for pressure problems. This year we will be launching our new Starite multi adjustable hip guide and adjustable arm troughs.

GERALD SIMONDS HEALTHCARE LTD

STAND 1.2

9 March Place

Gatehouse Way

Aylesbury

Bucks

HP19 8UA

Tel: 01296 380 239

Fax: 01296 380 278

Email: info@gerald-simonds.co.uk

Website: www.gerald-simonds.co.uk

Gerald Simonds Healthcare Ltd is the leading national supplier of wheelchairs and pressure relieving seating systems in the UK. On our stand at PMG this year we will be showcasing the latest editions to our portfolio from Easy Stand, Active Controls, Stimulite and Jay. We look forward to meeting you and discussing your clients' needs.

GREENCARE MOBILITY LTD

STAND 9

2 Simcox Court

Riverside Park Road

Middlesbrough

TS2 1UU

Tel: 01642 353 492

Fax: 01642 223 313

Email: info@greencaremobility.com

Website: www.greencaremobility.com

We are a UK based manufacturer specialising in individually built wheelchairs. Our range includes paediatric and bariatric sizes, active user styles, recliners, and front wheel drive chairs.

HANDICARE

STAND 46

82 First Avenue,

Pensnett Estate,

Kingswinford,

West Midlands

DY6 7FJ

Tel: 07985 160 675

Email: constantmenace@hotmail.com

Website: www.handicare.co.uk

Handicare manufacture high quality, modular wheelchairs, both manual and powered. With our extremely adjustable Sedeo seating system, our products are very suitable for clients with postural and positioning needs.

INTERNATIONAL SEATING & MOBILITY

STAND 35

Unit 2, West Side

Cambrian Industrial Estate

Coedcae Lane

R.C.T.

Wales

CF72 9EX

Tel: 01443 236 990

Fax: 01443 239 355

Email: info@v-trak.com

Website: www.v-trak.com

ISM are the distributors of V-trak in the UK. We operate V-trak seating clinics - a one day solution, suitable for complex seating clients, incorporating the full V-trak and Axxis range of products including the new Axxis Deep Contour Segments. We offer a fitting service as well as product customisation.

INVACARE

STAND 41-42

Unit 4

Pencoed Technology Park

Bridgend

CF35 5AQ

Tel: 01656 776222

Fax: 01656 776201

Email: uk@invacare.com

Website: www.invacare.co.uk

Showcasing on the Invacare stand will be a number of new and innovative products including the new TDX SPNB with Modulite seating, new Fox entry level power chair, and our new Rea Dahlia with 45 degree seat tilt, plus a comprehensive range of cushions.
Visit the Invacare stand for all the latest product innovations, or just drop by for a catch up – we'd love to see you.

ISEL UK LIMITED

STAND 22

Unit 17, Maylands Business Centre

Redbourn Road

Hemel Hempstead

HP2 7ES

Tel: 01442 531 225

Email: marja.wright@isel-uk.com

Website: www.isel-uk.com

Isel UK is a German subsidiary of a large engineering company who have developed, with Ottobock, orthotic, prosthetic and rehabilitation solutions for a wide range of conditions.
Isel UK offers a solution for manufacturing assistive wheelchair seating using 3D scanning technology, CAD/CAM software and a foam cutting CNC milling machine.

KARMA MOBILITY

STAND 49

Unit 6 Target Park

Redditch

Worcestershire

B98 8YN

Tel: 0845 630 3436

Fax: 0845 630 3736

Email: mark@karmamobility.co.uk

Website: www.karmamobility.co.uk

Karma Mobility are the suppliers of a wide variety of wheelchairs and power wheelchairs. We are the exclusive agent for Karma products in the UK and Eire.

KAROMED

STAND 12

Millfield Industrial Estate

Chard

Somerset

TA20 2BB

Tel: 01460 66033

Fax: 01460 66252

Email: pressurecare@karomed.com

Website: www.karomed.com

Karomed continue to deliver cost effective solutions for the demanding challenges faced by clinicians during assessments. It has already been established that the Transflo cushion range provides equivalent pressure relief to other manufacturers' cushions treble the price; additionally Karomed charge nothing extra for bespoke sizes. Get free assessment stock now!

KYMCO HEALTHCARE LTD

STAND 3

30 North Road

Bridgend Industrial Estate

Bridgend

Mid Glamorgan

Tel: 01656 670095

Fax: 01656 858353

Email: info@kymcohealthcare.co.uk

Website: www.kymcohealthcare.com

KYMCO Healthcare has been manufacturing and supplying mobility scooters in the UK for over 10 years and has established a strong market position through both the high street mobility dealerships and the Motability scheme. Launched at Naidex 2014 KYMCO disclosed its new range of power chairs, which will be the focus of its display at the PMG exhibition

LECKEY

STAND 31-33

19 Ballinderry Road

Lisburn

Co Antrim

BT28 2SA

Tel: 028 9260 0750

Email: marketing@leckey.com

Website: www.leckey.com

James Leckey Design have a comprehensive range of durable and versatile mobility seating systems for kids and young people with moderate to complex postural needs. Using our specifically designed and engineered interfaces allows us to pair them with a variety of bases, making them an ideal mobility solution.

OTTOBOCK

STAND 28-30

32 Parsonage Road,

Englefield Green

Egham

Surrey

TW20 0LD

Tel: 01784 744900

Fax: 01784 744901

Email: bockuk@ottobock.com

Website: www.ottobock.co.uk

Ottobock's expertise and technologies have set standards throughout an entire market sector because they are focused on a single purpose: to help people maintain and restore independence. We manufacture paediatric buggies, manual wheelchairs, power chairs and walking frames, plus our seating site provides custom seating units.

PRO MEDICARE

STAND 6

Via Montagna Z.I. Lotto 41

C.A.P. 72023

Mesagne (Br) – ITALY

Tel: 0039(0)831.777840

Fax: 0039 (0)831.730739

E-mail: info@promedical.co.uk

Pro Medicare s.r.l. is an Italian manufacturing company operating in the rehabilitation field. Taking advantage of 20 years' experience in research, we are involved in the development and production of seating systems and modular aluminium frames. In our portfolio of products: the Adacta-Versa, the Adacta Klim and the Inserto seating solution.

QBITUS PRODUCTS LTD

STAND 5

Springwood Cornmill

Holywell Green

Halifax

HX4 9ED

Tel: 01422 377775

Fax: 01422 311750

Email: sales@qbitus.co.uk

Qbitus Products Ltd are UK manufacturers based in West Yorkshire, supplying bespoke and standard pressure relieving products to the NHS and the community.

QIMOVA UK LTD

STAND 51

C/O Seaborne Leisure

Court Meadow

Kempsey

Worcestershire

WR5 3JL

Tel: 01905 5821407

Email: ashley@qimova.com

Website: www.qimova.com

"QIMOVA ADJUSTING TO YOUR LIFE"

Qimova are a high quality specialist wheelchair manufacturer. We specialise in standard and individually designed COMFORT and corrective posture wheelchairs that have a wide range of adjustability for growth. All chairs - paediatric, adult and bariatric - incorporate Tilt in Space and full reclining backrest. Manual and powered options with over 5000 components, we have an answer to your NEEDS. We believe COMFORT, POSTURE and QUALITY come hand in hand.

QUANTUM LTD

STAND 44

32 Wedgwood Road

Bicester

Oxon

OX26 4UL

QUANTUM®

The Rehab Power Chair Solutions Company

Tel: 01869 324 600

Fax: 01869 323 070

Email: sales@pride-mobility.co.uk

Website: www.pridemobility.co.uk

The Quantum power chair range offers the very best in the design and development of powered technology; from the ultimate in comfort seating, to market leading powered positioning systems, offering the user the chance to re-discover their freedom and independence.

RHEALTHCARE

STAND 7

Botterills Building

Unit 9, South Avenue

Blantyre Industrial Estate

Blantyre

Glasgow

G72 0XB

Tel: 0845 1460 600

Fax: 01246 453 881

Email: sales@rhealthcare.co.uk

Website: www.rhealthcare.co.uk

Supplying manual wheelchairs, including Dash Life and Dash Lite, and spares to the NHS and dealers.

R82 UK LTD

STAND 25

Unit D4A, Coombswood Business Park

East Coombswood Way

Halesowen

West Midlands

B62 8BH

Tel: 0121 561 2222

Fax: 0121 559 5437

Email: R82uk@r82.com

Website: www.r82-uk.co.uk

Manufacturers and suppliers of wheelchairs, bathing chairs and buggies for children.

RADCLIFFE REHABILITATION SERVICES

STAND 26

5 The Sidings

Top Station Road

Brackley

Northamptonshire

NN13 7UG

Tel: 01280 700 256

Fax: 01280 703 428

Email: enquiries@radclifferehab.co.uk

Website: www.radclifferehab.co.uk

Radcliffe Rehab, established in 1983, focused on the mobility sector with the Shadow wheelbase and Netti wheelchairs, which continue to be sold to the NHS. In recent years the company's portfolio was expanded to include the Tina bariatric range of wheelchairs and this year have added the Aktiv wheelchair.

RMS LIMITED

STAND 43

Thompson House

Unit 10

Styles Close

Sittingbourne

Kent

ME10 3BF

Tel: 01795 477280

Fax: 01795 229692

Email: Katie@rms-kent.co.uk

Website: www.ineedawheelchair.co.uk

Visit us on Stand 43 to collect Edition 6 of our new accessories catalogue, which includes our latest products. We will be displaying some of our new products including the Simba Buggy, swing-away lateral pads, Gill 2 seating system and NXT backrests and cushions.

SIMPLE STUFF WORKS CIC

STAND 48

Simple Stuff Works

Units 4 and 5, Cavendish

Lichfield Road Industrial Estate,

Tamworth

B79 7XH

Tel: 01827 307870

Fax: 01827 818313

Email: admin@simplestuffworks.co.uk

Website: www.simplestuffworks.co.uk

Simple Stuff Works provide award winning night-time positioning equipment for children and adults with complex healthcare needs. Soft, silent to use and inexpensive, our equipment is quickly becoming a firm favourite with families and professional alike.

SMIRTHWAITE

STAND 1

17 Wentworth Road

Heathfield

Newton Abbot

TQ12 6TL

Tel: 01626 835 552

Fax: 01626 835 428

Email: info@smirthwaite.co.uk

Website: www.smirthwaite.co.uk

We are market leaders in the design and manufacture of equipment for babies, children and young adults with special needs.

SOFT OPTIONS

STAND 36

Amisfield House

Amisfield Road

Hipperholme

Halifax

HX3 8NE

Tel: 01422 204 500

Fax: 01422 204 501

Email: info@softoptions.co.uk

Website: www.softoptions.co.uk

Demonstrating BEST (Bringing Equipment Services Together) Version 12: the complete disability services management system, with modules covering wheelchairs, prosthetics, orthotics, environmental equipment, communication aids, joint equipment, offline assessments and orbital prosthetics.

SPECIALISED ORTHOTIC SERVICES LTD

STAND 38-40

Unit 127/128, Fauld Industrial Park

Fauld Lane

Tutbury

Staffordshire

DE13 9HS

Tel: 01283 812 860

Fax: 01283 520 401

Email: enquiries@specialorthotic.com

Website: www.specialisedorthoticservices.co.uk

Specialised Orthotic Services are one of the country's leading companies in the provision of clinical services for specialist seating and mobility products. Our products include a wide range of custom moulded and modular seating for all ages and acute disabilities, for both mobility and home use.

SOUTHWEST SEATING & REHAB LTD

STAND 13-14

Unit 9, Hatch Mews Business Park

Hatch Beauchamp

Taunton

TA3 6SE

Tel: 01823 481 100

Fax: 01823 481 001

Email: sales@neowheelbase.com
sales@matrixseating-sws.co.uk

Website:www.neowheelbase.com
www.matrixsearting-sws.co.uk

We believe the art is in the making! The Matrix Seating System and the NEO wheelbase are made to measure products, created with care and expertise for each individual client. Come and have a chat to discover custom seating at its best.

SUITE OPTIONS

STAND 2

Old Griffin Field

Windsor Street

Pentre

RCT

CF41 7JJ

Tel: 0800 37 37 02

Email: sales@reclinersltd.co.uk

Websites: www.reclinersltd.co.uk

Recliners, the motion furniture manufacturer with a real difference. With over 100 years' experience in the furniture and upholstery sector. Providing bespoke mobility furniture for the past 12 years. Assured of high standards of quality and servicing.

SUMED INTERNATIONAL (UK) LTD

STAND 27

Integrity House

Units 1-2 Graphite Way

Hadfield

SK13 1QH

Tel: 01457 890 980

Fax: 01457 890 990

Email: sales@sumed.co.uk

Website: www.sumed.co.uk

Sumed® will be showcasing the ROHO Agility™ back including the new "custom" air cell option. Full demonstrations will be available of our innovative range of Uniroll® crash tested HD wheelchairs suitable for client weights up to 300kg, as well as X-sensor™ pressure mapping sessions and our full range of cushions, including ROHO®, Tempur -Med® Intelli-Gel® and Flowform™ Ultra 90

SUNRISE MEDICAL

STAND 17-19

Thorns Road

Brierley Hill

West Midlands

DY5 2LD

Tel: 0845 6056 688

Fax: 0845 6056 689

Email: marketing@sunmed.co.uk

Website: www.sunrisemedical.co.uk

Sunrise Medical is a world leader in the development, design, manufacture and distribution of manual and powered wheelchairs; standard and customised seating and positioning systems. Visit us to see the latest products from Quickie, Zippie, JAY and JCM. Don't miss the innovation area to see our future products first!

TENDERCARE LTD

STAND 20

PO Box 3091

Littlehampton

West Sussex

BN16 2WF

Tel: 01903 726 161

Fax: 01903 734 083

Email: info@tendercareltd.com

Website: www.tendercareltd.com

On show at this year's PMG will be the new tRide Pushchair, along with the newly improved Snazzi and Swifty pushchairs and the updated Snappi.

Our modular, which has recently been updated, will also be on show for the first time in the UK.

THE HELPING HAND COMPANY

STAND 4

Bromyard Rd,

Ledbury,

Herefordshire,

HR8 1NS

Tel: 01531 635678

Fax: 01531 635670

Email: sales@helpinghand.co.uk

Website: www.lowzone.co.uk

Driving down the true costs of pressure management. We have guaranteed the outcomes of 2.1 million patients. Integrating pressure management, postural control and temperature regulation with technology driven solutions. Focused on addressing the needs of your service and patients.

#Eliminate Pressure Sores

ABSTRACTS
OF CONFERENCE PRESENTATIONS

TUESDAY, 8TH JULY 2014

OPENING PLENARY SESSION

PL1/1

NEUROMUSCULAR HIP DISLOCATION: THE OFTEN SILENT PROBLEM

Presenter: Miss Clare Carpenter

Hip stability is paramount in the management of the child with the neuromuscular disorder. All too often the hips silently migrate and remain undetected until the hips are dislocated. The natural history of the migrating hip is well described, and the clinical outcome can be detrimental to the child's daily functions.

Surveillance programmes for these children are controversial, as surgical interventions do not always predictably halt the progressing dislocation. They may however alter the natural history sufficiently to reduce the magnitude of surgical intervention.

One thing is certain, that hips are much more comfortable when they remain in joint. An algorithm for the management of the neuromuscular hip is presented.

Correspondence details
Miss Clare Carpenter
Consultant Trauma and Orthopaedic Surgeon
University Hospital of Wales
Heath Park
Cardiff
CF14 4XW

Email: carpie@doctors.org.uk

PL1/2

GAINING INTERNATIONAL AGREEMENT ON BEST PRACTICE GUIDELINES

Presenter: Barend ter Haar

Over the last 30 years international standards have been developed for the mechanical and engineering-oriented items that PMG members use day-by-day. This approach of concentrating on the technical side of provision hankers back to the pre-McColl days (pre-1986) of centralised Disablement Services Centres run by Technical Officers with little or no qualified clinical input to assessment and provision. The knock-on from this is that procurement officers look at assistive technology as a commodity, and decisions are made around price rather than function.

Modern posture and mobility practice looks at an individual and assesses the need, and appropriate solutions are prescribed. However, providing the best diagnosis and the best solutions can take years of experience, and for newcomers it can be difficult to know where to turn for the best advice. In addition, seasoned practitioners may not always have all the relevant information at their fingertips. There is, as a result, an identified need to produce Best Practice Guidelines (BPGs) to which practitioners are able to refer in order to help find solutions to challenging clinical problems. Such guidelines would be all the more robust where they have been agreed not just nationally, but internationally, and this was the aim for the International Conference, sponsored by the British Society of Rehabilitation Medicine, Posture & Mobility Group, and the Scottish Posture & Mobility Network, in Glasgow in 2010.

Working groups, with contributors from the UK, Ireland, mainland Europe, North America, and Australia, tackled a dozen topics in the two years before the conference, and presented the results of their efforts in workshops where the attendees could be trained on the outcomes of the work, and feedback provided to the contributors.

The aim was that these BPGs should be living documents placed in the public domain where professionals could comment on them, leading to revisions every 5 to 10 years as practice developed. Difficulties were experienced with finding a suitable host for the documents but since then, PMG made some developments to their website, and this is where they have started to be placed.

The success of this exercise can be measured by the fact that the first BPG set up, BPG1 on transportation, is now considered by many to be the gold standard in the field, and the MHRA have withdrawn their guidelines in preference (or deference) to BPG1.

Correspondence details
Barend ter Haar BSc DPhil ATP
Managing Director
BES Rehab Ltd
131 South Liberty Lane
Ashton Vale
Bristol BS3 2SZ UK

Email: barend@bescorporate.net

FREE PAPERS

FP1

WHEELCHAIR NAVIGATION AND UNILATERAL NEGLECT: CAN THE USE OF TECHNOLOGY IMPROVE PERFORMANCE?

Presenter: Geoff Harbach

Additional Author: Dr David Punt

Summary
We tested a novel and affordable collision-avoidance system (the Anti-Bump System, or ABS) for a powered wheelchair in a small group of patients with unilateral neglect, a deficit which often prevents affected patients from accessing powered mobility.

Aims and Objectives
We aimed to demonstrate proof of principle of a novel and affordable collision-avoidance system for a powered wheelchair in a small group of patients with unilateral neglect; a relatively common perceptual deficit that typically prevents affected individuals from accessing powered mobility.

Background
Powered mobility can have a dramatic impact on the quality of life of disabled people. However, many disabled people are unable to benefit as they cannot safely navigate a powered chair around their environment. Patients who have unilateral neglect following stroke are a relatively well-defined group who generally do not access powered mobility because of difficulties in safely navigating around their environment. Patients with unilateral neglect have a deficit in spatial attention and typically tend to bump into objects on their affected (normally left) side.
A collision-avoidance system known as the Anti-Bump System (ABS) was developed by Special Controls Service, part of the Posture and Mobility Service at the West Midlands Rehabilitation Centre. In this study, we tested the impact of the ABS on power wheelchair navigation in a small group of patients with unilateral neglect.

Methods
Nine participants with unilateral neglect navigated a powered wheelchair through an obstacle course 20 times - 10 times with the ABS activated and 10 times under control conditions. Whether the ABS was active or not was randomised across trials. The chair and obstacles had reflective markers attached to them, and participant performance was monitored via a motion capture system. The number of collisions per trial were counted offline and categorized according to SIDE (affected vs unaffected) and TYPE (direct hit vs. side swipe). After testing, participants were asked whether they had been aware of the ABS.

Results
Direct hits were reduced when the ABS was active, although this was associated with a small increase in side swipes; the latter appeared to increase due to the ABS being active, causing the chair to avoid a collision on one side, the subsequent deviation leading to a collision on the contralateral side. The ABS appeared to be of most benefit to participants with the most severe navigational problems. None of the participants were aware when the ABS was active or not.

Discussion
In summary, our study demonstrates the feasibility and potential benefits of the ABS in a relatively well-defined group of patients who are currently denied access to powered mobility. However, technological limitations require further developmental work, and it is likely that technology is one of numerous components that need addressing if more patients are to gain access to powered mobility. Importantly, the need for engineers, clinicians and users to work together in this endeavour is essential.

Correspondence details
G.J.Harbach I.Eng MIED IIPEM ATPsoc
Access to Communication and Technology
West Midlands Rehabilitation Centre
91 Oak Tree Lane
Selly Oak
Birmingham B29 6JA

Email: Geoff.Harbach@bhamcommunity.nhs.uk

David Punt PhD
Senior Lecturer
School of Sport Exercise & Rehabilitation Sciences
University of Birmingham
Edgbaston
Birmingham
B15 2TT UK

Email: t.d.punt@bham.ac.uk

FP2

ACCEPTING WHEELCHAIR USE

Presenter: Linda Walker

Summary
Statutory wheelchair provision in England and Wales has been equipment led since its inception in 1990. However, users are reported to be dissatisfied with the service, and a reorganisation of provision is underway that purports, in accordance with recent Government advice (DOH, 2012), to make the wheelchair user central to the supply process. However, little is known about wheelchair users' perspectives of the equipment that they use to inform this process.

Aims and objectives
This study seeks to enter the world of permanent, fulltime wheelchair users, exploring their perspectives on their wheelchair; how these were formed and what affected their attitude towards the mobility equipment that they used. A theoretical model of accepting wheelchair use was developed out of the data to explain the social process that the participants described.

Background
Adopting an interpretivist perspective and a theoretical framework based on symbolic interactionism, ten permanent, fulltime wheelchair users were interviewed. These interviews took the form of unstructured one to two hour, in-depth conversations with the participants about their experience of wheelchair use. The first four participants were selected by purposive sampling. This sampling method is reported to increase the significance of the findings even in small samples (Merriam, 2001). Following this, data analysis informed theoretical sampling of six further participants to maximise variation in cases. Digital audio-recordings were made of each interview and transcribed.

Dimensional Analysis, a second generation (Morse et al, 2009) method of grounding theory in the data, was then applied. All of the dimensions of the texts were identified and analysed. Using constant comparative method shared patterns of behaviour were recognised, and further analysis enabled an understanding of the social process of being a wheelchair user to be constructed.

Participants were understood to have different approaches to wheelchair use. The first group were those who were lifelong wheelchair users. They had not experienced change in their abilities, having never walked, and their attitude to wheelchair mobility was formed on the basis of a consistent approach to equipment use. The second group had become wheelchair users later in life, having walked for some period.

Analysis revealed that the perspective of the user, on adopting wheeled mobility, affected their attitude to wheelchair use and ultimately their level of independence. For those who acquired their disabilities later in life, engagement in the process of becoming a wheelchair user was essential for them to form a new understanding of themselves from the standpoint of their altered mobility. This process was conceptualised as a transition from walker to wheelchair user, and this was considered to comprise a number of stages. These were: becoming**,** embracing and being. The participants were at different places in the process, and the reasons for this were explored. A number of pre-existing contextual and biographical features affected each participant's response to wheelchair use. These and other factors moderated the process of change for each individual. Maximum independence was determined to be achieved when the participant embraced the wheelchair into their lifestyle, irrespective of their level of disability. This required that they made practical, psychological and emotional changes in their lives.

Discussion
This study was timely in the light of the latest proposal to reorganise wheelchair provision. The findings show that the majority of wheelchair users are able to assess their needs and access the wheelchair that they require, having undergone rehabilitation or special schooling. These users have developed a lifestyle as wheelchair users. However, there are a number who come later to wheelchair use and are not offered specialist training. For them, transition into being a wheelchair user may never be completed, and they make

concessions to their disabilities that result in increasing social isolation and dependency. Further work is required to determine the best way of identifying these individuals and providing support.
The individual's reaction to becoming a wheelchair user has been explored and a theory of phased transition to acceptance identified. The contribution that this study makes to our understanding of accepting wheelchair use may assist in shaping therapists' approach to wheelchair assessment, provision and skills training.

Correspondence details
Dr Linda Walker DPhys, MSc, BSc (Hons), GradDipPhys, MCSP
46 Thamesdale
London Colney
Herts AL2 1TL

Email: lindawalk1@aol.com

FP3

MEASUREMENT OF HAND/HANDRIM CONTACT FORCE USED IN ONE ARM DRIVE WHEELCHAIRS: A COMPARISON OF THE NEATER UNI-WHEELCHAIR TO OTHER CONTEMPORARY ONE ARM DRIVE WHEELCHAIRS

Presenters: Anne Mandy and Lucy Redhead

Summary
Hand/handrim forces, in non-disabled users, were measured in two different manual one arm drive wheelchairs. Total contact force and individual finger, thumb and palm force at the hand/handrim interface were compared. The lever drive generated significantly higher forces, and the Neater Uni-wheelchair significantly lower force.

Aims and Objectives
To compare the hand/handrim forces generated in two different manual one arm drive manual wheelchairs. The GripTM system was used to measure total dynamic interface grip force and individual finger, thumb and palm force between the propelling hand and the wheelchair handrim.

Background
Manual wheelchair propulsion is known to be an inefficient means of ambulation, and is associated with a high prevalence of upper limb injuries occurring from a combination of repetitive movements, heavy loads on the extremities, upper limb weakness, and inefficient propulsive technique. Hemiplegic users are vulnerable to upper limb injury because of being reliant on only one arm for propulsion.

Currently the most common one arm drive manual wheelchairs include the ratchet arm/lever-drive mechanism, the dual handrim mechanism and the Neater Uni-wheelchair. Lever arm design involves a pushing/pulling action on the end of a lever mechanism. This design usually has a fixed mechanical advantage, the ergonomics of simultaneous propulsion and steering can be awkward, and the operation of the brake is not intuitive. The dual hand rim has two hand rims mounted on the same side of the wheelchair. Propulsion involves gripping and rotating both rims at the same time in order to move forward in a straight line. This can be difficult for users with a small hand span or with impaired hand function. Moreover, steering and propulsion cannot be actuated simultaneously, and braking via the dual handrim is more difficult than with a standard wheelchair since the user must simultaneously grasp both handrims to avoid turning. For a large number of users, the overall ergonomics of operation are not efficient.

The Neater Uni-wheelchair (NUW) has been designed specifically for hemiplegic users. It comprises an Action 3 wheelchair to which novel propulsion and steering kit is attached, enabling the user to steer with the footplate, and propel the wheelchair with only one handrim. The kits can be attached to either side for use by either right or left handed users. Current research suggests that the NUW is ergonomically more efficient to drive and preferred by users in both a laboratory setting and in a simulated activities of daily living setting. Users' experiences of using the NUW in their own homes produced four key themes of increased user independence, ease of use and manoeuvrability, usefulness, and increase in activity. Recent work exploring vertical reaction forces under both buttocks indicates that the dual handrim wheelchair produced the greatest force under both buttocks. The force measured through the buttocks is indirectly a result of force applied at the hand/handrim interface. Therefore it could be speculated that propulsive effort may vary according to the type of propulsive mechanism being used.

Whilst there is some research exploring handrim forces in standard wheelchairs, there is none involving one arm drive wheelchairs. Hand/handrim contact forces were measured in an indoor circuit in the NUW, and a standard Action 3 with NUW steering attached (Hybrid). The circuit included straight running, slalom and textured surfaces. Results indicated that the different wheelchairs generated different patterns of force across the hand and that lever action generated the greatest total force ($p<0.01$).

Discussion

The results indicated that non-disabled users applied higher total forces, and also finger and thumb forces at the hand/handrim interface in straight running when using the foot steered Action3 wheelchair (Hybrid). This difference may be explained through the action of the differential in the Neater Uni-wheelchair. The differential ensures that the force applied to the handrim delivers equal torque to both drive wheels of the wheelchair, thus ensuring that the wheelchair will propel easily in a straight line. In the foot steered Action3 wheelchair, the force is applied to only one rear wheel.

References

1. Finley MA, Rodgers MM. Prevalence and identification of shoulder pathology in athletic and nonathletic wheelchair users with shoulder pain: a pilot study. *J Rehabil Res Dev 2004*; 41:395–402

2. Van de Woude LHV, Dallmeijer A.J Janssen TWJ, Veeger D. Alternative modes of manual wheelchair ambulation: An overview. *Am J Phys Rehabil 2001*; 80:10:765-777

3. Morrow M.M.B, Hurd W.J, Kaufman K.R, An K. Upper limb kinetics expression during wheelchair propulsion. *JRRD 2009;vol 46, 7, 939-944*

Correspondence details

Dr Anne Mandy and Dr Lucy Redhead
University of Brighton
49 Darley Road
Eastbourne
Sussex
BN20 7UR

Email: am86@brighton.ac.uk

FP4

MEETING THE NEED FOR KPI REPORTING THROUGH THE PRAGMATIC USE OF ADAPTED OUTCOME MEASURES

Presenter: Gill Packham

Summary
Kent Community Health NHS Trust was awarded the contract to provide the Wheelchair Service across Kent and Medway from September 2012. A range of data for Key Performance Indicators (KPI) was needed, including subjective parameters. This paper details how modified outcome measures are being practically used to meet this requirement.

Aims and Objectives
To provide delegates with a practical example of where the necessities to meet KPIs as set by commissioners require inventive and lateral thinking in order to find a practical solution to meet the need to report data.

To provide an overview of the considerations, pros & cons and pressures the service was under at that time, and how this impacted upon the development of the management tool and its implementation.

Background
Commissioners are beginning to understand that it is not the number of 'contacts' or 'activities' that a service performs which determines its worth or benefit, rather it is the positive outcome for the service user. This is not a new concept for therapists and others who are practically engaged in the delivery of healthcare at the 'coal face'. However, it has always been a conundrum as to how the 'outcome' can be measured and therefore demonstrated. Also it can be suggested that the way in which an outcome is measured will depend upon who the recipient of the information will ultimately be. If it is the service user, there will be a very individual appreciation of what they have gained from the intervention, but if it is to inform research, the outcome needs to be referenced in a standardised way in order to glean attributable meaning.

There are many definitions of what an 'outcome' is – Laver Fawcett suggests 'an outcome is the observed or measured consequence of an action or occurrence. In a therapeutic process, the outcome is the end result of the therapeutic intervention'. However, commissioners do not appear to have access to expert knowledge in terms of setting outcomes for a service through the identification of a specific outcome measurement tool. There is also an array of standardised outcome measurement tools available to services, and specifically Wheelchair and Seating Services, as highlighted at PMG in 2012 by McDonagh and Wright, which have been further presented at an HDTI training event in May 2013 and recently referenced by Kenny S and Gowran RJ in February 2014.

The commissioners at the time of preparing the service specification for the Wheelchair Service for Kent and Medway decided they had three areas they wanted to measure from a client focused perspective, to ensure the service provider was delivering a quality service. The KPIs specified within the contract for reporting on were:

• Promoting independence through the provision of new wheelchair and/or specialist seating system. - % of clients reporting an increased level of independence through using their new wheelchair and/or specialist seating system.
• Participation in chosen activities. - % of clients who state an increased level of confidence in being able to participate in a chosen activity.
• Improvements to the client's posture through the provision of a new wheelchair and/or specialist seating system. - % of clients reporting significant improvements to their posture as a result of receiving the new wheelchair and/or specialist seating system.

The Commissioners did not specify how they wanted these measured; also there appears to be an assumption that all service users accessing the service will be provided with a new wheelchair and/or seating system as a result of an intervention. This is not always the case. A way therefore needed to be found to provide a percentage outcome for each of the above parameters.

Discussion

Following a review of the existing outcome measurement tools available via the HDTI training event in May 2013, it was concluded it would not be possible to use the standardised measures presented in their entirety, as there was not one individual measure that fully informed the required KPI reporting. Also the time taken to administer the tools was sadly felt to be prohibitive.

For these reasons, along with the consideration of what the information being gathered was to be used for - which did not include research - the KCHT Wheelchair Service undertook a pragmatic review of the existing outcome tools developed for seating and mobility services. A process of matching the required KPIs to specific questions within the tools was undertaken, along with the decision to use a Likert measuring scale as referenced within COPM, which a high range of service users would be able to interact with. This resulted in a subjective KPI questionnaire/tool that provides the specific information needed to meet the KPI reporting requirements. This involves four questions which are posed to the service user at the start of their intervention with the Wheelchair Service, and repeated once they have been provided with the equipment they were assessed as requiring.

The journey KCHT Wheelchair Service has undertaken has been a practical one based upon the old adage 'necessity is the mother of invention' – and is therefore presented to PMG as a practical example when required to meet the challenges of KPI reporting.

References

Laver Fawcett AJ (2007). Principles of Assessment and Outcome Measurement for Occupational Therapist and Physiotherapists – Theory, Skills and Application. J Wiley& Sons Ltd. p10
Posture & Mobility Group (2012) – *Abstracts of Conference Proceedings*
HDTI training event – Outcome measures for Wheelchair and Specialist Seating Services - May 2013
Carpenter et al (2001). The use of the Canadian Occupational Performance Measure as an outcome of a Pain Management Programme. *Canadian Journal of Occupational Therapy* – February 2001
Kenny S, Gowran RJ (2014) Outcome measures for wheelchair and seating provision: a critical appraisal. *British Journal of Occupational Therapy* 77(2), 67-77

Correspondence details

Gill Packham
Wheelchair Service Manager
Kent Community Health NHS Trust
Trinity House, 110-120 Upper Pemberton
Ashford
Kent TN25

Email: Gill.Packham@kentcht.nhs.uk

PARALLEL SESSIONS

AFTERNOON OF TUESDAY, 8TH JULY 2014

PS1

THE DEVELOPMENT OF THE NEURO POWERED WHEELCHAIR

Presenter: Jenny Rolfe

This workshop will explore the clinical rationale and development process of the new Neuro Powered wheelchair prescriptions of EPIOCs provided by Invacare, Sunrise Medical and Ottobock. The project developed as a result of the increased cost to providers and delays in provision to the clients incurred by having to order “off prescription”/“specials” to meet the ongoing needs of people living with MND (plwMND). There will be an opportunity to discuss the clinical features of the prescription and development process, review the prescription forms and chairs, discuss joint working with the MND Association, and how this project will impact statutory provision.

Acknowledgements
MND Association
Department of Health
Invacare
Ottobock
Sunrise Medical
University of Oxford MND Care and Research Centre

Correspondence details
Jenny Rolfe
MND Specialist OT
OCE
Windmill Road
Headington
Oxford, OX3 7LD

Email: Jennifer.rolfe@ndcn.ox.ac.uk

COLLABORATIVE WORKING: HEALTH AND SOCIAL SERVICES

Presenters: Pam Wood and Richard Jarczyk

Do you work in wheelchair services with lots of different commissioning partners?
Are you juggling your service to support all your commissioning agreements but wonder if it could be easier?

Join us at our workshop to discuss current models and trends, what changes you would like to implement, and gain some top tips from our interactive sessions and fellow colleagues.

The workshop is interactive, with the aim being to look at the current models in use across wheelchair services; then looking at proposed models, and how to facilitate changes while working with our partners.

Correspondence details
Pam Wood
Clinical Advisor – Pressure Relief
Solent NHS Trust
c/o Millbrook Healthcare
Portsmouth Community Equipment
Units A12 & A13
Railway Triangle
Walton Road
Portsmouth PO6 1TN

Email: Pamela.Wood@Solent.NHS.UK
richard.jarczyk@gmail.com

PS3

A VISIONARY GLANCE FORWARDS - WHAT MIGHT THE FUTURE HOLD?

Presenters: Henry Lumley and Linda Marks

There has been endless talk about how services might be delivered in the future. Much of this is inevitably influenced by the funding structure within which our services, along with the rest of the NHS, have to survive.

But where are the opportunities to influence and change our services to deliver improved pathways for users?

This session is designed to support a more informed message from PMG and professionals to the current NHS England work, following their Wheelchair Summit in February 2014.

Correspondence details
Henry Lumley
Specialty Manager - Rheumatology & Rehabilitation
Bristol Centre for Enablement,
North Bristol NHS Trust
Highwood Pavilions
Jupiter Road
Patchway
Bristol BS34 5SP

Email: Henry.Lumley@nbt.nhs.uk

HOW DIFFERENT SEATS IMPACT UPON SPINAL CORD INJURY (SCI) SUBJECTS

Presenters: Rosaria Caforio and Ian Deumayne Jones

Additional Author: Maru Marquez Apolinario, Occupational Therapist

Summary
Seating Acquired Pressure Ulcers (SAPU) within the SCI population is very frequent. Many high quality cushion materials of different technologies address SAPU prevention, but it is unclear as to the effectiveness arising from the use of pressure relief cushion over a postural type. The choice depends upon the comfort, durability, postural stability and functionality.

Aims and Objectives
The aim of this study is to understand what parameters lead to define the criteria of choice for a specific technology, material or a specific combination of cushion design, and to verify how these criteria influence the biomechanics of the user, their functional performance and perception.

Background
MATERIALS AND METHODS
Consenting participants were of 2 groups:
Group 1 consisted of 5 able-bodied subjects (2 male, 3 female)
Group 2 consisted of 5 SCI subjects (3 male, 2 female)
Materials: 2 different sized manual wheelchairs (Ottobock Aventgarde) with solid seat base and back.
2 main cushion groups (A = Pressure relief and B = Postural) divided into 3 sub-groups of differing technologies and materials.
A1=Air, (Roho6LP) A2=Polymeric/Fluid, (Jay Ext) A3=Polymeric combination, (Inserto Modo)
B1=Air, (Roho Quatro) B2=Polymeric/Fluid, (Jay 2) B3=Polymetric combination (Inserto Novo)

STUDY DESIGN
Three observation moments were established: T0, T1 (15minutes after T0) and T3 (30 minutes after T0) in both static and dynamic phases. During the dynamic phase, subjects propelled for a distance of 10 meters four times (total distance 40 meters and 45 minutes sitting time in each cushion). All subjects positioned at 90 degrees at pelvis, knee and ankle.

Using ISO 16840-1:2006 a protocol was established to standardise the recording of the biomechanical data for all subjects as follows:-
Biomechanics: 3 absolute body segment angles (1. Frontal Pelvic. 2. Sagittal Pelvic. 3. Sagittal trunk)

Discussion
Results of this study suggest that the whole asset of design, technology and cushion materials influence the user's biomechanical modifications. These biomechanical modifications in turn influence functional performance, pressure loads and the perception of comfort and stability. For this to happen, cushions need to be personalised. Analysing pressure data helps to better understand the performance of the design, technology and cushion materials.

There are however other criteria to rely upon other than just the pressure parameters which are influenced by cushion design, the materials used both for the cushion and cushion cover, the material the pressure mat is constructed from, the sensor features, user morphology and the configuration of the wheelchair. The following better guarantees the integrity of choice: The assessment of the user. Customisation of the cushion. The perception of comfort and stability. The visual observation of skin.

Pressure results are important markers of body stability reached by users in the time spent during the static/dynamic phases and during propulsion and functional activities. These results are also very useful to understand the performance of cushion material and technology whilst being used. A contoured cushion design, whatever the technology of the materials, promotes a balance between the stability of the pelvis and trunk, improving the coordination of movement, minimises and/or inhibits pelvic instability on the frontal and sagittal planes. The design of the cushion builds a proximal support (anterior, posterior and lateral of the pelvis) improving the manual ability and facilitating the sitting position during the time spent in related activities, making them safer, effective, economical and comfortable. Combining the different technologies, materials and design shows that in order to prevent both the SAPU and deformities, the materials employed must have the capability to constantly adapt and adjust during user activity.

References

Douglas A. Hobson, PhD and Robert E. Tooms, MD: Seated Lumbar/pelvic alignment- a comparison between spinal cord injured and non injured groups. *Spine* vol 17 1992
Leigh Pipkin, MSPO; Stephen Sprigle, PhD, PT: Effect of design, cushion construction and interface pressure mats on pressure and immersion. *JRRD* Vol 45 2008
David M. Brienza, Mary Jo Geyer and Patricia Karg. White paper on pressure management. Pitt.edu.

Correspondence details

Rosaria E. Caforio
MD and Orthopedist Technician
Promedicare Srl
Via A. Montagna Zona Industriale
Mesagne
BR72023

Email: rcaforio@promedicare.it

CLINICAL INTERVENTIONS WITH LUMBAR PRESSURE ULCERS CAUSED BY POOR SEATED POSTURE: A CASE REPORT OF D.G.

Presenters: Heike Clincke and Bart Van der Heyden

Summary
D.G. is a young male who suffered a C5-C6 level complete spinal cord injury. Over time he has developed a pressure ulcer at stage 4 at the lumbar spine. We will discuss the many interventions by the entire care team, which have impacted D.G's wound healing.

Aims and Objectives
We want to achieve full closure of D.G's wound so that he can continue his life and activities of daily living (ADLs). We want to achieve this by eliminating all risk factors in order to improve the wound healing process. Two of D.G.'s main risk factors are pressure at the wound and poor seated posture.

Background
D.G. has a history of pressure ulcers at the lumbar spine. In 2011 he developed a pressure ulcer, which closed following a skin graft. D.G. currently has a stage 4 pressure ulcer and a score of eleven on the Braden Scale, which places him in a 'high risk category of developing pressure ulcers'.

After a full assessment, special attention has been given to the following risk areas:
Moisture management has been followed up with the nursing staff and special care has been given in setting up fixed times where D.G. catherizes himself in order to avoid moisture at the wound bed.
The nursing staff, in conjunction with a nutritional consultant, is managing D.G.'s nutritional status.
The physical therapist is focusing on joint and muscle mobility. In order to avoid contractions the postural muscles are strengthened and stretched.
The ADLs are supervised by the occupational therapists (OTs).
D.G.'s seated posture while using his manual and powered wheelchair is being monitored by the OT.

From a tissue integrity point of view, use of the manual wheelchair is being encouraged, because it is fitted with a ROHO® QUADTRO SELECT® seat cushion and a ROHO® AGILITY BACK™ support. At the moment this is also installed at his powered wheelchair, but now this is in a testing phase. This shell back support system provides improved pressure distribution at the lumbar pressure ulcer location while improving his seated posture.

Because we're still testing the RoHo in the powered wheelchair, it can only be used for outdoor activities and for three consecutive hours at a time (except for excursions).

When seated D.G.is avoiding crossing his legs, which helps to decrease peak pressures at the lumbar spine. D.G. has no sensory awareness of the lower extremities, but can provide feedback related to pain at the spine caused by poor posture. The physical therapist is also following up with a postural management programme.

The listed interventions take a lot of effort from both the care team and D.G., but improvements are apparent. In January 2013, prior to using the ROHO® AGILITY BACK™, the first pressure ulcer wound bed measured 2 cm in width, 6 cm in length and 2 cm in depth, while the second pressure ulcer measured 3cm in width, 4 cm in length and 2 cm in depth. By June 2013, the first pressure ulcer wound bed decreased in size to 2 cm width, 3,5 cm in length and 1,5 cm in depth, while the second pressure ulcer decreased in size to 2 cm width, 1cm in length and 0,5 cm in depth. Both wound edges are showing visible sign of re-epithelisation. In April 2014 the first wound is 3cm width, 3cm in length and 0,5cm in depth. The second wound is increased to 1cm width and 0,5cm in length and very superficial.

Undertaking a pressure imaging assessment, there is also noticeable improvement. In January 2013, the contact area at the spine with the standard back upholstery of the manual wheelchair was 661 cm² with a peak pressure of 81 mmHg. When using the ROHO® AGILITY BACK™, the contact area at the spine increased to 1064 cm² with a peak pressure of 81 mmHg. The recordings show the entire lower back is weight bearing when using the ROHO® AGILITY BACK™ and the magnitude of pressures at the pressure ulcer areas is considerably less. In February 2014 we changed the ROHO® AGILITY BACK™. Now D.G. has a full ROHO® AGILITY BACK™. Now the peak pressure is 40,2 mm Hg. The average pressure is 19,4 mm Hg.

Discussion

There are many factors impacting the healing of the pressure ulcers. The seated posture and pressure distribution at the lumbar spine play a very important role in the healing process. The entire team feels the wound closure process improved because of better posture and lower pressures at the lumbar pressure ulcers. We hope the ROHO® AGILITY BACK™ will continue to provide enough pressure distribution in order to avoid relapse of D.G.'s skin integrity status in the future.

Correspondence details

Email: heike_clincke@hotmail.com
bvanderheyden@attglobal.net

POSTURAL CARE AND THE CONFIDENTIAL INQUIRY INTO PREMATURE DEATH OF PEOPLE WITH LEARNING DISABILITIES (CIPOLD)

Presenter: Sarah Clayton

Summary
We will outline the findings of CIPOLD.

Recommendation 9 states "CCGs must ensure they are commissioning sufficient and sufficiently expert, preventative services for people with learning disabilities regarding their high risk of respiratory illness. This would include expert, proactive postural care support"

But what does this mean in reality?

Aims and Objectives
This workshop will provide an opportunity to explore the following elements:

- What is 'expert, proactive postural care support' – who does it, what does it include, and are you providing it?
- What is co-production – how does co-production differ from traditional service delivery?
- How do we focus on objective outcomes – what are the service centred outcomes we are used to working to, and how can we balance these with person centred outcomes?

Background
We have considered Postural Care and Protection of Body Shape within a Positive Deviance model as described in "The Power of Positive Deviance" R. Pascale, J. Sternin, M. Sternin.

"Positive Deviance is based on the observation that in every community there are certain individuals or groups whose uncommon behaviours and strategies enable them to find better solutions to problems than their peers, while having access to the same resources and facing similar or worse challenges"

There is a lack of accountability for service delivery in this area which has led to the development of a culture of impunity in which basic, person-centred outcomes are not being recorded, collated or shared. The Living University is an international online platform where information and, most importantly, results can be shared freely. By highlighting the phenomenal success in some parts of the UK and overseas we may focus attention on areas that are achieving the best results as well as disseminating materials and strategies that have led to this success. Our aim is to improve outcomes for people and their families, to raise awareness of the preventative and restorative potential of Postural Care and to foster accountability for service delivery. The Living University also serves to provide access to information for individuals and their families in order to raise expectations of what may be possible using Postural Care.

One success story shared will be that of Wakefield. The dramatic reduction of numbers of children with hip dislocation (a common, often painful, debilitating secondary complication associated with reduced mobility for many children and young people) has been co-produced through partnership, working with individuals and their families, alongside changes in behaviour by a diverse range of practitioners, including the local orthopaedic surgeon, therapists, teachers, teaching assistants and short break staff. Wakefield also changed their equipment provision systems and processes, all of which has taken almost 10 years to achieve.

The result is astonishing: A total of 274 children and young people aged between 0 and 18 who access the physiotherapy service in Wakefield led by Suzanne Carter. Of these 122 have a Gross Motor Function Classification Scale (GMFCS) of 1, 106 have a GMFCS of 2 or 3, and 46 have a GMFCS of 4 or 5. Not a single child or young person accessing this service has a dislocated hip and, in the past 12 months, only 4 have

undergone preventative soft tissue surgery. This success not only impacts on the lives of individuals and their families, but it is also cost effective.

Discussion
Discussion will focus on the findings of the original Inquiry and progress since publication.

This workshop has been accepted for the CIPOLD Conference in March 2014 following which further information will be available.

References
Heslop et al: Confidential Inquiry into the Premature Death of People with Learning Disabilities: Final Report. Norah Fry Research Centre, March 2013

Correspondence details
Sarah Clayton
The Sharratts
School Lane
Hopwas
Tamworth
Staffs
B78 3AD

Email: Sarah@posturalcareskills.com

FROM USER GROUP TO COPRODUCTION

Presenters: John Colvin and Fiona Ballantyne

Summary
The desire of many services to engage productively with wheelchair users and their carers can be hindered by a lack of capacity or awareness about what works. This paper will highlight the range of engagement strategies we found most useful in the wheelchair service in WestMARC.

Aims and objectives
The aims of the presentation are:-
To review common methods of engaging with users and to highlight some of their limitations.
To provide an overview and feedback on our early experiences of using a range of coproduction techniques

Background
Few people would argue against the importance of user engagement. This area was identified as weak in Scotland's national review of 2006 "Moving Forward" and was further highlighted in the National Action Plan. The Scottish Government currently have a Wheelchair and Seating Quality Improvement Framework that reinforces the need for accessible information, and requires services to carry out a user satisfaction survey at least every 2 years.

There are good examples of user groups working with wheelchair services but there are many more examples of user groups where there have been significant problems with constituency, empowerment and resilience. In the West of Scotland the 6 Health Boards took different approaches. Some established a user group, some already had one and some established a broad network of groups and individuals. As part of our response to the National Action Plan we have established user groups/networks in the 6 Health Boards, we agreed a core data set to be included in our information leaflets and web sites, and we developed national standards with users. Despite these changes, we did not feel we had adequately addressed this area.

We explored other methods of user engagement and we have now started to use a range of coproduction techniques. We assessed the breadth of our existing activities across the four coproduction areas, examples of each will be given, for:-

Co-commissioning
Co-design
Co-assessment
Co-delivery

What we found was that, although we had been performing well in the area of Co-commissioning, other areas of Coproduction were weak. There was a trend of improvement in the area of Co-design with the use of focus groups and opportunity interviews when carrying out our A3 improvement cycles. The area of Co-assessment was seen as weak, because our methods were not contemporaneous or frequent. In the area of Co-delivery, apart from users designing some of our information leaflets, we struggled to evidence any activity.

To address the problem of Co-assessment we wanted to introduce a technique that gave more immediate feedback of patient experience in small manageable chunks so that we could reasonably resource it. We introduced a technique into the service called Emotional Touchpoints. We will explain this technique, how we resourced it, and give some examples of how it has changed service provision.

Our biggest challenge was undoubtedly in addressing the lack of Co-delivery. To initiate this we have carried out an exercise to identify a single prioritised list of service improvements. The methodology included a survey of staff priorities, a survey of user priorities using our user networks, and a joint session between staff and users producing a single prioritised list. This list will be presented.

The next steps in improving Co-delivery of services will be outlined.

Discussion
Effective user engagement can be challenging for wheelchair and seating services. Traditional methods such as user groups and satisfaction questionnaires have a place, but there are other ways to address engagement. Viewing and using our users and carers as potential assets in service delivery is an opportunity we can ill afford to ignore. Coproduction offers an off the shelf structure and a tool-kit of resources that can be used by wheelchair and seating services to assess their strengths and weaknesses, and gives them a rare opportunity to make positive change with minimal resource investment.

Correspondence details
John Colvin
Head of Service
WestMARC
Southern General Hospital
1345 Govan Road
Glasgow

Email: john.colvin@ggc.scot.nhs.uk

RESULTS OF A CLINICAL AUDIT, MEASURING THE EFFECTIVENESS AND EFFICIENCY OF SPECIAL SEATING SERVICES ACROSS THE UK AND IRELAND

Presenter: Neeta Patel

Summary
This study aimed to quantifiably measure the effectiveness of the seating process, from assessment to delivery. Analytical data, regarding the demographic of special seating clients, namely their age, diagnosis and seating history was gathered; providing insight into the types of individuals who have found this seating appropriate to their needs.

Aims and Objectives
To gain a client's perspective of the special seating service

To provide a snapshot of the clients using the service

To measure the effectiveness of the seating provided

To measure the efficiency of the seating service

To measure the clinical skills of the clinicians

To give clients the opportunity to suggest improvements to the service

To implement changes that seek to improve and develop the service and products

Background
This survey is to gain a client's perspective of the service provided by the Ottobock Special Seating Service. This involves the manufacture and upkeep of the special seating provided. It is essential to provide a service that meets the needs and requirements of the all the clients seen. To facilitate service improvement, clients could suggest areas for development to enhance their special seating experience. Basic demographic data will provide a snapshot of clients attending the clinic. All information gained will be shared with the clinic manager and governance staff.

Technique
The aspects of care being surveyed are –

Promptness and length of time of appointment

Involvement of client in decision making process with sufficient information

Length of time of manufacture

Comfort, function, fit and appearance of the seating system

Manner, listening ability, helpfulness, care received and efficiency of the seating engineer

All respondents are asked to list ways of improving the service

A draft questionnaire was sent to Ottobock seating engineers for comments. Once piloted with three clinics and approved, 100 clients were asked anonymously to complete the questionnaire during their attendance at special seating clinics throughout the UK over a period of about 12 months. (these are the current numbers, up

until 2013, the up to date data will be added to the presentation, before the conference, making this study as current as possible)

Standards: Healthcare Standards for NHS-Commissioned Wheelchair Services May 2010

Results and Testing
Of the 100 questionnaires returned, 46 (46%) were incomplete in some way but all questionnaires were used. The results are given as a percentage of the number of responses to each question, the number not completed is also given. 29 respondents gave their names as an indication that they wish to discuss their comments further. To maintain confidentiality a separate list of names will be given to the seating engineers, to enable either them or the clinic manager to contact the respondents.

Demographic information
46 respondents were male (46%) and 46 (46%) were female; eight (8%) respondents did not complete this question.

Clinical presentation
52% of the clients recorded cerebral palsy as their diagnosis. The other diagnoses recorded were; spina bifida (6%), multiple sclerosis (5%), spinal muscular atrophy (2%). 16 other conditions including Batten's disease, spinal injury, stroke, Rubella and scoliosis were recorded in the 'Other' category. Eleven clients recorded combined or more than one diagnosis, and a further eleven clients did not record a diagnosis.
78 clients (78%) were established service users of between 1 and 40 years.
58 clients (58%) spent more than four hours per day in their seating system (average 6.3 hours), 32% spent between two and four hours per day and 8% spent less than two hours per day in their seat.

Areas identified for service improvement will be highlighted during the presentation.
Full results of service/seating analysis provided will be reported at the presentation.

Discussion
The findings of this audit have accurately identified the demographic of special seating users, the frequency of their clinical attendance and the efficiency of the seating manufacturer. With the data obtained from the results, wheelchair services can have a clear understanding of clients seating needs, over a sustained period, the renewal cycle of special seats, the modification characteristics, in correlation to the type and functionality of the user in question. This data is powerful in comprehending a realistic model of a special seating service, the efficiencies that can be measured, and the implications on the financial and time constraints, governing the clinical model. The effectiveness of the seating provider in delivering seating solutions can also be quantified in real terms, the type of seating with the most positive outcomes, the assessment procedure and the manufacturing techniques can also be evaluated, through this user led analysis.

Ultimately this study provides a tool with which the wheelchair service and the seating provider can assess the performance of a special seating service, identify areas for improvement, and recognise strategies that are already successful in providing quality seating systems efficiently. The results of this work have enabled Otto Bock Healthcare to audit our seating systems to assess the success of the system in use, and evaluate the user's experience within a special seating clinic.

Correspondence details

Email: Neeta.Patel@ottobock.com

POSTERS

Q&A: TUESDAY 8TH JULY 2014
3PM TO 4PM

P1

LATERAL THINKING – A BESPOKE SEATING CHALLENGE CASE STUDY

Presenter: Lynn Broughton
Additional author: Gill Rawlinson

Summary
This poster presents a complex seating case study where the need arose to design seating for an active user with several fixed deformities, including severely limited hip flexion. Inspiration was taken from the Balans chair as this was a position of comfort and function for our client Wayne.

Aims and Objectives
Our aim was to design bespoke seating to be integrated into an active user wheelchair to improve Wayne's mobility, independence, postural and lifestyle needs. The following objectives were identified:

•To increase Wayne's sitting tolerance to 2-3 hours to allow him to go out

•To enable Wayne to actively self-propel again

•To improve Wayne's independence

•To make it easier to get the wheelchair in the car

Background
Wayne is a 43 year old male with a diagnosis of Spina Bifida and Kyphoscoliosis. He lives independently and wanted to live an active independent lifestyle. However this was being severely limited by his lack of mobility due to an unsuitable wheelchair. He was using a Quickie GPV, Pudgee cushion and Vicair back cushion, but they did not meet his postural needs. He was therefore spending the majority of his time laying prone or sitting in a reclined position with his legs tucked underneath him on the floor. Wayne was choosing to crawl around at home rather than use his wheelchair, as he was unable to tolerate sitting in it for more than 30 minutes and reported it made him 'ache all over'. Wayne and his family also found the GPV difficult to fit in the car due to the fixed frame.

A postural assessment was completed which highlighted the following fixed deformities:

•Pelvic obliquity up on left by 1"

•Very limited hip flexion: 60 degrees on right and 70 degrees on left

•Right hip fixed in 70 degrees of internal rotation

•Left hip fixed in 5 degrees of internal rotation

•Severe kyphoscoliosis, double curve with large rib hump on right

•Limited knee extension, 90 degrees on right and 100 degrees on left

Wayne was most comfortable sitting in a position similar to how you would sit on a Balans chair, with his hip angle open and his feet tucked up under the seat. As nothing like this was currently being produced we worked with the medical engineering department at Salisbury Hospital to develop seating to replicate the Balans chair position, that could be integrated into an active user wheelchair.

Before choosing equipment and designing the seating several other factors had to be considered. Wayne needed to be able to transfer from the floor to the wheelchair independently which he did so using upper body strength alone, so the wheelchair needed good forward stability and a low seat to ground height. Wayne wanted a folding frame chair to make fitting it in the car easier. Wayne required an active user wheelchair to improve his independence as he already had excellent wheelchair skills.

Equipment chosen

•Quickie Neon – folding frame but active

•Bespoke forward ramped cushion

•Padded strap as a knee block

•Padded foot strap on raise and lower ratchet system

The outcome of the completed seating integrated into the Quickie Neon was very positive. Wayne's sitting tolerance increased to 6+ hours and he advised his comfort was much improved. Wayne was able to transfer from the floor to wheelchair independently and the finished wheelchair had surprisingly good forward stability. Wayne was able to back wheel balance with ease and reported the Neon was much easier to fit in the car.

Discussion

It is clear from Wayne's previous equipment that wheelchair services do not always take the time to fully understand client's postural and lifestyle needs. Sometimes we are all constrained by available equipment and resources, but if a good outcome is to be achieved for our clients we must always design or choose the equipment to meet the client needs, rather than try to make the client fit the equipment. Taking the time to complete a thorough postural assessment and establish Wayne's own goals was essential to the success. We had to think out of the box and be prepared to take a risk with a new design that may not work. However this is the only way practice will move forward and new designs will develop. We acknowledge that within Swindon Wheelchair Service we have been supported to think laterally in order to achieve the best outcomes for our clients. We hope that in the future all wheelchair services will be given similar support in order to achieve the same positive outcomes for all clients.

Correspondence details
Lynn Broughton
Swindon Wheelchair Service
Unit 12, Birch
Kembrey Park
Swindon
SN2 8UU

Email: lynn.broughton@swindon-pct.nhs.uk
gill.rawlinson@nhs.net

P2

A USER'S PERSPECTIVE ON A RISER MECHANISM TO FACILITATE INDEPENDENT TRANSFERS AND FUNCTION

Presenter and additional author: James Hollington
Author: Lesley Purves

Summary
This is a case study poster presentation. The poster will present the provision of a riser wheelchair in order to facilitate independent transfers to crutches for a service user with GNE Myopathy.

Aims and Objectives
To demonstrate making a case for the provision of a powered wheelchair with riser facility in order to assist a service user to stand from the seated position.

Background
GNE Myopathy is one of a group of conditions known as distal muscular dystrophy. It is an inherited condition and in Mrs J's particular case is recessive in pattern, which means both parents would have to pass on copies of the defective gene. Mrs J's children will be carriers.

Mrs J's condition has got progressively worse over a period of 14 years. Her tone is low and she has muscle weakness. In this condition the quads are not affected and likewise neither are the heart and lungs. Mrs J's pain in her hips and legs are completely alleviated by weight bearing.

She was provided with an indoor/outdoor powerchair chair in 2010. At this time she was also told a riser facility was not available through the NHS. In order for Mrs J to transfer into the standing position to use her crutches her husband has to stand on her feet to secure them in position during the standing movement.

Mrs J is determined to provide as normal a family life as possible for her children. She won't accept carers for herself during the day, but has child-minders within the home for the children. She very much retains control of all their activity, and the carers do not act without her instruction. In order to do this she needs to be able to go to the loo herself, stand to relieve the radiating pain when it gets intolerable, and she needs to contribute to domestic activity, for example she can help sort packed lunches etc if upright.

A colleague had previously tried to resolve issues through things like higher/firmer cushions but without success. It was decided that a more innovative approach be taken. Using a chair with tilt we aimed to provide an ejector seat. By tilting the seat back as far as possible and fitting a wedge shaped cushion, a flat seat surface was achieved. Mrs J could then tilt the seat forward again which, in effect, raised the rear of the seat significantly.

Unfortunately it didn't quite provide enough height. Had the pivot point for the seat, which was at the rear, been further forward, more height would have been achieved. However this wasn't the only problem - it did show us that while a high seat height was needed for standing, a low seat height was needed when sitting. It also highlighted the critical nature of the height of the footplates - when set at the correct height for her they were too high off the ground for her to lift her feet up onto them.

By this stage in the process, we had come to understand at least some of Mrs J's aims for herself and objectively speaking they were sound and achievable. We felt there was enough clinical evidence to suggest an exception be made in relation to riser provision. We borrowed a chair for trial.

Discussion
The result was completely successful, with Mrs J being able to achieve a stable and safe sit to stand movement with minimal energy consumption or pain. The variable seat height also meant that the footplates could be set correctly and the seat lowered until they were very close to the ground, enabling Mrs J to lift her feet onto

them relatively easily.

Conclusion
On this occasion we were able to make a case for the provision of a riser that is not normally available; we also hope the additional idea of using tilt will give food for thought.

Correspondence details
Lesley Purves
Senior Specialist Occupational Therapist
Adult Wheelchair Service
&
James Hollington
Clinical Scientist
Bioengineering

SMART Centre
Astley Ainslie Hospital
Edinburgh
EH9 2HL

Email: James.hollington@nhslothian.scot.nhs.uk

P3

PROVIDING THE RIGHT WHEELCHAIR IN THE RIGHT WAY
WHY THE WHO WHEELCHAIR SERVICE TRAINING COULD WORK IN THE UK

Presenter: Sarah Frost

Summary
Three wheelchair service training packages have been developed by the World Health Organisation (WHO) in partnership with Motivation, to ensure that more people around the world receive the right wheelchair, with the right training, to meet their needs. This practical and comprehensive package has already reached participants from 45 countries.

As this training spreads globally, what is its relevance for the UK?

Aims and Objectives
Aim: To present an overview of the impact of the Wheelchair Service Training Package.
Objectives: To have a discussion with the audience on the relevance of these packages and how they could work in the UK.

Background
The three part package trains personnel to provide properly fitted manual wheelchairs.

Basic: The 8-step basic module is designed to train personnel or volunteers to provide an appropriate manual wheelchair and cushion for children and adults who can sit well without any additional support.
Intermediate: The intermediate module follows the same pattern as the Basic, but trains people to provide an appropriate manual wheelchair and cushion for children and adults who need a chair that gives them extra postural support to be able to sit upright.
Managers and Stakeholders Training (to come later in 2014): The focus of this module is to create advocates for good wheelchair delivery systems that are accessible, cost effective, and responsive to the needs of wheelchair users.

Discussion
The package is being successfully rolled out globally. This is an opportunity to discuss the content and methodology and discuss the relevance for the UK context.

References
World Health Organization (2008). Guidelines on the provision of Manual Wheelchairs in less resourced settings
http://www.who.int/disabilities/technology/wheelchairpackage/en/
http://www.who.int/disabilities/technology/wheelchairpackage/wstpintermediate/en/

Correspondence details
Sarah Frost
Motivation Charitable Trust
Brockley Academy
Brockley Lane
Backwell
Bristol
BS48 4AQ

Email: sarahf@motivation.org.uk

P4

INDEPENDENT MOBILITY IN PRONE LYING
A CLINICAL CASE STUDY

Presenters: Rick Houghton and Martin Smith

Summary
To provide safe, secure and comfortable independent mobility for a client of very small stature who has limited mobility and can only lie prone.

Aims and Objectives
The primary aim was to improve social interaction by enabling our client to operate a powered wheelchair in a raised position. Secondarily to improve comfort, and respiratory and digestive function, by offering a tilted position. Maintaining independent access to the mobility system, and use of public transport was also required.

Background
Our client has spinal muscular atrophy and diastrophic dysplasia.
Spinal muscular atrophy is a genetic disease that causes muscle weakness and progressive loss of movement. Diastrophic dysplasia is a disorder of cartilage and bone development. Affected individuals have short stature with very short arms and legs. Most also have early-onset joint pain (osteoarthritis) and joint deformities which restrict movement.

Current equipment is a Balder FWD wheelbase used back to front. The support surface is a Balder backrest set horizontally. She was able to access the chair using the elevating footrests which are fitted with remote switches, but this has not been working, so she has now developed a sideways transfer from her sofa. The Balder can tilt, but she cannot use this as there is nothing to stop her sliding back down the chair which cannot be operated when the seat is raised and tilted.

A Spectra with rise and tilt functions was chosen and a lying surface was carved in CM50 foam. A moulding was designed to fit around the lower back and upper legs to hold her in place. A mounting system, incorporating a Linak actuator with 100mm stroke, was developed to allow access. The first iteration of the design required the client to access the system from the front of the chair, turning on the "seat" and wriggling back into position. Whilst it was possible to do this, it was difficult for the client, who is expected to weaken further. The posterior support was seen to need to be moved so far out of position to facilitate the action that it was not deemed possible to realise. Instead, it was decided the client should access the "seat" from the rear, as she does at present, so long as the posterior support can be raised sufficiently to allow her to pass through the aperture created.

A second iteration of the system was designed using the same actuator, moving the posterior support up through an arc in order to allow unimpeded access from the rear. While she felt she would still benefit from a powered step access she was most concerned that it did not increase the overall length of the wheelchair, as her local bus operator would not allow her to use the bus.

At this point it was decided to divide the project into two parts:-

Firstly to continue to issue the Spectra fitted with the revised posterior support, as this had proved to be successful in a trial.
Secondly to design a powered access step that was removable, and would not increase the overall length of the wheelchair.

Discussion
The project has used a number of skills available to us at the Oxford Centre for Enablement. The need for an unusual solution was identified at an early stage at a wheelchair service clinic. Powered riser units are not

usually supplied by the wheelchair service. On the rare occasions when they have been supplied it has been out of clinical necessity. An Invacare Spectra Plus with powered tilt and riser functions was allocated from re-conditioned fleet stock. A customised foam base and posterior support was designed to the client's preference during Oxfordshire Wheelchair Service custom contoured seating clinics, and carved on a 3-axis CNC milling machine. The rehabilitation engineering department realised the design and manufacture of the final actuator mechanism, using a 3D solid modelling system and in-house fabrication.

Static stability testing was conducted at a relatively early stage with the seat fully raised and tilted back, confirming the system to remain stable beyond 16 degrees with respect to rearward stability and in excess of 12 degrees with respect to lateral stability.
Further consideration will be given to this and transportation risks. The system is currently being completed for delivery to the client.

Acknowledgements
Damian Green, Jan Edwards, Paul Harrington and Nacim Bouraba

Correspondence details
Rick Houghton
Oxford Centre for Enablement
Nuffield Orthopaedic Centre
Headington
Oxford OX3 7LD

Email: rick.houghton@ouh.nhs.uk

P5

MEASURING TEMPERATURE IN FOAM CARVED CONTOURED WHEELCHAIR SEATING

Presenter: Scott Chalmers

Summary
WestMARC has an established process for in-house production of foam carved (FC) contoured seating. User feedback indicates that the greatest need for improvement is in the regulation of temperature to reduce perspiration. This study aims to discover what changes can be made to our FC seating in order to reduce the interface temperature and increase user comfort.

Aims and Objectives
1. To establish a protocol for measuring temperature in foam carve seating
2. To investigate and minimise the errors associated with the measurement technique
3. To investigate if the measurement would be sensitive to common strategies used for regulating temperature in FC seating.

Background
A contoured seat is a bespoke seating system prescribed for individuals with a significant degree of postural deformity. The seat is designed to match the corrected shape of the occupant and to promote good posture. Due to the enveloping nature of this type of seating and because it is manufactured from foam, it insulates the user and can result in temperature increases causing perspiration and discomfort, especially in individuals who find it hard to regulate body temperature.

The issue of temperature regulation in FC seating has been long-standing and is a problem for all manufacturers. Some practitioners have started to report techniques designed to decrease the temperature and humidity experienced by the user. However, there is a lack of evidence to support the effectiveness of these seating modifications. This study investigates the relationship between different modifications made to the FC seating and the measurable temperature at the seating interface. The aim is to finally incorporate the most effective techniques into WestMARC's FC seating.

A draft standard exists for the measurement of sensible moisture dissipation characteristics of cushions (ISO 16840-11). The complexity and cost of such measures and the remaining errors in the technique indicate that it is not yet a feasible method of shaping the design of FC seating. As there is typically a reasonable correlation between temperature and sensible moisture we focused on exploring effects of different designs on temperature only.

Two FC contoured seats were manufactured for a normal subject. FC1 was manufactured as per the current standard operating procedure and FC2 was manufactured with vents cut into the foam. Two vents travelling upwards from the posterior superior iliac spines at a 300 angle from vertical, and two vents travelling anteriorly away from the user's groin (cut into the pommel of the cushion) at 300 from horizontal. For both seats, thermistors were affixed at Ischial tuberocities, groin, sacrum and mid thoracic regions of the cushion/user interface. There was also a thermistor measuring ambient temperature which was maintained at 30 degrees C +/- 1degree C. A distance of 25mm +/- 2mm was maintained between each funnel edge and each thermistor at the sacral and groin positions. Both FC seats were tested with 3 different types of commonly used covers giving 6 test samples.

A single healthy human subject was placed in each sample for a 30 minute period. The mean temperature over the last 5 minutes of each test was recorded for each thermistor. The temperature of each sample was allowed to reduce to ambient temperature before re-testing. This was repeated 5 times with SD of temperature measurements noted. The data will be analysed in terms of the measurements repeatability and sensitivity to modifications that are subjectively reported by clinicians as effective.

At the time of writing this abstract (February 2014), the measurement equipment and protocol have been developed and the sample seats have been manufactured. Data collection and analysis is planned for March

and early April allowing time to produce a poster in time for PMG NTE.

Discussion
This study is a feasibility study investigating if simple temperature measurements can be used to meaningfully shape the design of FC seating.

Measurement of interface temperature with FC users is highly variable. Subjective feedback from users can also be unreliable. Despite this clinicians report that they use different types of fabrics or vents to control temperature and excessive perspiration in FC seating. This study will investigate if the temperature measurement protocol developed using normal subjects can be sufficiently precise and sensitive to any of the commonly used interventions.

If the measurement protocol is shown to be effective then it can be used to investigate more novel design changes to contoured seating.

Correspondence details
Scott Chalmers
WestMARC
Southern General Hospital
1345 Govan road
Glasgow
G51 4TF

Email: scott.chalmers@ggc.scot.nhs.uk

P6

ARE WE MAKING WHAT WE'RE MOULDING?

Presenter: Sarah Ward

Summary
A 3D shape comparison study to investigate the accuracy of bespoke seating systems

Aims and Objectives
Aim:
To quantify the accuracy of the digital seating process and identify areas where accuracy could be improved.
Objectives:
- Determine the accuracy of our current manufacturing techniques
- Identify trends in post manufacturing modifications

Background
Our department currently produces custom contoured seating solutions by moulding the individual in their optimum seating position using vacuum consolidation bead bags. A white light scanner is used to capture the 3D surface geometry of the mould and the data is processed in a CAD/CAM Computer Aided Design/Manufacture package to design tool cutting paths which are sent to a Computer Numerical Controlled (CNC) machine. The moulded shape is carved out of foam blocks and is assembled ready for a client fitting.

Previous work has quantified the accuracy of the scanning process, however the accuracy of the whole process was not known. Also it had been recorded in a recent audit that clients were often requiring more than 1 mid-fit appointment (that is where the cushion is trialled and modified) before the final cushion was issued to the client. This raised the questions of whether or not the manufacturing process is accurate and what post manufacturing modifications are we applying.

Testing
The 3D surface geometry of the vacuum consolidated bead bag mould, the post CNC assembled cushion and the final cushion at issue to the client was captured using the 3D white light scanner. This was performed for a range of seating formats i.e. base cushion, back support and full seat cushions. All cushions (total of 8) were made from one of two polyurethane foams which varied in density and viscoelastic property. Standard cutting parameters were not altered during the study.

The scans were compared using the Geomagic shape comparison software which provides a 'best fit alignment' of similar shapes and allows a 3D comparison of those shapes. Results are displayed numerically and graphically as a surface contour plot.

Results – comparing initial mould to post CNC cushion:
The total mean deviation of all cushions was 3.4mm, SD 1.3mm. The maximum deviation of all cushions ranged from 13mm to 39mm. From visual inspection of contour plots, maximum deviations were found to be at the edges of cushions where they had been hand cut out of foam blocks. These sections are not in contact with the client and, although are important for seat interface, are not clinically significant. There were two cushions which displayed exceptions to this. The first presented a maximum deviation of 34mm at the base cushion thigh support due to an undercut when machining, and the second presented a 39mm deviation due to the misalignment of two cushion components.

95% of data points for all machined cushions were within 10mm of the moulded shape, with the exception of the previously mentioned misaligned mould (85% < 10 mm deviation) and a second base cushion (90% < 10mm deviation).

Comparisons of scan data for the initial cushion shape to that of the cushion at final issue are currently being processed.

Discussion

Results from this study indicate that the whole manufacturing process is sufficiently accurate for the manufacture of bespoke seating systems. However, the acceptable tolerance is debatable, and will invariably depend on the client's needs in terms of comfort, function, posture and skin integrity. It may be beneficial for clinicians to determine key areas where tolerance is particularly important.

The largest inaccuracies in manufacturing do not arise during machining but instead originate from the design of the tool cutting paths within the CAD/CAM software, specifically when the shapes to be cut are split in the software package and positioned within the designated parameters of the CNC machine. Positioning of shapes needs to be optimised to prevent undercuts, due to limitations of the 3 axis CNC machine. However, undercuts are not always avoidable especially when dealing with more complex shapes. The second cause of inaccuracy identified by a single case within the study was due to misalignment of back and base seat components.

A similar audit is being performed in a second REU, who employ the same manufacturing technique. This collaboration and comparison of results will help improve manufacturing methods which may inform other wheelchair seating services.

This work has provided some quantification of the accuracy of the whole digital seating process and has highlighted specific areas of attention required at the computer processing and assembly stages of the manufacturing process. This work has also demonstrated the value of using this 3D comparison tool to audit and evaluate custom contoured seating manufacturing processes.

Correspondence details
Sarah Ward
Rehabilitation Engineering Unit
Medical Physics & Clinical Engineering
Specialist Rehabilitation Centre
Morriston Hospital
Swansea
SA6 6NL

Email: sarah.ward2@wales.nhs.uk

INTEGRATION OF CAD / CAM MANUFACTURING INTO AN EXISTING CUSTOM CONTOURED SEATING CLINICAL AND MANUFACTURING WORKFLOW

Presenter: Lee Morris

Summary
This project involved the integration of a bespoke CAD/CAM seat manufacturing system into the Consolor Ltd custom contoured seating clinical workflow. The areas covered include changes to the clinical and manufacturing processes and logistics, 3D laser scanning, including benefits gained and challenges encountered.

Aims and Objectives
To improve Consolor Ltd's clinical seating service through the use of CAD/CAM manufacturing processes by providing the following benefits:

- More efficient use of clinic time
- Faster turnaround of work by improving logistics
- Improved correlation of captured seat shape to finished seat shape
- Improved sub-contract manufacturing ability
- Future potential for automatic generation of fabric patterns for manufacture of seating covers

Background
Consolor's clinical seating specialists work remotely from the manufacturing workshops. Consolor also completes subcontract seat manufacturing for clinicians and seating companies that have the skills to record best-corrected seated posture, but lack manufacturing capability.

After creating a plaster cast it needs to be dried for several days, packaged, then shipped to the workshop. This gives rise to problems of storage, turnaround time, and risk of loss or deformation of casts during transit. At the workshop these plaster casts are placed into a manual 3D pantograph milling machine to produce foam seating, or are used directly as positive moulds to produce firm seating.

Consolor has commissioned a full digital seating system workflow consisting of handheld 3D scanners and a 7-degrees-of-freedom industrial robotic arm to carve foam seating, or carve positive moulds over which to form firm seating. Scans can be safely emailed to the workshop from the assessment and the finished seating will more closely match the originally captured best-corrected seated posture.

Technique
Consolor has independently sourced and integrated the hardware and software that make up its bespoke digital custom seating capture and manufacturing system. A 7-degrees-of-freedom industrial robotic arm and cutting tool was specified and sourced, custom software was developed to process scans and generate cutting tool paths. Easy to use handheld digital scanners were sourced and tested. All parts of the system have been integrated into a streamlined clinical, logistical, and manufacturing workflow.

Clinical Detail
Plaster casting in clinic can be messy, slow and back aching. There are risks, costs and time delays associated with storing, drying and shipping the casts. There are potential sources of human error in the manual carving of the seating systems. This new digital system solves many of these problems. The final seat is more accurately reproduced from the original negative moulded shape; this can be proven by scanning the seat and comparing with the original scan of the best-corrected posture. It is also possible to compare new seating with existing seating in clinic, and so track progression of growth or changes in posture over time.

Testing
A series of corrected postures were moulded using a bean bag and vacuum consolidation technique, the firm temporary seats were scanned and then plastered. Existing manual methods were used to produce a seat from the plaster cast, and the robot was used to produce a seat from the scan. The two finished seating systems were once again scanned, and then compared with each other and the original scan. In all cases the robot produced seats that more accurately matched the original captured seating shape.

Results
Consolor has successfully integrated and transitioned to a bespoke and fully digital clinical and manufacturing workflow. This has streamlined the clinical, logistical and manufacturing processes. Assessments can be cleaner as well as quicker or more precise. Risks associated with drying, storing and shipping plaster casts have been eliminated. The finished seating system more accurately reproduces the originally captured seating shape.

Discussion
Consolor has successfully integrated and transitioned from a traditional manufacturing process to a bespoke and fully digital clinical and manufacturing workflow process.

The primary aims and objectives of the project have been met, but further work is required to make full use of the system. This includes:

- Further develop Consolor's existing subcontract seating system manufacturing service to lower the cost of entry for clinicians and seating companies that have the skills to record best-corrected seated posture, but not the resources to manufacture the seating. This may take the form of a seating-service-in-a-box, which would include a hand-held 3D scanner and laptop, moulding bags, adjustable wheelchair, and appropriate training.
- Developing an alternative to moulded and Lynx / Matrix seating systems so that the system can produce all prescribed seating, whilst maintaining the clinical outcomes of such systems.
- Develop and integrate automated seat cover pattern generation and fabric cutting using captured 3D data to streamline the manufacture of custom contoured seat upholstery covers.

Correspondence details
Lee Morris
Consolor Ltd
188-194 Spring Road
Bournemouth
Dorset
BH1 4PX

Email: lee@consolor.co.uk

APPROXIMATING THE POSITION OF THE ISCHIAL TUBEROCITIES IN CBM MEASUREMENTS USING PHYSICS SIMULATION

Presenter: Adam Partlow

Summary
Cardiff Body Match (CBM) measurements record the shape of a body in a seated position. An algorithm has been designed to automatically locate the position of the ischial tuberocities using physics simulation. This paper presents the algorithm and the results of the testing completed at Cardiff and Vale University Health Board (UHB)'s Rehabilitation Engineering Unit (REU).

Aims and Objectives
The position of the ischial tuberocities when in a seated position can be used to determine the orientation of the pelvis. Recording this information can inform a clinical engineer as to what shape a custom contoured seat should be or used to monitor the progression of musculoskeletal conditions relating to the pelvis. This study aims to develop an algorithm to automate the recording of the pelvis's orientation.

Background
Cardiff and Vale UHB's REU perform clinical assessments on clients with neurological, musculoskeletal and/or other conditions that result in limited movement, complex body shapes and poor posture. Some data collected at a clinical assessment is subjective and is susceptible to inter-observer errors. Using Cardiff and Vale UHB's REU's CBM shape sensor it is possible to capture the shape of a client's body. The shape data captured using the CBM shape sensor can be analysed and anthropometric measurements can be extracted from the measurements.

A previous algorithm that was designed to extract pelvis features from CBM measurements performed poorly when a CBM measurement contained a pelvis that was not parallel to the front of the CBM shape sensor. A new approach was tested using physics simulation to locate the most significant clusters which would contain the position of the ischial tuberocities. This technique locates the position of the ischial tuberocities which can be used to calculate the orientation of the pelvis and the sacral region of the spine.

Technique
The algorithm was developed in C++ and using rigid body physics calculates the path of a rolling sphere. The simulation places spheres at uniform and random intervals on a 3D surface which has been constructed using CBM measurement data. The resting points of the spheres are stored, and through cluster analysis the two most significant clusters are denoted as the position of the ischial tuberocities. The 3D positions of the centroids of the two most significant clusters are used as the estimated positions of the inferior median of the ischial tuberocities; from these locations the pelvis's orientation can be calculated.

Clinical details and preliminary results
The outputs from the algorithm can be used to monitor the progressions of a client's musculoskeletal condition over time and inform clinical engineers as to the position of a client seated in the CBM shape sensor. Further testing of the algorithm is planned through a clinical trial whose participants will be clients of Cardiff and Vale UHB's REU.

Testing
The algorithm was tested by capturing measurements in the CBM shape sensor of people with low complexity musculoskeletal conditions or no musculoskeletal conditions. The positions of the ischial tuberocities at the time the CBM measurement was captured and were recorded. The proximity of the ischial tuberocities output by the algorithm were compared to those captured in the CBM shape sensor and are presented in this paper.

Discussion
The results show that the algorithm is able to correctly identify the locations of the ischial tuberocities. This facilitates the recording of the pelvis's orientation to a high degree of accuracy and repeatability. The algorithm can be used to objectively measure the position of the ischial tuberocities; eliminating the inter-observer errors which can be associated with different clinicians performing the same measurement.

When a seating assessment/review is performed the orientation of the pelvis is recorded. If the same client is then measured after a period of time has elapsed it is possible to quantify the effect that the client's care has had on their pelvis's orientation, and determine whether the care has resulted in improved or worsened posture.

The performance of the algorithm was validated using subjects with low complexity musculoskeletal conditions or no musculoskeletal conditions. In order for the algorithm to be applied to the wider client base of Cardiff and Vale UHB's REU a clinical trial with participants who exhibit severe musculoskeletal conditions is required.

The positions of the ischial tuberocities and the orientation of the pelvis can be used as features for input into a knowledge based engineering system. The system is being developed to aid clinical engineers in the manufacture of custom contoured seats for clients with severe neurological and musculoskeletal conditions that result in poor posture. The custom contoured seats will promote improved function and comfort levels and often provide therapeutic benefits such as improving posture.

Correspondence details
Adam Partlow
Faculty of Computing
Engineering and Science
University of South Wales
Pontypridd
CF37 1DL.

Email: adam.partlow@southwales.ac.uk

P9

ENABLE FAMILY INDEPENDENCE WITH SEATING

Presenter: Russ Mears

Summary
To highlight the importance that seating can have on a disabled individual's quality of life and independence, even when it's not being used as a traditional form of mobility.

Aims and Objectives
The challenge was to develop a seating system that would allow Richard to independently care for his baby boy. Richard wanted to be able to care for his son within the home environment; this would include feeding, transferring in and out of the cot, and moving to the changing table.

Background
Richard was born with a condition which left him without lower limbs, so that he lives with a pelvis only. As a child he was provided with a manual wheelchair to enable him to mobilize independently. In his early teens he was given a custom made power chair with a hi/lo function, which was capable of in and outdoor use. This is the only wheelchair provision that Richard has required over the years. In adulthood Richard opted for prosthetic limbs and still uses these for everyday life outside with the aid of walking sticks. These have also given Richard the freedom of driving independently.

Indoors, Richard rarely uses his prosthetics and he still uses the power chair he was given during his teens for its hi/lo function enabling him to access the food preparation and cooking areas in the kitchen. Apart from that, Richard is very active and has tremendous upper body strength enabling him to transfer independently throughout their ground floor flat.

Richard lives with his wife and they were due to have their first baby two months after my first meeting. Richard was aware that he would need some alternative support to ensure he would be able to lift the baby independently and safely.

The main objectives of this piece of equipment were to allow Richard to have a range of movement, while maintaining a stable and safe position, for example leaning forwards with both arms free. This would enable him to hold his baby securely whilst placing him in his cot or on a changing table. We gave him lateral and anterior support thus freeing both arms for these activities in the form of a bespoke, custom made moulded seating shell. This was mounted on to an electrically operated indoor hi/lo base with the seating shell positioned in an anterior tilt as its normal and functional operating position. When the electric rearward tilt was engaged it would then bring the system back to a neutral upright position. Across the laterals was fitted a padded 40mm Velcro securing strap giving security while tilted forward.

Using the equipment, Richard was able to care for his son independently. He is now self-sufficient and has the ability to place his son in his cot, reassure his son during the night if needed, and also transfer him from the cot to the changing table. All of these activities are performed at various height levels with easy use of the electric hi/lo function of the base. This equipment has given Richard a full and active role at such a demanding time in their family life.

Discussion
Professionals need to ensure they use a holistic person centred approach when assessing an individual for a piece of equipment. Richard's case highlights how a simple but effective piece of equipment can be designed to meet the individual's needs as a result of a good understanding of what the individual expected and wanted to achieve through the use of the equipment. It could have been easy for us to fall into the trap of dismissing the needs of Richard and his new-born son by not giving the problem our full attention. We could have ended up just suggesting that a standard piece of equipment, such as his existing powered wheelchair, be used to perform the simple but demanding and potentially unsafe activities. But with an open mind and a blank canvas

to work with it was possible to enable Richard and allow him to carry out normal parenting tasks, with increased safety.

Correspondence details
Russ Mears
Consolor Ltd
188-194 Spring Road
Bournemouth
Dorset
BH1 4PX

Email: russ@consolor.co.uk

MEASUREMENT OF EMG SHOULDER MUSCLE ACTIVITY IN ONE ARM DRIVE WHEELCHAIRS: A COMPARISON OF CONTEMPORARY ONE ARM DRIVE WHEELCHAIRS

Presenters: Lucy Redhead and Anne Mandy

Summary
Hemiplegic users are particularly vulnerable to upper limb injury. Research exploring shoulder muscle activity during manual wheelchair use has not included one arm drive wheelchairs. This study measured muscle activity in non-disabled subjects in six muscles around the shoulder whilst propelling different one arm drive wheelchairs around an indoor circuit.

Aims and Objectives
To measure muscle activity using EMG in Biceps, Triceps, Anterior Deltoid, Posterior Deltoid, Infraspinatus and Pectoralis Major during propulsion of the same three different one arm drive wheelchairs. The objective was to determine which wheelchair generated the least amount of muscle activity during propulsion.

Background
Manual wheelchair propulsion is known to be an inefficient means of ambulation and associated with high a prevalence of upper limb injuries occurring from a combination of repetitive movements, heavy loads on the extremities, upper limb weakness and inefficient propulsive technique. Hemiplegic users are vulnerable to upper limb injury because of being reliant on only one arm for propulsion. Currently the most common one arm drive manual wheelchairs include the ratchet arm/lever-drive mechanism, the dual handrim mechanism and the Neater Uni-wheelchair. Lever arm design involves a pushing/pulling action on the end of a lever mechanism. This design usually has a fixed mechanical advantage, the ergonomics of simultaneous propulsion and steering can be awkward, and the operation of the brake is not intuitive. The dual hand rim has two hand rims mounted on the same side of the wheelchair. Propulsion involves gripping and rotating both rims at the same time in order to move forward in a straight line. This can be difficult for users with a small hand span or with impaired hand function. Moreover, steering and propulsion cannot be actuated simultaneously, and braking via the dual handrim is more difficult than with a standard wheelchair since the user must simultaneously grasp both handrims to avoid turning. For a large number of users, the overall ergonomics of operation are not efficient.
The Neater Uni-wheelchair has been designed specifically for hemiplegic users. It comprises of an Action3 wheelchair to which novel propulsion and steering kit is attached enabling the user to steer with the footplate, and propel the wheelchair with only one handrim. The kits can be attached to either side for use by either right or left handed users. Current research suggest that the Neater Uni-wheelchair is ergonomically more efficient to drive and preferred by users in both a laboratory setting [1] and in a simulated activities of daily living setting [2]. Users' experiences of this wheelchair in their own homes [3] produced four key themes of: increased user independence, ease of use and manoeuvrability, usefulness and increase in activity [3]. Recent work exploring vertical reaction forces under both buttocks indicates that the dual handrim wheelchair produced the greatest force under both buttocks. The work suggests that the Neater Uni-wheelchair may be a viable alternative to current one drive provision.

This study explored shoulder muscle EMG activity in 3 wheelchairs with a foot steering attachment: A Neater Uni-wheelchair, an Action 3 wheelchair and a lever drive wheelchair. Activity was recorded in straight running, cornering and over different surfaces.

The lever drive produced the greatest levels of activity in Biceps and Pectoralis Major over mats and during cornering. The Neater produces the least levels of activity in Biceps and Pectoralis Major over mats and during cornering. The Action3 produces the greatest levels of activity in Triceps during straight running. This work may have implications for rehabilitation teams' wheelchair prescribing.

Discussion

The activation and involvement of different muscles again reflects the different type of effort required to propel the different wheelchairs. The evidence suggests that the lever drive is the least efficient to propel and the Neater Uni-wheelchair generated the least muscle activity during cornering and over mats. The Neater Uni-wheelchair produced the lowest levels of activity in two muscles which may be as a result of the differential in the rear wheel. The differential enables a single pushrim to drive both rear wheels equally resulting in the wheelchair moving in a straight line with steering that can be employed as required. It also ensures that the load on the pushrim stays constant whatever the direction of steering is. The evidence would suggest the need to replicate the study in a user population is warranted.

Correspondence details

Dr Lucy Redhead
Senior Lecturer
School of Health Sciences
University of Brighton
Robert Dodd
49 Darley Road
Eastbourne
Sussex BN20 7UR

Email: l.redhead@brightonac.uk

P11

3D SKELETAL REPRESENTATION OF SPECIALISED SEATING DATA

Presenter: Michael Voysey

Additional authors: Janusz Kulon, Adam Partlow, Colin Gibson, Paul Rogers

Summary
The body shape measurement is vital in determining the optimum design of custom-contoured seating. Research commenced to produce an interactive 3D model of a human skeleton. Its purpose is to visualising the relationship between custom contoured seat shape and musculoskeletal deformities, aiding clinicians in visualising and communicating a client's posture.

Aims and Objectives
To produce an interactive 3D computer model of a human skeleton that can be used by clinicians to record and communicate a patient's particular posture. The model will be used in conjunction with the Cardiff Body Match (CBM) system, to visualise the relationship between custom contoured seat shape and musculoskeletal deformities. The software tool produced will interface the model with the CBM system and enable visualization of the clinical data.

Background
Cardiff and Vale University Health Board's (UHB's) Rehabilitation Engineering Unit (REU) produce custom contoured seating systems. Clients with severe musculoskeletal deformities require engineers with specialized skills to produce a seat that will accommodate shape; reducing pressure sores and possibly improving posture. The custom contoured seating systems are produced either by manipulating the seating material into an appropriate shape for a particular client's form (e.g. Bead Seat Technique) or by taking an impression of the client's 'shape' using body shape measurement systems such as CBM or scanned bag [1][2].

Custom contoured seating design methods involve a long and laborious procedure. After the seat geometry has been carefully designed and optimised it is recoded on to a computer. It is difficult to infer and visualise a client's posture from the recorded clinical data, especially in the case of clients with complex body shapes. Such visualisation would be very useful from the clinical perspective; it would assist clinicians in analysing and learning from past seating designs, monitoring the progression of a client's musculoskeletal condition, promoting function and the comfort of the individual. In order to assist the clinical engineers in visualising complex seated postures from the CBM measurements and to investigate the relationship between seat shape and musculoskeletal deformities, an interactive 3D computer model of a human skeleton has been developed.

Technique
The interactive 3D model was developed using 3D CAD package SolidWorks, combined with object-oriented API® programming interface coded in C#. The model supports movement and deformation of body parts both in the coronal and sagittal planes. The dimensions and description of anthropometric measurements used in the model were based on ISO-7250-1:2008 standard. The human body was partitioned into several parts (head, arms, legs and spine). The spine contains 24 vertebrae representing the cervical, thoracic and lumbar regions. Each vertebrae dimension is based on a percentage from the spine length, each vertebrae being adjustable to different angles [3]. To move the model into specific positions, Denavit-Hartenberg inverse kinematics was used to correctly place body parts. For example, placing a foot at a certain x-, y- and z-location requires the algorithm to calculate the transformation matrices in order to determine the position and orientation of hip and knee angles along the hierarchy.

Clinical details and preliminary results
REU has a large database of hundreds of client shapes dating back to 1996 obtained via the CBM. These clients have a wide range of neurological, postural and musculoskeletal conditions (e.g. kyphosis and lordosis). An interactive 3D model is capable of representing the client's seated posture captured in the CBM system corresponding to different musculoskeletal conditions and postural characteristics. The prototype has two

modes of operation - automatic and manual. In automatic mode the CBM data is processed by the algorithm to produce the visual representation of the seated posture. In manual mode the model can be manipulated through the user interface. Preliminary testing of the model has been completed and presented to clinical engineers who were very enthusiastic about the project's potential.

Discussion

In order to test the validity of the 3D model different postures were recreated in a series of control experiments. The known positions were captured using the CBM system and recorded photographically. The control data include positions such as: normal sitting with minimal pelvic obliquity and a straight spine; subject leaning forward simulating different degrees of posterior displacement of the thorax relative to the pelvis; subject leaning to the left and right with slight torsion of the trunk, with as little pelvic obliquity as possible but displacing the shoulders laterally thus creating lateral spinal curvature.

Each time the control postures were captured in the CBM system the anthropometric measurements were also recorded, including pelvic orientation and the position of the anatomical landmarks.

The shape information from the CBM system in the form of back and seat impression, together with the anthropometric data, were subsequently processed by the bespoke feature extraction algorithm and input into the model. The preliminary findings from the control measurements showed that it is possible to visualise client postures through the 3D model. The user can separately manipulate the model to simulate different postural conditions and analyse the relationship between the seat shape from the CBM and its 3D anatomical representation.

More work needs to be done to improve the accuracy of the model by increasing the number of joints in the thoracic and lumbar regions and to understand the trade-off between the complexity of the model, redundancy of the system, and the efficiency of determining a posture.

References

Kulon, J., Partlow, A., Gibson, C., Wilson, I. and Wilcox, S. 2014. Rule-based algorithm for the classification of sitting postures in the sagittal plane from the Cardiff Body Match measurement system. *Journal of medical engineering \& technology,* 38 (1), pp. 5--15.

Partlow, A., Gibson, C., Kulon, J., Wilson, I. and Wilcox, S. 2012. Pelvis feature extraction and classification of Cardiff body match rig base measurements for input into a knowledge-based system. *Journal of medical engineering \& technology*, 36 (8), pp. 399--406.

Busscher, I., Ploegmakers, J., Verkerke, G. and Veldhuizen, A. (2010). Comparative anatomical dimensions of the complete human and porcine spine. *European Spine Journal*, 19(7), pp.1104--1114.

Additional authors: 1Kulon J, 1Partlow A, 2Gibson C, 2Rogers P
1Department of Computing & Mathematical Sciences, University of South Wales
2Cardiff and Vale UHB – Rehabilitation Engineering, Rookwood Hospital, Cardiff

Correspondence details
Michael Voysey
Department of Computing & Mathematical Sciences
University of South Wales

Email: michael.voysey@southwales.ac.uk

Mailing Address:
J448 University of South Wales
Pontypridd
CF37 1DL

P12

COMPARISON OF WHEELCHAIR PROVISION FOR REHAB PATIENTS DISCHARGED IN 2012 AND 2013 FROM THE NATIONAL SPINAL INJURIES CENTRE.

Presenter: Hannah Proctor

Summary
A comparative audit of the wheelchair provision for rehabilitation patients who had sustained a new spinal cord injury, discharged in both 2012 and 2013 from the National Spinal Injuries Centre (NSIC).

Aims & Objectives
In 2012 an audit was carried out to ascertain what types of wheelchairs patients were discharged with, if they were interim or permanent, and which wheelchair service provided the equipment. A comparative study is now being completed to see if the trend of provision remains the same, or if more suitable equipment is being provided for our patients on discharge by their local wheelchair services.

Background
There has been a large amount of research highlighting the need for appropriate wheelchair provision to meet an active user's functional and postural needs, to help maintain skills and to prevent secondary complications, including joint degeneration and pain.

Wheelchair provision affects quality of life, health and well-being, and is important in facilitating social inclusion and improving life chances (Out and About - Wheelchairs as part of a whole systems approach to independence, 2006).

All of the current research highlights the need for appropriate, lightweight wheelchairs being provided for active wheelchair users to maximize function and independence.

But are we meeting the needs of this particular client group and communicating their needs clearly enough to the wheelchair providers to ensure that research evidence and standards are being met?

In 2012 we found that 47% of our patients were discharged with interim equipment as their wheelchair service was unable to meet their clinical need on discharge, they wanted to perform their own assessment of the patient or suitable equipment could not be provided in time for discharge.

Within an average year the NSIC can be dealing with approx 50 different wheelchair services. There was also a large discrepancy about what types of wheelchair's, rigid v's folding and wheelchair models, that are being provided by different wheelchair services, even within the permanent rigid frame provision for active users.

Data is currently still being collected for 2013 patients through the retrospective audit of their discharge reports: the type of wheelchair provided on discharge, if interim or permanent; what long term provision is and which wheelchair service is providing the equipment. A comparison will be made to see if provision has changed in the last year, what types of wheelchairs are tending to be supplied for active users and, from our service point of view, how often we are able to get permanent provision provided for discharge, or if we are continuing to be reliant on interim equipment from the wheelchair services.

Discussion
Ideally we want to be minimizing the number of interim wheelchairs being provided, particularly for active users, as there is a large risk of deskilling, reduction in independence and potential psychological impact. Young, independent users want to be returning to work, driving, caring for their children, being active in their local community etc. To do this they need to have optimal, lightweight wheelchairs which meet their postural and functional needs.

With a number of patients we often don't know their long term provision, as they are waiting for an appointment from their wheelchair service after discharge home, and also how long they are then having to use interim equipment for, hence leading to the risks stated above. We ideally want to be avoiding this and having appropriate equipment ready for discharge or having assessments earlier prior to discharge. There also continues to be a large discrepancy between the types of wheelchairs being provided by the different wheelchair services, and this urgently needs to be considered in the future of wheelchair provision nationally for active users to prevent the ongoing "postcode lottery" that currently exists.

References

Spinal Cord Med. 2005; 28(5): 434–470.Preservation of Upper Limb Function Following Spinal Cord Injury. A Clinical Practice Guideline for Health-Care Professionals, Paralyzed Veterans of America Consortium for Spinal Cord Medicine

Rose, L. & Ferguson-Pell, M. 2002a, Wheelchair provision for people with spinal cord injury: 1. *British Journal of Therapy and Rehabilitation*, vol. 9, no. 10, pp. 392-400.

Rose, L. & Ferguson-Pell, M. 2002b, Wheelchair provision for people with spinal cord injury: 2. *British Journal of Therapy and Rehabilitation* vol. 9, no. 11, p. S11-S16.

Correspondence details

Hannah Proctor
Advanced Physiotherapist
Physiotherapy Department
National Spinal Injuries
Stoke Mandeville Hospital
Mandeville Road
Aylesbury HP21 8AL

Email: Hannah.proctor@buckshealthcare.nhs.uk

P13

REDESIGNING THE WHEELCHAIR SERVICE FOR CHILDREN IN CROYDON

Presenter: Sarah Vines

Summary
This is a service paper, combining the findings of an MSc Management and Leadership in Healthcare dissertation project regarding developments in wheelchair services for children, and the experience of implementing a version of *Child in a Chair in a Day* in a NHS wheelchair service.

Aims and Objectives
The study aimed to recommend a suitable model of service for children and their families in Croydon. Its purpose was to understand the background and drivers for change, to share the experience of other service providers and to understand the views of stakeholders in order to inform the recommendations. In tandem a new service model was trialled. This paper reflects on the challenges and successes of this model.

Background
NHS wheelchair services for children have come under criticism and there had been little evidence of change. In 2013, a CQUIN target was implemented by the Department of Health to encourage change. Within Corydon Wheelchair Service there was a desire and a need to reorganise service for children. As a result two projects were undertaken, an MSc dissertation and a service trial.

Initial research showed that published information from NHS wheelchairs regarding service development is limited. This work was motivated by a desire to share and discuss practice.

Research Aims
The main research questions of the MSc project were

1. To understand the motivating forces behind the changes to children's wheelchair services
2. To identify new models of wheelchair services for children in England
3. To explore what parents and other stakeholders needed from Croydon wheelchair service
4. To recommend a model of service provision that best meets the needs of children within Croydon Health Services

The research was conducted via a literature review in combination with a qualitative survey approach. Stakeholders included wheelchair services, paediatric health and social care professionals, and parents of wheelchair users. It had been intended to undertake a number of in-depth interviews with wheelchair services; however it was only possible to complete one.

In April 2013 a new model of buggy/wheelchair clinic was initiated with the support of several wheelchair suppliers and our maintenance contractor. Based on data and trends collated over previous years a version of *Child in a Chair in a Day* was created. Children were able to be assessed and, where appropriate, be provided with equipment on the same day.

The literature indicated that the voluntary sector has been a principle driver for change. It also identified a range of parental requirements including: access to a range of equipment at assessment, being involved in decision making with regards to their child's wheelchair/buggy, and short waiting times for assessment and provision of equipment. The literature also suggested that professionals can find involving service users in decision-making challenging.

Results

As three groups were questioned only key areas of the data are presented.

The service surveys showed that 40% of wheelchair services that responded had redesigned principally as a result of the CQUIN target. Of these services only one service agreed to an in-depth interview. This produced practical suggestions that could be used within Croydon.

The health professional questionnaires raised a range of local issues including telephone access and maintenance support.

The parental responses broadly corresponded with earlier projects citied in the literature in addition to local issues.

Data collection was challenging due to difficulties achieving ethical approval to contact parents and the small number of services that agreed to participate. Due to the wide range of host organisations, some wheelchair services felt it difficult to take part because of competition issues. Despite this, recommendations could still be made.

Discussion

This project demonstrated the key role of the voluntary sector as a driver of change and a facilitator of participation. It also indicated that across a range of exercises parents express consistent views about their children's needs. These needs identified would not be limited to wheelchair services. Parental desire to be involved in decision-making came across most strongly. Support and training may be required to give staff the confidence and skills to do this.

Services were more reluctant to take part than was anticipated which was a concern as it prevented useful sharing of information - essential for small specialised services.

This version of *Child in a Chair in a Day* proved popular with families, reduced waiting times, reduced staffing resources required, and did not increase equipment costs. However it did rely on the ability to predict equipment needs, experienced wheelchair assessment staff, providing a limited choice, excellent administrative support, support from suppliers and maintenance contractor, and the ability to make timely decisions regarding equipment purchase. Close working relationships with paediatric occupational therapy teams were vital, and our stock choice was greatly affected by static seating provision for children attending clinic.

It had not been intended to run the two projects in parallel; however the resulting information provided the service with a great deal of information and experience.

Correspondence details

Sarah Vines
Mobility Services Manager
Queen Elizabeth Mobility Centre
1 Metcalfe Avenue
Carshalton
Surrey

Email: Sarah.vines@qef.org.uk

P14

WHAT CAN WE DO WITH STABILITY MEASUREMENTS?

Presenters: Owen Mills, John Colvin

Summary
Wheelchair stability is a significant consideration in managing risk. Measurement systems have been developed that can be utilised in a clinical setting but there is no clear guidance to aid interpretation. This poster will summarise how WestMARC measures wheelchair stability in clinic and uses their own data to inform their clinical practice

Aims and Objectives

- To describe the method used at WestMARC to measure wheelchair stability
- To present an analysis of stability data gathered
- To compare different patient populations served by WestMARC
- To present guidance provided to WestMARC clinicians on how to interpret stability measurements

Background
When providing a wheelchair and configuring it to optimise the balance of risk and performance, traditional static ramp tests do not provide sufficient information. More sophisticated systems of measurement have been developed but there is no clear guidance to help clinicians interpret the data.

WestMARC assesses stability by calculating theoretical performance metrics (rearward braked tipping angle and front to rear weight distribution) based on geometry and ground reaction forces beneath the wheels.

Technique
The test performed at WestMARC is similar to that used by several other wheelchair services and requires two inputs:

- Five measurements of wheelchair geometry
- Ground reaction forces for the occupied wheelchair in two different orientations

In order to control the accuracy of the measurement system we have developed a standard operating procedure and a clinician competency assessment.

Results and Testing
The test takes approximately 5 minutes to perform. WestMARC focus on two main outputs:

- Theoretical rearward braked tipping angle
- Front to rear weight distribution

By focusing on two key results, the clinical team can develop a good understanding of the data and build their own knowledge of how different configurations perform and the effect that changes have on stability.

For manual wheelchairs, WestMARC staff will focus on rearward braked tipping angle. This gives an indication of the wheelchair's stability in the sagittal plane (high result indicating stable rearward and potentially unstable forward, low result indicating unstable rearward and potentially stable forward). This result gives a clear indication of the stability and manoeuvrability of the wheelchair.

For powered wheelchairs, WestMARC staff focus on front to rear weight distribution. Drive wheel traction is a major consideration for powered wheelchairs where loss of control due to sliding generally occurs before tipping. Measuring front to rear weight distribution allows clinicians to optimise the weight passing through the drive wheels, therefore maximising traction.

Normal data
WestMARC staff typically take stability measurements during the delivery appointment when stability is an identified concern. WestMARC is also building normal data sets for different categories of patients and

wheelchairs where modifications have not been made.

The normal data set is vital in that it allows results for situations where there are stability concerns to be compared with those of a known acceptable population.

Discussion

Wheelchair configuration requires compromise between stability and manoeuvrability. The patient should not be exposed to undue risk, whilst promoting function. A test along these lines provides the clinician (and to a certain extent the patient) with objective information that can aid decision making and provide a convenient, clear record of the effect of changes.

Experience at WestMARC has shown that this test procedure produces reliable, clinically relevant results and there is value in comparing the data for individual patients to normal data sets. The clinical team use information from this work in routine practice to optimise wheelchair configuration.

Correspondence details
Owen Mills
WestMARC
Southern General Hospital
1345 Govan Rd
Glasgow
G51 4TF

Email: owen.mills@ggc.scot.nhs.uk

WEDNESDAY, 9TH JULY 2014

PLENARY SESSION 2

PL2/1

ALL YOU EVER WANTED TO KNOW ABOUT FOAM, BUT WERE AFRAID TO ASK!

Presenter: Dr Craig A Kirkwood

A whistle-stop tour of foam's history, chemistry and mechanics, as used in seating.

Covering latex, polyurethane and polyethylene foams, a taster is given of the complexities involved in the manufacture, testing and clinical characterisation of foams.

A little about everything and not too much about anything, this will be a thought-provoking presentation, hopefully leading you to delve deeper into this fascinating and frustrating area.

Correspondence details
Dr Craig A Kirkwood
Principal Clinical Scientist
Deputy Head NHS Tayside Assistive Technology Service
TORT Centre
Ninewells Hospital
Dundee
DD1 9SY

Email: craig.kirkwood@nhs.net

PL2/2

"UNDER ONE ROOF" – THE SOUTH WALES POSTURE AND MOBILITY SERVICE

Presenters: Mark Inker, Kate Morgan and Keith Roberts

The South Wales Posture and Mobility Service [PMS], provides equipment to c.45,000 wheelchair users in the southern half of Wales.

Political and organisational factors since 2010 have transformed the PMS so that it now has in-house capacity for wheelchair assessment, delivery, collection, maintenance, reconditioning, specialised seating, and bespoke manufacture. This control, critical size, and diverse workforce have afforded both opportunities and challenges for service provision.

This presentation seeks to provide an overview of PMS, and explores the pros, cons and limits of 'doing it yourself'.

Correspondence details
Mark Inker
Project Manager
ALAS
Rookwood Hospital
Llandaff
Cardiff
CF5 2YN

Email: Mark.Inker@wales.nhs.uk

FREE PAPERS

FP5

ADAPTING A ROHO CUSHION:
A CASE STUDY WHICH PROVOKED THOUGHT ABOUT PELVIC STABILITY

Presenter: James Hollington

Summary
This free paper presents a case study of adapting a ROHO cushion in order to increase lateral pelvic stability. The presentation will go on to explore an idea, initiated by the case study, of how we can increase lateral pelvic stability through simple design.

Aims and Objectives
The aim of this presentation is to provoke thought about our practice and seat cushion design when aiming to increase lateral stability at the pelvis, by questioning whether we could better control or stabilise the pelvis with an alternative but simple design.

Background
The case study: a lady with MS required the use of a Roho Quadtro for the pressure redistributing properties of this cushion. However an additional requirement was an increase in stability in order to remove the need for the full depth lateral trunk supports which were not being tolerated. It was decided to cast her base whilst she sat on her Roho to see if increasing the contouring of the Roho would increase her stability.

The cast was scanned, processed and carved from Evezote and placed under the Roho for future use. The result was very successful, significantly increasing her sense of stability and dependency on full depth lateral trunk supports. However, the resultant shape of the Evezote was not as dramatic as anticipated. This shape was therefore analysed to explore the possible reasons for its success.

This case study and further experimentation will be presented. It will also highlight the power of reflecting on successful clinical intervention in order to understand why success has been achieved.

Discussion
It is widely agreed that stabilising the pelvis is critical when aiming to control a person's posture in order to optimise upper body function. Providing lateral stability to the upper body is, in many clinicians' experience, one of their most trying problems to solve. We are constantly adjusting the positioning of lateral trunk supports so that they are high enough to be effective whilst not too high that service users hang off them, and at the same time being padded enough so they're comfortable whilst not being too bulky that they get in the way of arm function. So, looking below this problem area, the problem may be easier to solve in some cases if we start off with better lateral stability of the pelvis.

Present practice, when providing lateral support to the pelvis, is to apply stabilising forces to the thighs via lateral thigh supports. However, in doing this we are not actually stabilising the pelvis. The forces are acting on the femurs which are attached to the pelvis on a freely moving ball and socket joint designed for mobility not stability.

Exploration of the anatomy of the pelvis shows there is little area to provide direct lateral support to its structure. However, through applying forces to the inferior posterior lateral aspects of the pelvis at approximately 45 degrees to the transverse plane and angled at approximately 15degrees from the vertical, can lateral stability of the pelvis be increased?

The case study above and subsequent preliminary experiments suggests this could be an effective strategy in providing lateral pelvic stability.

Correspondence details
James Hollington
Clinical Scientist
Bioengineering
SMART Centre
Astley Ainslie Hospital
Edinburgh
EH9 2HL

Email: james.hollington@nhslothian.scot.nhs.uk

FP6

EFFECTIVENESS OF GRAVITATIONAL BALANCE: A CASE STUDY

Presenters: Rosaria Caforio and Ian Deumayne-Jones

Postural balance and alignment are often difficult to reach for users with severe deformities, but are crucial in respect of clinical and physical implications.

This clinical work illustrates a personalised posture management approach designed to identify and provide an optimal balance and alignment performance. With the use of a modular seating simulator to identify the appropriate combination of body support and gravitational balance in the wheelchair seating system, combined with a planned schedule of intervention and instrumental analysis to provide the optimum: user balance and alignment; pain and pressure sore reduction; breathing and respiratory improvements; increased social participation; a reduction in social cost.

This study details how modular systems allow for better and more efficient cost control, whilst allowing for, and effecting, postural change.

Contact details
Ian Deumayne-Jones
Director
DMS Limited

Email: iandmsltd@gmail.com

FP7

RESEARCH STUDY COMPARING HEAT TRANSFER CHARACTERISTICS OF THREE CUSTOM SEATING MATERIALS

Presenter: Nicola Aburto

Summary
This pilot study compares heat transfer characteristics of MSI, Carved Foam and Lynx. An increase in heat has been shown to lead to an increased risk of developing pressure ulcers. This pilot study aims to give guidance for clinicians when prescribing custom seating for our complex clients, as to which materials transfers the most heat away from the skin surface.

Aims and Objectives
The aim of the pilot study was to compare the thermal characteristics of three custom seating materials Lynx, MSI (moulded seat insert) and carved foam. This information would then be used to establish which material transferred the most heat away from the body and skin surface. Heat is a contributing factor to the development of pressure ulcers. Pressure ulcers are painful for the client and expensive to treat for health services. Seating material choice is key in the prevention of pressure ulcer development.

Background
Immobile and disabled people are less able to pressure relieve. The combination of immobility and postural deformity can lead to localised areas of high pressure. Custom seating is prescribed for clients with complex postures and a high risk of developing pressure ulcers. Custom seating increases the surface area contact, thus reducing the likelihood of localised high pressure areas. Heat is a contributory factor to the development of pressure ulcers and so must be taken into account when prescribing custom seating.

Literature Study: There is currently little research to guide clinicians prescribing custom seating. There are no qualitative research studies for heat transfer characteristics and custom seating materials. Some studies have been performed for mass manufactured wheelchair cushions, but the data from these studies cannot be used for materials such as MSI and Lynx.

Materials and Methods: Temperature data was simultaneously acquired from three RTD (resistance temperature detector) sensors placed under the participants' left and right IT's (ischial tuberosity) and right thigh. Measurements were also taken of the body's core temperature. Six participants (3 males, 3 females, aged 21 to 30, BMI 16.2 to 21.8) sat for 30 minutes in a temperature controlled environment on the three seats (Lynx, MSI and carved foam).

Analysis of data from the sensors using ANOVA and follow up t-tests showed statistical significance ($p<0.05$) for the female group comparing MSI and Lynx. This revealed that for this group Lynx had a lower temperature increase than MSI. The male group had statistical significance ($p<0.05$) when comparing the sensor positions against core temperature measurements for both Lynx and MSI. Statistical significance was also found when comparing the male and female readings for MSI across the sensor locations.

Conclusions

This was a pilot study; from the results the method appears to be sound as statistical significance was found with a small sample size. Further research is required to find definitive conclusions as to which material is cooler and which has the greater heat increase. Changes to the design of custom made seating could improve the heat transfer properties, resulting in benefits for clients in pressure ulcer prevention.

Correspondence details

Nicola Aburto
Hounslow Wheelchair and Special Seating Service
Heart of Hounslow
92 Bath Road
Hounslow, TW3 3EL

Email: nicola.aburto@hrch.nhs.uk

VALIDATING THE MPD 24/7 FORM- TESTING THE RELIABILITY OF MEASURING JOINT RANGES FOR ADULTS WITH COMPLEX POSTURES

Presenter: Kate Parker
Additional authors: Dave Long and Mark Bowtell

Summary
This study investigates the intra- and inter-rater reliability of using the Management of Posture and Disability 24/7 (MPD 24/7) form to measure hip and knee joint ranges of motion (ROM) and pelvic orientation.

Aims and Objectives
The primary aim of this study is to evaluate inter- and intratester reliability of clinicians using visual estimation and recording data using the Neutral-0 method in subjects with severe neurological impairment. The secondary aim is to compare data collected from clinicians who are very experienced in taking ROM measures ('experts') with those who have limited experience ('novices'). The novice clinicians will have recently completed an in-house posture management course.

Background
Specific quantitative data must necessarily be gathered to inform clinical decisions in respect of the prescription of a 'customised' physical management regime, including the prescription of equipment. To this end, an assessment form has been specifically designed to capture the information required, the Management of Posture and Disability 24/7 (MPD 24/7) (Pope, 2007).

A crucial part of the MPD 24/7 is the section concerned with the visual estimation and recording of the passive range of movement (ROM) of the joints. This is a vital part of the examination of individuals with complex disability, the purpose of which is to establish any limitation of the critical ranges, such as hip flexion.

This study is the second part of the validation process of the MPD 24/7 form, the first of which was completed in July 2013. The previous study, 'Reliability of visual estimation (VE) of angles relating to joint ranges of motion in rehabilitation', used drawn angles and photographs of positioned limbs to help define confidence bands for using VE. As a desk based study it was able to gain information from a large number (24) clinicians who regularly use VE, and was able to relate their answers to a gold standard (i.e. the actual angle drawn). The study was presented as a poster at the PMG NTE in 2013.

This follow-on study has been devised in order to provide further evidence of the reliability of using VE; the study will also test the reliability of recording the ranges of motion using the Neutral-0 method. Unlike the previous study, ranges of motion will be captured from participants having a neurological disability and with postural limitations in sitting or lying. As such, a smaller data set will be collected.

The study will be carried out at the National Star College, Cheltenham. Eight students will be assigned to the 'expert' group, and eight to the 'novice' group. Each student will be seen by either two experts or two novices, who will measure and record ten ranges of motion and the orientation

of the pelvis. The process will be repeated the following day.

In order for data to be gathered from a representative group of participants it was necessary to gain ethical approval for research with adults who do not have capacity to consent. A considerable part of this study was therefore to undertake an ethics application through IRAS (Integrated Research Application System); supporting documentation, such as participant consent forms, information forms and consultee declaration forms, were also completed. The study was reviewed and has been given approval to proceed by the South-

Central Oxford Ethics Committee.

Discussion

Data will be collected in June 2014. The results have a potential impact on both current clinical practice and the training in the use of visual estimation and the MPD 24/7. At times, different clinicians examine a patient for appointments before, during and after interventions. Findings relating to the difference between intra-rater and inter-rater reliability will determine whether there are implications for this practice. Results should also allow us to communicate whether the inter-rater reliability is better between clinicians who have many years of experience, or between those who are new to the field.

Data collection will be followed by an intensive period of data analysis in order to facilitate the presentation of findings at the NTE.

References

Pope, P.M. 2007 *Severe and Complex Neurological Disabilities: Management of the Physical Condition*. London: Butterworth-Heinmann

Ryf C, Wymann A. *Range of Motion - AO Neutral-0 Method. 1st Edition ed*.: Thieme Stuttgart, Germany; 1999.

Correspondence details

Kate Parker
Specialist Disability Service
Oxford Centre for Enablement
Windmill Road
Oxford
OX3 7HE

Email: kate.parker@ouh.nhs.uk

ALDERSEA LECTURE 2014

TERESA E POUNTNEY

A presentation by
Donna Cowan and David Porter

Dr Terry Pountney, Research Physiotherapist and Head of Research & Development at Chailey Heritage Clinical Services (CHCS), has recently retired after many years of service.

Terry started her career at CHCS in 1979 as a physiotherapist. She contributed significantly to the early work at CHCS to define levels of ability. Terry's particular area of research interest was the effectiveness of postural management programmes for children with bilateral cerebral palsy and, in 2002, she was awarded a PhD for this work.

In 2003 Terry was appointed Head of Research at CHCS and in 2008 became Director of Research for the Sussex Community Trust. She was successful in obtaining research grants, and worked tirelessly to put together a multidisciplinary research team and develop a portfolio of studies.

Terry has authored several books including "Physiotherapy for Children" and "The Chailey Approach to Postural Management" both of which are used widely by health professionals working in the field of rehabilitation and neurodisability. The Chailey Approach has been translated into several languages.

For a number of years Terry taught on various postgraduate and undergraduate physiotherapy courses at the University of Brighton, the University of Greenwich and at Queen Margaret University College, Edinburgh. She also worked part time as a Senior Research Fellow at the University of Brighton, and supervised various MSc and PhD students.

Terry has acted as a peer reviewer for the Posture & Mobility Group Research Fund since its inception in 2005. She was also an active member of the Chartered Society of Physiotherapy and on the editorial board of the Association of Paediatric Chartered Physiotherapists. In 2009, in recognition of her considerable contribution to the profession, Terry was awarded a Fellowship from the Chartered Society of Physiotherapy.

Terry has been an example to us all through her research achievements and her clinical practice. Her enthusiasm, drive and focus on high quality learning and research has inspired many working in the field of posture and mobility. She has moved the treatment and management of children and young people with complex disability forward, and has made a significant difference to the lives of the young people and their families.

This year's Aldersea Lecture is generously sponsored by Active Design, who have also donated a copy of *The Chailey Approach to Postural Management* – signed by Terry Pountney - as one of the prizes for our Last Man Standing draw at the end of proceedings.

FINAL PLENARY SESSION

PLENARY SESSION 3

Chaired by: Dr Linda Marks

HOW HAS PMG BEEN WORKING WITH THE DEPARTMENT OF HEALTH?

This session enables you to get up to date with what is happening about wheelchair services reform. It includes a presentation of the first PMG commission, and gives a resume of the various strands of work affecting service delivery, which are beginning to come together.

PL3/1

REPORT ON PMG COMMISSION: "SERVICE USERS' VIEWS ON CHOICE IN WHEELCHAIR AND POSTURAL SEATING SERVICES"

Presenter: Jo Goodship

This scoping exercise has explored the issue of 'choice' for users in the provision of NHS funded wheelchair and postural seating services. In a series of focus groups and online consultations, user 'consultants' (recruited via three wheelchair services and one local authority community involvement team) have explained:

- the extent to which they feel they have choice in NHS services at present;
- what is really important to them in terms of choice in wheelchair and postural seating services;
- their awareness of the voucher scheme and how it works; and
- how choice for wheelchair service users could be improved, bearing in mind the financial constraints under which services are operating.

User consultants were also asked about the best methods to employ for a wider, nationwide consultation with wheelchair and postural seating service users. The key findings and themes to emerge from this first, qualitative element of the scoping exercise will be presented to the Conference. Jo Goodship will also outline how these findings will inform the design of a short user-friendly survey instrument on 'choice' which, in the second phase of the scoping exercise, will be piloted with volunteer user consultants.

Correspondence details
Jo Goodship
Admiralty Consulting Ltd
43 Admiralty Tower
Queen Street
Portsmouth
Hampshire
PO1 3GA

Email: jo.goodship@googlemail.com

TARIFFS, COMMISSIONING AND A WHOLE LOT MORE!

Presenter: Henry Lumley, Chair of PMG Strategy & Policy Committee

An overview of what's been happening with regard to commissioning and improving wheelchair services since the 2013 PMG conference, along with feedback from Tuesday's parallel session, PS3: *A visionary glance forwards - what might the future hold?*

Correspondence details
Henry Lumley
Specialty Manager - Rheumatology & Rehabilitation
Bristol Centre for Enablement,
North Bristol NHS Trust
Highwood Pavilions
Jupiter Road
Patchway
Bristol BS34 5SP

Email: Henry.Lumley@nbt.nhs.uk

CPD REFLECTION SHEET

USE THIS PAGE TO HELP REFLECT ON THE SESSIONS YOU ATTEND AT THE NTE

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