ISS

23rd International Seating Symposium

Moving into the Age of Accountability

March 8 – 10, 2007

Buena Vista Palace in the Walt Disney World Resort • Orlando/Lake Buena Vista, FL, U.S.A.

Featuring the Seventh Annual Chris Bar Research Forum
Sponsored by the ROHO Group, Inc.

Review Course on Assistive Technology
Tuesday, March 6, 2007

Pre-Symposium Workshops
Wednesday, March 7, 2007

23rd International Seating Symposium: *Moving into the Age of Accountability*
March 8 – 10, 2007

Sponsored by:

- University of Pittsburgh
  - *Department of Rehabilitation Science and Technology*
  - *School of Health and Rehabilitation Sciences*
  - *RERC on Wheelchair Transportation Safety*
  - *RERC on Telerehabilitation*
- Pittsburgh VA Rehabilitation Research and Development Center of Excellence - Human Engineering Research Laboratories
- Sunny Hill Health Centre for Children
- University of British Columbia
- NRRTS
- RESNA

Course Director:
Elaine Trefler, MEd, OTR/L, FAOTA, ATP
Assistant Professor
University of Pittsburgh
School of Health and Rehabilitation Sciences
Department of Rehabilitation Science and Technology

Co-Director:
Mark R. Schmeler, PhD, OTR/L, ATP
Instructor
University of Pittsburgh
School of Health and Rehabilitation Sciences
Department of Rehabilitation Science and Technology

RST Department of Rehabilitation Science and Technology
School of Health and Rehabilitation Sciences • University of Pittsburgh

Contents

Schedule

General Information

Audience

Assistive Technology Practitioners (ATP)
Occupational Therapists
Physical Therapists
Assistive Technology Suppliers (ATS)
Educators
Manufacturers
People with disabilities
Physicians
Rehabilitation Engineers
Vocational Rehabilitation Counselors
Introduction

Presentations will cover evaluation, provision, research, and evidence-based practice issues in seating and mobility for people with physical disabilities. The symposium will include scientific and clinical papers, in-depth workshops, special topic sessions, poster sessions, and an extensive exhibit hall.

Program Objectives

Identify seating and mobility interventions for people with physical disabilities
Discuss service delivery practices
Explore current research
Understand features and clinical impact of seating and mobility technologies
Materials available in alternate formats upon request.
Continuing Education Credit

The University of Pittsburgh, School of Health and Rehabilitation Sciences awards Continuing Education Units to individuals who enroll in certain educational activities. The CEU is designated to give recognition to individuals who continue their education in order to keep up-to-date in their profession. (One CEU is equivalent to 10 hours of participation in an organized continuing education activity). Each person should claim only those hours of credit that he or she actually spent in the educational activity.

The University of Pittsburgh is certifying the educational contact hours of this program and by doing so is in no way endorsing any specific content, company, or product. The information presented in this program may represent only a sample of appropriate interventions.

1.75 Continuing Education Units (CEU's) will be awarded to individuals for attending 17.5 hours of instruction. CEU's will be pro-rated for those not attending the full program.

Exhibits

The exhibit hall will be filled with commercial products from North America and abroad. There will be ample opportunity to explore technical seating and mobility options.

The public is invited to visit the Exhibit Hall "free of charge" on Friday afternoon from 1:00 to 3:00 PM. You must register at the ISS Registration Desk to receive an "Exhibit Hall Pass". Admission at all other times is for Symposium participants only.

Seating Symposium

Wednesday, March 7, 2007

7:00 AM
Registration Desk Opens (Great Hall Foyer)

6:00 PM
Registration Desk Closes (Great Hall Foyer)

Thursday, March 8, 2007

7:30 AM
Registration Desk Opens (Great Hall Foyer)

8:30 AM
Opening (Great Hall)

Elaine Trefler, MEd, OTR/L, FAOTA, ATP
Assistant Professor
Department of Rehabilitation Science and Technology
School of Health and Rehabilitation Sciences
University of Pittsburgh

Rory A. Cooper, PhD
FISA/PVA Chairman and Distinguished Professor, Department of Rehabilitation Science and Technology
School of Health and Rehabilitation Sciences
University of Pittsburgh
Director and VA Senior Research Career Scientist of the Center of Excellence for Wheelchairs and Related Technology,
VA Pittsburgh Healthcare System

9:15 AM

Sunrise Medical Keynote Address

Change is Inevitable… Direction is Choice

Marilyn Hamilton
Vice President Global Strategic Planning, Sunrise Medical
Carlsbad, CA

10:00 AM

General Session - Papers - Great Hall

Segway Human Transporter - Investigation into Viability as a Mobility Device

Bonita Sawatzky, PhD
University of British Columbia, Vancouver, BC, Canada
The UN Convention on Civil Rights

Pressure Ulcers: More Questions than Answers

Dave Brienza, PhD
School of Health and Rehabilitation Sciences,
University of Pittsburgh, Pittsburgh, PA

11:00 AM

Walk-about Lunch (Included in tuition) Exhibit Hall

12:00 Noon

Interactive Poster Session

Note: Posters will be available for viewing from 8:00 AM through 5:30 PM

Enabling Safe Powered Wheelchair Mobility With Long Term Care Residents With Cognitive Limitations
Rosalie Wang, BSc (OT), PhD Candidate
Pamela Holliday, PhD
Geoff Fernie, PhD
Graduate Department of Rehabilitation Science and Institute of Biomaterials & Biomedical Engineering, University of Toronto, Toronto, ON, Canada, Technology Team, Toronto Rehabilitation Institute; Centre for Studies in Aging, Sunnybrook Health Sciences Centre, Toronto, ON, Canada

Using Qualitative Methods to Characterize Power Assist Wheelchair Users
Sandra Hubbard, PhD, OTR/L, ATP
Michael Stancil
Pete Giacobbi, PhD
University of Florida & N. Florida/ S. Georgia Veterans Health System, Ft. White, FL

The Introduction and the Roles of the Japanese Society of Seating Consultants (JSSC)
Takashi Kinose
Tokyo Metropolitan University, Faculty of Health Sciences; Department of Occupational Therapy, Tokyo, Japan
Hideyuki Hirose, PT, Mech. Eng.
National Rehabilitation Center for Persons with Disabilities, Tokorozawa, Saitama, Japan

1:00 PM

Instructional Courses • Four-Hour Session

(1:00-5:00 PM)

1. Service Delivery: Setting Up and Running a Successful Seating & Mobility Service

Setting up and running a seating and mobility service delivery program presents many challenges. This panel presentation will provide practical information about various successful models around the world.
Over the past 25 years, seating and mobility specialists have created and re-created how services are delivered in line with client needs and funding realities. Seating and mobility service delivery has always posed challenges. As funding has changed, these challenges are magnified. Service delivery has always been time and equipment intensive. Additionally, there can be a dearth of qualified practitioners and suppliers. THIS panel will present various successful service delivery models, including a rehabilitation center-based program, a community-based program, the use of tele-rehab, a “hub and spoke” modes, and an innovative state-funded, community-based model.
This presentation will begin with an overview of the commonalities of any type of service delivery model. This will be followed by survey results of how rehabilitation center-=based programs around the US function.
The unique aspects and challenges of the following models will then be presented:

- A specific rehabilitation center-based program
- Community-based service through a therapist
- The “Hub and Spoke” model in Ireland
- Service Delivery through Telerehab
- An innovative, community (home) based, state-funded program

Documentation for evaluation and obtaining, as well as marketing of services will also be presented. There will be time for discussion after the presentations.

Moderator:
Susan Johnson Taylor, OTR/L
Rehabilitation Institute of Chicago, Chicago, IL

Panel:
Geoff Bardsley, PhD
Tort Centre, Ninewells Hospital, Dundee, Scotland
Teresa Berner, MS, OTR/L, ATP
Ohio State Univ Med Ctr
Chris Chovan, MS, OTR/L, ATP
Rehab Mobility Specialists, Inc, Pittsburgh, PA
Laura Cohen, PhD
The Shepherd Center, Atlanta, GA
Brad Dicianno, MD
University of Pittsburgh Medical Center, Pittsburgh, PA
Ann Eubank, OTR/L, ATP
Permobil, Lebenon, TN (Commercial)
Simon Hall
Central Remedial Clinic, Seating & Mobility Department, Clontarf, Dublin, Ireland
Jean Minkel, MA, PT
Minkel Consulting, New Windsor, NY
Richard Schein, MS, PhD Candidate
University of Pittsburgh, Pittsburgh, PA
Jill Sparacio, OTR/L, ATP, ABDA,
Sparacio Consulting Services, Downers Grove, IL
** Advanced*

2. Clinical Training: Considerations and Equipment Selection Relative to Impairment

The objectives of this session will be to assist the beginning therapist in determining how to gain important assessment data required for the completion of a seating and mobility prescription. Data will then be compiled and compared with client choice and requirements for functionality based on impairments as well as potential areas for maximizing function. This will be a hands on workshop with interaction between participants in reviewing assessment and simulation techniques as well as problem solving and working through case studies to determine best practice, and critical pathways to follow in decision making.

Sheila Buck BSc (OT), Reg (ONT), ATP
Therapy NOW! Inc., Milton, ON, Canada
** Beginner*

3. A Comparison of Custom Molded Seating Systems

Custom molded seating can challenge the clinician/vendor's skills more than any other type of seating intervention. The key to effective molding is a comprehensive mat evaluation, coupled with the knowledge and ability to manipulate the molding bags to create the surfaces that are needed. The technical/mechanical aspects must be blended with solid process and problem solving techniques. It is often times the subtle differences in methods that make the biggest differences in outcomes. The proper foundation, consisting of the machine and its components must be in place. At times during the molding process, bags present with too many limitations. How shapes can be created and fine tuned to match client parameters will be explored. Tricks will be discussed to overcome these road blocks through the use of readily available items often found in a seating clinic/therapy department.
This four hour Special session will consist of several components. First, faculty will present case studies that demonstrate which clients are most in need of custom seating, how shapes can be created and fine tuned to better match client parameters and what technical/mechanical aspects of molding can be used to solve seating challenges.
Next, there will be a presentation of commercial systems that can be used by clinicians and suppliers, to create custom molded seating systems. Finally, there will be an opportunity for participants to share their unique stories in "Contour Land". These will be quick, 'back to back' presentations selected from a casserole of submissions. They promise to be unique and tasty dishes suitable for the adventures palate. Solicitations will be make to dealers and clinicians for 5-6 minute presentations. Persons wishing to participate can communicate directly with Cathy Bazata & C. Kerry Jones who will be coordinating this component of the presentation. Participants must submit presentations in PowerPoint format. For more information contact Cathy or Kerry at cbckj@aol.com

Jill Sparacio, OTR/L, ABD, ATP
Sparacio Consulting Services, Downers Grove, IL
** All*

4. CPT Coding and Reimbursement for Therapy Services

How should I bill for what I just did? Can I use a treatment code with an evaluation code? Do I need to write a treatment plan? Learn the answers to these questions and more! This course will review how to utilize Common Procedural Terminology (CPT) Codes for billing of professional therapy services. Documentation requirements and reimbursement issues for various practice settings, insurances and disciplines will be reviewed. Example scenarios will illustrate the variable use of codes and enhance understanding. Participants will be encouraged to share their experiences of what has been reimbursed and what has been denied in their particular practice setting or region.

Barbara Levy, PT, ATP
CarePartners Health Services, Asheville, NC
** All*

Instructional Courses • Two-Hour Sessions
(1:00-3:00 PM)

5. Configuration, Programming and Application of Head Access with Powered Mobility for Adults with SCI, ALS, MD, and TBI

Therapists need to know how to perform the complex "feature-match" approach of assessment to ensure appropriate selection of both the technology and head access needed to enable adults to use powered chairs even with deterioration or complex diseases. This session will compare and demonstrate various commercially available technologies and through the use of case studies, facilitate the learning of decision making process which can be used for complex clinical needs.

Karen Kangas, OTR/L
Shamokin, PA
** Intermediate*

6. Mobility RERC Report on the State of the Science

In September 2006, the RERC on Wheeled mobility held a state of the science forum to address key issues in seating and mobility research. This was a consensus building forum to address the methodological challenges of studying health, activity and participation of wheelchair users. This course will provide an overview of common design hurdles in seating and mobility research, conceptual and methodological issues associated with measuring activity and participation as defined by the International Classification of Functioning, Disability and Health (ICF) and an understanding of proposed research strategies to measure questions such as how to measure activity and participation among wheelchair users, how to discern the health impacts of wheelchair use, how to utilize research results to design new seating and mobility products, how to best study functional impacts of seating and positioning supports and others.

Stephen Sprigle, PhD, PT
Fran Harris
Center for Assistive Technology and Environmental Access, Georgia Institute of Technology, Atlanta, GA
Kim Davis, MSPT, ATP
Crawford Research Institute, Shepherd Center, Atlanta, GA
** Advanced*

7. **Measurements of Positions of Sitting Posture and Posture Support Devices According To ISO 16840-1**

Presenters will summarize the concepts in the ISO 16840-1: international standard for measurement of seated posture and postural support devices and will demonstrate two simple methods of applying the definitions in the standard during clinical practice. Participants will have an opportunity to engage in an active learning process, actually trying out the tools and methods discussed. The tools have been used successfully in Japan for over five years and they are anxious for feedback to further develop their methods and instructions.

Hideyuki Hirose, PT, Mech. Eng.
Taro Kenmoku
National Rehabilitation Center for Persons with Disabilities, Tokorozawa, Saitama, Japan
Barbara Crane, PhD, PT, ATP
University of Hartford, West Hartford, CT
** Advanced*

3:00 PM
Break - Exhibit Hall

3:30 PM

Instructional Courses • Two-Hour Sessions

(3:30-5:30 PM)

8. **Musculoskeletal Pain: Classification of Pain Mechanisms, Evaluation Parameters, and Intervention as it Relates to Seating in a Wheelchair**

The Rehabilitation Institute of Chicago has developed a classification system to assure each dimension of musculoskeletal pain is assessed. During this workshop, the classification system will be taught and interventions such as referral to a pain behavioral psychologist, education, active movement, manual therapy, modalities and positioning intervention will be presented.

Annie O'Connor, PT, OCS, Cert. MDT
Jessica Presperin Pedersen, MBA, OTR/L, ATP
Rehabilitation Institute of Chicago, Chicago, IL
** All*

9. **Custom Seating - The 5 Ws**

The who, what, where, when, why (and why not) of custom seating options will be presented. A process for implementation from initial identification of client needs through the deliver of a final, functional system will be discussed.

Stephanie Laurence, OT, Reg (ONT)
Motion Specialties - The Motion Group, Toronto, ON, Canada
** Intermediate*

10. **Clinical Application of Quantitative Measures in Manual Wheelchair Assessment: An Example of Evidence Based Practice**

Tools exist that can be used to describe all forms of manual propulsion, both upper extremity and lower extremity. They range from low-tech to high-tech but can all provide quantitative date that can be used in conjunction with visual observation to document an individual's ability to propel a wheelchair. Sample cases studies will be used to demonstrate how data collected can be used to recommend technology and evaluate clinical outcomes. Both features and limitations of the data collection tools will be presented.

Carmen DiGiovine, PhD, ATP, RET
6 Degrees of Freedom, LLC, Wheaton, IL
Ron Boninger, MBA
Three Rivers Holding, Mesa, AZ (Commercial)
** Advanced*

5:30 PM

Adjournment and Reception (Exhibit Hall)

FRIDAY, March 9, 2007

7:30 AM
Continental Breakfast (Exhibit Hall)

8:00 AM

Instructional Courses • Two Hour Sessions

(8:00 AM - 10:00 AM)

11. **Management of Spasticity to Enhance Seating and Positioning**

People with disorders in which spasticity is a prominent feature (such as cerebral palsy, brain injury, spinal cord injury) often have difficulty with positioning and seating. The management of spasticity requires a multidisciplinary team approach, including the patient and caregivers, physicians, and therapists. This workshop will discuss the management of spasticity via medications (oral and injected), surgery (both orthopedic and neurosurgical), orthotics, seating and the impact of these interventions on seating and mobility. A hierarchical framework of spasticity management will be presented, with case examples of management options.

Bette Cotzin, MS, PT
Washtenaw Intermediate School District, Ann Arbor, MI
Virginia Nelson, MD, MPH
University of Michigan, CS Mott Children's Hospital, Ann Arbor, MI
Carey Larabee, BA Sports Management
Disney Wide World of Sports, Orlando, FL
** All*

12. Managing the Seating and Mobility Needs of the Bariatric Client: Challenges and Strategies

This interactive session will describe common problems associated with seating and mobility for the morbidly obese client. Measurement and positioning strategies, environmental accessibility issues and transportation challenges will be included for both manual and powered wheelchairs technologies.

Jean Minkel, MA, PT
Minkel Consulting, New Windsor, NY
Susan Johnson Taylor, OTR/L
Brenda Canning, OTR/L
Rehabilitation Institute of Chicago, Chicago, IL
** All*

13. Let 'em Fly - Minimalist Seating for Maximum Function

When are persons who use wheelchairs able to do their best work? When they are free to move! This session will investigate how to allow clients to use their own posture to improve function. Lecture, case studies and a discussion format will be used to demonstrate the concept of allowing motion instead of restricting it.

Kevin Phillips, CRTS
Ability Center San Diego, San Diego, CA
** Intermediate*

14. Dynamic Seating

This workshop addresses dynamic seating as postural control. Technology allows controlled but temporary postural changes while providing needed support. The changes are initiated by the user and have shown a reduction in strength and duration of strong full body extension, and they enabling weak neck extension and rotation to ease breathing and reduce reflux.

David Cooper, MSc, Kinesiology
Elaine Antoniuk, BSc, PT
Maureen Story, BSc, PT
Sunny Hill Health Centre for Children, Vancouver, BC, Canada
** Intermediate - Advanced*

15. Destructive Postural Tendencies: Identification and Treatment

Postural deterioration of persons utilizing a wheelchair for mobility is not inevitable. Early identification and treatments coupled with on-going monitoring of progress is key. This workshop will provide an opportunity to discuss strategies for evaluation and treatment of destructive postural tendencies in sitting with a focus on intervention.

Tom Hetzel, PT, ATP
Ride Designs/ Aspen Seating, Sheridan, CO (Commercial)
** Intermediate*

16. VA Equipment Provision: Interdisciplinary Collaboration to Optimize Outcomes for US Soldiers & Veterans

This session will focus on VA policy and practices for providing wheelchairs and seating equipment and other assistive technologies to veterans and active duty soldiers. It will include a discussion of the Prosthetics and Sensory Aids Service (PSAS) and will present information related to eligibility, roles of PSAS staff and VA clinicians, manufacturers and suppliers.

Kendra Betz, MSPT, ATP
VA Puget Sound Healthcare System, Seattle, WA
Fred Downs Jr.
Department of Veterans Affairs, Washington, DC
** All*

17. Creating Functional Seating Strategies Using the MOVE (Mobility Opportunities Via Education) Program

This session will present the philosophical basis of the MOVE Program, a top-down, task oriented approach to teaching the functional skills of sitting, standing and walking to individuals with physical disabilities. Emphasis will be placed on functional seating and the teaching of sitting skills.

Therese Goebel, PT, MHS
Brittany McClary, MS, OTR
MOVE International, Milton, FL
** Beginner*

10:00 AM

Break - Exhibit Hall

10:30 AM

Instructional Courses • One Hour Sessions

(10:30 - 11:30 AM)

18. The Evaluation Needed for Powered Mobility for Young Children or Children with Significant Developmental Delays

This course will focus on strategies required to set up an assessment environment for evaluation for powered mobility. The environment should include technology but also skills, strategies and activities that support a your child/s interests, limit her anxiety, and encourage adequate and accurate clinical observation. Assessment forms and reports will be shared.

Karen Kangas, OTR/L
Shamokin, PA
** Intermediate*

19. Wheelchair Transportation Safety: From Standards, to Application, to the Courtroom

Rehabilitation professionals have a responsibility to inform consumers about the risks associated with the products that they are being prescribed. WC transportation safety standards are now resulting in wheelchairs that are improving the safety of those who must use them as seats in motor vehicles. Failure to use products that meet the safety standards is resulting in increased injury and related lawsuits. This change in practice is having implications for not only product manufacturers and suppliers but those recommending wheelchair products.

Douglas Hobson, PhD
University of Pittsburgh, Pittsburgh, PA
** All*

20. Early Intervention: Preventing the Consequences of Inappropriate Seating and Immobility

Poor sitting posture with inappropriate support contributes to deformities in children with hypotonia, paralysis, weakness, neuromuscular dysfunction and/or cerebral palsy. Components of seating systems that are appropriate for very young children (ages 1-5) based on their developmental and chronological age will be presented with a systems approach supported by evidence in the literature.

Ginny Paleg, PT
Montgomery County Infants and Toddlers, Silver Spring, MD
** Intermediate*

21. Wheelchair Maintenance for Clinicians

The vast majority of wheelchair users have no idea that a wheelchair needs maintenance. Improper tire inflation for example, can result in a considerable increase in energy expenditure when propelling a manual wheelchair. The same wheelchair has twelve bearings all of which must be straight and in good adjustment if the wheelchair is to be propelled efficiently. This workshop will help clinicians learn skills that will improve their ability to fix commonly occurring faults in wheelchairs and to teach clients skills that they can use at home.

Ian Denison, PT, ATP
GF Strong Rehab Centre, Vancouver, BC, Canada
** Beginner*

22. Standing - The Alternate Position

Individuals with limited mobility require a variety of postures and frequent change of position throughout the day. This workshop will focus on standing as an ‘alternate position’ including general principles, benefits, how standing fits into 24 hour positioning, education, follow-up and the practicality of providing the technology. Upright, prone and supine positions will be reviewed along with substantiating literature.

Maureen Story, BSR, PT/OT
Sunny Hill Health Centre for Children, Vancouver, BC, Canada
** Beginner/Intermediate*

23. Back from the War: Rehabilitation Challenges for Soldiers with Polytrauma Injuries

As a result of modern warfare tactics, U.S. military service members serving in Operation Iraqi Freedom and Operation Enduring Freedom are sustaining complex blast-related “polytraumatic” injuries such as Traumatic Brain Injury (TBI), amputation, Spinal Cord Injury (SCI), wounds, visual and hearing impairment, musculoskeletal compromise and psychological trauma or any combination of the above. In response to this set of unique and complex urgent, acute care and rehabilitation needs, the Secretary for Veterans Affairs have designated four Polytrauma Rehabilitation Centers in VA facilities that are charged with provide a “seamless transition” of the injured soldier into the VA system. This workshop will review the unique challenges presented by this population using case examples and with an emphasis on wheelchair seating and mobility.

John Merritt, MD
Yasmin Gonzalez, OTR/L
James A. Haley VA Medical Center, Tampa, FL
Pete Herrick
Consumer, Tampa, FL
** All*

24. Lessening the Load: Propulsion Assistance Products: How and Where to Use Them

Long term wheelchair propellers are at significant risk for development of shoulder injury not only from the constant wheeling motion but from other day to day activities, transfers, reaching, lifting etc. As most daily activities cannot be easily changed reducing strain on the shoulder joint during propulsion lessening at least one risk factor which may decrease the likelihood of injury occurring or reoccurring. Development of products which provide assistance to propulsion have become available over the past several years. Power assisted wheels have provided support to reduce the effort in the motion of propelling. Most recently a geared wheel has become available to reduce strain on the shoulder and provide assistance in climbing and descending inclines. Using case studies this presentation will compare these two types of wheeled assistance and provide an opportunity for participants to understand how and where these products can best assist their clients.

Kathryn Fisher, BScOT, ATS, OT Reg. (ONT)
Therapy Supplies and Rental Ltd, Toronto, ON
Allan Boyd, E Eng.
Magic Wheels, Inc, Seattle, WA (Commercial)
** Intermediate*

25. Podcasting - Not Just for iPods!

Following hard upon the success of small technology such as the Palm or PocketPC product for clinical application, comes the Podcast and the RSS (Really Simple Syndication). These two methods of obtaining, and sharing information are making inroads into clinical practice, data collection and sharing methods and tools for 'evidence based practice'. Bring your own device and learn how to use it for other than listening to the golden oldies.

Doug Gayton, ATP
GF Strong Rehab Centre, Vancouver, BC, Canada
* Beginner

11:30 AM

Lunch - Exhibit Hall

12:00 Noon

Interactive Poster Session

Note: Posters will be available for viewing from 8:00 AM through 3:30 PM Friday

Development of Posture Measurement Instrument and Its Clinical Application

Taro Kemmoku
Toua Gishi Kogyo Co.,Ltd
Saitama-shi, Saitama, Japan,
Hideyuki Hirose, PT, Mech. Eng.
National Rehabilitation Center for Persons with Disabilities, Tokorozawa, Saitama, Japan

The Role of OT Within Postural Management

Rannveig Baldursdottir, OTR/L
Svanborg Gudmundsdottir
The State Centre for Assistive Technology in Iceland, Kopavogur, Iceland

Consumer's Discussion About Their Own Pressure Mapping Measurement is an Effective Method of Education to Prevent the Recurrence of Pressure Ulcers

Junko Niitsuma, PhD
De Maria Fernanda
National Rehabilitation Center for Persons with Disabilities, Tokorozawa, Saitama, Japan

1:00 PM

Instructional Courses • Two Hour Sessions

(1:00 - 3:00 PM)

26. Special Session - Ethics

This session will address ethical issues in seating and wheeled mobility service delivery. Healthcare practitioners and suppliers are bound by their codes of ethics that a consumer should be able to expect. Consumers also have a responsibility in the service delivery process. Panel members including a therapist, engineer, supplier, physician and consumer/parent will present ethical standards that define their fields of practice and/or their lives. After short presentations, vignettes addressing some common and not-so-common ethical challenges will create a focus for discussion.

Moderator
Stephen Sprigle, PhD, PT
Georgia Institute of Technology Center for Assistive Technology & Environmental Access, Atlanta, GA

Panel Members:
Jean Minkel, MA, PT
Minkel Consulting, New Windsor, NY
Brad Dicianno, MD
University of Pittsburgh Medical Center, Pittsburgh, PA
Gerry Dickerson, ATS, CRTS
Medstar, Inc, College Point, NY
Faye Warren, BFA
Assistive Demonstration Technology Center, Speech Disorder Clinic, University of Central Florida, Orlando, FL
** All*

27. Integration of Mobility Options to Maximize Function in Manual Wheelchairs

With the use of clinical case studies and hands-on demonstrations, attendees will understand the impact of their manual mobility recommendations on their clients posture, mobility and function. They will learn to select appropriate options and emphasis will be placed on follow-up and readjustment as client skills alter.

Theresa Berner, MOT, OTR/L, ATP
The Ohio State University Medical Center, Columbus, OH
Tricia Henley, PT, MPT, ATP
Baylor Institute for Rehabilitation
Tina Roesler, MSPT, ABDA
TiLite, Kennewick, WA (Commercial)
** Intermediate*

28. It's Not Rocket Science: Transforming Your Good Ideas Into Viable Clinical Research Topics

This interactive tutorial session will involve structured exercises that will guide participants through the process of developing their clinical questions into researchable topics. Topics will include specifying the population, describing the treatment intervention, articulating the outcome variables, selecting appropriate measurement tools, and obtaining assistance with research design and statistical analysis. Take home value will be maximized if participants bring 1 clinical research question to the session so that they can apply course content to their own situations during the structured exercises.

James Lenker, PhD
The State University of New York at Buffalo, Buffalo, NY
** All*

Paper Session
Outcomes • Two Hour Sessions
(1:00 - 3:00 PM)

Moderator:
Shirley Fitzgerald, PhD
University of Pittsburgh, Pittsburgh, PA

Researching Remote Seating Assessment: Is the Level of Sitting Scale Assessment Better in Face-to-Face Assessment than through Videoconferencing? (Pilot Study)
David Jordan
Jen Sawrenko
Sunny Hill Health Centre for Children, Vancouver, BC , Canada

Using FIATS to Measure the Effect of Seating Devices on Families of Children with Physical Disabilities
Stephen Ryan, BESc, PEng
Kent Campbell
Patricia Rigby, OT/L
Bloorview Research Institute, Bloorview Kids Rehab, Toronto, ON, Canada

The Impact of Power Assist Wheels on QOL: An interim Report
Charles Levy, MD
North Florida/South Georgia Veterans Health System, University of Florida, Gainesville, FL
Peter Giacobbi, PhD
John Chow

24-Hour Postural Care - The Quest for Objective Data
Stefanie Laurence, OT
China Page
Lyndal Hill
Motion Specialties - The Motion Group, Toronto, ON, Canada

Wheelchair Satisfaction in Individuals with Spinal Cord Injury
David Calver, MOT
Trevor Mazurek
Bonita Sawatzky, PhD
University of British Columbia, British Columbia's Children's Hospital Vancouver, BC, Canada

Personal Preferences for Completion of Daily Activities: Implications for Assistive Technology Use
Joanne Nunn, OT
Jan Miller-Polgar, PhD, OT Reg. (Ont.),
The University of Western Ontario, London, ON

Towards Establishing the Responsiveness of the Seated Postural Control Measure (SPCM)
Debbie Field, MHSc OT
Sunny Hill Health Centre for Children, Vancouver, BC, Canada

Paper Session
Research • Two Hour Sessions
(1:00 - 3:00 PM)

Moderator:
Maureen Story, BSR, PT/OT
Sunny Hill Health Centre for Children, Vancouver, BC, Canada

Humidity and Temperature Measurements for Wheelchair Cushions
Noriyuki Tejima, PhD
Yoko Takahashi
Ritsumeikan University, Kusatsu, Shiga, Japan

Load Redistribution in Standing, Tilt-in-Space, and Reclining Wheelchairs
Chris Maurer, MPT, ATP
Shepherd Center, Atlanta, GA
Stephen Sprigle, PhD, PT
Georgia Institute of Technology, Atlanta, GA

Impact of an Interface Pressure Mat on Immersion and Pressure Distribution
Leigh Pipkin
Center for Assistive Technology and Environmental Access, Georgia Institute of Technology, Atlanta, GA

The Effect of Wheelchair Tilt on Seat and Back Pressure Distribution In Adults Without Physical Disabilities: Influence of Antrhopometric Variables
Sheri Bergeron
Jan Miller-Polgar, PhD, OT Reg. (Ont.)
The University of Western Ontario, London, ON, Canada

Exploring Tools to Improve Pressure Ulcer Detection: Spectroscopic Assessment of the Blanch Response in Elderly Nursing Home Residents at Risk for Pressure Ulcers
Jeanne Zanca, PhD
Mount Sinai School of Medicine, New York, NY
David M. Brienza, PhD
Margo Holm, PhD
University of Pittsburgh, Pittsburgh, PA
Michael Sowa, PhD
National Research Council of Canada, Canada

Paper Session
International • Two Hour Sessions
(1:00 - 3:00 PM)

Moderator:
Jessica Presperin Pedersen, MBA, OTR/L, ATP
Rehabilitation Institute of Chicago, Chicago, IL

Dumbo Project: Changing the Disability that Isolates into "Tolerable" Diversity
Giovnni De Angelis
Antonio Cinquegrana
Ciro Grazioli
Pontelambro, Italy

Ataxia-Teleangiectasia- a Model for Cooperation Between a National Disease Center and an Assistive Technology Unit

Efrat Shenhod, BOT
Etzyona Eisenstein
Andreea Nissenkorn
Safra Children Hospital, Sheba Medical Center, Tel Ha Shomer, Israel

Designing Wheeled Mobility Devices for Remote Environments: A Case Study from India

Jon Pearlman, MSc
University of Pittsburgh, Human Engineering Research Lab,
VA Pittsburgh Healthcare System, Pittsburgh, PA

Seating in the Third World

Delia "Dee Dee" Freney-Bailey, OTR/L, ATS
Castro Valley, CA

1:00 PM

Instructional Courses • One Hour Sessions

(1:00 - 2:00 PM)

29. Therapeutic Positioning During Sleep

Many individuals with physical disabilities have a difficult time sleeping due to movement dysfunction, pain, or because of difficulties with breathing, swallowing or digestion. This leads to poor sleep quality and duration - for both the disabled individual and their caregiver. Additionally, many children with severe motor impairment sleep in asymmetrical postures which promote the development of orthopedic deformities such as scoliosis and hip dislocation. In this seminar, participants will be introduced to the concept of Nighttime Positioning, which is the specific therapeutic positioning of a person's body during sleep. We will discuss the goals of nighttime positioning, intervention strategies and equipment options for positioning during sleep

Kelly Waugh, MS, PT
University of Colorado Health Sciences Center - Assistive Technology Partners, Department of Rehabilitation Medicine, Denver, CO
** All*

30. She's Sliding Again!

Sliding is a common problem for clients who use wheelchairs and is a concern as it may cause skin breakdown and put the client at risk for falls and injury. This workshop will address the observation skills need to identify the cause of sliding and then provide solutions to the problem.

Linda Norton, OT Reg. (ONT)
Shoppers Home Health Care, Toronto, ON, Canada
** Intermediate*

31. Preserving Upper Limb Function in Wheelchair Users: Application of Clinical Practice Guidelines

Clinical Practice Guidelines for the preservation of Upper Limb Functions Following Spinal Cord Injury was published in 2005 by PVA. They contain a series of recommendations that are intended to provide health-care professionals with concise, practical information that will aid in the prevention and treatment of upper limb pain and injury in persons with spinal cord injury. Clinicians will be empowered to understand and apply the Guidelines to their clinical practice.

Alicia Koontz, PhD
University of Pittsburgh, VA Pittsburgh Healthcare System, Pittsburgh, PA
Kendra Betz, MSPT, ATP
VA Puget Sound Healthcare System, Seattle, WA
* All

2:15 PM

Instructional Courses • One Hour Sessions

(2:15 - 3:15 PM)

32. Wound Care Protocol for Sitting Acquired Pressure Ulcers: Best Practice

Sitting acquired pressure ulcers (SAPUs) are unique pressure ulcers that deserve to have their own protocol for assessment and treatment. This session will present the assessment protocol and provide the treatment guidelines according to the stage/grade of the wound, location and wheelchair seating system and alternate lying surfaces. The standardized wound assessment includes how to measure the length, width and especially the depth of the wound. Wound care dressings, debridement, signs of infection, and indicators for surgery will be highlighted. Vacuum assisted closure (VAC(r)) will be discussed. Wheelchair cushions designed specifically for wound treatment will be highlighted using case studies. Lying surfaces for treatment will also be included in the case studies.

Jillian Swaine, OT
Swaine & Associates - Rehabilitation Services, Calgary, AB, Canada
Karen Lagden, BScN, RN, ET
Calgary, AB, Canada
Michael Stacey, MD
School of Surgery and Pathology, University of Western Australia, Perth, Western Australia, Australia
** Intermediate/Advanced*

33. Resistance is Futile -- Fostering Treatment and Compliance

What do we do with the non-compliant client who won't use their new chair or cushion and will not follow instructions about usage? Three domains that influence compliance will be presented in the context of providing treatment plans and equipment.

Linda Norton, OT Reg. (ONT)
Shoppers Home Health Care, Toronto, ON, Canada
** Advanced*

34. When a Wheelchair is a Seat in a Motor Vehicle

Community mobility is an important advantage gained by having a well-selected and properly fitting wheelchair that matches the client's daily occupations and transportation options. With the advent of WC19 ISO standard for a crash-tested wheelchair, there are new issues related to integrating wheelchairs into community transportations systems. This workshop will cover the clinical application of standards using transit safe products.

Mary Ellen Buning, PhD
University of Colorado at Denver & Health Sciences Center, Denver, CO
** Intermediate*

3:15 PM

Break - Exhibit Hall

3:45 PM

Instructional Courses • One Hour Sessions
(3:45 - 4:45 PM)

35. Augmentative and Alternative Communication (AAC) 101: The Basics for Success

Severe communication impairment is one of the most significant of disabilities addressed by assistive technology. AAC addresses this essential human need. This beginner session reviews the basic components and issues involved in providing AAC services and technology. Evidence on performance and outcomes achieved using AAC is also reviewed.

Katya Hill, PhD
University of Pittsburgh, Pittsburgh, PA
** All*

36. Behind The Scenes- Things Clinicians Don't Know About Suppliers, But Should.

There is much therapists can learn about the world of the supplier to lessen the disconnect between the prescribing therapist and the RTS providing the equipment. This course will identify one task that is behind the scenes of work for the RTS, distinguish the billable from the non billable work of the RTS and help the therapist to understand the evaluation to delivery cycle from the suppliers perspective.

Kay Koch, OTR/L, ATP
Mobility Designs, Children's Healthcare of Atlanta, Atlanta, GA
** Intermediate*

37. Review of the Purpose, Use and Content of the RESNA Position Papers on Wheelchair Seat Elevators & Standers

In 2005, RESNA issued its first position paper specific to wheeled mobility and seating interventions. A RESNA position paper is an official statement by the organization that, based on the consensus of experts, summarizes current research and best-practice trends in a relevant area. It may then serve to guide practitioners in the development and provision of interventions and provide evidence based justification to obtain funding for technology. Case examples of how the position paper has been utilized to overturn unfavorable funding decisions as well as to apply for coverage policies will be reviewed.

Julianna Arva, MS, ATP
Permobil Inc., Gillette, NJ (Commercial)
Michelle Lange, OTR, ABDA, ATP
Arvarda, CO
Mark Schmeler, PhD, OTR/L, ATP
University of Pittsburgh, Pittsburgh, PA
** Intermediate*

38. QOL Using Stand-up Wheelchair

The decision for a Stand-up wheelchair is based on obvious medical issues such as: improved circulation, reduces spasms, reduced risk for dequibitus, deeper respiration, improved digestion, increased independence and better integration. Using case studies, daily activities of daily living have been measured by a monitoring system that shows periods and angles of standing. Data collected help clinicians understand the usage patterns of technology and the effectives of training of people with disabilities when offered the option of a standing system.

Jürg Stoll, MSc PT, LEVO AG
Wohlen, Switzerland (Commercial)
** Intermediate*

39. Evidence-Based Practice: The First Steps in Critical Review of the Literature

Evidence-based practice promotes the collection, interpretation and integration of knowledge and begins with a critical review of the literature. The best evidence should be utilized to improve our clinical judgment, quality of care and future research. This session will assist in conducting a literature review, evaluating current literature and interpreting the findings as they apply to clinical practice.

Teresa Plummer, MS, OT, ATP
Belmont University, Antioch, TN
Ann Eubank, OTR, ATP
Permobil Inc., Lebanon, TN (Commercial)
** Beginner*

Paper Session
Research: Wheelchair • One Hour Sessions
(3:45 - 4:45 PM)

Moderator:
David Cooper, MSc,
Kinesiology Kine.- Rehabilitation Technologist,
Sunny Hill Health Centre for Children, Vancouver, BC, Canada

Whole-Body Vibration and Power Wheelchairs
Erik Wolf, PhD
Walter Reed Army Medical Center, Washington, DC
Rory Cooper, PhD
University of Pittsburgh, Human Engineering Research Lab,
VA Pittsburgh Health Care System Pittsburgh, PA

Seating Forces to Analyse Sitting Posture - Experimental Analysis
P. vanGeffen, PhD Candidate
H.F.J.M. Koopman, PhD
P.H. Veltink, PhD
University of Twente, Department of Engineering Technology, Laboratory of Biomedical Engineering, Enschede, The Netherlands

Pelvic Tilt and Proper Chair Adjustment Derived from Contact Forces on the Seat - Biomechanical Analysis
P. vanGeffen, PhD Candidate
H.F.J.M. Koopman, PhD
P.H. Veltink, PhD
University of Twente, Department of Engineering Technology, Laboratory of Biomedical Engineering, Enschede, The Netherlands

4:45 PM

Chris Bar Research Forum

Sponsored by
The ROHO Group, Inc.

Geoff Bardsley, PhD
Tort Centre, Ninewells Hospital, Dundee, Scotland

The 2007 Chris Bar Research Forum is a British Parliamentary style debate focusing on current research or service delivery issues.

The motion to be debated is as follows:
"This House Believes That Manual Wheelchair Design Has Gone As Far As It Can Go"

5:50 PM
Adjourn

6:00 PM
NRRTS Membership Meeting

Saturday, March 10, 2007

8:00 PM
Continental Breakfast - Great Hall Foyer

8:30 PM

Instructional Courses
Three Hour Sessions
(8:30 - 11:30 AM)

40. Adaptive Sports & Recreation: Professional Roles in Supporting Participation & Performance

Kendra Betz, MSPT, ATP
VA Puget Sound Healthcare System, Seattle, WA
Rory Cooper, PhD
Ian Rice, OT/L
University of Pittsburgh, Human Engineering Research Lab, VA Pittsburgh Healthcare System, Pittsburgh, PA
Brad Dicianno, MD
University of Pittsburgh Medical Center, Pittsburgh, PA
** All*

41. Lower Extremity Edema Management Essentials

Clinicians frequently fail to appreciate the dynamic physiological forces governing tissue fluid balance and the central regulating role of the lymphatic system. An understanding of the lymphatic system is crucial to the differential diagnosis of lower extremity edemas. Distinguishing edema from lymphedema is important because treatment is different; therefore, a brief overview of the anatomy & physiology of the lymphatic system and the mechanisms regulating extracellular fluid balance will be presented. The distinguishing clinical features of lymphedema will be contrasted with those of chronic lower extremity edema from other causes. Associated examination procedures will be described along with indications for/contraindications to the definitive management of various forms of edema. Participants will be instructed in the principles of compression therapy and multi-modal treatment techniques. Basic and advanced hands-on techniques will be presented in a laboratory format. Problem-based case scenarios will be used to aid in the development of clinical reasoning skills and the practical application of management principles.

Mary Jo Geyer, PhD
Chatham College, Graduate Health Sciences Division, Pittsburgh, PA
** Intermediate*

8:30 AM

Instructional Courses • One Hour Sessions
(8:30 - 9:30 AM)

42. What's Hot and What's Not

The exhibit hall is a favorite intellectual watering hole where participants come to gather and ogle at all the new "stuff" available from manufacturers. This presentation will highlight the finest and even a few of the 'Huh?' mobility and seating fare. How to look at and analyze products will be infused within the presentation.

Adrienne Falk Bergen, PT, ATP/S
Delray Beach, FLI
** All*

43. Pathophysiology of Specific Impairments and Disabilities: Common Technology Interventions

Although each client who presents for AT evaluation is different, understanding the prevalence and pathophysiology of a client's primary diagnosis is essential for addressing the seating and mobility needs. This workshop will discuss some of the most common diagnoses that result in mobility impairments, common co-morbid conditions, and impairments that present unique challenges for each group.

Brad E. Dicianno, MD
University of Pittsburgh Medical Center, Pittsburgh, PA
** Beginner*

44. The Need for Supplier Standards to Improve Quality and Appropriateness of Medical Equipment

The US government is attempting to save money and improve the quality and appropriateness of equipment provided to beneficiaries by instituting a competitive bidding process in the health care system for medical equipment. To ensure companies bidding have appropriate knowledge and staffing, supplier standards were developed. These standards are supposed to assist Medicare in preventing fraud and abuse, improve appropriateness of equipment provided and maximize safe and appropriate use of equipment. But are they enough? Are they useful for other health care systems?
This course will discuss the development of the standards and the changes to the standards due to public comments over the past 2 years. This course will also pose the question "what is the best method to improve quality and appropriateness of medical equipment in all health care systems?"

Faith Saftler Savage, PT, ATP
The Boston Home, Nantick, MA
** All*

45. Clinical Criteria for Provision of Body Support Systems

Practice application of existing guidelines, standards and regulations used to identify health and well-being domains, the definition of loss of junction, assessment of needs, strategies and recommendations of wheelchair seating have been used to develop an algorithm to assist in defining clinical criteria used to provide body support systems. This work will stress how in today's climate of accountability and productivity demands, we must move beyond our traditional roles and utilize all available resources to improve efficiency and effectives while maintaining client satisfaction.

Linda Elsaesser, PT, ATP
Saylorsburg, PA
** Advanced*

46. Research Utilization: Moving Research to Practice

This course will discuss the concepts of research dissemination, evidence based practice (EVP) and the challenges associated with incorporating EBP into a daily clinical routine. The results of a research project evaluating the effect of targeted evidence based educational programs of knowledge of manual wheelchair technology, clinician attitudes towards practice and manual wheelchair recommendation practices will be reported.

Laura Cohen, PhD
Clinical Research Scientist, Mobility RERC, Shepherd Center, Atlanta, GA
Stephen Sprigle, PhD, PT
Georgia Institute of Technology, Center for Assistive Technology & Environmental Access, Atlanta, GA
** Advanced*

9:30 AM
Break - Great Hall Foyer

9:45 AM
Instructional Courses • Two Hour Sessions
(9:45 - 11:45 AM)

47. Wheelchair Seating: Tests, Measurement and Analysis, From the Lab to the Clinic

There is need for in depth understanding of the performance of wheelchair cushions and their ability to protectively interact with skin viability, posture and positioning and functional performance. There will be a review of proposed ISO Standards and their implications for wheelchair users in the context of current state of the science and practice

Evan Call, MS
Weber State University/ EC Service Inc. Testing Lab, Centerville, UT
Martin Ferguson-Pell, PhD
University College of London, Centre for Disability Research & Innovation, Stanmore, UK
Stephen Sprigle, PhD, PT
Georgia Institute of Technology, Center for Assistive Technology & Environmental Access, Atlanta, GA
* All

48. **Advanced Case Studies**

Moderator:
Daniel Lipka, OTR/L ATS CRTS
Miller's Assistive Technologies,
Akron, OH

Seating The Unseatable For Independent Mobility, A Case Study
Kevin Phillips, CRTS
Ability Center San Diego, San Diego, CA

Assistive Technology Adjustments in Ataxia-Teleangiectasia Patients.
Etzyona Eisenstein, Ms.C. PT
Pediatric Neurology Unit and National AT Center, Safra
Children Hospital, Sheba Medical Center, Tel Ha Shomer, Israel

Cases to Consider
Vicki Bunton, PTA
Carolinas Healthcare System, Charlotte, NC

Audience Participation
Bring complex cases for discussion
** All*

49. **Evaluation and Problem Solving Demonstration Consumer Participation**

Clients with multiple needs will be evaluated during this session. Using interactive discussion, technology and therapeutic recommendations will be proposed.

Adrienne Falk Bergen, PT, ATP/S
Delray Beach, FL
** All*

50. **Custom Seating: When and Where Do I Start**

This course will assist the therapist in gathering critical assessment data from the completion of a mat assessment. This data will then be used to help determine how the design of the seating system will develop through simulation. Although financial constraints may often be the final factor in determining a seating system, it is important to be able to determine what will work for the client and what won't. Often off the shelf seating is modifiable, and this in itself can designate "custom seating" as it is taking an initial shape and modifying it. This workshop will then assist therapists in looking at what can be modified, how it can be done and when to draw the line at modifications versus full custom seating.
Sheila Buck BSc (OT), Reg (ONT), ATP
Therapy NOW! Inc., Milton, ON, Canada
** All*

51. **Rollin', Rollin', Rollin' … Get This Wheelchair Rollin': Selecting Access Methods for Power Mobility**

Faculty will present a framework for assessing and determining to best access method for clients with physical and developmental challenges to enable their use of powered mobility technology. Video case studies, hands on technology demonstrations and discussion will facilitate learning of this often complex problem solving process.
Roslyn Livingstone, Dip COT
Nicole Wilkins, BSc, OT
Sunny Hill Health Centre for Children, Vancouver, BC, Canada
** Beginner*

11:45 AM

Special Session - Moving Forward on Continuous Quality Improvement of Assistive Technology Services

Moderator:
Douglas Hobson, PhD
University of Pittsburgh, Pittsburgh, PA

Panel:
Sheila Buck, BSc. (OT), Reg. (Ont.), ATP
Therapy Now, Inc., Milton, ON, Canada
Frederick Downs, Jr.
Department of Veterans Affairs, Washington, DC
Doran Edwards, MD
SADMERC Medical Director, Columbia, SC
Martin Ferguson-Pell, PhD
University College of London, Stanmore, UK
Jean Minkel, MA, PT
Minkel Consulting, New Windsor, NY, USA
Thomas Stripling
Paralyzed Veterans of America, Washington, DC

1:00 PM
Adjournment

Faculty

A

Elaine Antoniuk
Sunny Hill Health Centre for Children
3644 Slocan Street
Vancouver , BC V5M 3E8
Canada

Dynamic Seating
IC 14 - Friday - 8:00 AM

Julianna Arva
Permobil Inc.
106 Preston Drive
Gillette, NJ 07933
julianna.arva@permobilus.com

Review of the Purpose, Use and Content of the RESNA Position Papers on Wheelchair Seat Elevators & Standers
IC 37 - Friday - 3:45 PM

B

Rannveig Baldursdottir
The State Centre for Assistive Technology in Iceland
Smidjuvegur 28
Kopavogur, Iceland 200
rannv@tr.is

The Role of OT Within Postural Management
Poster Session
Poster - Friday - 12:30 PM

Geoff Bardsley
Tort Centre, Ninewells Hospital
Dundee, Scotland DD1 9SY
geoff.bardsley@tuht.scot.nhs.uk

Setting Up and Running a Successful Seating and Mobility Service Delivery Program: Innovations and Strategies
IC 1 - Thursday - 1:00 PM

Chris Bar Research Forum
Chairman - Friday - 4:45 PM

Adrienne Falk Bergen
13727 Plaza Mayor Drive
Delray Beach, FL 33446
adriennebergen@aol.com

What's Hot and What's Not
IC 42 - Saturday - 8:30 AM

Evaluation and Problem Solving Demonstration
IC 49 - Saturday - 9:45 AM

Theresa Berner
The Ohio State University Medical Center
410 W. 10th Avenue
Columbus, Ohio 43210
theresa.berner@osumc.edu

Setting Up and Running a Successful Seating and Mobility Service Delivery Program: Innovations and Strategies
IC 1 - Thursday - 1:00 PM

Integration of Mobility Options to Maximize Function in Manual Wheelchairs
IC 27 - Friday - 1:00 PM

Kendra Betz
VA Puget Sound Healthcare System / Private Practice
9277 Mountain Brush Trail
Highlands Ranch, CO 80130
Kendra.Betz@comcast.net

VA Equipment Provision: Interdisciplinary Collaboration to Optimize Outcomes for US Soldiers & Veterans
IC 16 - Friday - 8:00 AM

Preserving Upper Limb Function in Wheelchair Users: Application of Clinical Practice Guidelines
IC 31 - Friday - 1:00 PM

Adaptive Sports & Recreation: Professional Roles in Supporting Participation & Performance
IC 40 - Saturday - 8:30 AM

Ronald Boninger
Three Rivers Holdings, LLC
1826 West Broadway Rd.
Mesa, AZ 85202
ron@3rivers.com

Clinical Application of Quantitative Measures in Manual Wheelchair Assessment: an Example of Evidence Based Practice
IC 10 - Thursday - 3:30 PM

David Brienza
University of Pittsburgh
Department of Rehabilitation Science & Technology
2310 Jane Street
Pittsburgh, PA 15203
dbrienza@pitt.edu

Pressure Ulsers: More Questions than Answers
Opening - Paper - Thursday - 8:30 AM

Sheila Buck
Therapy NOW! Inc.
811 Graham Bell Crt
Milton, Ontario L9T 3T1
Canada
therapynow@cogeco.ca

Clinical Training: Considerations and Equipment Selection Relative to Impairment
IC 2 - Thursday - 1:00 PM

Custom Seating: When and Where So I Start?
IC 50 - Saturday - 9:45 AM

Moving Forward on CQI of AT Services
Closing - Saturday - 11:45 AM

Mary Ellen Buning
University of Colorado at Denver & Health Sciences Center
2408 Syracuse Street
Denver, CO 80238
maryellen.buning@uchsc.edu

When a Wheelchair is a Seat in a Motor Vehicle
IC 34 - Friday - 2:15 PM

Vicki Bunton
Carolinas Healthcare System
1100 Blythe Blvd.
Charlotte, NC 28203
Vicki.Bunton@carolinashealthcare.org

Cases to Consider
IC 48 - Saturday - 9:45 AM

C

Evan Call
Weber State University/ EC Service Inc. Testing Lab
875 South Frontage RD
Centerville, UT 84014-2101
evan@ec-service.net

Wheelchair Seating: Tests, Measurement and Analysis, From the Lab to the Clinic
IC 47 - Saturday - 9:45 AM

David Calver
University of British Columbia, British Columbia's Children's Hospital
Apt #3, 2456 West 4th Ave
Vancouver, BC V6K 1P3
Canada
decalver@yahoo.com, trevormazurek@yahoo.ca

Wheelchair Satisfaction in Individuals with Spinal Cord Injury
Paper - Outcomes - Friday - 1:00 PM

Brenda Canning
University of Hartford
200 Bloomfield Avenue
West Hartford, CT 06117
bcrane@hartford.edu

Managing the Seating and Mobility Needs of the Bariatric client? Challenges and Strategies
IC 12 - Friday - 8:00 AM

Chris Chovan
Rehab Mobility Specialists, Inc
922 Graham Street
Belle Vernon, PA 15012
cchovan@verizon.net

Setting Up and Running a Successful Seating and Mobility Service Delivery Program: Innovations and Strategies
IC 1 - Thursday - 1:00 PM

Laura Cohen
Shepherd Center
2020 Peachtree Rd, NW
Atlanta, GA 30309
laura_cohen@shepherd.org

Setting Up and Running a Successful Seating and Mobility Service Delivery Program: Innovations and Strategies - Panel
IC 1 - Thursday - 1:00 PM

Research Utilization: Moving research to practice
IC 46 - Saturday - 8:30 AM

David Cooper
Sunny Hill Health Centre for Children
3644 Slocan Street
Vancouver , BC V5M 3E8
Canada
dcooper@cw.bc.ca

Dynamic Seating
IC 14 - Friday - 8:00 AM

Rory Cooper
University of Pittsburgh
Department of Rehabilitation Science & Technology
5044 Forbes Tower
Pittsburgh, PA 15260
rcooper@pitt.edu

Opening - Thursday - 9:00 AM

Adaptive Sports & Recreation: Professional Roles in Supporting Participation & Performance
IC 40 - Saturday - 8:30 AM

Bette Cotzin
Washtenaw Intermediate School District
High Point School
PO Box 1406
Ann Arbor, MI 48106-1406
bcotzin@wash.k12.mi.us

Management of Spasticity to Enhance Seating and Positioning
IC 11 - Friday - 8:00 AM

Barbara Crane
University of Hartford
200 Bloomfield Avenue
West Hartford, CT 06117
bcrane@hartford.edu

Measurements of Positions of Sitting Posture and Posture Support Devices According to ISO16840-1
IC 7 - Thursday - 1:00 PM

D

Kim Davis
Crawford Research Institute
Shepherd Center
2020 Peachtree Rd., NW
Atlanta, GA 30309
Kim_Davis@Shepherd.org

Mobility RERC Report on the State of the Science
Instructional Course (2 hour)
IC 6 - Thursday - 1:00 PM

Giovnni De Angelis
Via Caslino 11
Pontelambro, ITALY 22037
a.zzaniga@fumagalli.org

Dumbo Project: Changing the disability that isolates into “tolerable” diversity
Paper - International - Friday - 1:00 PM

Ian Denison
Vancouver Coastal Health
GF Strong Rehab
4255 Laurel St
Vancouver, BC V4M 2A8
Canada
ian.denison@vch.ca

Wheelchair Maintenance for Clinicians
IC21 - Friday - 10:30 AM

Brad Dicianno
University of Pittsburgh
Human Engineering Research Laboratories
VA Pittsburgh Healthcare System
7180 Highland Drive Building 4,
Pittsburgh, PA 15206
bedst3@pitt.edu

That’s Not My Responsibility!!
IC 26 - Friday - 1:00 PM

Adaptive Sports & Recreation: Professional Roles in Supporting Participation &
Performance
IC 40 - Saturday - 8:30 AM

Pathophysiology of Specific Impairments and Disabilities: Common Technology Interventions
IC 43 - Saturday - 8:30 AM

Gerry Dickerson
Medstar, Inc
15-40 128th Street
College Point, NY 11356
gdcrts@aol.com

That’s Not My Responsibility!!
IC 26 - Friday - 1:00 PM

Carmen DiGiovine
6 Degrees of Freedom, LLC
20 Danada Square West_Suite 255_
Wheaton, IL 60187
carmen@6degreesoffreedom.com

Clinical Application of Quantitative Measures in Manual Wheelchair Assessment: An Example of Evidence Based Practice
IC 10 - Thursday - 3:30 PM

Frederick Downs, Jr.
Chief Prosthetics and Clinical Logistics Officer
Department of Veterans Affairs
1722 Eye Street
Washington, DC 20006

VA Equipment Provision: Policies & Practices to Optimize Outcomes for US Veterans & Soldiers
IC 16 - Friday - 8:00 AM

Moving forward on CQI of AT Services
Closing - Saturday - 11:45 AM

E

Doran Edwards
SADMERC Medical Director
Palmetto GBA
P.O. Box 100143
Columbia, SC 29202-3143

Moving Forward on CQI of AT Services
Closing - Saturday - 11:45 AM

Etzyona Eisenstein
Pediatric Neurology Unit and National A-T Center, Safra Children Hospital, Sheba Medical Center, Tel Ha Shomer, Israel
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Matan, Israel 45858
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Assistive technology adjustments in Ataxia-Teleangiectasia patients.
IC 48 - Saturday - 9:45 AM

Linda Elsaesser
PO Box 466
Saylorsburg, PA 18353
elsaesser@enter.net

Clinical Criteria for Provision of Body Support Systems
IC 45 - Saturday - 8:30 AM

Ann Eubanks
Permobil, Inc
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Lebanon, TN 37090
Ann.Eubank@permobilus.com

Setting Up and Running a Successful Seating and Mobility Service Delivery Program: Innovations and Strategies
IC 1 - Thursday - 1:00 PM

Evidence-Based Practice: The first steps in critical review of the literature
IC 39 - Friday - 3:45 PM

F

Martin Ferguson-Pell
University College of London
Center for Disability Research & Innovation
Stanmore HA7 4LP
England

Wheelchair Seating: Tests, Measurement and Analysis, From the Lab to the Clinic
IC 47 - Saturday - 9:45 AM

Moving Forward on CQI of AT Services
Closing - Saturday - 11:45 AM

Debbie Field
Sunny Hill Health Centre for Children
3644 Slocan Street
Vancouver, BC V5M 3E8
Canada
dfield@cw.bc.ca

Towards Establishing the Responsiveness of the Seated Postural Control Measure (SPCM)
Paper - Outcomes - Friday - 1:00 PM

Kathryn Fisher
Therapy Supplies and Rental Ltd
104 Bartley Drive
Toronto, ON M4A 1C5
Canada
kfisher@shoppershomehealthcare.ca

Lessening the Load: Propulsion Assistance Products, How and Where to Use Them
IC 24 - Friday - 10:30 AM

Delia "Dee Dee" Freney-Bailey
19356 Darcrest Ct.
Castro Valley, CA 94546
DDFreney@aol.com

Seating in the Third World
Paper - International - Friday - 1:00 PM

G

Doug Gayton
GF Strong Rehab Centre
4255 Laurel Street
Vancouver , BC V5Z 2G9
Canada
doug.gayton@vch.ca

Podcasting - Not just for iPods !
IC 25 - Friday - 10:30 AM

Mary Jo Geyer
Physical Therapy Program
Chatham College
Woodland Road
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mgeyer@Chatham.edu

Lower Extremity Edema Management Essentials
IC 41 - Saturday - 8:30 AM

Therese Goebel
MOVE International
5370 Lakewood Dr.
Milton, FL 32570
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Creating Functional Seating Strategies Using the MOVE (Mobility Opportunities Via Education) Program
IC 17 - Friday - 8:00 AM

Yasmin Gonzales
SCI Service (128)
James A. Haley VA Medical Center
13000 Bruce B. Downs Blvd
Tampa, FL 33612
Yasmin.Gonzalez@va.gov

Back from the War: Management of Polytrauma Injuries in the VA and Military Hospitals"
IC 23 - Friday - 10:30 AM

H

Simon Hall
Central Remedial Clinic
Seating & Mobility Department
Vernon Avenue
Clontarf, Dublin 3
Ireland
shall@crc.ie

Setting Up and Running a Successful Seating and Mobility Service Delivery Program: Innovations and Strategies
IC 1 - Thursday - 1:00 PM

Marilyn Hamilton
Sunrise Medical Inc.
2382 Faraday Avenue
Suite 200
Carlsbad, CA 92008-7220

Change is Inevitable...Direction is Choice
Keynote Addres
Opening - Thursday - 8:30 AM

Fran Harris
Georgia Institute of Technology
Center for Assistive Technology & Environmental Access
490 Tenth Street
Atlanta, GA 30332
Fran.harris@coa.gatech.edu

Mobility RERC Report on the State of the Science
IC 6 - Thursday - 1:00 PM

Tricia Henley
Baylor Institute of Rehabilitation
2050 Kenny Rd STE 2102
Columbus, OH 43221

Integration of Mobility Options to Maximize Function in Manual Wheelchairs
IC27 - Friday - 1:00 PM

Tom Hetzel
Ride Designs/ Aspen Seating
4251 S. Natches Ct, Suite E
Sheridan, CO 80110
tom@aspenseating.com

Destructive Postural Tendencies: Identification and Treatment.
IC 15 - Friday - 8:00 AM

Katya Hill
University of Pittsburgh
Communication Science and Disorders
5026 Forbes Tower
Pittsburgh, PA 15260
khill@pitt.com

Augmentative and Alternative Communication (AAC) 101 The Basics for Success
IC 35 - Friday - 2:15 PM

Hideyuki Hirose
National Rehabilitation Center for Persons with Disabilities
4-1 Namiki
Tokorozawa , Saitama 359-8555
Japan
hirose@rehab.go.jp

Measurements of positions of sitting posture and posture support devices according to ISO16840-1
IC 7 - Thursday - 1:00 PM

Douglas Hobson
University of Pittsburgh
Department of Rehabilitation Science & Technology
2310 Jane Street
Pittsburgh, PA 15203
dhobson@pitt.edu

Wheelchair Transportation Safety: From Standards, to Application, to the Courtroom
IC 19 - Friday - 10:30 AM

Moving forward on CQI of AT Services
Closing - Saturday - 11:45 AM

Sandra Hubbard
University of Florida & N. Florida/ S. Georgia Veterans Health System
8239 SW Old Wire Rd.
Ft. White, FL 32038
shubbard@phhp.ufl.edu

Using Qualitative Methods to Characterize of Power Assist Wheelchair Users
Poster - Friday - 12:30 PM

J

Susan Johnson Taylor
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Setting Up and Running a Successful Seating & Mobility Service Delivery Program - Innovations & Strategies
IC 1 - Thursday - 1:00 PM

Managing the Seating and Mobility Needs of the Bariatric client? Challenges and Strategies
IC 12 - Friday - 8:00 AM

David Jordan
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Researching remote seating assessment: is the Level of Sitting Scale assessment better in face-to-face assessment than through videoconferencing? (pilot study)
Paper - Outcomes - Friday - 1:00 PM

K

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Configuration, Programming and Application of Head Access with Powered Mobility for Adults with SCI, ALS, MD, and TBI
IC 5 - Thursday - 1:00 PM

The evaluation needed for powered mobility for young children or children with significant developmental delays
IC 18 - Friday - 10:30 AM

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Toua Gishi Kogyo co.,ltd
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Measurements of positions of sitting posture and posture support devices according to ISO16840-1
IC 7 - Thursday - 1:00 PM

Development of posture measurement instrument and its clinical application
Poster - Friday - 12:30 PM

Takashi Kinose
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The introduction and the roles of The Japanese Society of Seating Consultants (JSSC)
Poster - Friday - 12:30 PM

Kay Koch
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Behind The Scenes- Things Clinicians Don’t Know About Suppliers, but should.
Instructional Course (1 hour)
IC 36 - Friday - 3:45 PM

Alicia Koontz
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Preserving Upper Limb Function in Wheelchair Users: Application of Clinical Practice Guidelines
IC 31 - Friday - 1:00 PM

L

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Custom Seating - The 5 Ws
IC 9 - Thursday - 3:30 PM

24-Hour Postural Care - The Quest for Objective Data
Paper - Outcomes - Friday - 1:00 PM

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It's Not Rocket Science: Transforming Your Good Ideas Into Viable Clinical Research Topics
IC 28 - Friday - 1:00 PM

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The Impact of Power Assist Wheels on QOL: An interim Report
Paper - Outcomes - Friday - 1:00 PM

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CPT Coding and Reimbursement for Therapy Services
IC 4 - Thursday - 1:00 PM

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Advanced Case Studies
IC 48 - Saturday - 9:45 AM

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Rollin', Rollin', Rollin' … Get This Wheelchair Rollin':Selecting Access Methods for Power Mobility
IC 51 - Saturday - 9:45 AM

M

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Load redistribution in standing, tilt-in-space, and reclining wheelchairs
Paper - Research - Pressure - Friday - 1:00 PM

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Creating Functional Seating Strategies Using the MOVE (Mobility Opportunities Via Education) Program
IC 17 - Friday - 8:00 AM

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Back from the War: Management of Polytrauma Injuries in the VA and Military Hospitals
IC 23 - Friday - 10:30 AM

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Personal Preferences for Completion of Daily Activities: Implications for Assistive Technology Use
Paper - Outcomes - Friday - 1:00 PM

The effect of wheelchair tilt on seat and back pressure distribution in adults without physical disabilities: Influence of antrhopometric variables
Paper - Research - Pressure - Friday - 1:00 PM

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Setting Up and Running a Successful Seating and Mobility Service Delivery Program: Innovations and Strategies
IC 1 - Thursday - 1:00 PM

Managing the Seating and Mobility Needs of the Bariatric Client? Challenges and Strategies
IC 12 - Friday - 8:00 AM

That's Not My Responsibility!!
IC 26 - Friday - 1:00 PM

Moving forward on CQI of AT Services
Closing - Saturday - 11:45 AM

N

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Management of Spasticity to Enhance Seating and Positioning
IC 11 - Friday - 8:00 AM

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Discussion about their own result of pressure mapping measurement is an effectual method as the education to prevent the recurrence of pressure ulcers.
Poster - Friday - 12:00 PM

Linda Norton
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She's Sliding Agaiain!
IC 30 - Friday - 1:00 PM

Resistance is Futile -- Fostering Treatment and Compliance
IC 33 - Friday - 2:15 PM

O

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Musculoskeletal Pain: Classification of Pain Mechanisms, Evaluation Parameters, and Intervention as it Relates to Seating in a Wheelchair
IC 8 - Thursday - 3:30 PM

P

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Early Intervention: Early Intervention: Preventing the consequences of inappropriate seating and immobility
IC 20 - Friday - 10:30 AM

Jon Pearlman
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Designing Wheeled Mobility Devices for Remote Environments: A case study from India
Paper - International - Friday - 1:00 PM

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Musculoskeletal Pain: Classification of Pain Mechanisms, Evaluation Parameters, and Intervention as it Relates to Seating in a Wheelchair
IC 8 - Thursday - 3:30 PM

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Let 'em fly – minimalist seating for maximum function
IC 13 - Friday - 8:00 AM

Seating the Unseatable for Independent Mobility, a case study
IC 48 - Saturday - 9:45 AM

Leigh Pipkin
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Impact of an interface pressure mat on immersion and pressure distribution
Paper - Research - Pressure - Friday - 1:00 PM

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Evidence-Based Practice: The first steps in critical review of the literature
IC 39 - Friday - 3:45 PM

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Adaptive Sports & Recreation: Professional Roles in Supporting Participation & Performance
IC 40 - Saturday - 8:30 AM

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Integration of Mobility Options to Maximize Function in Manual Wheelchairs
Instructional Course (2 hour)
IC 27 - Friday - 1:00 PM

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Using FIATS to Measure the Effect of Seating Devices on Families of Children with Physical Disabilities
Paper - Outcomes - Friday - 1:00 PM

S

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The Need for Supplier Standards to Improve Quality and Appropriateness of Medical Equipment
IC 44 - Saturday - 8:30 AM

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Segway Human Transporter – Investigation into Viability as a Mobility Device
Opening - Thursday - 8:30 AM

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Setting Up and Running a Successful Seating and Mobility Service Delivery Program: Innovations and Strategies
IC 1 - Thursday - 1:00 PM

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ISS Co-Director

Review of the Purpose, Use and Content of the RESNA Position Papers on Wheelchair Seat Elevators & Standers
IC 37 - Friday - 3:45 PM

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Ataxia-Teleangiectasia- a model for cooperation between a National Disease Center and an Assistive Technology Unit
Paper - international - Friday - 1:00 PM

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Setting Up and Running a Successful Seating and Mobility Service Delivery Program: Innovations and Strategies
IC 1 - Thursday - 1:00 PM

A Comparison of Custom Molded Seating Systems
IC 3 - Thursday - 1:00 PM

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Mobility RERC Report on the State of the Science
IC 6 - Thursday - 1:00 PM

That's Not My Responsibility!!
IC 26 - Friday - 1:00 PM

Wheelchair Seating: Tests, Measurement and Analysis, From the Lab to the Clinic
IC 47 - Saturday - 9:45 AM

Jürg Stoll
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QOL Using Stand-up Wheelchair
IC 38 - Friday - 3:45 PM

Maureen Story
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Dynamic Seating
IC 14 - Friday - 8:00 AM

Standing – The Alternate Position
IC 22 - Friday - 10:30 AM

Thomas Stripling
Paralyzed Veterans of America
Research, Education, Clinical Practice Guidelines
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Washington , DC 20006

Moving Forward on CQI of AT Services
Closing - Saturday - 11:45 AM

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Wound Care Protocol for Sitting Acquired Pressure Ulcers: Best Practice
IC32 - Friday - 2:15 PM

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Humidity and Temperature Measurements for Wheelchair Cushions
Paper - Research - Pressure - Friday - 1:00 PM

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ISS Course Director

Opening – Thursday – 9:00 AM

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Seating Forces to Analyse Sitting Posture - Experimental Analysis
Paper
Paper - Research - W/C - Friday - 3:45 PM

Pelvic Tilt and Proper Chair Adjustment Derived from Contact Forces on the Seat - Biomechanical Analysis
Paper
Paper - Research - W/C - Friday - 3:45 PM

W

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Enabling safe powered wheelchair mobility with long term care residents with cognitive limitations
Poster - Friday - 12:30 PM

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That's Not My Responsibility
IC 26 - Friday - 1:00 PM

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Therapeutic Positioning During Sleep
IC 29 - Friday - 1:00 PM

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Rollin', Rollin', Rollin' … Get This Wheelchair Rollin'
IC 51 - Saturday - 9:45 AM

Erik J Wolf
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Whole-Body Vibration and Power Wheelchairs
Paper - Research - W/C - Friday - 3:45 PM

Z

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Department of Rehabilitation Medicine
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Exploring Tools to Improve Pressure Ulcer Detection: Spectroscopic Assessment of the Blanch Response in Elderly Nursing Home Residents at Risk for Pressure Ulcers
Paper - Research - Pressure - Friday - 1:00 PM

23rd International Seating Symposium Planning Committee

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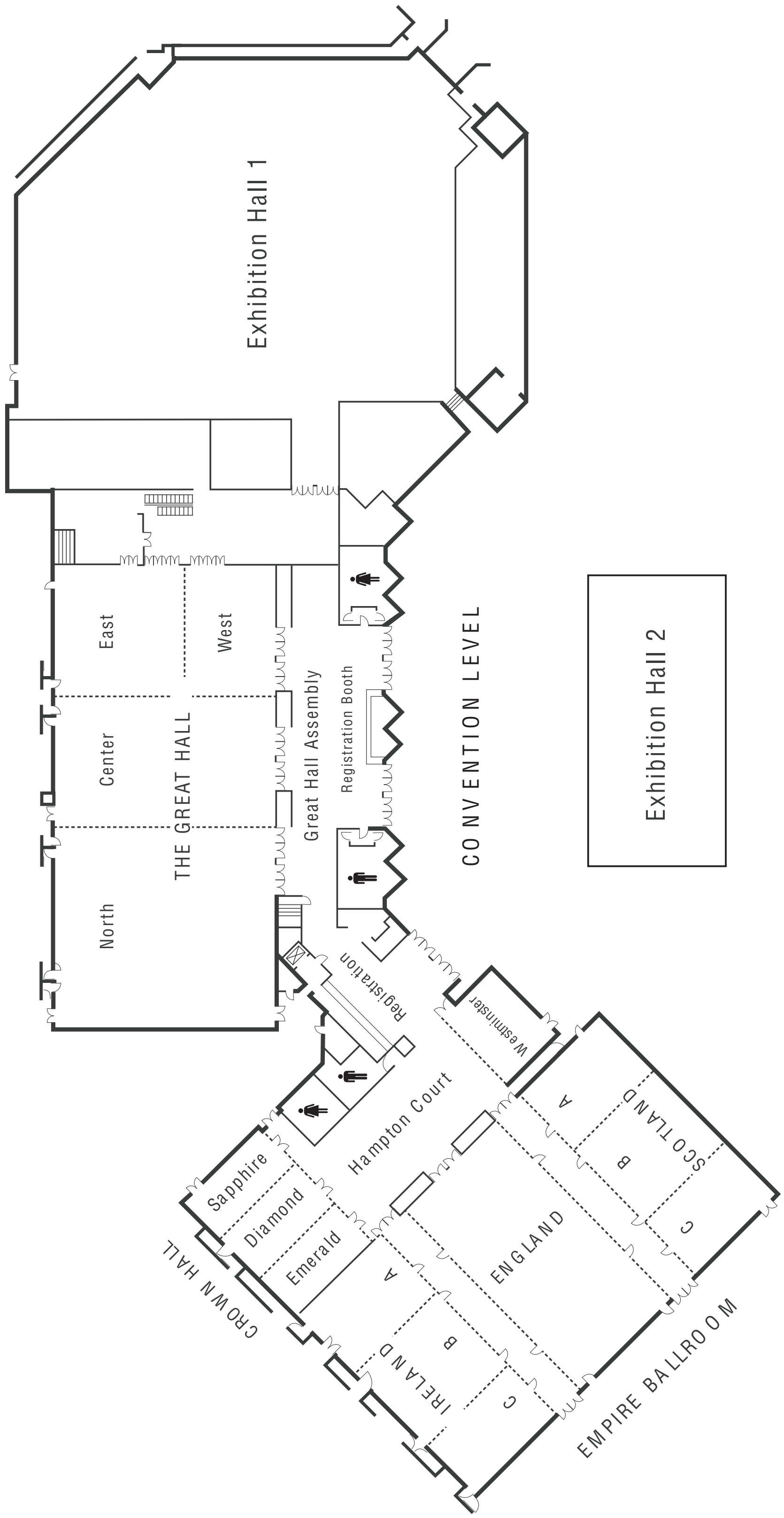
Hotel floor plans



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Z

Thursday, March 8, 2007

Change is Inevitable, Direction is Choice

Marilyn Hamilton

On the day Marilyn Hamilton found her self injured in a hang gliding accident she began a new chapter in her life story. From founding Quickie wheelchairs to being the recipient of the State of California's Minerva Award and meeting the Dali Lama Marilyn's life resume is full of astounding accomplishments. The path that Marilyn's life has taken has not been by default, her exuberant personality and untiring ambition has made her one of the most prominent members in the rehab and consumer communities. Spending time with Marilyn will leave you inspired to dream the seemingly impossible.

Investigating the Segway Human Transporter as an Alternative Mobility Device

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The Segway Human Transporter was introduced onto the market in 2001 and is described as “the first self-balancing, electric-powered transportation device” 1. The rider stands on a small platform supported 20 cm off the ground by two parallel wheels and holds onto handlebars that are used to steer the device. When the rider leans forward, the Segway moves forward and when the rider leans back, the Segway moves back or stops. Balancing on the Segway is possible because gyroscopes and other sensors constantly sense an individuals’ centre of gravity and make minute adjustments to ensure a balanced and upright posture 1 .

Although there are no peer-reviewed articles regarding the Segway as a mobility aid for disabled populations, there are many personal accounts in the public domain about people with disabilities who use the Segway for mobility purposes (ie. Parkinson’s, multiple sclerosis, amputees, etc) 2.

The purpose of this study was to determine what skills are necessary for successful use of a Segway for individuals with disabilities and which functional outcome measure(s), if any, would be predictive for therapists to use when assessing clients potential for Segway use. Approval for this project was through university and hospital clinical research ethics boards.

Methods

Participants

Participants included those with some form of mobility impairment, aged 19 to 65, with sufficient cognitive capacity to follow instructions, and the ability to walk 6m either independently or with walking aids. Participants were excluded from the study if they were at high risk for osteoporosis or scored less than 24 on the Cognitive Capacity Screen Examination.

Instrumentation

Assessment included a preliminary interview to collect demographics of each participant including age, height, weight, gender, medical diagnosis and current mobility device usage. Other measures included the Berg Balance Scale, hand grip strength (using a Jamar hand dynamometer), manual muscle testing of muscles involved in standing (quadriceps, hamstrings, gluteal muscles and gastrocnemius) and the Timed Get Up and Go were used to assess functional ability 3,4,5 . The Cognitive Capacity Screening Examination was administered upon the first session to determine baseline cognitive ability18.

Procedure and Data Collection

Session 1- The 90 minutes session included obtaining informed consent, baseline assessment measures and providing a 45 min training session on the Segway that included learning basic skills (getting on/off, going forwards/backwards, turning, etc). All functional assessments and training were conducted by KH.

Session 2 - A 30 minute included review of skills learned in Session 1 and training on more advanced skills such as traveling up/down ramps and negotiating varied terrain (grass, curb cuts, tree roots, uneven pavement etc).

Session 3 - The third session, which took place within one week of the second session, provided a 15 min review of skills, followed by Segway Task Assessment administered by investigators (BS or ID).

Results

Twenty-three participants completed all three sessions, while four participants were excluded or withdrew from the study. Characteristics of age, sex and current mobility aids are presented in Table 1 The medical conditions of the participants and the time since diagnosis varied widely and are summarized in Table 2.

Sex	
Male	15
Female	8
Age	
Range	21-65 yrs
Mean	45.2 yrs

Table 1: Demographic data collected

Assessments

As expected from such a wide range of individuals with disabilities, we found a wide range of scores on the functional measures. The most striking was the relatively low score on the Berg test. These low scores were from three subjects with paraplegia. See Table 3.

Segway Task Assessment: The range of scores for the “required skills” on the Segway Task Assessment was 22-24 with the median of 23.73. The range of scores for the “advanced skills” was 3-8 with a median score of 7.

Medical Diagnosis		# of subjects (N=23)	Years since diagnosis/ injury
Amputee	Bilateral- above knee and below knee – (1)	2	1 year, 4 years
	Unilateral -below knee-(1)		
Incomplete Spinal Cord Injury	C1-2- ASIA D(1)	4	7 mos.- 23 years
	C4-5- ASIA D (2)		
	C5-6- ASIA D (1)		
Complete Spinal Cord Injury	T5- ASIA B(1)	2	3 years, 31 years
	T9-ASIA A (1)		
Multiple Sclerosis		6	6-18 years
Guillian Barre Syndrome		1	7 mos.
Rheumatoid Arthritis		1	10 years
Spondyloepiphyseal dysplasia		1	32 years
Cervical myelopathy		1	2 years
Muscular dystrophy		1	33 years
Spincocerebellar ataxia		1	6 years
Spinal meningitis		1	43 years
Spinal cord lipoma		1	31 years
Stroke/C5 fracture		1	Less than 1 year since stroke

Table 2: Medical diagnosis of participants and years since injury/ diagnosis

Evaluation Tool			Range	Median
Berg Balance			7-56	42.13
Hand Strength	Right		0-56.67	32.07
	Left		7.33-53.33	27.67
Manual Muscle Testing	Quadricpeps	Right	0-5	4.25
		Left	0-5	4.18
	Hamstrings	Right	0-5	3.48
		Left	0-5	3.28
	Gluteal	Right	0-5	3.89
		Left	0-5	3.61
	Gastrocnemius	Right	0-5	3.57
		Left	0-5	3.38
Timed Get up and Go (sec)			7.9-93	19.12
Cognitive Capacity Screening			26-30	29.22
Segway Task Assessment		Required Elements	22-24	23.73
		Advanced Skills	3-8	7

Table 3: Evaluation range, median and standard deviation of preliminary assessments

Analysis

Assessment Data

Analysis for this study was projected to comprise of a univariate analysis and a multiple regression analysis of the data, however a statistician was consulted and after 23 participants it was discovered the study had reached a ceiling effect. All participants, regardless of their scores on the preliminary assessments were able to complete the mandatory Segway Tasks successfully. Due to the lack of variability in the Segway score in the 23 subjects, it was suggested to terminate the study early as more subjects would not enhance the results. Thus no regression was performed between the pre-assessment scores with the Segway Assessment score.

Discussion

Functional Assessment

The results from this study demonstrate that there was no correlation between the functional assessments chosen and performance on the Segway. All participants were capable of operating the Segway independent of their scores on the preliminary functional assessments for balance, grip strength and muscle strength. Although the functional outcomes measures used in this study may not be predictive of successful Segway use, valuable information was gained by the high level of success of the all participants on the Segway Task Assessment. The participants' disabilities and functional ability varied widely and therefore, it could be concluded that the Segway may be an appropriate mobility device for a broader range of disability groups and functional levels than first realized.

Limitations to Study

It is recognized that there are limitations to this study. Participants were gained through self-recruitment; therefore, a sample bias is likely to have occurred. Also, the data analysis showed a ceiling effect which may indicate that the assessment tools used in the study may not have been sensitive enough to capture capability and success of operating the Segway. The inconsistent use of mobility aids during the initial assessments (Berg Balance Scale and the Timed Get Up and Go) was another limitation of this study, as some participants used assistive device during the assessments and some did not. One final possible limitation is that this study involved participants with a broad range of disabilities, resulting in a high degree of variability. While this may be seen as a limitation in terms of predicting the use of the Segway for a particular population, this factor was seen as a strength by the investigators because it enables the findings of this study to be generalized to a larger population and speaks to the clinical utility of the results.

Further Research

Due to the ceiling effect that occurred in this study, a second phase has been developed in order to complete a more detailed analysis of Segway use. The purpose of Phase II is to determine how the Segway compares to a subjects current mobility device in the performance of a task the subject has identified as being important to them using the Wheelchair Outcomes Measure (WhOM) 6. This further research will help to establish the Segways potential as a mobility option.

Conclusion

This study has shown that the Segway can be used by a broad range of populations and functional abilities. It has the potential to enable individuals to participate in meaningful activities that their current mobility aids are unsuited to and anecdotal feedback overwhelmingly suggests that the Segway promotes higher self esteem and greater quality of life. With continued research, the Segway has the potential to be considered as a viable mobility option for individuals with disabilities.

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Pressure Ulcers: More questions than answers

David Brienza, Ph.D

Considerable effort has been expended over the past 50 years aimed at understanding the causes and developing methods to prevent and treat pressure ulcers. Both the severity in terms of the potential harm to individuals, and extent in terms of incidence and prevalence within and across populations are well documented. Putting aside issues related to treating pressure ulcers once they develop, the primary questions our community has considered are: (1) what causes pressure ulcers? and (2) how are pressure ulcers prevented? The literature is replete with studies that either identify new factors or confirm known factors, however, there are few, if any, publications eliminating factors. While it is evident that there is no single cause for all, or perhaps, any pressure ulcer, it is equally plausible that many in the vast array of potential factors are, in fact, not factors. At the present time, it would seem that we should arrive at a point in the development of our knowledge concerning pressure ulcer etiology and prevention where we are beginning to narrow the realm of possible causes and solutions. Answers to following questions might allow us to cull list of potential factors are as follows:

- What causes pressure ulcers? Ischemia? Reperfusion injury? Impaired interstitial fluid flow? or Sustained tissue (muscle) cell deformation?

- Can pressure ulcers be prevented by simply reducing pressure on the skin?

- Are superficial (Stage 1 and Stage 2) pressure ulcers caused by pressure? That is, are they pressure ulcers at all?

- Is shear an important factor? And if so, how does shear cause pressure ulcers?

- What role does friction play in the development of pressure ulcers?

- Is heat a cause or contributing factor?

- Are all pressure ulcers preventable?

These are not simply academic questions without real-world consequences. For example, consider the question about the legitimacy of stage 1 and stage 2 pressure ulcers. A variety of different dermal lesions result from factors other than pressure. For example, urinary or fecal incontinence cause skin maceration. Superficial erosions may develop from friction when an immobile patient is dragged in bed. Shear forces may also cause stretching and tearing of blood vessels, resulting in non-blanchable erythema over a boney prominence. The inclination often will be to call these lesions pressure ulcers as they are occurring in patients at-risk for ulcers and at locations typical for a pressure ulcer. However, since pressure ulcers by definition are pressure-induced lesions, these non-prolonged pressure-related dermal injuries should not be called pressure ulcers. The importance of not labeling these lesions as pressure ulcers is widely recognized among experts in the field. At a recent National Pressure Ulcer Advisory Panel Consensus Conference, the strongest point of agreement among expert respondents was that the definition of a stage 2 pressure ulcer should be changed so as to specifically exclude non-prolonged pressure related injuries such as from friction or moisture (Black, 2005). Such mislabeling causes confusion among clinicians. While no epidemiological research or clinical studies exist describing the extent of such mislabeling, experience suggests that many superficial lesions are inappropriately labeled as pressure ulcers.

All of these questions reflect significant issues. Answering them will result in the development of more effective prevention strategies and devices.

References

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Setting Up and Running a Successful Seating and Mobility Service Delivery Program: Innovations and Strategies

Susan Johnson Taylor, OTR/L, moderator- Rehab Inst of Chicago
Geoff Bardsley, Phd- Clinical Engineer, TORT Ctr, Ninewells Hosp.
Teresa Berner, MS, OTR/L, ATP Ohio State Univ Med Ctr
Chris Chovan, OTR/L, ATP, Private practice, PA
Laura Cohen, PhD, PT, ATP, Shepherd Center
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Jean Minkel, MPT, Minkel Consulting
Rick Schein, MS, CATEA, U of Pittsburgh
Jill Sparacio, OTR/L, ATP, ABDA, Private Practice

A. Introduction and overview of common aspects of service delivery
Susan Johnson Taylor 15 minutes

B. An international perspective:
Client survey from program in Dundee, Scotland
Geoff Bardsley 15 minutes

C. Coding and Billing services: US
Teresa Berner 30 minutes

D. Service Delivery Methods 15 minutes each

Survey of rehabilitation center based seating clinics
Anne Eubank

Community based, private practice seating service
Chris Chovan

A "hub and spoke" program in Ireland
Simon Hall

Tele-rehab
Rick Schein

Special state funded program overview
Payer Support Social Participation Model of Long Term Managed Care
Jean Minkel and Gerry Dickerson

E. Documentation method
Jill Sparacio 30 minutes

F. CMS Funding changes and how they impact practice
Laura Cohen 30 minutes

Discussion and Wrap-up 15 minutes

Clinical Training:

Considerations and Equipment Selection Relative to Impairment

Sheila Buck B.Sc.(OT), Reg.(Ont.), ATP

A good seating evaluation involves assessment and consideration of many client factors including physical, functional and lifestyle. These and many other factors play a role in determining the prescription of seating components and wheelchair frames/design. How do product design features meet specific client needs? How do you balance the client's needs and wants for function with theoretical concerns for pressure management and postural support? Establishing a list of priorities and goals is essential in developing a seating system that will not only meet the client's physical needs, but also address functional and lifestyle concerns.

Common Physical Concerns:

Pressure management – tissue integrity	Orthopedic issues
Moisture/temperature management	Physiological function
Balance through an upright posture – postural support and stability	Mobility

Common Functional Concerns:

Upper/lower extremity function	Comfort
Sitting endurance / tolerance	Transfers
self care / ADL skills required	propulsion

Lifestyle concerns:
Current

transportability – weights, ease of assembly	accessory accommodation
maintenance/cleaning	aesthetics
cost effectiveness	

Future

- prevent postural deformity/ pressure sores/shearing
- growth adjustability/durability

AREAS OF ASSESSMENT

Medical/Physical

• Prognosis	• Bony protrusions
• Potential for change	• Weight changes
• Surgeries previous or planned	• Incontinence
• Medications	• Allergies
• Ability to sit unsupported	
• Skin condition - At risk skin areas – sensory changes	
• Tonal changes/contractures/muscle strength	
• Reflexes – normal/abnormal – use of reflexes in postural support	
• ability to reposition self	
• orthopedic – ROM, Contractures	

Lifestyle/environment

- Home /Other locales
- Transport methods
- Climate/environment
- Independent/caregivers
- School, work, leisure
- Past, present, future

Perceptual /Cognitive Status

Ability to identify and communicate pain

Equipment Needs

- Current equipment or abandonment - what has and has not worked
- Equipment needs/ wants for function- height, weight, degree of support
- Method of propulsion
- Posture and function in equipment already owned

The M.A.T. Assessment

Supine Assessment

Pelvic and sacral range of motion

posterior pelvic rotation	pelvic obliquity
anterior pelvic rotation	lateral pelvic rotation

Trunk range of motion

kyphosis – anterior curvature	rotation
scoliosis – lateral curvature	rib hump – rotoscoliosis

Lower extremity

- hip range of motion – stabilize the pelvis first – internal/external rotation, flexion, extension, ab/adduction
- knee ROM (to measure hamstring length as related to seating) – stabilize the pelvis, maintain hip at sitting angle, assess knee extension/flexion
- foot range – inversion, eversion, plantar flexion, dorsiflexion

Upper extremity

shoulder flexion/extension for propulsion/reach	elbow/wrist range of motion
shoulder retraction	grip strength

Simulation

- Determine location and amount of support to achieve and hold balanced position

Observe:Head position – cervical flexion, hyper extension

- Upper extremity position– shoulder protraction/ retraction
- reach forward, sideways, up, grip strength
- Effect of tilt or recline on – positioning, repositioning, relaxation, tone
- Determine if you are able to “correct” into a desired posture or accommodate a fixed position
- How much force are your hands and legs applying to hold this position? (minimal, moderate, maximum)
- Is the “final position” agreeable to person and caregiver for relaxation, function and support, swallowing, communication? Can caregiver/ person, get them in/ out of this position without too much effort?

Postural Control vs. Pressure Distribution

Postural control is applicable for clients with decreased ability to maintain an upright sitting posture. This impacts their functional capacity based on weakness, abnormal tone or orthopedic deformity. Improved postural control begins with central/ proximal stability, initiated with pelvic stabilization. It is important to provide even pressure distribution over weight bearing surfaces for clients who do not have the ability to shift weight independently, who have sensory impairment or emaciation or for clients with asymmetrical alignment – i.e. hip dislocation or obliquity. Posture and seating is dynamic in nature through out the day and over time. Individuals change as they grow and develop, and their need for postural support or pressure relief changes as well. For individuals with progressive disorders, the need for postural support or pressure relief will likely increase over time.

Prevention, Correction or Accommodation

All three may be incorporated into one seating system. i.e. prevention of pressure or further deformity, correction of a partially flexible scoliosis and accommodation of windswept legs.
1. Prevention of abnormal postures, orthopedic deformities and/ or pressure problems.
2. Correction of abnormal postures and functional orthopedic deformities that are flexible and will enhance function. Healing/ correction of causes of pressure problems.
3. Accommodation of abnormal postures and orthopedic deformities which are structural (fixed) in nature. To provide comfort, enhancing or preserving functional ability and ease of management.

Pelvic Deviations: What do they tell YOU?

Posterior Pelvic Tilt

Instability (client attempts to lower center of gravity)	Client lacking 90 degrees of true hip flexion
Spasticity	Too high seat to floor height for foot propellers – combination with transfers, is power better?
Too short seat depth	Tight hamstrings
Too little (short) back height	Fixed sacral angle
Back support starts too high above seat cushion	Lack of comfort or pressure relief
Sling back upholstery	

Anterior Pelvic Tilt

- Low trunk tone/trunk weakness
- Stronger trunk/head/neck extensor than antagonistic flexors
- Tight hip flexors/low tone in back extensors

Pelvic Rotation

- Seat to floor height too high for unilateral foot propellers – consistently pulling self forward – use of power to reduce rotation?
- Spasticity
- Lack of 90 degrees of hip flexion on one side only, but seat to back angle set at 90 degrees

Pelvic Obliquity

Unstable sitting surface	Lack of 90 degrees of hip flexion on one side only
Spasticity	Previous hip fracture or hip dislocation

Matching Product to Seating Assessment

PRESCRIPTION JUSTIFICATION

• Identify problems and potential for function	• Identify equipment parameters
• Develop goals	• Translate parameters into product
• State objectives	• Verify product fit and use
• Identify product properties	

SHAPE – SEAT BASE

• Anterior shelf	• Anterior medial support
• Posterior opening	• Posterior depth to accommodate pelvic rotation
• Posterior lateral shelf	• Anterior depth to accommodate leg length discrepancy
• Anterior lateral support	

SHAPE – BACK SUPPORT

• Sacral – to PSIS	• Scapular
• Lumbar – not an area to add force	• Shoulder
• Thoracic	• lateral
• Cervical – not an area to add force	

SEATING SYSTEM SET-UP

Mounting the seating system in the chair is just as critical as the product being applied.

- Height- back support in relation to cushion and lower back hardware
- Angle- back, seat, canes
- Portability – multiple use, hardware slippage
- Affect on chair depth, seat depth, leg angle, centre of gravity, back cane interference, R.O.M. of arms

LANDMARKS FOR PROPER POSITIONING

- Space behind knee to edge of cushion
- Height of headrest in relation to the head
- Space behind buttocks and back edge of cushion
- Space from seat cushion up to initial contact of the lower back on the back support
- Orientation of the ASIS

CENTER OF GRAVITY

- Refers to the “Balance Point” of an individual in relation to the wheelchair
- Forward C.O.G. improves responsiveness of the wheelchair and allows easier propulsion
- Rearward C.O.G. improves stability of the wheelchair for “First Time” users
- Affected by Axle position, Caster placement, and Caster orientation

SEATING CONSIDERATIONS FOR WHEELCHAIR SET UP

- Centre of gravity changes for kyphotic postures or changes in hip/pelvic angles, weight changes
- Centre of body over axis or rear wheel to maximize mobility and stability
- Too forward – hard to push, hard to tip
- Too far back – chair tippy backwards, difficult to steer, may sit in kyphosis to stabilize self

SHOULDER/CHEST SUPPORTS, HEADRESTS, TRAYS, ELBOW SUPPORTS, ANTERIOR PELVIC SUPPORTS, FOOT SUPPORTS

- What is your goal and that of the client? Three points of positioning/forces
- If everything needs to be tied down, then the relationship of the pelvis to the trunk may not be correct

A Comparison of Custom Molded Seating Options

Jill Sparacio, OTR/L, ATP, ABDA

The use of indirect molding was developed over 20 years ago to provide seating solutions for those individuals with significant positioning needs. Although it's most common use is with individuals with fixed skeletal deformities, it has also been found to be effective with others, including those with movement disorders and hypotonicity. Since the introduction of the original Pindot ContourU line in the 1980's, other manufacturers have brought their versions to market, expanding available options.

The key to successful indirect molding is a thorough mat evaluation. During this process, the physical needs of the individual can be assessed, identifying his/her seating needs. Simulation provides additional evaluation information. The development of indirect molded seating systems led to the invention of the simulator, a frame used to capture an individual's shape and contour. A simulation can be completed as part of the evaluation process. Once completed, additional information regarding the shapes and contour needed for proper support can be easily identified. This information can lead to product selections and recommendations.

During the molding process, a variety of molding frames and technology have been developed. All simulators include some type of frame as well as molding bags. These are usually a shapable bag filled with foam or plastic beads. As air is pulled out of these bags, the filling becomes more rigid, allowing the bag to be shaped around the individual in the desired contour. Once completed, the shape needs to be captured in some manner to provide the information to the manufacturer. Shapes originally were captured only through the use of plaster casting. This was time consuming, labor intensive and costly. It also resulted in a dusty and dirty work area. Now, in addition to plaster casting, there are several methods of collecting shape data. These include a variety of methods with digital technology as well as foam in place. These digital methods have decreased the cost of indirect molding, eliminating the need to purchase plaster, the labor hours to complete a plaster cast and the cost of shipping the cast to the manufacturer. Each manufacturer has their own preferred means of capturing shapes.

Once the shape is captured and transported to the manufacturer, either digitally or shipping, the seating is fabricated. This process has also evolved since its invention. Each manufacturer has its own process for manufacturing. All manufacturers provide constant scrutinization of the process to insure that the contour of the original mold is maintained.

Available features in the final product also vary by manufacturer. Options can include a simple change in seat depth to a reinforced, swing away lateral trunk support. Most manufacturers are willing to "customize" their options to meet their customer's needs. Although upcharges are associated with most options, it can be a successful method to gain the proper support and contact needed.

Although all manufacturers strive to provide a support surface with contour that exactly matches the simulation, cushions can look very different. The various manufacturing processes vary in terms of cushion thickness, lateral support thickness, and the design of the surfaces not making contact with the end user. The cushion coverings also mark differences from one manufacturer to another. These can vary from vinyl to removable covers of various fabrics.

A significant difference among the manufacturers is found in their foam choices. Various densities and foam qualities are available, offering options from very soft to very rigid. Most custom contoured cushions are somewhat heavy due to the nature of the foams used as well as the means of mounting the cushion.

From a dealer perspective, the remake policy of the various manufacturers needs to be fully understood. All companies offer the ability to remake a cushion if the fit is not optimal. The time frames available and the reasons for remakes vary greatly. Since these are often changing, it is imperative to have current guidelines.

Custom molded seating systems provide a solution for individuals with significant positioning needs. As each cushion is custom, so is the manufacturing process. Each manufacturer offers it own special techniques and options to provide a unique cushion. These specific features need to be taken into consideration when selecting a manufacturer. It should be kept in mind that the cushions are only as good as the molded shape. The key to successful custom molded seating is an accurate mold while fully understanding the seating needs of the end user.

CPT Coding and Reimbursement for Therapy Services

Barbara Levy, PT, ATP

Learning Objectives

The participants will:

1. Define the components of CPT Codes and describe how the codes and reimbursement rates are determined.

2. Describe the process for obtaining editorial changes and new codes.

3. Name 10 CPT Codes and describe the use of each code as they relate to AT Services.

4. Name and describe 5 coding challenges that affect the use of CPT Codes for service billing.

5. Utilize the Correct Coding Policy Manual to determine which codes can be used together and which are considered edits.

6. Describe the documentation requirements to support the billing codes.

7. Compare and contrast the billing requirements and reimbursement process for various practice settings

8. List, describe, and integrate 3 specific resources to maintain current (and changing) knowledge of CPT Codes, the allowable reimbursement rates, and documentation requirements.

Physician's Current Procedural Terminology (CPT) - Accurate descriptive terms for reporting medical services and procedures. CPT provides uniform language and allows for reliable nationwide communication. The American Medical Association (AMA) holds the copyright to the CPT Codes.

Resource Based Relative Value Scale (RBRVS)
This is the standardized payment schedule that is based on the cost of providing the service. All payors are suppose to use CPT based on HIPAA regulations.

Relative Value Unit (RVU)
These indicate how much one procedure is worth in relation to another procedure.
Components of Relative Value: Physician (provider) Work, Practice Expense, and Professional Liability Insurance Costs.
Components of Work include: Time to perform the service, Technical skill and Physical effort, Mental effort and Judgment, and Psychological stress.
Components of Practice Expense include: Administrative labor, Clinical labor, Medical supplies and equipment, Office supplies, All other expenses.

Conversion Factor
Translates the RVU into an actual dollar amount.

National Average Allowance (NAA)
Conversion Factor x Relative Value Unit (RVU) = NAA
NAA x Geographic Practice Cost Indices (GPCI) = Local Payment Rates

Requests for Coding Changes
Through a process that includes research, consultation and coding expertise, coding proposals are developed, reviewed and acted on by the AMA's CPT Editorial Panel, CPT Advisory Committee, Relative Value Scale Updating Committee (RUC), Health Care Professionals Advisory Committee (HCPAC), and the AMA Department of Coding & Nomenclature.

Documentation requirements for a new code: Code Description, Clinical Vignette, Applicable Diagnoses, Rationale, Supportive Research Documentation, Related Code Deletions.

Editorial revisions that do not require a change in relative value can be submitted by a professional association, in the form of a letter of request, to the AMA.

Physical Medicine and Rehabilitation 97000 Series CPT Codes©AMA

CPT code	Description
97001 97003	PT Evaluation OT Evaluation No time attached
97002 97004	PT Re-Evaluation OT Re-Evaluation No time attached.
97112	Therapeutic procedure; neuromuscular reeducation of movement, balance, coordination, kinesthetic sense, posture, and/or proprioception for sitting and/or standing activities; Direct one-on-one patient contact, Each 15 minutes
97530	Therapeutic activities, direct (one on one) patient contact by the provider (use of dynamic activities to improve functional performance), each 15 minutes
97535	Self-care/home management training (eg, activities of daily living(ADL) and compensatory training, meal preparation, safety procedures, and instructions in use of assistive technology/adaptive equipment) direct one on one contact by provider, each 15 minutes
97537	Community/work reintegration tTraining (eg, shopping, transportation, money management, avocational activities, and/or work environment/modification analysis, work task analysis, use of assistive technology device/adaptive equipment), direct one-on one contact by provider, each 15 minutes (For wheelchair management/propulsion training, use 97542)

CPT code	Description *(Continued from page 53)*
97542	Wheelchair management (eg, assessment, fitting, training), each 15 minutes
97750	Physical performance test or measurement (eg, musculoskeletal, functional capacity), with written report, each 15 minutes. Requires direct one-n-one patient contact.
97755	Assistive technology assessment (eg, to restore, augment or compensate for existing function, optimize functional tasks and/or maximize environmental accessibility), direct one-on-one contact by provider, with written report, each 15 minutes (To report augmentative and alternative communication devices, use 92605 or 92607)
97760	Orthotic(s) management and training (including assessment and fitting when not otherwise reported), upper extremity(s), lower extremity(s) and/or trunk, each 15 minutes
97762	Checkout for orthotic/prosthetic use, established patient, each 15 minutes

Coding Challenges

ICD9-CM
The ICD9 codes support the medical necessity and are linked to specific CPT Codes.

Modifiers
Provider Specific – To be used after each code:
GP – Physical Therapist
GO – Occupational Therapist
GN – Speech Language Pathologist

59 – Distinct Procedural Service
52 – Reduced Services
22 – Unusual Procedural Services

Time Billed
8-22 minutes = 1 unit
23-37 minutes = 2 units
38-52 minutes = 3 units, etc.

If provide a service for 7 minutes or less, you cannot bill for one unit.
If two different procedures provided within a 15-minute time frame, bill for the service performed for the most minutes.

Number of units billed = total treatment time. Person must be present in the room.

Example: 24 minutes of code 97760 + 23 minutes of code 97542 = 47 minutes 3 units are billed (2 – 97760, 1 – 97542)

Documentation
Documentation must support the procedure codes that are billed and demonstrate the need for the skilled intervention. Treatment plans must be completed every 30 days or every 10 visits, and should include objective, measurable, functional and obtainable goals. The physician's certification must be signed and in the medical record prior to billing for services.

HCFA 700 form - Plan of Treatment for Outpatient Rehabilitation
HCFA 701 form - Updated Plan of Progress for Outpatient Rehabilitation

Correct Coding Initiative (CCI)
Purpose is to curb fraud and abuse.
Problematic CCI edits are problematic codes that will not be reimbursed when rendered by the same provider on the same date of service as other codes.

References:

- *American Medical Association's CPT Book*
- *APTA website (www.apta.org) members only pages for Private Practice Relative Value Units and Medicare Calculator, HCFA Correct Coding Initiative*
- *Botten, Linda; Introduction to Coding and Billing Systems for Assistive Technology Therapy Services; RESNA Annual Conference, June 2000*
- *Briefings on Outpatient Rehab Reimbursement & Regulations – December 1999 Fearon, H.; Brewer, K; Zawicki, P.; Reimbursement for Rehabilitation Services:*
- *Bridging The Gap Between Documentation and CPT Coding; APTA Conference, 1999 Fearon, H; Levine, S.; Tools For Managing Reimbursement in the Outpatient Physical Therapy Setting; APTA Seminar, January 2004*
- *Hayes, M.; Working Document of RESNA Technical Assistance Project, December 2000 Physicians Fee & Coding Guide; Healthcare Consultants of America, Inc.; 1999 and 2000*
- *Sprigle, S; 1999 CPT Codes and possible editorial revisions; RESNA CPT Code Working Group Document*

Resources:
1. *AMA Department of Coding and Nomenclature 800-621-8335 for AMA Press Catalog*
2. *AMA CPT Assistant Publication*
3. *The Coding Companion and CPT Insider*
4. *National Correct Coding Policy Manual; US Government's National Technical Information Services (NTIS); 800-553-6847*
5. *Federal Register: New Orders, Superintendent of Documents, PO Box 37194, Pittsburgh, PA 15250-7954*
6. *Healthcare Consultants of America, Inc.; 1054 Claussen Road, Suite 307; Augusta, GA 30907; 706-738-2078*
7. *Medicare RBRVS: The Physician's Guide 800-621-8335*
8. *Websites:*
   http://www.cms.hhs.gov/physicians/pfs
   http://www.ptmanager.com
   http://www.cms.hhs.gov/physicians/cciedits/default.asp

A complete power point handout and further information will be provided to attendees.

Configuration, Programming and Application of Head Access with Powered Mobility for Adults with SCI, ALS, MD and TBI

Karen M. Kangas
Lisa Rotelli

In the past our only choices of access for many adults who could use a standard joystick due to weakness from an acquired injury or from a degenerative, progressive disease, we chose to use a Sip'n Puff system, or a mounted chin joystick.

These two systems are still available, and can be used as they always were, or can be used in new ways and configurations, or other methods of head access can be considered.

Today we will share the systems available, how they need to be configured, and applied, and share real case studies which demonstrate how these various methods of access can work. It is important for everyone considering these systems, to actually set them up and work them for themselves on themselves, and this can best be done if working with a partner, each trying it for themselves.

Setting up the systems will require the alternative method of access and a remote programmer and visual display for the particular brand of powered chair. If powered seat functions and/or access to a computer or augmentative communication device will also be needed to be utilized by the driving access technique, then an auxiliary interface (Auxiliary Control Module or ECU interface or COM interface) will be needed, as well as additional specific cables and/or wireless transmitter/receiver modules.

No one who is using a powered chair or has used one with driving with a joystick should be presumed to be able to immediately learn how to use the chair with alternative access. The persons teaching/assessing (both therapist and RTS) should be, themselves competent at driving and managing tasks using head access. They also need to be competent at programming the powered chair, and teach it to the patient. The patient must know how things can be altered. This cannot occur in a single session at fitting and delivery. Instead, follow-up should be planned and presumed a part of the delivery process.

We will start by configuring the alternative driver controls, and then after we have discussed these, we will discuss how to set up the systems for access to other tasks besides the driving. (For quite some time there have only been two types of programmable electronics in powered chairs in the USA; Mark 4,5,6 for Invacare chairs and Penny & Giles (P&G) electronics for Quickie, Quantum Rehab/Pride, and Permobil. However, this year, all the companies are going to be utilizing new electronics: Quickie's Delphi, Quantum Rehab's Curtiss, and Permobil's new P&G. We may be able to demonstrate these, or not, depending on the timing of the availability, however, the conceptual framework of these configurations will remain the same. And, you may still have to deal with older chairs on the market, so all the principles will remain the same.)

Definition of Terms: (Biggest Mistakes currently made are not knowing these terms)

1. Programmability is of the chair's performance, not the access technique
2. Proportional vs. Non-proportional
   a. Peachtree, Chin Joystick
   b. Sip 'n Puff, Proximity 3 Switch Head Array, Combo
3. Reset/Mode change switch (RIM control; for proportional and non-proportional)
4. Visual Display
5. Remote programmer
6. 3 Head Array (proximity switch) with fixed or adjustable laterals, Size of
7. Programmable Electronics: Each brand of chair's unique programmability, how its done,What is necessary, how display works
8. ACM, ECU, Auxiliary Interface, COM interface, D-9 ports, wired & "wireless"

Newer Alternative Head Access Choices:

1. Proximity Switch plus Sip'n Puff Control
2. Mini Proportional Chin Joystick

Older or More Common Historically Head Access Choices:

1. Proximity Switch Head Array, adjustable lateral pads vs. fixed
2. Peachtree Proportional Control (has now changed, too)
3. Single Switch Scanning

Configuration and Programming:

1. How to program chair's responsiveness with head access
   a. Proportional control
      How to manage "reverse"; additional switch vs. RIM control
      Where to place reset/mode change switch
      How to manage On/Off
   b. Non-proportional control
      Immediacy of responsiveness, vs. delay
      (Acceleration/Deceleration/Sensitivity)
2. Difference in electronics programmability in various chairs
3. How to manage powered seat function, too
4. Looking at additional switch sites for mode/reset switch
   a. What switch to use
      1). Electronic switch: infrared or proximity or fiber optic
      2). Mechanical switch, which one, where located
   b. Where to locate it
      1). Need for stability of placement
      2). Need for transfers in and out of chair

5. Try with various Powered Chairs (P&G vs. MK5; soon to be Curtis, Delphi and P&G)
   a. All systems do not function equally
   b. Remember, must mount access control, visual display reset/mode change switch
   c. Use of chair in various environments, and with what tasks
   d. How to manage powered seat functions and AAC access or computer access

Application:

1. How to teach:Peachtree, driving first, then On/Off and Mode/reset switch last
2. Chin Joystick, drive first, then look for RIM control or reverse, may try reverse switch first, then change to RIM
3. Head Array, then add reset/mode switch again, RIM vs. Reverse as a separate switch
4. Where initial reset/mode change switch starts is not where it ends up
5. Make sure all driving is competent first, before adding other access
6. Do not set up everything at its “optimal” site, until machine is fully learned
7. Visual display Dependent or Not: where to mount and why and on what
8. Teaching use for TBI, different from SCI and different from ALS
9. For Invacare electronics, two modes of access can still “live” simultaneously, for P&G, not possible, all access is “global”

Mobility RERC report on the State of the Science

Stephen Sprigle, PhD, PT
Fran Harris, PhD
Kim Davis, MSPT, ATP

This course will summarize the results of the Mobility Rehabilitation Engineering Research Center's State of the Science conference. Attendees will come away with:

1. an understanding of the common hurdles in designing seating and mobility research;
2. an understanding of both the conceptual and methodological issues associated with measuring activity and participation as defined by the International Classification of Functioning, Disability, and Health (ICF).
3. an understanding of proposed research strategies to address the questions above.

Content Description:
The field of Assistive Technology and the subspecialty of seating and wheeled mobility remain at a youthful age, especially when considering its scientific body of evidence. Research design in the area of seating and wheeled mobility presents unique challenges. Increasingly, we are called to provide more scientific evidence to support the success we see clinically. This is especially true with regard to coverage determination for seating and mobility products. Moreover, in the world of wheeled mobility, we have yet to prove the link between active living and medical health.

The Mobility Rehabilitation Engineering Research Center held its State of the Science Conference on September 17th and 18th, 2006. This was a consensus building forum to address the methodological challenges of studying the health, activity and participation of wheelchair users. Experts in the field gathered to address key issues in seating and mobility research. Day 1 and the morning of Day 2 were comprised of keynote speeches followed by moderator-led breakout group discussions. Attendees were assigned to groups to assure a representation of diverse backgrounds. The latter half of Day 2 consisted of a summary session during which representatives from each breakout group reported their findings to the entire group. The summary session was open to a broader seating and mobility audience. Invitations were sent to 110 researchers, clinicians, policy makers, manufacturers, methodologists, wheelchair users and representatives from federal research funding agencies; of those 90 accepted and 67 attended the working group portion of the conference.

As part of the registration process, attendees were asked to submit their three greatest areas of concern/interest in the areas of wheeled mobility and seating/posture research. mRERC staff reviewed all submissions and compiled a list of seven priority topics each within the mobility and seating/posture categories. These were based on frequency of topic areas submitted by the attendees. The priority topics are listed below, using the format of an introductory statement followed by the specific research question(s) to be addressed. At the conference, attendees were asked to vote on their priorities, narrowing the topics to four each for mobility and seating/posture. All the topics are listed below, with the topics selected for discussion in italics.

Priority Topics: Wheeled Mobility
1. Long term (manual) wheelchair can expose users to secondary physiological complications, whether related to propulsion, transfers or performing functional tasks from a seated position. These secondary effects are difficult to measure as they do not occur in isolation, but rather co-mingle. Furthermore, over a lifetime of wheelchair use, the impact of using varying equipment in differing environments must be considered.

What is the best methodology for studying the long term effects (health impacts) of wheelchair use over the lifetime of a wheeler?

2. In the US, provision of wheeled mobility devices within the third party payment system is based on medical necessity. General consensus in the service delivery community is that greater emphasis should be placed on functional needs to maximize activity and participation. Within the International Classification of Function model, activity and participation are seen as indicators of health.

What methodology can be used to study the relationship between activity & participation and medical benefit?

What are the health impacts of community activity and participation?

3. Despite the ADA and advances in wheelchair technology to overcome physical barriers, the environment continues to present hurdles, whether real or perceived, to the activity and participation of wheelchair users.

What methods can be used to measure the influence of the environment on the activity and participation of wheelchair users, (being mindful of minimizing subject burden)?

4. Wheeled mobility tends to be viewed differently from other forms of assisted mobility, i.e. lower extremity prosthesis use, with respect to societal attitudes, public policy and funding. Why? How do equipment use, activity and participation differ in wheelers versus ambulators who require prostheses?

What type of useful information would this comparison generate, and what is the best method to do a comparative study of the activity and participation of wheelchair users versus those who ambulate with the aid of a LE prosthesis?

5. The consensus of many rehabilitation clinicians is that a proper and thorough seating and mobility evaluation is necessary to insure the health and function of a client. As with the provision of any service, the quality of a wheelchair evaluation outcome is related to the skill of the provider(s). Participants voiced a myriad of concerns regarding assuring quality evaluations to optimize outcomes both in regard to matching technology to user needs and assuring high end training on use of the recommended equipment.

What is the best means to train service providers (clinicians and RTSs) and to measure the impact of training/skill level on wheelchair evaluation outcomes?

What approach can be used to answer the question: does a seating/mobility evaluation improve the health and function of a wheelchair user?

6. Historically, there has not always been a direct link between academic research findings and the design of new mobility products.

What is the best method to apply research results to the design of new mobility products?

7. Many designs of wheelchairs are commercially available – a fact that offers the potential for choice, but also complicates the selection process. How does mobility equipment impact the medical and functional outcomes of wheelchair users?

Priority Topics: Seating & Posture

1. Causation of pressure ulcers is a multi-factorial process, although by definition, localized external pressure is the primary causative factor. Studies have shown that both magnitude and duration of pressure can be damaging. There is currently not a scientifically sound method of determining a "safe" magnitude and duration of load, specific to the individual. These factors drive clinical interventions such as cushion selection and pressure relief schedules. The guideline most often referenced, the Reswick and Rogers Curve, lacks scientific rigor.

How can acceptable pressure magnitude and duration be determined for an individual – in a lab environment, and within a clinical situation?

2. Each wheelchair user presents a unique profile, which impacts tissue tolerance, risk for pressure ulcers and equipment (support surface) needs. Funding guidelines often dominate clinical decision making regarding the type of cushion recommended (least costly) and the timing of cushion replacement. Short of obvious material failure or incidence of pressure ulcer, there is a dearth of clinical guidance to determine if a current cushion is still "good enough". Such clinical information could also guide whether initial cushion selection is good enough.

What methods can be used to develop a systematic, clinical approach to answer the question: "Is this cushion good enough?"

3. By nature, postural support devices can limit freedom of functional movement. Whether PSDs are used to aid in balance, address orthopedic deformity or both, there is generally a trade-off of restricted movement. Is the trade-off too great? Is there a way to achieve a better compromise?

How can we study the compromise between postural support and functional movement to better address the tradeoffs between the two?

4. Current cushion categories include those which offer "positioning". Bench tests exist to determine whether a cushion fits into this category. However, correlation of these bench tests with actual clinical performance of positioning cushions is lacking. Furthermore, does a cushion which offers positioning also offer a better base of support from which to perform functional tasks?

What are the best methods to objectively measure performance of functional activities across different wheelchair cushions in situ?
What is a clinically valid approach to study the postural and functional impacts of cushions and postural supports?

5. Variable position seating systems, especially power seating functions (tilt, recline, seat elevation and standing), are under regular scrutiny by third party funding systems as lacking medical necessity.

How do we best study the medical benefits of variable position seating?

6. In the seating (and mobility) profession, "proof" of the benefits of seating (and mobility) interventions is largely anecdotal, or based on single-subject case studies. The typical Randomized Clinical Trial is not an appropriate methodology to study the effects of a particular seating or mobility intervention.

In lieu of the RCT, what is the best method to measure the effects of a particular seating or mobility intervention? Is there a way to effectively study the return on investment of a particular seating or mobility intervention?

7. The long term use of wheelchairs can expose users to secondary postural/musculoskeletal complications. Understanding the impact of long-term wheelchair use may lead to prevention of these complications. A need exists to study how specific mobility and seating devices and interventions impact long term consequences of wheelchair use. For the purpose of this discussion, the following two questions are raised:

How do we measure the long-term consequences of sitting with respect to spinal and pelvic deformities?

How can we measure the ability of cushions and support surfaces to prevent musculoskeletal complications?

The primary outcome of the consensus conference was to help set the stage for future seating and mobility research. The summary session confirmed that there are unique challenges in studying each of the priority topics. A complete report of the conference is scheduled for publication as a special issue in mid 2007 in the international journal, Disability and Rehabilitation: Assistive Technology.

Measurements of body positions and postural support devices according to ISO16840-1

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1. Introduction

In the field of wheelchair seating, there has been tremendous variation in the use of terminology and definitions related to the clinical measures of a seated individual. Standard definitions and terms have been lacking for communicating critical postural information and support surface parameters in a way that is uniformly useful to service providers, technicians, researchers, manufacturers, wheelchair users and purchasers when selecting and providing wheelchair seating devices. To address this and other needs, work began in 1998 at an international level within the structure of the International Standards Organization (ISO) on the development of wheelchair seating standards. The purpose of 16840 Part 1: Vocabulary, reference axis convention and measures for body segments, posture and postural support surfaces is to specify standardized geometric terms and definitions for describing and quantifying a person's anthropometric measures and seated posture, as well as the spatial orientation and dimensions of a person's seating support surfaces. The plan throughout the development of this document was to provide a standard that would be useful not only for scientific research, but also for clinical practice in all areas of the service delivery process. Work has already begun on developing the tools necessary for clinicians to be able to utilize the measures in the Part 1 standard. This work will continue with refinement based on feedback from audiences such as this one. Successful implementation should allow clinicians to improve their clinical practice in the area of wheelchair seating.

2. Concepts in ISO16840-1

The following concepts are elements of the integrated measurement system that, when used together with the proposed terminology, permit the objective description and recording of both the person's seated posture and the dimensions of their postural support system.

A. Global Coordinate System: In order to take a measure of any kind that will have consistency across facilities and over time, agreement must first be reached on what recognized coordinate system, from the many possible, will be used as the standard. After much debate, the following coordinate system was chosen. The direction of the positive X, Y, and Z axes, relative to the seated person and as viewed by the observer, is defined in Figure 1 below. This has been termed the Global Coordinate System because it remains fixed in orientation and thereby serves as the constant reference to which all linear measures can be made - for the person, their support surfaces, and their wheelchair (only the person is shown in Figure 1). Figure 1 also shows the three- dimensional location of the origin (0,0,0p) of the coordinate system for the person.

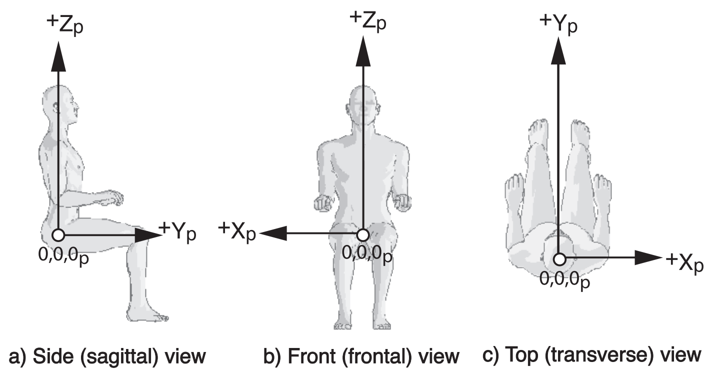

Figure 1-Definition of Global Coordinate System

As seen in figure 1, there are three views in which measures are considered – sagittal (side), frontal (front) and transverse (top), thereby allowing an approximate 3-D representation of posture. This simplification reduces all three-dimensional measures to two measures, which is consistent with current clinical practice. Note that values for linear location measures can be positive or negative depending on the direction they extend from the 0,0,0p center. Separately and/or collectively this coordinate system allows for measurement in the three traditional orthogonal planes of locations, angles and linear dimensions of a seated person's body and their seating support surfaces.

B. Absolute vs. Relative Angular Measures:
The recording of angular measures of body segments in all three planes gives us an objective method for describing and documenting seated posture. This standard defines two types of angular measures, absolute and relative, because it is clinically important to be able to define the orientation of body segments both with respect to other body segments (as this reflects joint position), and with respect to a fixed outside reference (as this reflects orientation in space). Absolute angles define the orientation of a single body segment or support surface relative to the vertical, and relative angles define the angle between two adjacent body segments or support surfaces. Terms for absolute angles are defined in all three views (sagittal, frontal and transverse), while terms for relative angles are defined in the sagittal view only for simplicity.

C. Body Segments, Anatomical Landmarks and Segment Lines:
In order to define absolute and relative angles of the body, it was first necessary to identify the specific body segments of interest, and then be able to specify their orientation. In order to accomplish this, body surface landmarks and lines joining these landmarks (termed segment lines) were defined for those body segments critical for defining seated posture, in each of the three views. The center of rotation (usually joint centers) for

each segment line is also defined. Measurements of deviations of body segment lines from the designated reference axis in the compass rose, projected to the three orthogonal planes, permit the measurement and recording of body segment angles.

D. Support Surface Geometric Center and Reference Lines: Determination of absolute and relative angles of support surfaces required an additional step in this process, because unlike body segments, support surfaces do not have a joint which helps define a natural center of rotation. Additionally, because support surfaces are not universal in their size, shape or configuration there is no way to define them based on an assumed size, shape, or configuration. For this reason, the concept of the support surface geometric center was necessary. This hypothetical point on any support surface has a consistent definition regardless of the size, shape, or configuration of the particular support surface involved. Unlike a body segment line, which has a natural point of rotation, the support surface geometric center is actually at the center of the support surface, so rotation occurs around it in any direction. This necessitates defining a support surface reference line which extends out of the support surface geometric center and which is then used in the determination of absolute and relative angular positions of that support surface. As with body segments, these reference lines are defined within each of the three planes. The SSGC is used not only as the standardized center of rotation for angular measures of support surfaces, it is also used as the standardized point to which linear location measures of support surfaces are taken.

3. Difficulties of clinical measurement according to ISO16840-1

A. It is difficult to calculate the joint centers mathematically when a patient cannot sit in the reference position (i.e. 90 degrees of hip and knee flexion).

B. Clinicians may not have the time needed to precisely calculate joint centers for measurement.

C. It is difficult to determine the orientation of a contoured postural support device (PSD), or of a PSD made of soft materials.

D. Determining the support surface geometric centre is quite challenging in a clinical setting.

E. Determining the location of the origin of PSDs is challenging using camera methods.

4. Measurement methods and the parameter

Due to the variety of measurements defined in the standard, developing a single measurement methodology is challenging. The best way involves using a three dimensional method to be able to measure all parameters (Fig.4). But a three dimensional methodology relies on equipment that is not clinically accessible and the Japanese clinical group has not been able to determine how to implement a three dimensional system. To address these challenges, this presentation will describe the effectiveness of measurement according to the ISO using one camera method and other simple tool (Kemmoku: Development of posture measurement instrument and its clinical application).

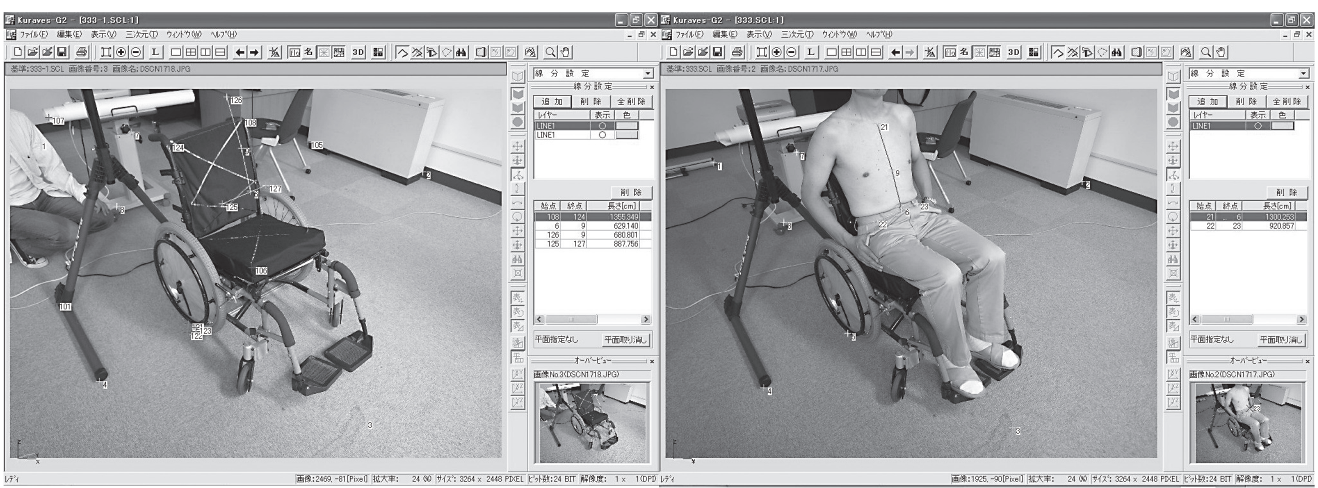

Figure 2 The three-dimensional measurement method uses two cameras and software to process the images

Table1 Parameter and the Measurement methods

	Measures parameter	Ruler	One camera method	Instrument	Three dimensional methods
Support surfaces	Coordinate location	Impossible	impossible	impossible	possible
	Absolute and relative angles	Impossible	possible	Partly possible	possible
A seated person	Linear	Possible	impossible	impossible	possible
	Absolute and relative angles	Impossible	possible	Partly possible	possible

We will demonstrate absolute and relative angles of support surfaces and absolute angle of a seated person using one camera method.

5. Simple measurement methods (Table 2)

As mentioned above, there are several challenging measurement issues related to the seated person, including difficulties calculating joint centers and measuring absolute and relative body angles effectively. To address these difficulties, the Japanese clinical group has selected anatomical points to be able to measure directly near calculation joint centers including use of the mastoid instead of the calculated upper neck joint and a mid point between C7 and upper sternal notch (Figures 5 and 6). Also, We will measure the angle of the sagittal pelvic line using ASIS and PSIS excluding a hip joint center. Additionally, we have developed some simple measurement methods to measure absolute relative angles of support surfaces and absolute angle of a seated person combining one camera method.

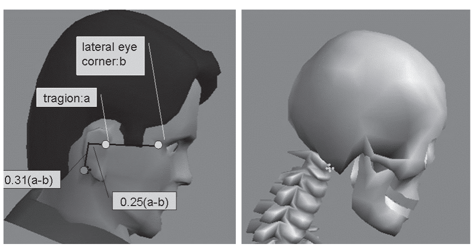

Figure 3 Upper neck point (Calculated and mastoid)

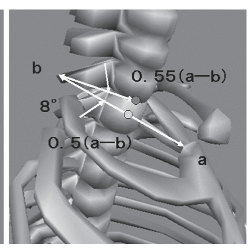

Figure 4 Lower neck point (Calculated and mid point)

6. Some tools for measurement

We have some ideas about measuring some anatomical landmarks hidden by the body and PSD. The hidden points can be measured using tools that extend the point outward so that it is not hidden. (see Figure 7). Also, we use a Martin Measurement Tool to measure the angle between ASIS and PSIS. The end point of a martin measurement tool is on PSIS and the middle edge point is on ASIS (Figure 9). The lever shows the angle between ASIS and PSIS. The figure shows the measurement method measuring angle between ASIS and PSIS. Finally, the hidden and soft surface of PSDs can be measured by using a cube box (Figure 10).

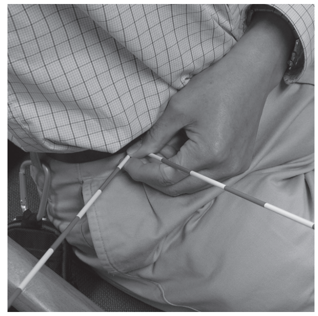

Figure 5 indicated bars

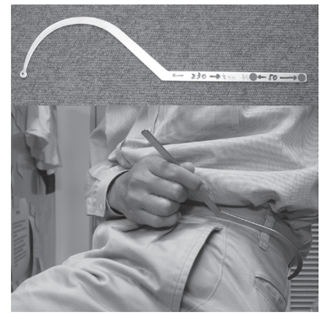

Figure 6 Martin tool and measurement

Figure 7 Box to referred a support surface

7. Results

Deformation of the pelvis and spine in PSDs has three dimensional position changes so we will have challenges how we analyze these data. We will show you simple methods to describe the posture and PSDs. We are all working together to advance the science of wheelchair seating and positioning.

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Musculoskeletal Pain: Classification of Pain Mechanisms, Evaluation Parameters, and Intervention as it Relates to Seating in a Wheelchair

Annie O'Connor PT, OCS, Cert. MDT
Jessica Presperin Pedersen MBA, OTR/L, ATP

Why Classify Musculoskeletal Pain?

- 1 in 7-10 people experience a persistent musculoskeletal pain problem; 70% continue to have pain despite treatments. (Crook 1, Magni 2)
- Musculoskeletal pain from the back, neck, shoulder, knee, hip, foot or hand is a major cause of morbidity in both the community and workplace. (Linaker 3)
- 20% of people have musculoskeletal pain that persists for more than 3 months. (Blyth 4)
- Pain is the most common reason for self medication and entry into the health care system. (Eccleston 5)

People only seek help for 2 reasons:

1. Pain – something hurts.
2. Loss of Function – something not working properly.

Because of this, clinicians need the ability to diagnosis pain, categorize pain and make clinical decisions related to processes of pain. The question to consider is "What type of musculoskeletal pain is the patient experiencing?" "Are there inflammatory features, ischemic features, and/or emotional features?" (8)

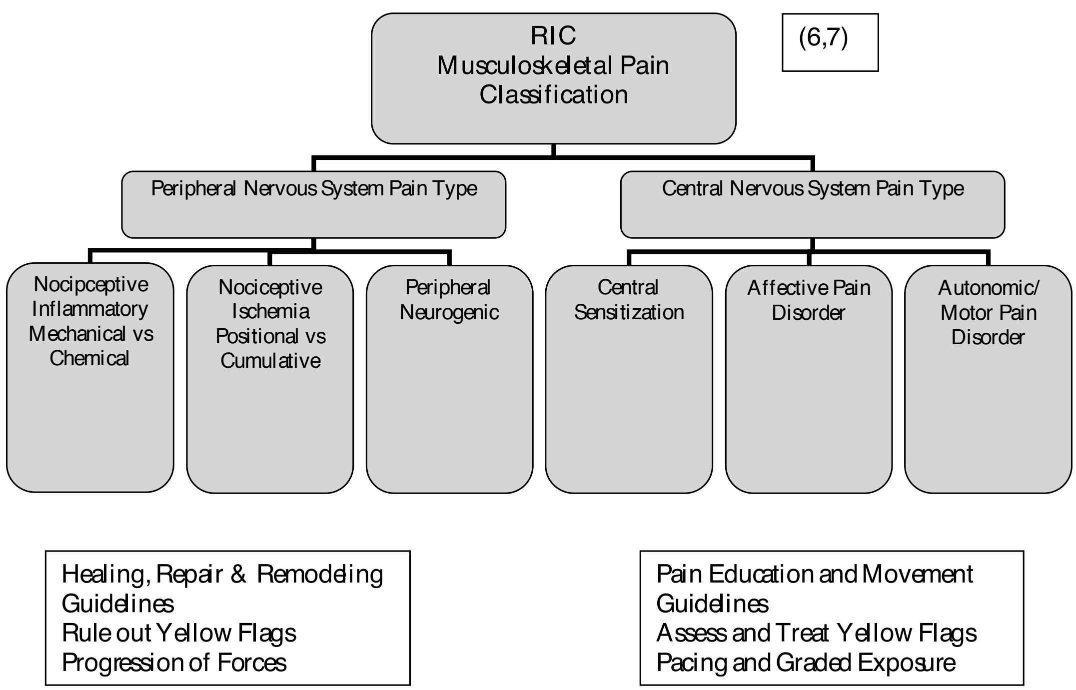
Rehabilitation Institute of Chicago (RIC) Musculoskeletal Pain Classification System

RIC's model for diagnosing musculoskeletal pain acknowledges that pain is not simply determined either by somatic factors or by factors 'outside' the body, but rather is the end result of a disturbance in nociceptive function interacting with a person's experience of being. Influenced by interactions with people, objects and events in the outside world including the family, the community and the environment. Thus, knowledge of nociception and pain from a traditional medical science aspect is essential to the understanding of pain. It cannot be divorced from knowledge of perception and pain from psychosocial point of view. The question to consider is "How well do I understand the emotional and social inputs to the pain experience with my patient?" (8)

RIC has developed a classification system to assure each dimension of musculoskeletal pain is assessed. This classification system is based on the growing literature supporting each mechanism of musculoskeletal pain and the physiologic knowledge of the brain's involvement. We know pain involves tissue irritation and the brain processing of the tissue irritation. (8)

When a patient enters RIC with a complaint of pain they have expectations of pain control. The therapist needs to evaluate each dimension of the pain experience and identify all involved mechanisms. This Algorithm (Appendix A) demonstrates the types of peripheral nervous system pain and the types of central nervous system pain which complete RIC's outpatient allied heath diagnostic classification system for musculoskeletal pain. (8)

The connection between peripheral neurogenic and central sensitization is an anatomical connection, meaning the peripheral nervous system is an extension of our central nervous system. This acknowledges that individuals with dominating peripheral nervous system pain types may have central nervous system contributions that should be assessed and treated. Because this can influence why patients may not progress or succeed with rehabilitation for acute pain. Patients may have qualities that predispose them to chronic maladaptive pain and periodically those qualities may be the dominating input that is not controlled; hence the individual maintains a pain state. (8)



Evaluation

The evaluation process includes the following form that the client fills out. (9)

What problem/issue brings you here today?					
How and when did it start?					
List 3 activities you are now unable to do:					
What makes it worse?					
What makes it better?					
What do you want to accomplish from today's visit?					
Is this a Worker's Compensation Claim or is there litigation pending?			Yes	No	
What diagnostic tests have you had for this problem?	X-ray	MRI	CT scan	EMG	Bone scan
What treatments have you had for this problem?	Massage	Injections	Physical Therapy	Psychotherapy	Chiropractic

Please make a mark on the line below to indicate the level of discomfort you have today.

No Pain ———————————————— Worst Pain Ever

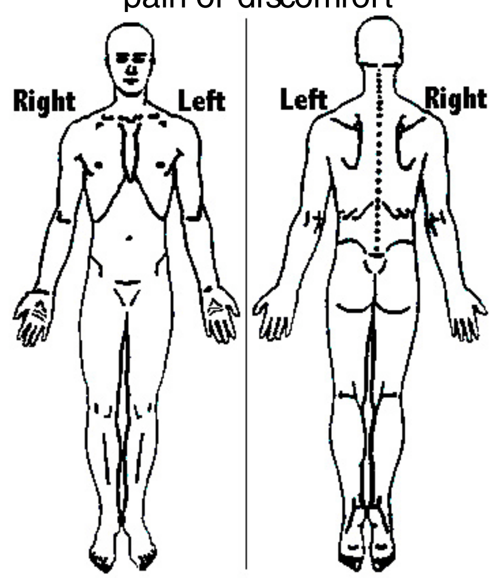
0 1 2 3 4 5 6 7 8 9 10

Please describe what the pain feels like: Dull, Achy, Burning, Stabbing, Numbness, Tingling, Pulling, Cramping, Tightness

Please describe the time course of your pain: Constant, Comes and goes, Getting worse, Getting better, Staying about the same

Medications (Current): ALL medications including Prescription, Over-the-Counter (ie Advil), Supplements, Vitamins			
Medical/Surgical History: ALL Surgeries, Diabetes, Cancer, High blood pressure, Heart attack, Pacemaker, Arthritis, Fractures, Accidents, Osteoporosis			
Allergies to medicines:			
Family History: Cancer, Heart disease, Stroke, Arthritis, Osteoporosis			
What do you do for exercise?			
Tobacco use (cigarette, cigar, pipe, chew):	Current	Quit	Never
Number of alcoholic beverages per week?			
Number of caffeinated beverages per day?			
Occupation:			

Please draw where you have pain or discomfort



Physical requirements:	Prolonged Sitting	Prolonged Standing	Lifting	Travel	Driving	Computer	Phone	Childcare

Employment status:	Full-time	Part-time	Light Duty	Off Duty due to injury	Full-time Parent	Not working

•	Night pain, fevers, unintentional weight change?	Yes	No
•	Vision change, double vision?	Yes	No
•	Difficulty swallowing, headaches?	Yes	No
•	Chest pain, palpitations?	Yes	No
•	Shortness of breath, wheezing, cough after exercise?	Yes	No
•	Nausea, vomiting, black stools, loss of control of stools?	Yes	No
•	Loss of control of urine, urinary frequency or urgency?	Yes	No
•	New rashes or psoriasis?	Yes	No
•	Dizziness, weakness, numbness, tingling?	Yes	No
•	Depressed mood, sleep problems, anxiety?	Yes	No
•	Current low back pain, other joint swelling or muscle pain?	Yes	No
	Are you pregnant, trying to get pregnant or breastfeeding?	Yes	No
	Last menstrual period date: Periods regular?	Yes	No

Patient's Initials:

□ ROS Reviewed/Addressed

HCP Initial/Date:

Physical assessment of active and passive movement, limitations due to pain, medical and radiographical information provide input to assist with determining the primary pain mechanism.

Intervention

Based on the results of the evaluation, intervention may include:

- referral to a pain behavioral psychologist
- education about pain, healing, repair, and remodeling guidelines of connective tissue strengthening
- active movement integrating positions that abolish pain
- manual therapy
- modalities
- and positioning intervention. (7,8)

References:

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Custom Seating – Who, What, Where, When, Why (and Why Not)

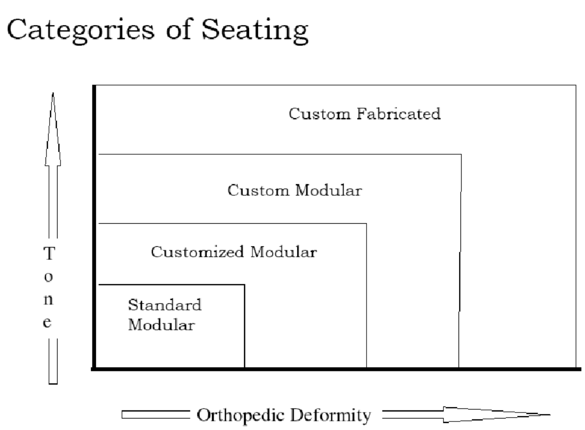
Stefanie Laurence, OT Reg.(Ont)

Custom seating is truly a creative endeavor. The who, what, where, when, why (and why not) of custom seating options for the client with severe positioning needs can be overwhelming for therapists, sales staff and technicians if it is not a regular part of their practice. Yet, when carried out successfully from the initial identification of client needs to the delivery of a final functional system, the result can be both empowering for the client and highly rewarding for the team involved.

Who and Where

Seating, regardless of the complexity, starts with assessment. This involves the determination of the needs of the client, including physical shape, degree of deformity, muscle tone, skin health, functional abilities, mobility and environmental needs. Based on the assessment, a set of generic goals and parameters are set that will act as a guide for determining the options available for seating, and act as a reference point when in the middle of a complicated prescription. Who actually needs custom seating is influenced both by the client themselves – physical needs, size and function, as well as the skills and resources of the team involved – the therapist, vendor rep and technician. The most amazing product will only be as good as the therapist who understands its application, the sales rep who knows how to quote on it and the technicians who know how to work with it. Where custom seating is appropriate and possible can be influenced by the wheelchair or mobility base that the seating will be mounted into and the environment that the equipment will be used it, whether it be the physical environment or the people such as caregivers that will be handling the finished system. While custom seating was once restricted to seating clinics, the increase in products and materials available has placed the capabilities into the hands of the community based vendor.

When



Seating can be categorized the by amount of tone (or lack there of) and the degree of physical deformity that they can accommodate. For purposes of this discussion, physical deformity may also be used to describe client dimensions that deviate from standard, e.g. the client who has a seat width of 14" and a seat depth of 20". Seating can be described as standard modular – a product that is routinely made by a manufacturer, taken off the shelf and put on a chair as it is, customized modular – a standard modular product that is modified by the vendor before being put on the chair, e.g. cut for a leg length discrepancy, custom modular – a standard modular product that is manufactured in a custom size or configuration, e.g. the 14x20" cushion, and custom fabricated – a one of a kind fabricated system, whether manufactured by a vendor or manufacturer. Each of the categories has pros and cons attached to them, and moving through the categories generally involves increasing cost and time from prescription to delivery, and decreasing ability to replicate the product if disaster befalls it after delivery.

All seating systems can be broken down into two components; the structural layer, or macro support that it offers the user, and the comfort layer, or micro support that it provides to the tissue through surface conformation. What mediums are used and how the two components are combined is what distinguishes the various manufacturers. Foam, gel and air each have their own abilities to fit the user, and every person reacts differently to the mediums. Seating, especially custom seating can also be broken down into the surface that contacts the clients, what creates and supports that shape, and the process that was used to capture the shape. These three components can be used to determine the most appropriate custom system for the client, both with respect to the final product for the client and skills required of the team.

What

Custom fabricated products, especially highly contoured seats and backs are a snap shot in time of the client, on that particular day, with that particular team capturing the shape. Products come and go, but the differences in the processes that are required to create and support the client's shape provide a starting point to be able to differentiate the systems. Generally speaking, custom seating includes foam-in-place (either directly or indirectly), laminar foam on a substrate (wood or ABS), air cells e.g. Roho, Star or Vicair, interlocking link systems e.g. Matrix, digitized shapes from a simulator (Invacare Silhouette, Ottobock Shape System, Signature 2000), casted shapes from a simulator (Invacare Contour U, Ride Designs, Signature 2000), and orthotics.

Each of the systems has varying capabilities to allow trial or simulation before fabrication, and differing abilities to do this simulation in the person's own mobility base or not. The needs of the individual client will determine how generalized or specific the shape has to be, and much handling the client can tolerate for the fabrication process. A fabrication process that requires a degree of client cooperation or lack of motion would not be ideal for someone with involuntary movements due to seizures or cognitive impairments. The functional needs of the client and the adjustability available in the base will determine how important it is to have the seating shape captured in the mobility base or not. Central fabrication of a product provides a uniform product, but decreases the degree of control over the process. Fabrication that is vendor based may allow shorter turn around time and decrease reinterpretation of the assessment data, but becomes very dependent on the skills of the technician that is fabricating the product.

Elements in Shape Capture and Fabrication

	Custom Seating Products											
	Modular	Foam in place (FIP)	Casted FIP	Invacare Silhouette	Ottobock (OBSS)	Signature 2000	Invacare Contour U	Ride Designs	Orthotic	Laminar foam	Roho / Star	Interlocking links
Shape trial before prescription / fabrication	x		x		x	x	x	x	x		x	
Person as own shape		x	x	x	x	x	x	x	x			x
Generalized shape	x									x	x	
Simulation based seating (casted or digitized)			x	x	x	x	x	x	x			
Fabrication vendor based	x	x	x						x	x		x
Central fabrication	x			x	x	x	x	x			x	
Shape captured in mobility base	x	x			x			x	x	x	x	
Shape captured remote from mobility base			x	x		x	x	x	x			x

Why and Why Not

Custom seating certainly has both advantages and disadvantages. Single piece construction of a back or seat means less moving parts to loosen or be changed, but also means less adjustability for changes in size and function. The specific fit to the client's body may provide aggressive positioning, but less forgiveness for changes in position due to a myriad of caregivers. Increased surface contact with the body can decrease pressure points, provide proprioceptive input to the body and increase proximal stability, but can also result in increased heat build up, trigger reflex patterns and be present challenges for winter clothing. Every custom seating system has varying abilities to address these issues. Ultimately, the final product is dependent on the relationship between the client, therapist and vendor rep and technician; the ability of the client to express their needs, the therapist to be able to interpret those needs and assessment information into functional supports, the vendor rep to be able to translate the needed supports into product and the technician to create the finished system. It is truly a dance among the players.

Custom seating is not for every one; client, therapist and vendor alike. However, it is a very valuable tool in addressing seating challenges whether used as a complete system or in combination with modular products. The number of ways that seating components, both modular and custom, can be combined to reach a final product is limited only by the imagination and artistry of the team involved.

Stefanie Laurence is an Occupational Therapist who has been working with people with special needs in a variety of settings for the past twenty five years. While the terms wheelchair lady, commode queen and equipment geek have all been used as worthy descriptors, she is actually the Education Manager for The Motion Group of VGM Canada, based out of Motion Specialties, Toronto, Ontario. She can be reached at slaurence@themotiongroup.com.

Clinical Application of Quantitative Measures in Manual Wheelchair Assessment: An Example of Evidence Based Practice

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Ron Boninger

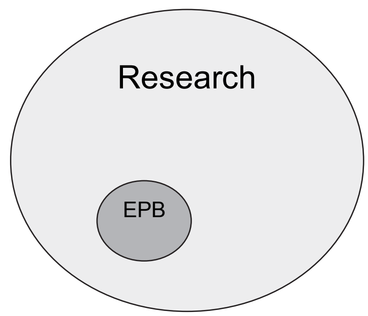
Purpose:
Numerous tools exist to quantitatively describe manual wheelchair propulsion. These tools range from low-tech to high-tech devices. The purpose of this course is to apply these tools to the assessment, implementation, and training process for manual wheelchair propulsion.

Objectives
• List six tools from the clinical tool box
• Define the functional measure for each tool
• Integrate measures into manual wheelchair assessment
• Compare and contrast low, medium and high tech tools
• Analyze results from clinical examples

Background
The current assessment, implementation and follow-up processes for manual wheelchair propulsion include little, if any quantitative values. The current tools of the trade typically include a tape measure and a goniometer, along with visual observation. The process is primarily based on the rehabilitation professional's clinical experience and the experiences of the individual using the wheelchair. Furthermore, there is a disconnect between clinical practice and the growing body of research related to manual wheelchair propulsion. The disconnect is partly due to the "ritual" of the service delivery process. Rehabilitation professionals have become comfortable with the status quo, which includes the assistive technology devices as well as the service delivery process.
The "ritual" of service delivery has been promoted through the
• Subjective observation of the client by the rehabilitation professional
• Rehabilitation professional's knowledge or history with similar clients
• Funding perceptions
• Rehabilitation technology supplier recommendations
• and the "We used it once, let's try it again" phenomenon
The "ritual" has led to a declining utilization of research in the service delivery process (figure 1).

One way to reverse this trend is to include quantitative tools within the service delivery process. The clinical tools' application within the service delivery process are depicted in Figure 2. Breaking the assessment process into three distinct components forces the multidisciplinary team to define objective goals prior to evaluating the assistive technology. By accurately defining the goals and incorporating clinical tools into the assessment process, the recommendation and justification process, which follows, becomes much easier. Likewise, rehabilitation professionals are able to track changes in performance over time, and detect when changes may be necessary in the system. It is important to realize that these tools are necessary for documenting all areas of assistive technology: devices, services, practices, and strategies.

The breadth of information related to manual wheelchair propulsion has been expanding. The clinical guidelines for the prevention of upper extremity injuries is an excellent example of the application of research in the development of evidence-based practice. However, the tools necessary to apply the clinical guidelines to an individual have not been incorporated into clinical practice.



igure 1. Diagram depicting the relationship between research and its effect on evidence-based practice. (Kirby, RESNA 2006)

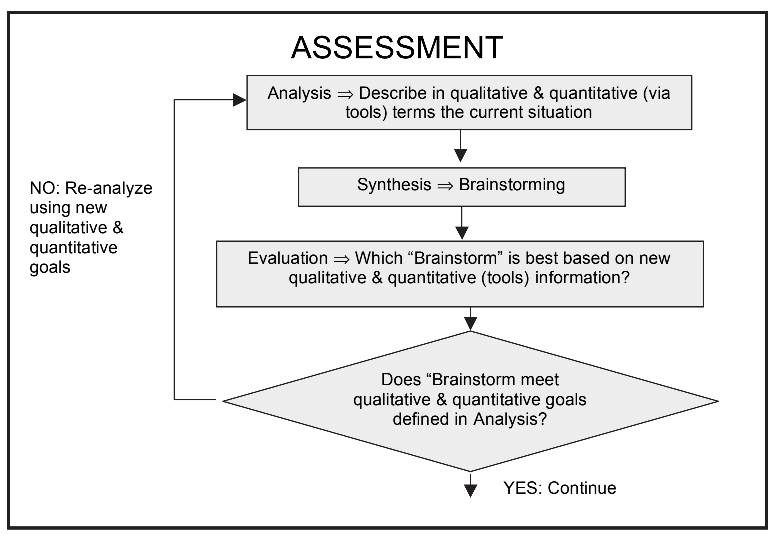


Figure 2. The assessment component of the service delivery process. (Adapted from Szeto, 2001)

Therefore, tools need to be identified and clinical guidelines defined in order to connect every day clinical practice to evidence-based practice.

The Tools

Numerous tools exist which allow rehabilitation professionals to quantitatively describe an individual's ability to manually propel a wheelchair. The tools can be used to describe all forms of manual propulsion, both upper extremity and lower extremity. These tools range from low-tech to high-tech devices. . Low-tech tools are defined as being analog in nature (no power required), low cost, portable, and relatively low precision. Medium-tech tools are defined as being digital in nature, do not require an external power source (e.g. outlet), low to medium cost, portable, and medium to high precision. Medium-tech tools, like low-tech tools are commercially available and are not specific to the field of assistive technology. High-tech tools are defined as being digital in nature, may require an external power source (e.g. outlet), medium to high cost, transportable to stationary, and medium to high precision. High-tech tools are commercially available, may require moderate to significant training, may require a computer and may be specific to the field of assistive technology. Examples of low-tech, medium-tech, and high-tech tools are listed in Tables 1-3.

The devices include equipment that can be purchased in hardware stores (analog inclinometer, tape measure), consumer electronics stores (digital cameras and video recorders), specialty athletic shops (actigraphs and cyclometers), and rehabilitation technology manufacturers (SmartWheel). These devices provide quantitative data that can be used in conjunction with visual observations to document an individual's ability to propel a wheelchair. This information can be used to justify the need for a specific piece of equipment or provide guidance to the individual as they learn how to more effectively propel a wheelchair.

Table 1 – Low tech tools

Tool	Purpose
Tape Measure	Linear distances: seat-to-floor height on a wheelchair, doorway widths
Analog Inclinometer	Angles and slopes: seat angle on a wheelchair and ramp slope
Goniometer	Relative angles: Joint angles for active/passive range of motion.
Stop watch	Time: time to complete an activity, velocity, stroke frequency
Bathroom Scale	Weight: wheelchair, individual

Table 2 – Medium tech tools

Tool	Purpose
Digital Caliper	Linear distance: tubing diameter (inner/outer)
Laser Distance Meter	Linear distance: distances between anatomical landmarks; relative distances between wheelchair and individual
Digital Inclinometer	Angle and slope: seat angle, back angle
Digital Force Gauge	Weight: manual wheelchair
Camera (analog / digital)	Documentation
Cyclometer / Pedometer / Activity Monitor / GPS	Distance traveled and activity

Table 3 – High-tech tools

Tool	Purpose
Wheelchair scale	Weight: wheelchair and occupant
Motion Analysis System	Gait training, manual wheelchair propulsion training
Force measurement system for manual wheelchair propulsion (e.g. SmartWheel)	Wheelchair comparison, justification, funding, training
Pressure Mapping system	Seating Systems

Examples of the Clinical Guidelines

The analysis process is the first step in the assessment (Figure 2 – Top Box). The clinical tools will be used to accurately measure the anatomical dimensions of the individual. If the individual has already been using a wheelchair the dimensions of the wheelchair and the performance of the individual will be described quantitatively via the clinical tools. The multidisciplinary team will use these measurements to define the primary goals of the assessment. Example goals, the measurement required to define the goal, and the required tool are listed in table 4.

Table 4 – Application of Clinical Tools

Goal	Measurement	Tool
Define anatomical dimensions of the individual (mat assessment)	Length, Angle	Laser distance meter, Digital inclinometer
Define location of shoulder with respect to rear axle	Horizontal and vertical distance measurements	Laser distance meter, Digital inclinometer
Measure angle between upper arm and forearm	Angle	Digital inclinometer
Define effect of wheelchair characteristics on propulsion (e.g., axle location, wheelchair & seating system weight)	Stroke frequency, velocity, weight, force	Video camera, stop watch, scale, force and moment sensing handrim, visual observation
Describe propulsion style	Visual observation, plot of force vs time	Video camera, force and moment sensing handrim

The data obtained from the clinical tools is then synthesized (Figure 2, Middle Box) to obtain potential recommendations for the individual in terms of appropriate seating and wheeled mobility. The individual evaluates the systems with the greatest potential for success. The performance characteristics (rows 2-5 of Table 4) are evaluated (Figure 2, Bottom Box) to determine the effectiveness of each wheelchair and seating system configuration. The evaluation process provides the quantitative justification necessary to make decisions (Figure 2, Diamond) consistent with evidence-based practice. This includes comparing the individual's results to typical and/or normative data (when available) or comparing the results across seating and mobility systems for one individual.

The application of quantitative tools to the manual wheelchair assessment process is consistent with evidence-based practice, and provides the multidisciplinary team with the information necessary to make clinically relevant decisions. Furthermore, these tools are critical to the development of standardized clinical protocols and clinical pathways to service. As the seating and mobility field grows and matures, the need for collaboration among stakeholders (consumers, rehabilitation professionals, manufacturers and researchers) must also grow. The collaboration can only occur with the incorporation of quantitative tools, in the service delivery process, thereby providing better services to individuals with disabilities and improving their overall quality of life.

Friday, March 9, 2007

Management of Spasticity to Enhance Seating and Positioning

Bette Cotzin, MS, PT
Virginia Nelson, MD, MPH
Carey Larabee, BA Sports Management

I Case Study

A young adult with severe quadriplegic cerebral palsy and a complex medical history will be presented. He presents with spasticity, scoliosis, contractures, asymmetry, and sleeplessness. Interventions have included orthopedic surgery, oral baclofen and intrathecal baclofen pump. Seating and positioning have been challenging throughout his life.

II Definition of Spasticity

MD Consult: Sanger TD - Pediatrics - 01-JAN-2003; 111(1): e89-97: A Consensus Statement

Spasticity is defined as hypertonia in which 1 or both of the following signs are present: 1) resistance to externally imposed movement increases with increasing speed of stretch and varies with the direction of joint movement, and/or 2) resistance to externally imposed movement rises rapidly above a threshold speed or joint angle.

> "Dystonia" is defined as a movement disorder in which involuntary sustained or intermittent muscle contractions cause twisting and repetitive movements, abnormal postures, or both.
>
> "Rigidity" is defined as hypertonia in which all of the following are true: 1) the resistance to externally imposed joint movement is present at very low speeds of movement, does not depend on imposed speed, and does not exhibit a speed or angle threshold; 2) simultaneous co-contraction of agonists and antagonists may occur, and this is reflected in an immediate resistance to a reversal of the direction of movement about a joint; 3) the limb does not tend to return toward a particular fixed posture or extreme joint angle; and 4) voluntary activity in distant muscle groups does not lead to involuntary movements about the rigid joints, although rigidity may worsen.

III Spasticity Issues Related to Seating

Neuromuscular and orthopedic challenges confront those with spasticity. A large variety of these issues affect seating, including abnormal movement patterns, contractures, hip subluxations, scoliosis, limitations in motor control, limited balance, limited repertoire of movement patterns and inconsistent muscle tone. Spasticity issues related to seating will be discussed.

IV Spasticity Management

The hierarchy for spasticity treatment starts with physical measures such as positioning and stretching, then continues with local and oral medications, and ends with surgical management.

A. Medications: A review of the main oral medications used to treat spasticity: baclofen, dantrolene, diazepam, and tizanidine. There will be further discussion of local medications, including botulinum toxin and phenol injections.

B. Surgery: Orthopedic and Neurosurgery
Surgical management of spasticity will be discussed, including procedures which treat the effects of spasticity (e.g., tendon lengthening) and procedures which reduce spasticity (selective dorsal rhizotomy and intrathecal baclofen pump implantation and use).

V Spasticity Management and Seating

Through case study presentations, the use of spasticity management strategies and their relationship to seating will be illustrated. Included will be discussion of spasticity management role in maximizing function, reducing pain and reducing abnormal motor patterns – and these effects these management strategies can have on wheelchair/seating system decisions.

VI Conclusion - A Personal Account: Spasticity Management and Life!

Seating and Mobility Considerations for the Bariatric Client

Jean L. Minkel, PT
Susan Johnson Taylor, OTR/L
Brenda Canning, OTR/L

Bariatrics is the branch of medicine concerned with the needs of persons who are very overweight. These persons of significant size are referred to as being obese or morbidly obese. Obesity can effect all functional activities of daily living and can greatly compromise a person's ability to get around, due to shortness of breathe, pain on the joints, mechanical interference to move the lower extremities during ambulation. More and more, seating and mobility professionals are being asked to provide service to persons of significant size and there are great challenges to address.

The level of obesity is calculated using the Body Mass Index (BMI). The BMI is calculated using the following formula: BMI = weight / height2. Persons who have BMI greater than 30 are considered obese, persons with a BMI over 40 are considered morbidly obese

As seating and mobility professionals, we maybe asked to provide recommendation to two different populations:

- persons for whom obesity is a secondary complication to a primary impairment (for example – Spinal Cord Injury)
- person for whom obesity is the primary cause of functional limitation.

There are multiple unique considerations in working with the Bariatric population, who may or may not have other primary diagnoses. For persons for whom obesity is a secondary complication to their primary diagnosis, a clinician must consider all the implications of the primary diagnosis, in addition to the complications of obesity.

Both of these populations share the complication of increased size. This increased size introduces environmental accessibility problems, mobility problems, transportation problems, as well as functional sitting supports and skin integrity concerns.

Initial Assessment

An in-depth interview is needed to understand all the functions in the person's life that have been negatively impacted by the obesity.

An important consideration is the potential for change in weight.

- Weight Profile – ideally weights from the last 6 mths, 1 year or even 2 years – obtaining this information is often difficult because access to scale is a challenge – Looking for frequency and magnitude of change.
- History of Conservative Weight Management Program
- Discussion of Surgery
- Use of Body Shape as a predictor of trends::
    - Pear shaped distribution - more likely to be stable.
    - Apple shaped distribution - more likely to fluctuate.

For persons who are experiencing limitations in mobility, as a primary complication of obesity, a wheeled mobility device might offer an option for restored mobility. An important discussion includes the options in manual versus power mobility. The manual versus power discussion very quickly introduces the need to understand the environmental considerations. Both home and community environments need to be considered. In the home, the person will need to enter and exit from the home. In some cases this may involve an elevator or an "outer door"/ entry before the encountering the primary entry/exit to the home. Inside, obviously doorway widths are of primary concern, but also turning space in halls, doorway thresholds, negotiating living environments as well as bathroom access, if needed. When considering to overall width of a mobility base; a power chair may be narrower, with the power base under the person, than in a self-propelling manual chair, with the wheels adding to the overall width of the chair.

The obese person may have significantly more difficulty negotiating non-flat environments in the community. Curb cuts and ramps may be too difficulty for either self-propulsion or even to be pushed by another person, depending on the size of the person in the chair. The total weight of the person and a chosen device needs to be considered when thinking about transportation. Most public buses can accommodate the obese person in a power chair, but personal van lifts need to be checked to know the overall lifting capacity of a motorized lift.

In discussions with the person it is helpful to get an understanding of not only there current level of activity, which might be greatly diminished, but more importantly the person's desired activity level. What activity would they most like to be able to participate in the future. These desired activities may strongly influence the power vs. manual decision.

Postural Support and Body Measurement

As noted earlier, if obesity is a secondary complication, there may be significant loss of sitting balance of underlining skeletal deformity, as a result of the primary diagnosis. Assessment of skeletal alignment and sitting balance is critical with this population. For persons for whom obesity is the primary impairment, in general, there are not the traditional skeletal alignment or sitting balance problems which might be encountered with persons with neurological impairments. However, the distribution of the adipose tissue introduces challenges in providing a supportive, functional sitting position.

There are different implications depending on the distribution of the adipose tissue. To get a clear picture of the person's shape, it is helpful to have the person sit over the edge of a treatment mat and observe the shape from both a frontal view and a side view. Is the person primarily "top heavy" or "bottom heavy"? The following relationships are important to note:

Side View:

- Back of the Trunk versus Back of the Buttock
- Distribution of weight – behind, in front, evenly distributed front and back
- Position of the head and upper extremities relative to the trunk
- "Flexed" knee position – Is knee flexion blocked by "bulk"

Front View

- "resting" position of the legs – where to the feet land on the floor?
- Adipose pocket behind the knee – shortening seat depth
- Front view of upper extremities "resting" postion.

Rear View

- Distribution of adipose tissue – buttock spread verses upper trunk width.

Important measurement considerations include:

1. Seat Depth
2. Seat Width
3. Elbow height from mat and position relative to trunk
4. Lower Extremity Position – knee flexion / extension, foot position relative to the midline

For seat width and depth measurements it is helpful to compare the position of three body segments:

- Pelvis and Buttocks as the base
- Upper Trunk – head and upper extremities – above the base.
- Lower Extremities – position of knees and feet relative to the "base"

Properly fitting a person with significant redundant tissue will require thinking of multiple dimensions – the width of the wheelchair seat (and cushion) may need to be wider or narrower than the width of the back posts. A back support may need to be mounted above the pelvis – allowing excess buttock tissue to rest on a shelf behind the trunk. The armrest may need to be higher from the seat and have longer pads to provide support in an abducted position and forward position (relative to the trunk).

Most importantly the seat must be positioned on the mobility base in manner which places the Center of Gravity of the person and the seat over the wheels for maximal mobility efficiency for both manual and power mobility. Working closely with a supplier and a manufacturer who is knowledgeable about the unique concerns of the bariatric population will contribute to a more effective mobility solution.

During the workshop we will present, through case studies, some of the unique challenges presented by the bariatric client in providing postural supports and mobility base options. This workshop is designed to be interactive to maximize the sharing of ideas and concerns when working with this relatively new population of persons needing wheeled mobility services.

Resources

1. www.bariatricrehab.com – Michael Dionne's website – wealth of information across a variety of topics – includes Resource List.
2. www.usatechguide.org – The TechGuide
3. www.pdgmobility.com – self-propelling bariatric manual chair
4. www.wheelchairs.com – 21st C power mobility options
5. www.pridemobity.com – Jazzy power chairs, Quantum Rehab
6. www.sunrisedmedical – Quickie and Jay products

Let 'Em Fly – Minimalist Seating for Maximum Function

Kevin Phillips

When are you able to do your best work? When you're strapped down, tied up, blocked in and squeezed? Or when you're free to move? The answer is obvious! The same holds true of our wheelchair bound clients, even those with the most complex involvement. So unbuckle the shoe holders, loosen the wrist straps, drop the pommel, swing out the laterals, pop the chest harness, and Let 'em Fly! You'll be amazed at the increased function you can help your clients find when they are able to mange their own posture, instead of having it controlled for them. The key is to find the seating configuration that allows your client to use their relation with gravity to control their own pelvis, torso, head, and upper extremities. Every client's level of function and positioning needs are different, but this theory works to improve function on all levels of clients with tonal abnormalities, and is just effective with adults as early intervention.

In a commendable effort to position clients with abnormal tone in a nice symmetrical posture, we've often taken away the essential abilities that all humans require to be able to function independently: bear weight, and move in and out of symmetry. High tone, low tone, wheelchair bound or not, it is our relationship to gravity and weight bearing that makes it possible to perform activities. All function based activities are accomplished by our body's rotation and movement in and out of midline. This movement from a seated position requires that we are weight bearing in our pelvis and lower extremities. Once the pelvis is weight bearing, it is then possible for a person to use the lower extremities to gain significantly more self-management of their own posture, and improve control of both the upper and lower extremities. For the most severely involved, it can result in improved head control that allows for effective use of specialty switches for motorized wheelchair drive controls, augcomm and computer access, and a measure of independence. When a person with abnormal tonal patterns and the inability to control and modulate tone, attempts to use their head or upper extremities to perform an activity, the result is often an extensor pattern that pushes the hips forward, head backward, and arms and legs into extension as the person tries to ground their lower extremities to develop the power necessary for movement.

All the well known positioning aids, the posterior dumped anti-thrust seat, the 4-point seat belt, the oversized pommel, the high top ankle huggers with shoe holders, the curved laterals, the chest harness, the lumbar roll, the jumbo sized headrest (maybe with a forehead strap) … all serve to prevent weight bearing in the pelvis, and the client can often be found perched precariously on their toes and the top of the backrest. These are the clients with such 'uncontrollable tone' that they break footrests, rip shoe holder straps, bend or break headrest mounts, or are sliding out and under every ingenious restraint devised. The seating must position this client such that they are weight bearing on their own; a client cannot be pushed, strapped or wedged into a weight bearing position. Much of the extreme tone that is demonstrated is not unlike what any of us would look like trying to perform an activity from a similar seated position. Seating for function must provide a stable base, but also allow for a range of movement such that the client can manage his/her own posture internally, as opposed to have their posture controlled externally.

There is no cookie cutter approach to a seating configuration for the client with abnormal tone. Especially at onset, spinal cord injuries, many neuromuscular conditions such as ALS, MS etc are relatively consistent and a successful seating configuration can often be reproduced successfully for multiple clients. While those diseases and conditions produce fairly consistent results that make seating configurations simple to design, no two clients with abnormal tone present with exactly the same seating needs. The only way to determine how and where the client can bear weight is a personal evaluation with minimal external supports. It is best done on a mat or chair with a qualified clinician evaluating. Most clients with CP respond positively to a seat slope with some anterior tilt that places the knees below the hips, a position we naturally use to perform tasks from a seated position. With the knees lower than the hips, it is easier for the seated person to bring the shoulders over or ahead of the pelvis, the best position for function. When lateral support is required, a broad area of lateral support such as is found on a contoured back system like the Matrix Elite works well to position without triggering a collapse onto lateral pads. Pelvic position can be well maintained for most with a simple pelvic strap mounted across the proximal thighs at an angle of 80 to 90 degrees perpendicular to the seat base. Seat belts mounted at a point farther back toward the joint between the seat frame and back cane tend to pull the pelvis into a posterior tilt, and increase the risk of the client sliding under the belt. An anterior tilt seat base position places the client where they are able to use their tone to manage their own posture. It requires some work to sit in a functional seat position, and is not a position that anyone can sustain all day. It is imperative that the client have the ability to come out of the task performance position to a rest position. For higher functioning clients, it may be done by self-transfer to another seat surfaces. For more involved client, it means that they must have power seat functions, and the ability to change position independently.

There will be several case studies of various complexities showing positioning and function in previous systems, and in task performance seating with minimal restraints and external supports.

Dynamic Seating – A Spectrum of Applications

David Cooper - M.Sc.- Rehab Technologist
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Background

My first introduction to dynamic seating was in 1982 at the RESNA conference in Huston Texas. In the exhibit hall there was a display of innovative seating systems from a hospital in New York. The seats were made of a white HDPE plastic. One version was hinged at the knees and the exhibitor was hypothesizing about the possibility of reducing stress on the knees with a dampening system that would control knee extension. A full 15 years later at the RESNA conference in Pittsburgh in 1997 the first paper I am aware of was presented. Ault et al reported on a small numbers study of changes in hip extension force and duration, in children with spastic quadriplegia with the provision of a spring loaded back support. They found a reduction in both force and duration of extensor spasms. Also in 1997, Conner reported on a one off spring loaded back support for an adult with full body extensor thrust. Conner reported on general improvements in the clients function, demeanor, and reduced repairs to the wheelchair.

At Sunny Hill Health Centre for Children we have been applying dynamic systems to seating problems since November 1997. Starting first with spring loaded back supports and building slowly into headrests, footrests, armrests, knee supports, trunk laterals and more. We have developed an array of possible custom solutions evolving some into manufactured components while also drawing on what commercial components have been available. It is becoming an approach that our seating therapists have incorporated into their problem solving repertoire. When we look back at the standard seating solutions we have been providing for years it becomes apparent that there have always been dynamic elements in our seating approach.

Dynamic Seating

For the purposes of this paper, dynamic seating is defined as: "posture control that allows controlled temporary postural changes of the user while providing support." This is a broad definition. It includes spring loaded and elastic components and powered devices. Though it is specific to postural changes it could include powered tilt and recline. If you want to stretch the definition it could include postural changes made by a caregiver under instruction of the user.

Dynamic systems fall into two categories. The first is those that allow the user to move out of a defined posture then bring them back. An example of this would be someone with full body extension thrust that pushes their back support backwards when they spasm then the back support brings them forward when they relax. The second category would be those that provide support through a range of movements without a specific return position. An example of this would be an arm support that moves with the arm as the user reaches.

Benefits

Reduction in spastic intensity.
It has yet to be rigorously demonstrated but there have been consistent observations of reduced strength and duration of full body extension with implementation of a dynamic back system. The amount of movement required to reach this goal is small. In all our experiences, allowing the top of the seat back to move back two inches or less is sufficient for very positive results. With this amount of movement, pelvic controls are not compromised. Almost all of our systems have been configured with the pivot point low, close to or at the seat rail, and the spring resistance minimal, just enough to return the back to its most upright position when the user relaxes.

Reduced pressures.
For individuals with strong extensor tone, pressures exerted by pelvic belts or bars can be excessive and can cause tissue damage. Dynamic backs can resolve this issue. Similar results can be found for feet and the use of dynamic footrests. Dynamic headrests have also played a role here. One application is as shock absorption for users that thrust their head backwards. Another is for users that push their head back rotated to one side. The dynamic headrest moves back as they push against it avoiding high pressures on the ear and side of the face.

More stable positioning.
An unexpected benefit of using dynamic components is that the users tend to stay positioned correctly in their seating system. By allowing distal movement the proximal areas are not forced out of position.

Improve comfort.
Reduced pain has been demonstrated in backs and knees with the use of dynamic backs and footrests. The mechanism for this is unknown but could be a result of movement about the joints and the associated shortening and lengthening of the muscles.

Increased function.
There are many examples of using dynamic systems to increase function. They range from gross movements such as reaching enabled by a pivoting, extending arm support, to breathing enabled by a light resistance dynamic headrest that allows the head to extend and turn to allow the airway to open. Such headrests have also resulted in reduced reflux. A version of a dynamic back allows someone with weak trunk extension to roll their upper trunk back extending it to increase breathing capacity and increase their speaking volume.

Reduced damage to positioning and mobility devices.
A side effect of dynamic seating is that there is greatly reduced wear and tear on mobility systems. Many of those that have received dynamic systems have a history of breaking the back uprights or footrest assemblies of wheelchairs. These problems are dramatically resolved when the users are allowed the controlled movement that dynamic systems provide. One particular dynamic footrest that rotates outwards when the user extends has not always been appropriate for the user but it has substantially reduced footrest hanger repairs. It is not all good news since there are failure issues with the dynamic hardware as well.

There Are Many Unanswered Questions

Are there benefits to the musculoskeletal system? How much resistance to movement is needed to optimally reduce spasm? Should dampening be implemented? Are there situations when the dynamic function should be locked out? What is the effect of multiple dynamic components? What are the possible negative effects of dynamic seating?

With reference to this last question, there are possible negatives. Technically, we are introducing complexity to the seating system and wheelchair. There are additional parts that could break. In some situations we are introducing a small amount of weight to the mobility system. Clinically, there are potential negative side effects. For example, one strong spastic quadriplegic fellow appeared to be rapidly increasing his lordosis over a six month period after receiving a dynamic back. The dynamic back was removed and we provided a dynamic footrest to absorb some of the tension created during his full body extension.

We have been selectively providing dynamic components for seating systems for nine years with extremely positive results, and it feels like we are just beginning.

References

Conner, P.S. A Bit of Freedom for Full Body Extensor Thrust. ISS, Pittsburgh, 1997, pp185-187.
Ault, H. et al. Design of a Dynamic Seating System for Clients with Extensor Spasms. RESNA, Pittsburgh, 1997

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Destructive Postural Tendencies: Identification and Treatment

Thomas R. Hetzel, PT, ATP

Introduction

When one considers the progression of postural deformity, pain, and dysfunction among wheelchair users aging with disability, it might be helpful to recognize that the able-bodied visit their doctors for attention to back pain and related problems more frequently than for any other complaint except the common cold. In fact, back pain is the most common cause of work-related disability in the United States, and a leading contributor to job-related absenteeism, according to the National Institute of Neurological Disorders and Stroke. The human body was not designed for long-term sitting, and even able-bodied people with their extensive repertoire of movement and postures in sitting, standing, walking, and lying are virtually guaranteed some variety of back pain and dysfunction in their lifetime. Thus, the goal of mitigating pain, deformity, and dysfunction amongst people who can only sit is daunting.

Perspective

Where do we begin? What is bad seated posture? What causes poor seated posture, and how do we influence improvement?

A recent presentation at the Annual Meeting of the Radiological Society of North America received significant attention, even in the mainstream media. Waseem Amir Bashir, M.B.Ch.B., F.R.C.R., author and clinical fellow in the Department of Radiology and Diagnostic Imaging at the University of Alberta Hospital, Canada, presented his findings from a small study of healthy individuals looking at intervertebral disc morphology in different sitting positions. It was revolutionary for two reasons; the device used to take the measurements and the findings. Dr. Bashir and his co-authors used whole body positional MRI which allows freedom of motion during imaging. The goal was to determine a spinal alignment in seating that showed the least biomechanical stress on the lumbar spine. What they discovered was that a 135 degree trunk-to-thigh angle appears to cause the least strain, most significantly when compared with an upright 90 degree sitting posture. The study also revealed exaggerated tension in forward flexed or slouched positions.

The attention given this small study has focused on its impact on the long-held belief in the value and importance of “sitting up straight”. No one should be surprised to discover that slouching in front of a computer for 10 hours may have long-term health impacts for our computer game and internet crazed teens, but to discover that yelling at them to sit up straight won’t help much (even if they did) is a blow to all parents and teachers! Apparently we need to be telling our youth to kick back in a Lazy Boy recliner with a lap top computer, an energy drink, and a bag of their favorite munchies.

As interesting as these findings may be, do they have functional application for seating the able-bodied? Consider millions of desk workers comfortably reclined 45 degrees beyond the 90 degree upright position attempting to muddle through their stack of daily tasks. Consider long haul truckers reclined back 45 degrees using mirrors to keep their eyes on the road ahead. This small study raises more questions than it answers, especially in consideration of full-time sitters, i.e. wheelchair users. For instance, is it the trunk to thigh angle that is important, or the orientation of the trunk relative to gravity (i.e. would tilt be as effective as recline)? What else was influencing the curves of the spines in this study? What was the seating configuration, and shapes of the back supports? Where was the pivot of the seat-to-back support juncture relative to the hip joint and spinal segments studied? Is there a seating configuration that can influence the spine towards improved alignment without such a dramatic amount of recline? How often, and for how long does a reclined position need to be used to reduce the long-term detrimental effects of upright sitting? Where is the nearest positional MRI system, and can I borrow it?

Dr. Bashir certainly identified something of importance; the stresses at the lumbar spine can be influenced through seating intervention. If nothing else, it adds to the body of literature supporting the use of dynamic recline (and possibly tilt) to alleviate spinal dysfunction in addition to their accepted use in promoting good skin integrity. It would be reasonable to consider that a lesser degree of tilt or recline, when coupled with appropriately shaped and oriented seating supports, may be adequate to reduce measurable stress in the spine sufficiently.

Identification of Destructive Postural Tendencies

Identification of destructive postural tendencies is key to supporting long-term health in sitting. Dr. Bashir’s study focused on a small group of healthy able-bodied volunteers without any history of back problems. The findings lend understanding to the nearly universal problem of back pain, and on a more metaphysical plane it causes one to ponder why, as an evolutionary species, hasn’t the spine evolved into a structure more tolerant of the forces humans have experienced since standing upright?

In a broader sense, this study serves as a backdrop to a philosophy supporting a hierarchy of general goals for wheelchair seating. Seated postures can be task specific. When sitting in a wheelchair, one is typically resting, propelling, or involved in a fine motor task such as keyboarding, eating, or playing poker. These tasks can be categorized as either resting, gross motor functional, or fine motor functional. Which posture is of greatest importance? Do the sums. Which task does the typical wheelchair user find himself using the most? Although no formal research has been conducted regarding this question, experience has shown that a large majority of wheelchair users find themselves resting and/or involved in fine motor activities the majority of the time.

Establish what tasks are being accomplished, for how long, and in what setting, and you are well on your way to developing an appropriate order of goals for the sitter you are serving. This exercise will influence the entire process of evaluation through intervention.

Use of this exercise has revealed to this author a common hierarchy with broad application across virtually all populations, and it serves as a compass to guide intervention:

- Support non-destructive resting postures.

- Ensure sufficient support is provided so that fine motor functional activities can be superimposed onto the resting posture without loss of alignment and stability at the core, i.e. thighs, pelvis, and lumbar spine.

- Do not obstruct transitions into gross motor functional postures. Certainly there are significant outliers such as paralympic and professional athletes, but the majority of wheelchair users’ tasks will most likely fall in this order.

Assessment

An all too familiar scenario is the elderly person sitting in her wheelchair parked along side the nurses' station in an extended care facility. Her destructive postural tendency typically results in a slow slide out of the wheelchair, and this is the primary complaint of the care providers. Where does the assessment begin?

1. Establish what tasks are to be accomplished, for how long, and in what setting.

2. Complete the interview to gain full understanding of medical (inclusive of skin integrity), social, recreational, and other background history relevant to the client.

3. Identify the destructive tendency.
   a. In this scenario you would expect to see a strong posterior tendency at the pelvis, with or without asymmetry, and associated spinal, head, neck, upper and lower extremity alignment.

4. Establish preliminary goal hierarchy. For this case, the above hierarchy would apply:
   a. Support non-destructive resting postures.
      i. The sums most likely add up to reflect that resting is the primary task.
   b. Ensure sufficient support is provided so that fine motor functional activities can be superimposed onto the resting posture without loss of alignment and stability at the core, i.e. thighs, pelvis, and lumbar spine.
      i. Determine what fine motor tasks will be targeted such as independence with meals, hygiene, social activities, etc…
   c. Do not obstruct transitions into gross motor functional postures.
      i. How does this client propel the wheelchair and transfer? How can propulsion be improved without compromise of the above goals?

5. Complete a mat assessment. (NOTE: Before moving forward with evaluating flexibility, a thorough skin check should be accomplished.)
   a. Focus on establishing flexibility of postural segments in directions opposite the destructive tendency.
   b. In this case:
      i. Pelvis: The destructive tendency is a posterior tilt and possibly asymmetry. Can it be leveled and passively moved towards a neutral to anterior pelvic tilt?
      ii. Hips: The destructive tendency is hip extension. Do the hips have adequate flexion for upright sitting?
      iii. Knees: The destructive tendency may be knee flexion. Do the hamstrings have sufficient length to allow a reasonable popliteal angle with hips flexed to optimal seated alignment?
      iv. Ankles/feet: The destructive tendency may be plantar flexion. Do the ankles have adequate range towards dorsiflexion for foot flat support?
      v. Lumbar spine: The destructive tendency is flexion. Step "i" above may have already revealed the extent of lumbar flexibility.
      vi. Thoracic spine: The destructive tendency is flexion, i.e. kyphosis. When stabilizing the pelvis and lumbar spine in best alignment, does the kyphosis reduce?
      vii. Cervical spine: The destructive tendency may be lower cervical flexion with upper cervical and capital extension. Does the cervical spine relax into a normal lordosis in response to reduction of proximal segment malalignment, and do the capital extensors have adequate range for capital flexion?
      viii. Scapula-thoracic relationship: The destructive tendency is protraction. Do the shoulder girdles demonstrate range towards a more neutral and balanced alignment?
      ix. Shoulder: The destructive tendency is most likely flexion, adduction, and internal rotation. Again, is there available range opposite this tendency?
      x. Elbow: The destructive tendency is flexion. Is there sufficient elbow extension for desired tasks?

The idea is to focus the assessment towards determining flexibility opposite destructive tendencies. The supine assessment typically allows the clinician to control for any neurological condition, and reduce the impact of gravity, affording the most objective ROM assessment possible. Assume the questions above were all answered in the affirmative. Does this mean the client can "sit up straight"? Probably not as this question can only be addressed in sitting.

Move the client into sitting, and establish where, within the available ROM assessed in supine, can the person be most comfortably supported towards a non-destructive resting posture. Here again lies another question: What is that non-destructive resting posture?

There are three primary postural tendencies in sitting:

1. Posterior

2. Anterior

3. Lateral/rotational (Which is always coupled with posterior or anterior.)

The goal for intervention for each is as follows:

1. Posterior: Control/reduce the tendency toward optimal sitting alignment.

2. Anterior: Whenever possible, reverse the tendency so that, when resting or involved in fine motor activities, the client relaxes back into the back support rather than collapsing forward into a lordotic posture with the trunk moving away from the back support. (Think of the typical posture of a young man with Duchenne's Muscular Dystrophy.)
3. Lateral: Whenever possible, reverse the tendency so that, when supported, gravity assists in elongation of the trunk opposite the direction of the destructive tendency.

Simulation

Once you have established a general idea of how the client can be supported, it is time to gather equipment and configure a simulation. Everything done to this point, and every evaluation finding will impact the seating and mobility prescription in at least one of the four following general parameters:

- Angles: Angular relationships of postural supports relative to anatomical angles.
- Shapes: Contours and shapes of supports relative to the unique shape of the sitter.
- Materials: Materials are selected with skin care, postural control, breathability, durability, and maintenance in mind.
- Orientation to:
  - Gravity for stabilization of posture into supports.
  - Mechanism of mobility.
  - Environment of use, including transportation when appropriate. These four categories can be remembered through the acronym AMOS; Angles, Materials, Orientation and Shapes.

Measure the results of the simulation against the specific goals outlined in the initial hierarchy:

- Support non-destructive resting postures.
  - If possible, encourage the sitter to relax, and observe postural change. A positive result in this case would show an improvement in postural alignment, and no migration of the hips forward on the seat.
- Ensure sufficient support is provided so that fine motor functional activities can be superimposed onto the resting posture without loss of alignment and stability at the core, i.e. thighs, pelvis, and lumbar spine.
  - Does participation in targeted fine motor activities result in loss of core stability?
- Do not obstruct transitions into gross motor functional postures.
  - Can the sitter complete gross motor activities and then restore herself into the non-destructive resting posture? It is nearly inevitable that the stresses of manual propulsion be it with bilateral upper extremities, lower extremities, or one arm and/or one leg will result in a change in the postural alignment of the sitter. The important element is determining if the sitter can propel and then reposition herself back into the supports once she gets where she needs to be.

Use the objective results of the simulation to make alterations to the simulated configuration as necessary until a definitive seating and mobility prescription can be established.

Summary of the Process

1. Identify the destructive tendency in sitting, and determine preliminary goals in a hierarchical fashion.

2. Establish flexibility opposite destructive tendency in supine.

3. Establish correct-ability in sitting, i.e. influence the client's posture in sitting towards the desired objective relative to established destructive tendency.

4. Determine preliminary seating objectives and parameters using AMOS as a guideline.

5. Gather appropriate equipment for simulation of the selected parameters.

6. Measure effectiveness of the simulation, and adjust parameters and goals appropriately.

7. Prescribe final equipment.

8. Fit the equipment.

9. Fully educate the client and care providers on use and care of the equipment.
10. Schedule a follow up visit or call to ensure long term effectiveness and outcomes.

A Brief Note on 24 Hour Postural Care

There will be times when this ideal model of intervention just doesn't or can't work. In the cases of more extreme postural deformity, severe spasticity, and movement disorders, you may discover that the wheelchair is not going to be the primary intervention for maintenance or improvement of sitting ability. In many of these cases the time spent in the wheelchair is considerably less than time spent out of it. It is absolutely imperative that alternative positions and appropriate supports be used out of the wheelchair for this segment of wheelchair users. Positions should be selected that promote reduction of the postural tendencies observed in sitting. It is not uncommon to restore or maintain a person's ability to sit through well-targeted interventions outside of the wheelchair. Remember that the posture that a person is in the majority of the day is the posture that wins!

Conclusion

A consistent approach to wheelchair seating and mobility has been presented. Consistency in approach and methods of evaluation and intervention is the easiest way to apply science to the often subjective and artsy elements of wheelchair seating. Well-organized goals in a correct hierarchy are the compass to guide you through the process. Identification of the destructive postural tendencies will help you to be more focused and directed through the assessment, and in the measurement of outcomes. And remember, it is not just the wheelchair that influences one's long term sitting health.

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VA Equipment Provision: Policies & Practices to Optimize Outcomes for US Veterans & Soldiers

Fred Downs Jr.
Kendra Betz, MSPT, ATP

Background: Veterans Health Administration

In the United States, the Veterans Health Administration (VA) is the largest integrated health care system. The VA provides comprehensive health care services for veterans of the US Armed Forces. In many cases, active duty service members are also eligible for the broad range of programs and services coordinated by the VA. VA healthcare is one of three programs managed by the U.S. Department of Veterans Affairs. The Secretary of Veterans Affairs, a member of the President's Cabinet, provides leadership for all VA programs. The Under Secretary for Health specifically manages the Veterans Health Administration.

The mission of the Veterans Healthcare System is to serve the needs of America's veterans by providing primary care, specialized care, and related medical and social support services. To accomplish this mission, VHA needs to be a comprehensive, integrated healthcare system that provides excellence in health care value, excellence in service as defined by its customers, and excellence in education and research, and needs to be an organization characterized by exceptional accountability and by being an employer of choice.

Eligibility for most VA benefits is based upon discharge from active military service under other than dishonorable conditions (i.e. "honorable discharge). Active service means full-time service, other than active duty for training, as a member of the Army, Navy, Air Force, Marine Corps, Coast Guard, or as a commissioned officer of the Public Health Service, Environmental Science Services Administration or National Oceanic and Atmospheric Administration, or its predecessor, the Coast and Geodetic Survey (from www1.va.gov/opa/is1/index.asp).

VA provides health services to individuals who became ill or injured "in the line of duty" while serving in the military (service connected or SC) AND those who became ill or injured after an honorable discharge from the military (non-service connected or NSC). In addition to SC versus NSC conditions, the client's financial data is also analyzed during the enrollment process. The veteran is then assigned to 1 of 8 priority groups with those SC 50% or more assigned to the highest priority group. Once enrolled, veterans can receive services at VA facilities anywhere in the country. For details on VHA eligibility see www.va.gov/healtheligibility. VA provides comprehensive health care services for the veteran or active duty service member, but not for their family members. Comprehensive services are available for both men and women. Pediatric care is not available. VA offers comprehensive programs in Primary Care, Medical and Surgical services, Spinal Cord Injury, Rehabilitation Services (Physical Medicine and Rehabilitation, Blind Rehabilitation, Audiology & Speech Pathology), Mental Health, and Geriatrics & Extended Care. Extensive patient issued adaptive equipment is coordinated and provided by the Prosthetics and Sensory Aids Service.

VA EQUIPMENT PROVISION:
Prosthetics and Sensory Aids Service

The Prosthetics and Sensory Aids Service (PSAS) coordinates the provision and funding of all equipment and devices that are issued to veterans. PSAS includes the total process associated with replacing, supporting, and/or complementing the human anatomy impaired or destroyed as a result of trauma or disease. Fred Downs Jr. is the Chief Prosthetics and Clinical Logistics Officer. He is assisted by one Deputy, four Program Managers, several Program Analysts and 23 VISN Prosthetics Representatives who oversee the Prosthetics services at each of the VA facilities in their region.

The mission of the Prosthetic and Sensory Aids Service (PSAS) is to provide specialized quality patient care by furnishing properly prescribed prosthetic equipment, sensory aids and devices in the most economical and timely manner in accordance with authorizing laws, regulations and policies. PSAS serves as the pharmacy for assistive aids and as case manager for prosthetic equipment needs of the disabled veteran.

The special mission of the Prosthetic and Sensory Aids Service (PSAS) is to be the headquarter advocate for a core population of veterans with special needs for prostheses and sensory aids. This group includes veterans and soldiers with any single or combined condition such as: Amputations, Spinal Cord Injuries and Spinal Cord Dysfunction, Visual Impairments, Hearing and Speech Impairments, Podiatric needs, Cardio-Pulmonary Disease, Traumatic Brain Injury and Traumatic Brain Dysfunction, Neurological Dysfunction, Muscular Dysfunction, Orthopedic impairments, Diabetes, Peripheral Vascular Disease, Cerebral/Vascular Disease, Respiratory/Pulmonary Dysfunction and Geriatric issues. PSAS receives consults from and provides support to all VHA programs that coordinate care for these individuals.

VHA Handbook 1173 establishes uniform and consistent national policy and procedures for the provision of prosthetic services. The comprehensive 15 chapter document is designed to address the process for serving disabled veterans relative to their equipment and supply needs. The following chapters are included in the Handbook:

1-Eligibility
2-Provision PSAS
3-Amputee Care
4-Automobile Adaptive Equipment
5-Blind Rehab
6-Wheelchairs
7-Audiology and Speech
8-Medical Equipment & Supplies
9-Footwear
10-Orthotic Support
11-Ocular Prostheses & Facial Restorations
12-RX Optics and Low Vision
13-Home O2
14-HISA (Home Adaptations)
15-Clothing Allowance

Prosthetics Clinical Management Program (PCMP)

In 2001, PSAS developed the PCMP as directed by the Under Secretary for Health.
The objectives of the PCMP are to coordinate the development of clinical practice recommendations that will enhance the appropriate use of prosthetic devices and promote a uniform prosthetic clinical practice. The PCMP also coordinates contracting opportunities to assure technology uniformity and ease of access to prosthetic prescriptions and patient care. Additional PCMP goals are to support outcome measurements and research, enhance and standardize the quality of care, and reduce the acquisition cost of Prosthetic appliances.

PCMP national workgroups are coordinated to address specific equipment identified in Handbook 1173. The PCMP workgroups are typically chaired by a VA clinician. Committee membership is representative of VA clinicians, PSAS staff, Legal Counsel, Contracting Specialists, Patient Safety, and Veteran Service Organizations. There are more than 30 PCMP workgroups. Relative to Assistive Technologies, active PCMP workgroups are addressing the following topics:

- Aids for the Blind
- Assistive Listening & Alerting Devices
- Computer Hardware & Software
- Home Health Telemonitoring
- Patient Lifts
- Speech Devices
- Vehicle Lifts
- Walkers
- Wheelchairs

Wheelchair Provision by the VA

VHA Handbook 1173.6 outlines eligibility, procedures, and guidelines for issuance of manual wheelchairs, motorized wheelchairs, scooters and sports wheelchairs. Eligibility for a back-up manual wheelchair is also addressed as is the process for maintenance and repairs. A supplementary document was published by the PCMP national Wheelchair Workgroup: “Clinical Practice Recommendations for Motorized Wheeled Mobility Devices: Scooters, Pushrim-Activated Power-Assist Wheelchairs, Power Wheelchairs and Power Wheelchairs with Enhanced Function”. This document further outlines specific clinical guidance in determining appropriateness for various options in power mobility. The document defines each of the power mobility options, offers indications and contraindications for each device and utilizes case examples to demonstrate sound clinical decision making. The PCMP Wheelchair Workgroup is currently compiling a similar comprehensive document to address clinical practice recommendations for the issuance of manual wheelchairs. The PCMP Recreation workgroup is actively addressing eligibility and processes for sports wheelchairs and recreational devices.

Wheelchair eligibility in the VA is different than other government agencies (i.e. Medicare and Medicaid) and most private insurance companies. Several examples demonstrate these significant differences. The VA “supports the dispensation of power mobility to allow the veteran to access medical care and to accomplish necessary tasks of daily living in ordinary home and community environments”, thus “in the home restrictions” do not apply. Individuals who use a manual wheelchair for primary mobility are eligible for a custom configured ultralightweight wheelchair with justified options/accessories AND a second wheelchair of equal value to serve as a back-up. Clients who use power wheelchairs are also provided with a back-up manual wheelchair. The VA is one of the only health care agencies in the world to provide sports/recreational wheelchairs and devices to beneficiaries who meet specific eligibility criteria and for whom the equipment will allow achievement of rehabilitation goals.

Actual processes for wheelchair evaluation, prescription, fitting and patient education varies between VA facilities. A client focused team approach that fosters a supportive collaboration between interdisciplinary professionals is most effective in optimizing outcomes for veterans.

Wheelchair Business with VHA

As the largest integrated health care system in the country, VA is a significant consumer of wheelchairs and related products and services. The VA spends approximately $100,000,000 each year on power wheelchairs, manual wheelchairs and scooters. VHA Handbook 1173.6 specifically states that “all wheelchairs for use by eligible beneficiaries will be purchased from current VA contracts using established procedures.” There are processes for purchasing wheelchairs that are not “on contract” with specific justification. Manufacturers are encouraged to contact the National Acquisition Center (NAC) in Chicago for specific information about VA wheelchair contracts. The NAC establishes and administers the Federal Supply Schedule and National contracts for wheelchairs and other equipment provided by the VA. For more information see http://www1.va.gov/vastorenac/.

Questions & Discussion

See list of websites below for additional information
SHG = Strategic Healthcare Group

* VA Intranet site

US Department of Veterans Affairs
www.va.gov

VA facility locator
www1.va.gov/directory/guide/home.asp?isFlash=1

Eligibility for VA health care services
www.va.gov/healtheligibility

VA Health Service Fact Sheets
http://www1.va.gov/opa/fact/index.asp

Prosthetics & Sensory Aids SHG
vaww1.va.gov/prosthetics *

Spinal Cord Injury SHG
vaww1.va.gov/health/sci/disorders *

Rehabilitation SHG
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VA Equipment Contracts
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Additional resources will be provided at the session

Creating Functional Seating Strategies Using the Move Curriculam

Terri Goebel, PT, MHS
Brittany McClary, MS, OTR

I. Overview of the MOVE Curriculum.

MOVE (Mobility Opportunities Via Education)® is an activity-based program designed to teach individuals basic, functional motor skills needed for adult life in home and community environments. The MOVE program was developed in the 1980's by D. Linda Bidabe, a special education teacher in Bakersfield, California. Linda refused to accept that some of her students with severe disabilities were not learning to sit, stand, and walk thus limiting them from full and meaningful participation in their lives. The need for the program became even more apparent upon realization that many of these students were graduating from school at age 22 with fewer skills than when they entered with at 3. These experiences and Linda's conviction that "all people can learn if we know how to teach them" led to the development of MOVE.

MOVE helps children and adults with disabilities acquire increased independence in core sitting standing and walking skills to experience, learn and gain more mobility, better health and enhance participation in life activities. The mission statement of MOVE is founded in the belief that the ability to move is the first foundation stone in building personal dignity. Individuals with severe disabilities have frequently been denied the opportunities to participate in typical life activities because of their inability to perform all necessary skills (Brown et al., 1979; Falvey, 1989). These individuals are often relegated to practicing prerequisite, infant skills in their educational program rather than practicing relevant life skills (Attermeier, 1991; Rainforth & York-Barr, 1997). The current trend in education of students with developmental disabilities has shifted from deficit model in which the individual's limitations are emphasized to a support model in which future potentials are emphasized (Barnes, 1999). Educational programs, such as MOVE, that incorporate the support model provide more opportunities for individuals with severe disabilities to participate in life activities.

MOVE teaches these critical sitting, standing and walking skills through the incorporation of the following fundamental principles:

1. Functional Curriculum – learning occurs within meaningful activities

2. Natural Environments – skills are practiced where they will be used

3. Family- centered - family priorities are an essential part of MOVE

4. Integrated Therapy – educators, caregivers, and therapists collaboratively plan, set goals and intervene in the individuals' natural environment

5. Partial Participation – individuals with disabilities actively participate to the greatest degree possible

Utilizing these key principles instructional activities and basic skills are selected based on functional outcomes, and instruction is incorporated into routinely occurring events dispersed through out the day. A transdisciplinary team which includes parents, educators, therapists and other professionals works collaboratively to assess the student's skills, design an individualized program, and teach the skills while the individual participates in school, home and community activities.

There are six steps in using the MOVE Curriculum:

1. Testing

2. Setting Goals

3. Task Analysis

4. Measuring Prompts

5. Reducing Prompts

6. Teaching the Skills

In Step 1 the curriculum provides a Top-Down Motor Milestone Test™ (TDMMT) that identifies the current level of ability to use functional motor skills needed for typical sitting, standing and walking activities. During administration of the TDMMT, the transdisciplinary team uses interview and observation techniques to determine if a student can consistently perform the specific behaviors necessary for functional seating and mobility in their naturally occurring environments. In Step 2 the individual's goals are identified based on family and or caregiver interview that addresses specific activities necessary for daily living that pose a challenge. Once needs are identified, the team selects priority activities to be addressed in daily programming. In Step 3, the practitioners perform a task analysis to identify critical skills needed for participation in the selected activities. Data gathered during the TDMMT are used to select key mobility skills to be embedded into daily activities. Step 4 provides a process for measuring the amount and type of assistance or physical prompts needed in order to perform a task and subsequently, in Step 5, the team identifies areas where assistance can be faded, as the individual becomes stronger and more independent. In Step 6, teaching strategies are identified for specific activities within the typical day. Practice opportunities are provided within natural environments promoting both motivation and generalization (Shelden, 1998; Damino 2006).

Although MOVE was first conceived in the 1980's, its basic premises align with current best practice strategies. A more optimistic of an individual's potential has led to a top-down approach to program planning that provides a framework for identifying life-long outcomes (Campbell, 1997). The current trend in education of students with developmental disabilities has shifted from a deficit model in which the individual's limitations are emphasized to a support model in which future potentials are emphasized (Barnes, 1999). Educational programs, such as MOVE, that incorporate the support model provide more opportunities for individuals with severe disabilities to participate in life activities. The individual is not held back because of the lack of independence, instead he/she is supported and allowed to problem solve within the natural demands of the setting. Integrated therapy delivers educational and related services in natural settings where skills will be functional and performance meaningful for the individual (Dunn, 1991, Rainforth & York-Barr, 1997). The integrated therapy approach breaks from the more traditional multi-disciplinary model in which team members conduct assessments and set discipline-specific goals in relative isolation (Orelove & Sobsey, I996). The MOVE program also recognizes the benefits of a collaborative team approach over a multidisciplinary approach. Parents and/or caregivers are full partners on the team become skilled at identifying opportunities for the individual to practice mobility skills in the settings where they live work and play (Palisano, 2006). Additionally, new thinking within the allied health field encourages a paradigm shift in program planning for individuals with developmental disabilities such as cerebral palsy from practice of isolated skills to activity based approaches (Damiano, 2006).

II. Development of Functional Sitting Skills

The M.O.V.E. program contains two sections related to the development of sitting skills: Section A. Maintaining a Sitting Position and Section B. Movement While Sitting. In addition, two types of sitting are identified. Functional sitting is defined as “leaning slightly forward at the hips (approximately 20 degrees) while sitting. This position is used for activities such as eating, working at a desk, speaking, and toileting (Kern County, 282). The second type of sitting or leisure sitting is defined as “allowing the trunk to lean against the backrest of the chair while sitting. This position is used while receiving information or while resting (Kern County, 283).

Any individual can sit if given enough physical assistance. This is an undeniable truth. The M.O.V.E. program uses a place then train model to identify how much physical assistance a person needs in order to begin learning to sit as independently as possible. Teaching motor skills is not the same as using substitutes for motor skills. Therefore M.O.V.E. shifts the instructional methods from “containing” a person towards the concept of helping a person to move. (Kern County, 14)

Traditional methods used to assist persons to sit use passive range of motion exercises as well as static seating and positioning techniques. The theory seems to be to treat the underlying cause of the disability while assuming automatic learning will simultaneously occur. While these techniques have demonstrated the ability to postpone the onset of fixed deformities, they have not been shown to teach new skills.

The M.O.V.E. approach differs from the traditional methods. Appropriate movement, as opposed to static positioning is key to improved health and independence. M.O.V.E. designs an individual program where the individual is only offered as much help as he/she needs to engage in a desired activity. A plan is put into place to reduce the amount of physical assistance until the individual is as independent as possible. This is achieved through placing the emphasis on sitting on moving into the appropriate position and maintaining the muscle balance needed to sustain a seated position within a desired functional activity. (Kern County, 147)

M.O.V.E. brings together the needs and dreams of an individual with physical disabilities, his/her family and/or caregivers to teach sitting in order for the person to live as independently as possible. For example a teenage girl would like to sit in a booth in a restaurant with her friends when they go out on the weekend. Using M.O.V.E., the young woman’s team would first complete a Top Down Motor Mile Stone Test to identify her present level of sitting ability. Her goal to sit in a restaurant booth would be identified in Step 2 of M.O.V.E. Then they determine how much assistance she currently needs to sit on a bench seat, measuring the amount of physical assistance needed today. This is Steps 3 and 4. Then, they would develop a plan to reduce the amount of physical assistance in order to achieve her end goal of sitting in a restaurant booth. This is called the “Prompt Reduction Plan,” or Step 5. In Step 6 times would be identified throughout the teenager’s day when she could practice the skills needed to reach her goal.

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The Evaluation Needed for Powered Mobility for Young Children or Children with Significant Developmental Delays

Karen M. Kangas OTR/L

When planning to evaluate a young child for more independent functional mobility with the use of a powered chair, it is critical to know that this evaluation cannot possibly be the same as one for an adult. Children are not small adults. Children with disabilities, especially very young children, have little experience in the world itself, and even less experience manipulating themselves, their bodies and play objects. Consequently, attempting to support them in mobility experiences must take place in a much more natural environment than a clinical one. First the child must be interested in and comfortable within the environment within which the evaluation will take place, as well as have an interest in using the powered chair itself.

Next, when evaluating young children, it is important to realize that for successful use of a powered mobility system these three issues must be resolved: 1). seating for task performance, 2). the powered chair programmed adequately, and 3). head first, "hands free" operation. These first two issues are non-negotiable, they must be resolved or the evaluation will never be successful, the "head first" may be altered, but I would choose to not just a proportional joystick as an initial method of access.

Creating an environment within which all of the above can occur, is critical, and must be planned. It should happen within the child's home, or pre-school classroom with which she is already familiar, if it must be in a clinical environment, then even more time and planning will be needed.

1. Environment is critical

a. Best in home, then preschool
b. If in a clinic setting, environment must be dramatically altered
   1). Visually interesting at child's eye level
   2). Objects available
d. Hallway, available for forward
e. Furniture around, closeness of natural objects within environment (clear away any potential hazards, but no big open space)
f. Never a gym or parking lot

2. Equipment Needed

a. Baby dolls
b. No joystick
c. Adult chair, too
d. Seating Simulation Equipment
   1). EZ back
   2). Remove legrests, armrests, fixed trunk supports, pommel
   3). Flax seed "bags"
   4). Neck towel
e. Remote programmer
f. Electronic Switches, set up for head first, several head arrays, and separate
   proximity switches
g. Other switch access readily available but not "seen" e.g. joystick

3. Before any strategy can be utilized, child must desire to get in the powered vehicle

a. A baby doll needs to make the "chair" go
b. An adult, familiar with the child, needs to be placed in a chair
c. Child may sit on adult's lap, child may make the "parent" go in the chair by managing the method of access, but not be in the chair.
d. Child may have to leave setting and return another time to try

4. Once child interested in getting in the powered chair these strategies must be utilized

a. Initial seating for task performance, not for "safety" nor "holding"
b. Switch placement where child is, not where "will be"
c. Experience of looking around the room
d. Experience of travel through a doorway
e. Experience of hallway
f. Experience "touching" things
g. Knowledge of Left/Right is not necessary
h. A natural "stop" will occur
i. Take a break, repeat the activity, not the act
   1). 10 minute vs. 10 second rule
   2). 10 trials vs. 1000 trials
j. Therapist must be responsive, not directive
k. A powered chair does not teach walking but teaches active "sitting" It does utilize the vestibular system, but not through "movement" but through managing postural control while intentionally planning to get somewhere

5. Techniques which won't work

a. Too long in the chair
b. Arbitrary commands of stop, go, go left, go right, come here, go there
c. Planning "optimal" placement of access
d. Overly-controlled seating
e. Big spaces, out in the open, except for out doors in a field
f. Safety is NOT first, but provided by the adult

6. What we really still need

a. Small powered chairs for indoor use
b. Seating which provides easy access to the environment
c. Fun, outdoor driving, which can handle a field
d. Powered mobility in an upright position
e. Still need independent opportunities to use the body

7. How Independent Mobility Develops

a. Personal exploration, “recreational”
b. Social or chance of social. . approach, and exit
c. Functional/Educational (by command to demonstrate skills)
d. Integrated into tasks desired, or tasks known

Final Notes:

In order to teach powered mobility much less “evaluate” a child for the use of powered mobility, the “teacher” and “evaluator” must be competent in powered mobility themselves. This does not include just programming a chair, nor driving with a joystick, but real competence in alternative access, or at least 40 hours of practice of use in a particular method of access.

Wheelchair Transportation Safety

Douglas Hobson, Phd

I. Abstract

Rehabilitation professionals have a responsibility to inform consumers about the risks associated with the products that they are being prescribed. Wheelchair transportation safety standards are now resulting in wheelchairs that are improving the safety of those who must use them as seats in motor vehicles. Failure to use products that meet the safety standards is resulting in increased injury and related lawsuits. This change in practice is having implications for not only product manufacturers and suppliers but also those recommending wheelchair products.

II. Learning Objectives

1. The risks associated with transport of individuals using wheelchairs in motor vehicles.

2. Wheelchair transportation safety standards and how to implement them in current practice.

3. Principles of wheelchair and wheelchair seating system crashworthiness

4. How to located resources related to wheelchair transportation safety.

III. Overview

This workshop will first provide attendees with a basic understanding of the physical aspects of motor vehicle crashes and the causes of occupant injuries. With this background, the basic principles of occupant crash protection will be reviewed along with a summary of how these principles have been incorporated into the essential design and performance requirements and associated test methods of voluntary standards for transit wheelchairs and for wheelchair tiedown and occupant restraint systems (WTORS). The steps involved in conducting wheelchair and WTORS crash testing and in evaluating and reporting equipment relative to design and performance criteria will also be described and illustrated using high-speed videos showing typical crash tests. Attendees of this workshop will have a better understanding of why wheelchairs and WTORS that comply with the new standards provide increased transportation safety for wheelchair-seated occupants as well as a better understanding of what is involved in designing, testing and recognizing products that comply with the standards. They will also be better informed to share this important information with wheelchair users and other clinicians who participate in the wheelchair selection process.

Finally, examples will be shared of cases in which wheelchair users have been injured and lawsuits have resulted, the hope that these situations can be avoided in the future

Early Intervention: Early Intervention: Preventing the consequences of inappropriate seating and immobility

Ginny Paleg, PT

The incidence of premature births has increased dramatically over the past decade. Contributing factors include in vitro fertilization, multiple births, maternal age (over 35), unmanaged diabetes or high blood pressure, previous premature birth, cervical incompetence, and exposure to certain viruses. Some reports cite the current United States rate of 20% to 25% of all births occurring at or before 36 weeks of gestation. Recent studies (presented at the American Academy for Cerebral Palsy and Developmental Medicine) show that more than 50% of these babies will have long-term physical, visual, cognitive, and/or language challenges. There also has been an increase in the rate of cerebral palsy.

A Seattle-based study on sudden infant death syndrome (SIDS) showed that the rate of death could be decreased by having babies sleep on their backs. This led to the back-to-sleep program. The result was intended to be that babies just slept on their backs, but the reality was that babies spent all of their time on their backs. The incidence of torticollis, plagiocephaly, and developmental delays skyrocketed. One study has shown that this led to a dramatic upward shift in the age of attainment of gross motor milestones.

Now more than ever, we need to make sure that infants move and learn the effects of their actions on the world as soon as possible. All parents need to make sure that their infant has at least 15 minutes of tummy time every day. The best baby shower gift is a floor system that provides a roll for under the arms of the child (to promote prone on elbows and prone play), a kick-activated mobile (the feet actually can manipulate toys before the hands), and a toy bar for the car seat. Studies have shown that some premature infants have learning issues right from the start. We need to build in mobility as early as possible. A 3 month old, with direct supervision, can wear a ribbon loosely tied to their wrist or ankle and then attached to their overhead mobile for 10 minutes a day. Studies have shown that the child learns in just a few trials that their movement makes the toy move. This is one of the earliest opportunities to encourage mobility and learning

If by age 5 months (adjusted age) the child is 25% (or more) delayed, we need to use augmentative mobility. The first step is to support sitting. Begin by supplying head and trunk support. Use this supported position to teach midline and tracking. Slowly reduce the amount of head support so you actually teach head control. If you wait much past 6 months to introduce sitting, you have lost valuable time to get the eyes working together.

At 8 to 9 months (adjusted age), it is time to introduce standing and crawling. Karen E. Adolph, PhD, a professor of psychology and neural science who specializes in perceptual cognition development and perception at New York University, has shown that crawling has nothing to do with learning to walk. If you want walking, you have to teach walking. But Rosanne Kermoian, PhD, at Stanford University, presents data that shows that crawling changes the way weight is borne on the palm and impacts handwriting and fine motor skills later on. Here again, positioning devices can really help you. There are a few crawling devices out there, and some are better at supporting the child than others. You also can use your treadmill and walking harness to do some crawling. Have the child wear knee pads and gloves and use manual guidance to get the crawling pattern you want. (Long Island, NY-based Phil Koch, PT, is the master of this intervention and has some wonderful case studies.)

When it comes to standing, the choices are numerous. If the child has Medicaid assistance, you may be limited to one of three devices that fit the reimbursement amount. There are standers that can accommodate severe knee flexion contractures, as well as models that go from sitting to standing with no lifting, and others that a child can move on his own (like a wheelchair). Some children need to have their head lower than their feet for postural drainage, or need a stander that can change from prone to supine to upright—and these options are available, although a letter of medical necessity might be necessary

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f a 3 year old is still not ambulating independently, you need to make sure they have an assistive mobility device that allows them some form of independent mobility. The child may be destined to be an independent ambulator, but to maximize cognitive and language development, they need an independent form of mobility beside commando crawling. Studies have shown that commando crawling does not afford the child the same cognitive and spatial benefits of belly-off-the-ground crawling. This means that a child who needs help in their walker needs to be in a gait trainer at least 30 minutes a day (that is not evidence based—just my opinion). This is a great time to ramp up body weight support gait therapy! If you do not think the child will be an independent ambulator for long distances by age 6, now is the time to start power mobility training. There are many studies showing that 18-month-old children can successfully learn to use power mobility. I usually do some trials at that age so they have the experience and exposure, but wait until they hit preschool (ie, wide hallways) to start daily training.

This is also the time to introduce 24/7 postural management. The new trend (it is “old hat” in Europe) is special beds that enable the caregiver to maintain the child’s spine, hips, and knees in the desired position. The Tardieu method has shown that it takes 6 hours of stretching to impact a spastic muscle in a child with cerebral palsy. Nighttime is the best time to do this. Studies also have shown that these sleep systems improve the child’s (and thus the caregiver’s) sleep.

If you do not expect the child to be able to sit independently before they reach 40 pounds, do not forget to order a car seat. There are three main choices. One is easy to clean, one is way cushy, and one is great for aggressive positioning (and the only one that goes up to 140 pounds). If you choose the one that reclines, make sure you have the seat depth in the car it will be in. Also make sure the family has hooks to attach the tethers.

Now the challenge is balancing educational and medical goals. The child is in school to learn. Who is responsible for stretching? Standing programs? Toileting? Transfers? Mobility? I believe that equipment is your friend. The recipe for success is picking equipment that requires the least amount of lifting and adult intervention. If the child is able to use a switch interface and uses power mobility, get a system that stands the child. A seat elevator or one that partially angles to assist with transfers may mean the child can toilet independently. A power system that lowers the child to the floor or a seat that tilts side to side so the child can reposition themselves independently is invaluable.

The family also will need to address exercise. Studies have shown that children with disabilities need to exercise as much as typically developing children. These devices are not usually covered by third-party payors. Bikes, treadmills, and elliptical trainers are all available for almost all children at all functional levels.

There are a great many choices in power mobility. Can any single person know them all? There is no substitute for good advice and experience. A good rule of thumb is to start with a provider who is NRTTS or RESNA certified. Another trick is to meet regularly with your local manufacturers' representatives. All the big manufacturers have education programs and will send you a qualified physical or occupational therapist to demonstrate the latest trends. Most of these courses are not product specific and can earn you free CEUs. In addition, these sessions provide the opportunity to expand your knowledge and give you time with new equipment. My favorite courses are those that do a half-day lecture, and then help you fix your equipment (and clients' equipment) for the second half of the day. These trainers are world class experts and love the challenge of solving your biggest problems.

If a child's home has any steps to the entrance, the manual or power chair may have to stay at school or in the car. You may need a separate activity chair for the home. There are a number of excellent chairs on the market. My favorite ones go up and down, so they can be used for floor time, or at the dining room table. I want the chair to easily tilt and recline. I also like a good headrest, a tray, and a fabric that cleans easily. One of my favorite chairs has independently adjustable leg supports and back pad so you can help the femoral head stay in the socket, as well as support the sacrum and lumbar spine.

Supported walking is another big trend for adults. Gait trainers and walkers that support the trunk and pelvis are now available from at least five different companies. These devices enable marginal ambulators to gain independence and function that were not previously possible. Exercise for people with disabilities has been identified by the Department of Health and Human Services and the American Physical Therapy Association as a top priority. Hippotherapy, aquatic therapy, weight lifting, elliptical trainers, stationary bikes, and treadmills are all good ways to stay healthy and strong. The best evidence-based choice is probably a body weight-supported treadmill system. At least seven systems are available, starting from harnesses that attach to the ceiling all the way to expensive computer-driven robotic systems.

Wheelchair Maintenance And Adjustment For ~~Dummies~~ Clinicians

Ian Denison PT ATP

Some people who use wheelchairs are very good at keeping on top of the regular maintenance required by the chair. In the twenty years or so that I have been involved in teaching wheelchair skills I have met less than a handful. Their three-year-old chair has less than a months accumulation of dropped food. The original finish is visible in more places than where clothing rubs off the dirt. Their quick release axles still release and their tires have been inflated in the last month.

The vast majority of wheelchair users have absolutely no idea the chair needs maintenance. Chairs these days are well made and any deterioration in their performance happens over such a long period of time that it often goes unnoticed. Tire inflation which changes more quickly than other factors takes two months to get down to half it's initial value and then another two months to half that. In other studies we established that there is no statistically significant increase in energy expenditure until pressures approach 25% of the recommended value. Is it any wonder that with such a slow rate of change, deterioration goes unnoticed.

Numerous clients attend the centre on an out patient basis complaining of shoulder pain. Treatment with conventional PT modalities, acupuncture, IMS and a balanced programming of stretching and strengthening usually prove beneficial…… particularly after we serviced their wheelchair.

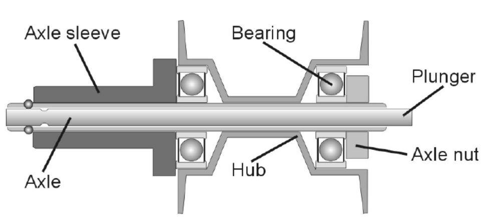
One of the most common service items is to check and adjust or replace the bearings. It is at the bearing not the wheel that actual movement occurs. Servicing bearings is relatively simple; identifying the need for service is even easier. The rewards realized from fixing a seized bearing make learning a little mechanics very worthwhile.

Bearings

A manual wheelchair has twelve bearings. Wheel bearings (4), caster bearings (4) and caster stem bearings (4). All the bearings are straight bearings and are different to bike wheel bearings which have a cup and cone design that requires pre loading when adjusting them.

Wheel, caster and stem bearings perform different tasks and need to be treated slightly differently

Wheel Bearings

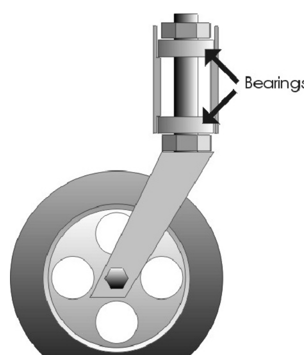


These bearings carry the majority of the weight and need to spin with minimal resistance. To set the bearing correctly; Install the wheel and over tighten the axle nut to make sure the bearing is seated properly. Back the nut off a quarter turn and wiggle the rim side-to-side, adjust the nut until there is minimal side-to-side play (wheels with a quick release axle can not be adjusted as precisely as those with a fixed axle and will always have more wiggle). Then spin the wheel and let it rotate freely to a stop. If the wheel slows and rotates backwards slightly the bearing is adjusted correctly. If it slows and stops dead it is too tight.

Caster Bearings

Are like smaller wheel bearings except they are much closer to the floor and as such are most likely to pick up hair and other contaminants which need to be removed on a regular basis particularly if there are furry pets around. The easiest way to clean the caster assembly is to remove the wheel, take out the hair, wipe it off and then reassemble. Tightening the axle nut is the same as for the wheel bearing.

Caster Stem Bearings



Unlike wheel and caster bearings stem bearings don't really spin, they just turn. They can be adjusted to be a little tighter than previously described for wheels. This will help to prevent caster flutter.

Some chairs use bushings at the top instead of a bearing. Bushings are basically discs of low friction material, like polypropylene or bronze with a hole for the axle. They are cheaper than bearings but tend to wear quicker. A bearing can often be used to replace a worn bushing.

Should You Lubricate Bearings?

Yes and No!

Almost all wheelchair bearings are sealed bearings, which keep all foreign bodies out and keep the lubricant inside. The lubricant eventually breaks down and at that time bearing wear increases dramatically.

Spraying WD 40 on the outside of a bearing and wiping it off will not hurt the bearing and will help to keep it clean. Smearing grease on the outside will not help the bearing and will attract dirt and other abrasive material, which could hurt the bearing and certainly make the chair less appealing.

If you want to lube a bearing you have to very carefully remove one of the seals (black bit) to expose the cage (shiny bit), wash the bearings in a solvent and let thoroughly dry before repacking with grease and replacing the seal. Do not use WD40 as a lubricant for bearings, it is too thin and will actually accelerate bearing wear. You can use it as a solvent though.

Compromised bearings can significantly increase the energy required to propel a manual chair. The slow onset of bearing deterioration makes it a very common occurrence because the user doesn't recognize the microscopically small increases in energy expenditure from day to day. Half an hour and $100 worth of bearings can make an incredible difference to someone's manual wheelchair propulsion efficiency.

This workshop will also answer the following questions:-

- How do I get the screw out when the head is damaged?
- How do I make a bolt shorter?
- Which way makes it tighter?
- How can I tell if it's metric or imperial?
- Why won't the axles quick release?
- How tight is too tight?
- What is a nylock nut and a Phillips #2 and why should I care?

Standing – The Alternate Position

Maureen Story B.S.R.(PT/OT)
Jennifer Law BSc.OT

Individuals with limited mobility require a variety of postures and frequent change of position throughout the course of a day. A therapeutic positioning program centers around proper functional wheelchair seating and is complimented by a variety of alternate positions. Standing is a beneficial alternate position and should be incorporated into a 24 hour positioning program. As in many areas, there is limited research evidence to support the benefit of standing. Reported benefits include the following:

1. Physiological benefits:

- Pressure relief
- Respiration
- Bowel emptying
- Bladder drainage

Standing brings pressure relief and improves blood circulation to the sacrum and ischial tuberosities for an individual who normally sits in a wheelchair. Position change is important in the prevention of pressure sores. Standing may have some respiratory benefits by allowing greater diaphragmatic expansion, thus increasing inspiratory volume. Bowel and bladder function is facilitated in this gravity assisted position.(Dunn 1998)

2. Orthopedic benefits:

- Prevents muscle contractures
- Prevents osteoporosis/increase bone mineral density
- Improves trunk posture

Prolonged passive stretching of muscles can prevent muscle shortening resulting in joint contractures (Poutney, 2000). Results of several studies suggest that weight bearing in standing promotes bone mineral density.(Gudjonsdottir, 2002; Stuberg, 1992; Caulton, 2004) This can in turn reduce the risk of osteoporosis and fractures. Articulation of the femoral head in the acetabulum through weight bearing appears to play an important role in acetabular formation (Stuberg, 1992). A single subject research study by Nelson (1997) suggests that using a standing support improves the erectness of the trunk posture.

3. Psychosocial benefits:

- Encourage social interaction
- Increased functional independence
- Improves self esteem/self image

Individuals are better able to interact with their peers at eye level in standing. (McEwen, 1992) Also they can more easily reach countertops, shelves and sinks. Acquiring the ability to stand is important in maximizing independence in standing transfers. Increased independence and social interaction is important for improved self-esteem.(Dunn 1998)

Assessment:

To ensure that the individual is a candidate for standing and that the appropriate standing device is chosen a full assessment needs to be done including physical, medical and psychosocial. The following areas should be addressed:

- Range of Motion – to determine any limitations
- Any muscle tightness that may interfere with standing– ie. Hamstring, heelcord, or adduction contractures
- Any leg length discrepancy
- Any deformities of the feet
- What type of support does the individual need
- Are there any medical contraindications to standing - Consult orthopedic surgeon if the individual has any orthopedic issues e.g. progressive scoliosis, dislocated hips that may preclude him/her from standing.
- Cardiovascular responses - Does individual have orthostatic hypotension, dizziness.
- Any bone integrity concerns
- What activities will the individual be doing in standing

Therapeutic Considerations

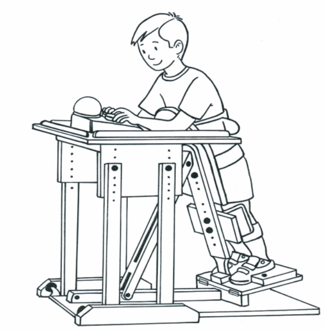
- Recommended position: Head, trunk and pelvis in midline, legs in abduction to approximately shoulder width (to increase base of support) and slight external rotation (for muscle relaxation), hips and knees in extension and feet flat on foot support (equal weight bearing).
- Standing program to start at the chronological age of 12 to 15 months.(Stuberg, 1994)
- Individuals should stand for the duration of about 60 minutes at least 4-5 times per week.
- As standing is a physically demanding position, individuals should gradually build up their tolerance in the initial phase. This position should be used for limited periods of time during the day. Monitor for any signs of discomfort and pressure marks on the skin.
- Accommodate for leg length discrepancy and minor contractures of the hips, knees and feet.
- Position knee blocks or straps below the patella to avoid direct pressure on the knees. For larger individuals a strap above and below the patella can be used. Check to see the individual is not locking his/her knees.
- Consider the use of orthotics to support the feet to provide proper weight bearing and stretches to heel cords.
- Use of tray for support and as a surface for school and home activities. Tray should be positioned at or slightly above the elbow. Tilting the tray can facilitate use of vision.

Factors to Consider when Selecting a Standing Frame

- Amount and type of support the individual needs, while facilitating active movements
- Adjustability of the equipment to accommodate the individual's growth and development
- Ease of transfer and number of caregivers required
- Activities the individual engages in while in the device
- Mobility of the standing frame
- Environment where the standing frame will be used and stored

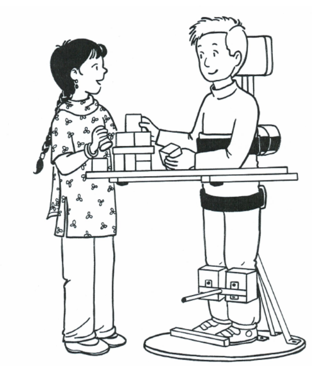
Standing

There are three basic standing "positions" – Prone, Upright and Supine. To achieve these positions there is a wide variety of standing devices available. These include static standing frames and dynamic devices. The dynamic devices can range from movement within the static device to allow the individual to shift his weight or move his limbs to the actual movement of the device through the environment. (eg. – push wheels allowing the individual to be mobile)



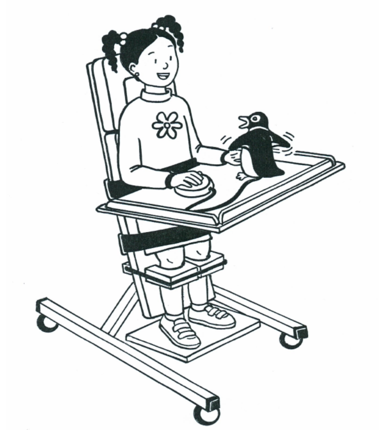
1. Prone Standing

Prone standing promotes extension of the head, trunk and legs. Prone standers are designed for individuals with fairly good head control. The individual faces forward in the standing frame with the primary support in front. Weight bearing through the lower extremities is increased as the standing frame is adjusted toward vertical. The orientation of this type of standing frame makes it more difficult to transfer the individual in and out.



2. Upright Standing

This position enables the individual to stand erect with maximum weight bearing through the lower extremities in comparison to prone and supine standing. The individual needs to have good head control and at least moderate trunk control. Upright standing frames are usually more compact and can position the individual lowest to the floor. Specially designed chairs that can easily be converted into upright standing frames are available on the market.



3. Supine Standing

In the supine standing position, the individual's back rests against the standing frame. The supine stander is designed for individuals with minimal head and trunk control. Weight bearing through the lower extremities is increased as the standing frame is adjusted to a more vertical position. Storage space for this type of standing frame can be an issue as they tend to have large bases. On the other hand, these standing frames are easier for transferring the large or heavy individual. The individual is placed in the standing frame in supine lying first. This allows the caregivers to properly position all the supports before bringing the individual to a more upright standing position. Some mechanical lifts that have adequate height clearance can be used to transfer the individual in and out of the stander.

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Polytrauma: Rehab Challenges

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Five Different Mechanisms of Blast Injuries

- Primary – Effects of Overpressure
- Secondary – Flying Debris/fragments
- Tertiary – Body Displacement/Wind
- Quaternary – Burns, septic syndromes
- Quintary – from additives (bacteria, rad.)

Four VHA Polytrauma Rehabilitation Centers

Some of the Recent Challenges:

- –Space accommodations to treat
  - Inpatients
  - Outpatients
- –Communication at multiple levels
- –Changing Rehabilitation & Vocational Needs
- –Meeting Standards addressing polytrauma needs.
- –Integrating Clinical Pathways across the continuum
- –Providing staff Education for complex polytrauma clients

  Continuing to meet diversified Equipment needs

  Increased need of staff education for complex polytrauma clients

Complexity of Polytrauma

- Burns, severe
- Blind /low vision clients with SCI
- Amputees with SCI
- TBI with SCI
- Hand /UE traumas/surgeries
- Lower extremity orthopedic injuries
- Wounds (Blast)
- Infections, new and old…

Multi-injuries; Multitask Environment

Technology accessing and training while on daily Tx, and while in the unit.
PC laptops availability and internet access.
OT providing training , TR providing PC for leisure use at bedside and Vocational Rehab providing guidance for career pursues.
Dept of Defense providing equipment as requested.

Changing Rehabilitation & Vocational Needs

Early referral for vocational rehab.
Return to work as a goal.
Pre-vocational skills
OT provides pre-vocational skills
Vocational Rehab is part of the Rehab team.

- Consults early, Attends team meetings

Infections

New resistive organisms
Multiple antibiotics
MRSA, VRE, C.diff, Pseudomonas
Acinobacter baumani & bruendii
Isolation
– In units, In therapy rooms, In activities

Integrating Clinical Pathways Across Continuum

Need to link pathways such as SCI with:
TBI, with: Amputee, with: Pain pathways, etc…
SCI with orthopedic multitrauma (shoulder protocols, Fx protocols, amputee protocols), SCI with burn protocols.
Continuing to meet diversified equipment needs
High technological devices for environment control, computer access, mobility, medical testing's
Specialty equipment (therapy and medical) needed for the multi conditions such as burns, amputees, orthopedic hand therapy

Therapist Points of View:

Increased anxiety of family and clients due to the complexity of the cases.
No "cookie cutter" approach (With the SCI clients we usually have a clearly defined rehabilitation prognosis) The clinical SCI pathway would be variable, less predicable in terms of the outcomes.
Family needs: Physical, Housing, Money, Information, Distance, Emotional, Information, Fears, Anxiety
Increased # of professionals, Scheduling, Communication, Multiple Consults, Complex care

Psychological Effects of the War

Lost of physical function vs. age; Lost of friends who died or were injured with them
Wanting to go back to action in the military, but can't perform the demands of the job.
Feeling of being "put down"; Loss of future military carrier.
Expectation to be taken care of by others.; Maturity level and age vs. how to handle the mentioned loss ; Belief that high tech and expensive equipment will replace the loss.
DOD – VA Exchanges

Case Studies

Lessening the Load: Propulsion Assistance Products, How and Where to Use Them

Kathy Fisher B.Sc.(OT), ATS, OT Reg.(Ont)
Allan Boyd B.Eng.

Long term wheelchair propellers are at significant risk for development of shoulder injury. Key causes of shoulder pain/shoulder injury include: repetitive motion leading to repetitive strain, weight bearing at the shoulder joint, rotator cuff strain and tears and degeneration of the shoulder joint (bone, cartilage).

The act of propulsion requires upper extremity strength to overcome rolling resistance of each wheel, additional upper extremity force to overcome resistance of soft, uneven or unlevel terrain, an often unstable position of shoulder joint during the push stroke, a "Surge effect" required to keep chair in forward motion while climbing and incline and isolated force required to slow wheels while descending an incline. Not only is the constant wheeling motion a source of stress but other day to day activities, transfers, reaching, lifting etc. add to the already damaging forces acting on the shoulder joint. As most daily activities cannot be easily changed reducing strain and minimizing forces on the shoulder joint during propulsion lessens at least one risk factor which may decrease the likelihood of injury occurring or reoccurring.

In the past power wheelchairs were prescribed as the only alternative means of mobility to reduce the destructive movements required for propulsion. Many clients dismissed powered mobility as a viable option choosing to continue to propel their manual wheelchairs despite the continued damage to their shoulders and upper extremities. Their reasons for wanting to remain manual wheelchair users may include maintaining their self-image, not wanting to "give in" to using a power wheelchair, not wanting to feel that they are deteriorating or becoming more disabled, wanting to remain active, maintaining portability of their equipment, maintaining their ability to drive a car rather than a van (and associated costs) and not wanting to give up accessibility to certain environments or activities.

Manufacturers have now developed products which offer propulsion assistance to manual wheelchairs. By providing assist to a manual chair, users can now maintain the look, control and functionality of a manual chair, without the extra effort involved in unassisted manual propulsion.

Power Assist Wheels

Power assist wheels (currently available E-Motion wheels, Alber/Invacare and Quickie Extender wheels, Sunrise Medical) are wheels comprised of lightweight motors and batteries (contained within the hub or mounted separately) combined with software to give the user a "boost" when power is engaged by applying pressure to the handrims. This can reduce manual effort by up to 80% (Alber). Power is generally left on while the client is pushing but can be turned off and still allow the wheels to be propelled.

Benefits of Power Assist Wheels:

- reduced force required while maintaining range of motion and activity
- increased efficiency of the push stroke
- reduced fatigue
- assistance climbing hills and inclines
- reduced effort pushing through soft, uneven terrain (carpet, grass, gravel surfaces)
- motor/gearing acts as a brake when traveling downhill
- flexibility of equipment - wheels can be interchanged with original manual wheels when manual wheelchair is required
- transportability – quick release axles allow wheels to be removed for chair to be folded and transported

Limitations of Power Assist Wheels:

- weight of up to 75lbs added to manual wheelchair
- limited battery life (often need to order extra batteries or car charger
- extra width added to wheelchair (3-4") which may restrict access to doorways, vehicle ramps etc.
- limited ability to position the rear wheel for ideal push stroke
- maintenance issues related to batteries and motors
- difficulty interchanging wheels on some wheelchair models due to limited space/position for axle receivers and brakes
- cost

Geared Assist Wheels

Geared Wheels (currently available Magic Wheels) are mechanical wheels with 2 easily shifted gears offering a standard gear (as with standard manual wheels) and a reduced effort gear to allow reduced effort to climb inclines and traverse rough terrain. A hypocycloidal reduction gear (patented technology) allows manual wheelchair users to climb grades at half the effort of conventional wheels. An automatic hill holder allows the propeller to stop on an incline and reposition their hands for the next strength without the chair rolling back. The person is always gaining ground up the incline without the damaging "surge effect" of catching the wheels and forcing them into a forward direction as their natural tendency is to roll back. On level hard terrain the wheels are generally left in the standard (1 to 1 gear ratio) position so as to not require extra push strokes and put into the reduced effort gear (2 to 1 gear ratio) when the pusher encounters difficult soft or uneven terrain or and incline.

Benefits of Geared Assist Wheels:

- no batteries, no motors
- increased push efficiency
- light weight (less than 10lbs added to manual wheelchair)
- no additional width added to the wheelchair
- easily adaptable to most wheelchairs
- flexibility for user depending on terrain – 2 speed drive(1 to 1 pushes

the same as a standard wheel, 2 to 1 provides 50% reduction in push required)
- reduced fatigue
- automatic hill holder in 2 to 1 gear ratio which has a manual override
- braking feature reduces force required to slow wheels while descending an incline by 50%
- double push rim option to provide 4 speeds
- manual shift requires minimal hand dexterity and strength
- portability
- decreased maintenance issues (geared hub is replaced not repaired)
- low gear only used when needed

Limitations of Geared Assist Wheels:

- no additional motor power
- individual wheels do not accommodate for discrepancies in upper extremity function or strength
- low gear is designed to reduce effort when obstacles (inclines and rough terrain) are encountered not for flat level pushing
- cost

Do these products offer the same benefits to a client? Do they provide the same functions? Can they be perscribed interchangeably?

As with all mobility products each offer features that are beneficial but there are limitations and drawbacks which must be considered and prioritized for each individual client. In order to determine which will offer the best solution a full assessment must be completed considering the following:
- diagnosis/functional condition – progressive or general aging
- current physical status
- shoulder pain, joint deterioration
- upper extremity strength
- limitations in mobility
- daily routine and activities
- lifestyle
- goals for continued independence and future mobility

In considering propulsion assistance products it is important to consider the long term needs of the client. Is the client looking for assistance to reduce the force required to propel over long distances or to reduce the effort required to climb and descend inclines.

This presentation will highlight case studies identifying where each of these types of propulsion assist products have been prescribed to promote the greatest benefit to each individual.

In our everyday lives we endeavor to do more than just "get around". For our clients, no matter what the activity is, the goals remain the same:

• Maximize independence and function
• Enhance mobility and safety
• Maintain optimal posture and skin integrity
• Manage discomfort
• Improve quality of life

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Podcasting – Not Just For iPods!

Doug Gayton, ATP

The editors of the New Oxford American Dictionary declared "podcasting" the 2005 word of the year, defining the term as "a digital recording of a radio broadcast or similar program, made available on the Internet for downloading to a personal audio player".

Podcasting has become a reliable and flexible method of providing video or audio materiel for easy and inexpensive sharing. Podcasting is not just for an iPod or one of the newer copycat similar pocket device. Rather the production makes materiel available to anyone making use of a computing device. A major and significant attribute of podcasting is the listener / viewer is able to use time-shifting … the complete ability to have control over the when and where the broadcast will be heard / viewed. The whole intent of RSS (Real Simple Syndication) is to provide a reliable media scheme including audio, video, graphics, and an open architecture able to support future advances not yet on the drawing board.

At the time of this writing in December 2006 – iTunes supported some 2,700 podcast subscriptions: each of these could support only one episode or perpetual daily updates. This in itself is a great information sharing system for people travelling to obtain the latest information from their home base, their home newscast, or favoured broadcasts. And using a piece of software such as iTunes permits the automatic updating function, making the availability dead simple.

For client purposes the benefits of being able to remain in better touch with their community 'happenings' and local government is quite wonderful. Coupled with the usefulness of the internet for viewing local sources of news the client is able to stay well in tune with their community and extended family. A useful feature of this method of reviewing is the ability to change the speed – this is especially intriguing for those clients wishing to have the audio delivery slowed down.

Clinicians can readily make use of this vehicle for sending home exercise programmes, nursing may wish to document wound care and treatment, while assistive technology practitioners could readily produce practice sessions and other training scenarios. Further more for those of us who might spend more time than we wish in cars, subways, or bicycle the podcast is a great way to keep up with whatever stream interests us at the time be it the latest in pharmacology, or news of the Brooklyn Dodgers!

The session explores what a podcast is, how to trap one, how to view one, where to find a variety for both clinician and client alike, and will provide pointers as to effective, and free, software to generate and distribute a podcast. Generating a podcast for clients to take home seems to be of the most interest in our facility. We will briefly look at Audacity, GarageBand, iTunes, LAME, Smart FTP, QuickTime, and Windows Media Player. The basic computer requirements will be 'briefly' glossed over: essentially a later version of a PC running on XP Professional or Vista, or a Mac running on OS X (OS 9 will work however the newer software enjoys the newer operating system). Either platform requires a minimum of 512 MB RAM, and as always 1 GB would be best. Hard disk space is easy to find these days as are appropriate sound cards. An optional MP3 Player or Pop Filter may be desirable.

We have also reviewed some of the best practices during the decision making process including:

- Planning;
- Producing;
- Publishing; and
- Promoting your podcast.

Using a player or iTunes software also permits the widespread use of audio books, lectures, and leisure activities. Many institutions of higher learning are placing lectures on the web in a podcasting formats such as Stanford, Princeton, Harvard, and Smith. http://www.ubc.ca/podcasts/index.php

The first of assistive technology podcasts may be found at http://www.assistiveware.com/podcasts.php. At the time of writing two podcasts were up, along with a plan for future. Conferences are beginning to place their proceeding on the web in podcast form – for example the XIII and XIV International Congress on Anti-Aging Medicine has been posting to the web in this format http://www.podcasts.com/?podcastID=24.

A leader in the distribution of information in this vein is The Northeast Centre, where an OT has taken the lead: - http://www.northeastcenter.com/podcast.htm has posted the following 30 minute podcasts:

- Helping People with Traumatic Brain Injury who have Cognitive and Behavioral Challenges at the Community Level
- Providing Community-Based Services to Individuals with Traumatic Brain Injury
- Brain Mapping
- Introduction to Traumatic Brain Injury
- Neurofeedback
- Choosing a Ventilator Weaning Program
- How to Wean Someone from a Ventilator

Excerpted iTunes Categories for Podcasting

- **Arts**
  - – Design
  - – Fashion & Beauty
  - – Food
  - – Literature
  - – Performing Arts
  - – Visual Arts

- **Business**
  - – Business News
  - – Careers
  - – Investing
  - – Management & Marketing
  - – Shopping

- **Education**
  - – Education Technology
  - – Higher Education
  - – K-12
  - – Language Courses
  - –Training

- **Games & Hobbies**
  - – Automotive
  - – Aviation
  - – Hobbies

- **Government & Organizations**
  - – Local
  - – National
  - – Non-Profit
  - – Regional

- **Health**
  - – Alternative Health
  - – Fitness & Nutrition
  - – Self-Help
  - – Sexuality

- **Kids & Family**

- **Music**

- **News & Politics**

- **Science & Medicine**
  - – Medicine
  - – Natural Sciences
  - – Social Sciences

- **Society & Culture**
  - – History
  - – Personal Journals
  - – Philosophy
  - – Places & Travel

- **Sports & Recreation**
  - – Amateur
  - – College & High School
  - – Outdoor
  - – Professional

- **Technology**
  - – Gadgets
  - – Tech News
  - – Podcasting
  - – Software How-To

- **TV & Film**

That's Not My Responsibility!!

Brad Dicianno, MD
Gerry Dickerson
Jean Minkel
Stephen Sprigle
Lori Warren

Within clinical service, issues relating to regulation, ethics and morality are ever-present and create an interesting triad at times. One cannot be involved in healthcare without being impacted by rules and regulations. The chance that any given person embraces all of the rules is slim. Periodically, we are obligated to make decisions based upon rules with which we disagree. This may create a moral dilemma. In addition, many practitioners are members of organizations that require members to adhere to a code of ethics. These codes are created for the best of intentions but cannot adequately guide us through all situations.

The differences between ethics and morals have long been debated and this session is much too short to even try. For the sake of this session, we will attempt to keep things simple. Ethics will be considered as behavior beholden to the four principals typically linked to medical ethics. Moral decision-making will be considered in the context of applying those principals to different situations.

The four principals of bioethics are:

Beneficence – the obligation that a practitioner should contribute to the welfare of the client

Non-maleficence – the principal instructing us to refrain from harming people

Autonomy - respecting another's right to make decisions that are independent from controlling influences (liberty)

Justice – the principal stating that we should give to each that which is his or her due. Justice forms the basis for the distribution of healthcare resources.

While these principals are well known and appear easy to follow, complications arise. More often than we expect, a situation arises in which the principals conflict with each other. Many clinicians have been faced with conflicting questions. For example, the question: "when, if ever, is violating patient confidentiality okay?" is often answered by balancing maleficence (the patient may be harmed by disclosure) with justice (a greater good will be achieved). To answer these questions, we call upon our internal gage of right and wrong to help guide us. Not surprisingly, these internal gages differ widely. This bodes well for this session since discussion and debate will not be boring.

Many issues relating to regulation, ethics and morals are impacted by the respective roles within service delivery. The roles and responsibilities of four parties will be represented, the client/family physician, supplier, and therapist. Reviewing and discussing roles and responsibilities will set the stage for discussing a series of situations

As an example, roles served by a physiatrist follows: The physiatrist performs a thorough medical history and physical examination and develops an assessment and plan for the client using information from the client, the H&P, and information provided from the other members of the AT team. The history focuses on the client's primary medical diagnosis, and the physiatrist can give guidance to the AT team with regard to the client's likely prognosis. Particularly important to consider is whether the client has failed alternative measures of treatment for the condition, undergone proper rehabilitation, and does in fact need a mobility device. The physiatrist also can guide the team with regard to how slowly or quickly a condition is likely to progress or if there is evidence that function will improve. On the examination, the physiatrist can often discover comorbidies such as neuropathies, cardiac disease, or lymphedema, for example, which need consideration in the prescription process. The physiatrist may also identify other treatments which are necessary. For example, bracing, prosthetic modifications, and interventional injections for spasticity are treatments that may be indicated for a client. Occasionally the client may need referral for further treatment by a physiatrist or another specialist. Using the gathered history and examination information and the information provided by the other members of the team, the physiatrist makes a final assessment on the type of device that will be provided and writes the prescription.

This description illustrates the multiple roles of one person in the process and indicates overlaps with other stakeholders. Clients, therapists, and suppliers also have roles that segue into responsibilities during a seating and mobility evaluation.

By the end of this session, attendees will understand the roles and responsibilities of key participants in the service delivery process. They have been exposed to various moral and ethical situations and will have participated in a discussion on how to reconcile the situations. Through this process, a respect for and understanding of differing viewpoints will be achieved.

Integration of Mobility Options to Maximize function in Manual Wheelchair Users

Theresa F. Berner, MOT, OTR/L, ATP
Tina Roesler, PT, MS, ABDA
Tricia Henley, MPT, ATP

Purpose:

There are a multitude of choices for components in selection of ultralight weight manual wheelchairs and bodies of evidence which illustrate how the effects of such imply medical complications. It is increasingly important for the clinician and supplier to collaborate in the decision making so that appropriate components are selected and the chair is adjusted properly. The purpose of the course is to review the chair components and the correlation to function so that the clinical assessment is translated into the wheelchair ordering.

Background: In the context of rehabilitation, therapists and suppliers are constantly making critical decisions regarding manual mobility without fully understanding the multitude of choices that are available from all manufacturers. The first chair set up, including wheel type and position, frame angles, back and seat angles and the ability to adjust those components, has important ramifications for the users long-term function. While available clinical guidelines review and discuss optimal chair configurations, it is often difficult for the clinician to make decisions based on the clients unique set of circumstances. For example, a client may be discharged with a TLSO and a specific chair configuration, but little consideration is given to the long-term impact on function once the TLSO is removed. Adjustable components should be selected carefully, based on potential for function and recommendations from clinical practice guidelines and current research. Via clinical case studies and hands-on demonstrations, attendees will understand the impact of their choices on mobility and function. They will learn to select appropriate options and emphasis will be placed on the follow-up and readjustment as the client's skills progress.

Objectives:

1. Identify at least 3 clinical guidelines related to manual mobility that will aide in wheelchair configuration.
2. Understand the impact of options on end-user function and mobility.
3. Translate clinical assessment into wheelchair ordering.
4. Apply content to hands on practical session

Course Outline:

Client Evaluation
- Supine and sitting evaluation
- Client Measurements
- Current w/c configurations and measurements
- Lifestyle needs

Wheelchair Selection
- Current wheelchair frame
- Client Lifestyle needs
- Client identified barriers
- Review of rigid and folding chair configurations

Wheelchair Orders forms
- Where to start with order forms
- Correlation to current chair and functional needs

Wheelchair components and ordering :

Clinical and functional considerations of each of the following measurements will be discussed:
- Seat Width
  (measurements from outside to seat tube vs. middle of the seat tube)
- Seat Depth (measure from front of back post to front edge of seat sling)
- Front Seat Height (measure from floor to top of seat tube):
- Rear Seat Height (measure from floor to top of seat tube at back post)
- Seat to footrest (measure from font edge of seat to top rear of footrest)
- Seat to back height (measure from top of back post to top of seat sling)
- Seat back angle (measurement from front of back post to the floor)
- Center of Gravity (measure from front of back post at seat tube to the center of the rear axle)
- Footrest width (measurement of inside of front frame tune to opposite inside of front frame tube)
- Rear wheel spacing
  (measure from outside of seat back post to inside of rear tire)
- Camber
- Front angle
- Total length of chair

New Chairs vs. loaner chairs

Opportunities for adjustment as patients needs change
- Clinical opportunities for intervention and tracking
- TLSO's getting removed
- Achievement of transfer training
- Better trunk stability
- Increased activity level

Case reviews

It's Not Rocket Science: Transforming Your Good Ideas Into Viable Clinical Research Topics

James A. Lenker, PhD, OTR/L

Introduction

Clinicians are often daunted by the prospect of conducting research. This is ironic because the best ideas for researchable topics frequently emerge from everyday clinical problems. This tutorial session sought to bridge the chasm between "practice" and "research" by facilitating development of practical clinical needs into researchable topics.

Methods

Participants in this tutorial session completed a series of structured exercises designed to develop their ideas into researchable form. All participants were encouraged to bring one clinical research question to the session in order to apply course content to their own situations during the structured exercises. The session included the following topics:

Developing a statement of need
- What do you want to know that you don't know now? If carried out, how would your idea change or improve clinical practice?

Specifying the target population
- Are you interested in a target group for inclusion or exclusion in your study based on specific demographic qualifiers? (e.g., age, disability group, functional level, gender, employment status)

Specifying the treatment intervention
- What intervention do you wish to test? (e.g., a particular device? Treatment technique? Service delivery model?) What sort of procedure would be required to administer this intervention? Would it require multiple sessions? What would be the length of each session?

Identifying outcome variables
- What are the salient indicators that your intervention has succeeded or failed? (e.g., functional reach, comfort, posture, assistance with transfers, mobility, occurrence of pressure sores, time out of bed,pressure distribution, community transportation, quality of life, employment, etc.)

Specifying your research hypotheses
- How will the target population be affected by your intended treatment?

Treatment theory
- Why are your hypotheses plausible? Is there a particular treatment theory that supports your hypotheses? Are these hypotheses attempting to prove things that are unproven, but accepted as truth by experienced clinicians?

Research designs: basic considerations
- Will you have a comparison group that receives an alternative treatment or perhaps no treatment at all? Will you use subjects as their own controls? Would you collect post-intervention measurements only, or would you also be able to collect baseline data prior to intervention?

Statistical analysis
- What is the appropriate statistic for answering your hypotheses, given the research design, independent variables, dependent measures, and treatment theory?

Practical considerations
- What expertise do you need in order to take this idea forward? Where would this research take place? Could intervention and data collection occur as part of everyday treatment sessions? Or, would it require additional time for clinicians and/or research assistants? How easy or difficult would it be to recruit participants for this study? How easy or difficult would it be to collaborate with other settings in order to reach your sample size targets? How much money is needed in order to carry out this research?

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Pilot Study: The Reliability of the Level of Sitting Scale using Videoconferencing

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When providing wheelchair seating for children, videoconferencing provides a means of managing travel for families of children and therapy outreach teams. The level of sitting scale (LSS) is an ordinal scale that measures change in the amount of sitting support required to maintain an upright sitting posture. The LSS is a part of seating assessment and can be used to monitor the ongoing need for seating. This pilot study sought to answer the question – is there enough information provided through typical videoconference audio and video data transmission to reliably perform the LSS via videoconferencing as compared to performing the test live?

Inter rater reliability establishes confidence that different therapists can perform the LSS and achieve the same result. Test retest reliability determines confidence that the test can be performed with the same results across conditions; in this case, over time and through different media (live vs. through a videoconferencing link limited to a total bandwidth of 384 Kb/sec.)

Subjects were children with stable medical conditions referred to Sunny Hill's positioning and mobility team for wheelchair seating. Five therapists participated, all trained in administration of the LSS. Therapist pairs independently scored LSS tests on 6 subjects in each of 2 conditions: live and through a videoconference. Test retest intervals exceeded three weeks (average 59 days) to limit therapists' memory of the first test finding.

Therapists agreed completely across all conditions: test and retest, live and videoconference. This sample of 6 subjects seems to indicate good inter rater reliability. Intra-class correlation coefficient measured across a larger number of subjects is required to analyze this result.

Test retest scores matched in 4 of 6 subjects. As this number of subjects is too small to analyze, reliability will be measured as the percent of item agreement adjusted for chance (Kappa test).

The interval between test and retest conditions limited therapists' memory of the initial test results for the subjects, but possibly contributed to the change in the subject score in 2 of 6 subjects. The ongoing study will attempt to limit variance in the interval between tests, and assess test retest reliability over the entire range of the level of sitting scale. Findings may be expected to further substantiate the contribution of LSS as a part of wheelchair seating assessment in the larger context of service delivery using videoconferencing.

Using the Family Impact of Assistive Technology Scale (FIATS) to Measure the Effect of Seating Devices on Families of Children with Physical Disabilities

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Background

Parents of young children with complex physical disabilities continually face challenges that are both physically and emotionally demanding. Parents of children with disabilities spend more time providing their children with assistance and supervision than other parents because their children are unable to do many everyday activities on their own. These added responsibilities, for mothers in particular, translate into less time attending to their own needs, the needs of their other children and household chores, and most of these mothers do not have time to work outside the home.

We hypothesized that assistive devices used at home would improve functional outcomes for children and provide a measurable form of relief for families by reducing caregiver burden. We may better understand the moderating role that these technologies play in the lives of families by using a responsive outcome measure with high levels of reliability and validity. However, measures with good psychometric properties are either unavailable or not sensitive enough to measure the effect of assistive device use on family life.

We developed a multi-dimensional measure called the Family Impact of Assistive Technology Scale (FIATS) to fill this measurement need. We demonstrated that the FIATS has good content validity and face validity1. Research data from the present study and an earlier research project allowed us to reduce the number of items and estimate the internal consistency and stability of this new measure. We showed that the FIATS had excellent internal consistency and test-retest reliability. The research version of the FIATS has 55-statements covering eight domains including autonomy, caregiver relief, contentment, doing activities, effort, family and social interaction, caregiver supervision, and safety. Parents complete the FIATS by indicating the degree to which they agree or disagree with each statement using a 7-point Likert scale.

In this paper, we report on the outcome of a repeated measures study (A (baseline) – B (intervention) – A (return to baseline)) to explore the ability of the FIATS to detect a change in family functioning due to the introduction of two special-purpose postural control devices.

Participants

We recruited thirty mothers and their young children who were clients of three children's rehabilitation centres in the Greater Toronto Area in Ontario, Canada. The children who participated (a) had a primary diagnosis of cerebral palsy with a functional status of Gross Motor Function Classification System Level III or IV; (b) were between the ages of 2 years, 6 months and 7 years, 6 months; and (c) lived in a geographical area serviced by one of the three children's centres. We identified mothers who provided daily primary care for the child – defined as not less than 10 hours of supervision per day – and did not use specialized postural devices to support their children at home for daily living activities that involve floor sitting, chair sitting and toileting.

Protocol One of two occupational therapists conducted interviews in the homes of participating families. Mothers completed the FIATS once during each of four home visits. They completed the measure at the initial visit and again 2 to 3 weeks later. After the second administration, the therapist provided two postural control devices – one for toileting (Aquanaut toilet seat), the other for floor and tabletop activities (Flip2Sit activity seat) – for the child to use in the home for six weeks. Mothers completed the FIATS a third time six weeks later (i.e., at the end of the intervention phase). Three weeks after returning the devices, participants completed the measure for the final time. The research design schedule is provided in Table 1 below.

Week											
1	2	3	4	5	6	7	8	9	10	11	12
Baseline Phase				Intervention Phase				Return to Baseline Phase			
FIATS		FIATS						FIATS			FIATS

Table 1: Research Design Schedule

Results

We used the FIATS scores at the end of each phase of the study to measure the overall level of family functioning. A repeated measures analysis of variance (RM-ANOVA) allowed us to test the within-subject effects of the postural control devices as measured by the FIATS. We found significant mean differences among the overall FIATS scores ($F(2, 58) = 17.11$, $p < .0005$). Post-hoc tests confirmed that the effect of the intervention resulted in statistically significant mean differences between the overall FIATS scores at the end of the intervention and ends of the baseline phases.

Conclusions

Our study showed that the short-term use of two special seating devices by children with cerebral palsy could have measurable effects on family life using the FIATS. Parents reported that with the use of one device for toileting and another device for floor and tabletop activities, their children performed better at home. The results of this study suggest that FIATS is a sensitive measure of the overall impact of postural control devices on family life. We plan to conduct further research to determine the ability of the FIATS to detect the effect of other types of assistive technologies on families of other children and youth with physical disabilities.

Acknowledgements

We are very thankful to the mothers and children who participated in this study. We gratefully acknowledge funding support from Sick Kids Foundation/Institute for Human Development, Child and Youth Health – Canadian Institutes of Health Research (CIHR). We extend a special thanks to Joan Walker who was our research assistant during the study.

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The Impact of Power Assist Wheels on QOL: An interim Report

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Power assist wheels (PAWs) decrease the effort required to propel a wheelchair in laboratory conditions. Their actual impact on users' daily function is unknown. We are investigating the impact of PAWs in users' natural settings in an ABA repeated measures design with a goal of recruiting 30 participants in an ongoing trial. The phases are 1) Pre-intervention (first 4 weeks): participants use their own manual wheelchairs; 2) Intervention (next 8 weeks): participants use power-assist wheels; 3) Post-intervention (final 4 weeks): participants return to manual wheels. Twelve participants have finished the protocol to date. At this point, it is premature to apply inferential statistical analyses. Therefore, this report summarizes our findings descriptively.

Hypothesis 1) Compared to wheeling with manual wheels, the use PAWs will be associated with:

A. Increased quality of life as measured by the Short Form-36 (SF-36) and Subjective Ratings of Quality of Life and the (SRQL)
B. Increased participation in social, recreational, and community events as measured by the Daily Life Events inventory (DLE) and the Physical Activity Scale for Persons with Physical Disabilities (PASIPD).
C. Increased daily affect as measured by the Positive Affect Negative Affect Scale (PANAS).
D. Decreased pain as measured by Wheelchair Users Shoulder Pain Index (WUSPI).

Interpretation: The measures most likely to be associated with PAW use should show a change from baseline to the period of PAW use, and a return near baseline values when users resume manual wheeling. The Physical Health Scale (SF-36), measuring physical functioning, physical role, bodily pain, and general health most closely reflects this pattern, suggesting benefit related to use of a PAW.

Hypothesis 2) The following baseline characteristics will be associated with improvements in quality of life, activity participation, affect, and pain, with use of a PAW:

A. Greater musculoskeletal pain as measured by the WUSPI
B. Less muscle power measured in accordance with the International Sports Organization for the Disabled.
C. Poorer manual wheelchair performance in the laboratory
D. Greater ease at transporting the wheelchairs equipped with PAWs
E. Better hand function as measured by selected items from the motor subscale of the Unified Parkinson's Disease Rating Scale (UPDRS).
   Method: each of these measures was dichotomized.
   The characteristics were also examined for their relationship with participant's subjective ratings of PAWs (Table 2)

Table 1: Preliminary Results for Hypothesis 1

Measures Applied At 4 Intervals	Manual Chair: Baseline	PAW : First 4 Weeks	PAW : Second 4 Weeks	Manual Chair: Last Four Weeks
SF-36: Physical Health	42.8	58.1	57.1	29.7
SF-36: Mental Health	81.4	82.7	82.1	87.8
SRQL	23.9	24.2	24.3	25.5
WUSPI	10.2	13.1	10.3	10.1
Daily and Weekly Measures	Manual Chair: First four weeks	PAW: Next 8 Weeks		Manual Chair: Last 4 weeks
PANAS: Positive Affect	29.1	31.3		31.3
PANAS: Negative Affect	13.7	12.9		12.3
DLE: Positive Life Events	5.4	5.1		4.75
DLE: Negative Life Events	1.7	1.3		1.4
PASIPD	36.7	31.7		32

Table 2. Participant Characteristics and Subjective Ratings

Subject #, (age) [Years post-injury]	Diagnosis	Hand Function Score (Category)	Baseline WUSPI (Category)	Averaged Performance Rank over 4 tasks	Self-loads, No lift, No helper	Subjective Rating of PAW
1 (28) [28]	Spinal Bifida (Lumbar), non-ambulatory	4 (1)	5.30 (1)	5.8	No	Positive
3 (22) [6]	T5 Complete SCI	0 (1)	9.80 (1)	4.5	Yes	Negative
4 (40) [22]	T1 Complete SCI	0 (1)	1.20 (1)	7.0	No	Positive/ Negative
6 (29) [11]	T12 Motor Complete SCI	0.50 (1)	15.40 (2)	2.8	Yes	Negative
7 (38) [19]	L1 incomplete SCI (limited walking)	0 (1)	0 (1)	1.0	Yes	Negative
9 (47) [27]	C6 Complete SCI with tendon transfers	9 (2)	18.6 (2)	7.8	No	Positive
11 (42) [13]	T-12 Paraplegia Hypothyroid,	3 (1)	0 (1)	3.5	No	Positive
13 (64) [33]	T4 complete SCI	9 (2)	18.1 (2)	10.3	No	Positive/ Negative
14 (64) [36]	MS	7 (2)	0 (1)	10.8	No	Positive
15 (68) [18]	Incomplete T 10 paraplegia	3 (1)	26.8 (2)	8.5	No	Positive
16 (40) [20]	Gunshot wound to neck, T4 paraplegia	3 (1)	32.7 (2)	4.3	No	Positive
17 (50) [36]	Juvenile diabetes (age 14), transtibial amputation, renal failure	4 (1)	21.9 (2)	12.0	No	Positive

Results. Dichotomization: lesser hand function and lesser wheeling performance at baseline were associated with lesser gains in Physical Health on the SF-36, while greater pain was associated with greater gains. Subjective Ratings: The factor of whether individuals self-loaded their chair into a vehicle was highly predictive of users' subjective assessments of PAWs , with self loaders rating PAWs negatively. Further results and interpretations will be discussed.

24-Hour Postural Care – The Quest for Objective Data

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Considerable time and effort is invested in the management of posture for people who present with skeletal deformities, ranging from complex seating and mobility systems to surgery for spinal instrumentation. From a therapist's perspective, we understand that lengthy periods of time spent in destructive postures counteract those efforts. The concept of 24-hour postural care is being embraced as a strategy for the prevention, maintenance and correction of skeletal deformities. Liz and John Goldsmith, from England are pioneers in establishing the therapeutic benefits in night time positioning and measuring body symmetry. Increasingly, products are available on the market to specifically address bed comfort and positioning both in the commercial market and in the durable medical equipment market. However, translating theory into practice can be daunting when funding and compliance are at issue. Funding agencies like to see objective data before committing dollars to equipment, and people like to see immediate results from interventions.

Posture of people with severe skeletal deformities is very difficult to quantify and changes are expected to be very gradual. Existing measurement tools for quantifying skeletal deformity either rely on x-ray, or are tools that cannot be used effectively when severe deformities are present.

A long-term study is currently underway with five individuals who are in their mid twenties, and present with moderate to severe skeletal deformities. All participants live in group homes and have had family identify concerns related to their posture, breathing, future ability to be seated and resulting quality of life, as none are considered surgical candidates. The purpose of the study is to track postural presentation before and after the introduction of night time positioning. Each participant was set up with an individualized position utilizing Symmetrisleep components. Physical measurements are taken at six month intervals, as well as nightly tracking of sleep, positioning, and acceptance of the equipment by the individuals. Training on posture, sleep, use of equipment and data collection was provided to care staff in the group homes and family members that chose to attend.

The initial expectation was to be able to collect objective data regarding physical changes in the individuals. Initial measurements were a uniform set of points over all individuals: ziphoid process to the mat bilaterally, ziphoid process to ASIS bilaterally, bottom rib to ASIS bilaterally, and ASIS to the mat bilaterally. The intention was to be able to track if changes occurred both in the asymmetry of the chest wall, spinal and pelvic rotation and spinal curvature, as had been evidenced in studies in England. However, questions arose as to whether these were the critical measures or if they should be more individual, whether they should be in the corrected or uncorrected posture, and influence of the environment on the individual. Measures were refined and developed for each individual, as well as a protocol for data collection to ensure consistency of the data collected.

While the physical measures have not changed significantly to date, what has emerged, however, has been powerful subjective data; changes in sleep patterns, decreases in waking tone, ease in handling, increased tolerance to range, decreased pressure issues over bony prominences, increased participation in daytime activities and acceptance of the equipment by the clients.

Challenges continue to exist in implementing the program; staff compliance and turnover being the greatest. Participants who are seeing the greatest benefits however, are becoming their own advocates for use of the equipment where care workers appear less than enthusiastic. Accuracy of data collection also continues to present a challenge resulting in simplification of data collected by care staff. The houses where the greatest resistance to participation by staff is present is also reflective of larger systemic issues in those individual homes.

It is recognized that physical deformities to do not develop over a short period of time, and non-invasive interventions will also require extended periods of time to show any result. The subjective changes that have become evident have certainly influenced other families to look at night time positioning as an adjunct to therapies. It is hoped that as the study progresses, the objective data will be able to show results, and ultimately be able to be used to influence decision makers and funding agencies, and enable the concept of 24-hour postural care to be implemented on a wider scale.

Wheelchair Satisfaction in Individuals with Spinal Cord Injury

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The prescription of a wheelchair can have significant positive or negative impacts on a user, depending on the appropriateness of the prescription and the user's satisfaction with the mobility aid. Therefore, when it comes time to prescribe a new wheelchair or replace an existing one, it is critical the consumer's perspective is understood and included in the selection process as studies have shown a relation between the lack of consumer involvement and consumer dissatisfaction with their prescribed equipment or device (1). According to Wressle and Samuelsson (2), the three most important items for consumers concerning assistive devices were safety, ease of use, and comfort.

Previous research at our centre (3) looked at how do children and adults compare with their satisfaction of their wheelchairs as well as between manual and power wheelchair users using the Quebec User Evaluation of Assistive Technology (4,5,6). We found no significant difference between pediatric and adult wheelchair users. However, power users generally are more satisfied with their power WCs compared to manual WC users ($p<.05$). Also, funding source does not appear to be a significant factor with respect to satisfaction and service and delivery problems occurs for all WC user groups.

Although several quantitative tools exist assessing the concept of user satisfaction, limited qualitative evidence can be found in the literature exploring an individual's perceptions of satisfaction and how their needs are met or unmet as it relates to wheelchair use among full-time users particularly in a group of athletic spinal cord injured population.

Objective

1) examine the perceptions of wheelchair satisfaction as it relates to full-time active, manual wheelchair users.
2) compare wheelchair satisfaction between active adult manual wheelchair users versus those adults who are less active

Methods

I

n this study, a mixed methods approach was utilized to further explore the concept of satisfaction as it relates to fulltime wheelchair users and their prescribed wheelchairs. Ten adult manual wheelchair users completed the QUEST 2.0 and the Physical Activity Scale for Individuals with Physical Disabilities (PASIPD) (7) and participated in a semi-structured interview. The qualitative data from the interviews was coded and analyzed to identify and extract relevant themes. Data from the QUEST 2.0 and PASIPD questionnaires were analysed for means and standard deviations and compared to similar data collected from participants in the first phase of this study.

Data Collection

The interview questions where 1) How would you define the word "satisfaction" as it relates to your wheelchair/ mobility in a wheelchair? 2) What about your current wheelchair are you satisfied with? 3) What about your current wheelchair are you not satisfied with? 4) What changes would you make to your current wheelchair to increase your level of satisfaction with it? 5) what do you plan/ want to change for your next wheelchair prescription? 6) If you could design your "ideal" wheelchair, free of any kind of limitations or parameters, what would it look like?

Data Analysis

Initially, the two primary investigators analyzed the data separately to identify and extract themes. Qualitative analyses examined the number of times key phrases or words to determine themes within each question as well as through the entirety of the data.

Results

Quantative results

A total of 10 adults participated in the phase II study plus 34 subjects from phase I. Phase II participants included diagnoses of quadriplegia (5), paraplegia (4) and spina bifida (1). Phase I participants included individuals with quadriplegia (20), paraplegia (19), spina bifida (3), multiple sclerosis (2), arachnoiditis (1), polio (1), and syringomyelia (1).

See Table 1.

Phase I subjects were statistically less active yet more satisfied than the wheelchair athlete Phase II group.

Table 1: Phase I and II Participant Data

	Phase I	**Phase II**
# participants	N=34	N = 10
Age Range (yrs)	23 – 76	22 – 42
Age Mean (yrs)	42	32
Length of disability Range (yrs)	1.78 – 67	.8 – 10
Length of disability Mean (yrs)	17	5
QUEST 2.0 *	3.81 (.74)	3.30 (0.72)
PASIPD (activity score)*	22.7 (19.4)	37.6 (24.1)

* p<.05

Qualitative results

From the qualitative interviews from the Phase II subjects, five main themes emerged that strongly impacted the participants' perceptions of satisfaction as it related to their wheelchairs. The themes of comfort, weight, collapsibility, aesthetics and ease of use were identified. These will be discussed in order.

Comfort was the strongest theme to emerge as a factor contributing, positively or negatively, to the participants' satisfaction with their wheelchairs. All of the participants listed comfort as one of the most important factors used to define satisfaction and many identified it as an area they were currently satisfied with. This was seen in comments such as "my wheelchair is comfortable, the combination of the cushion and backrest work for me" or "…the ride of this wheelchair is good, it is smooth and comfortable on various terrains". Another voiced her dissatisfaction by stating, "I'm not always comfortable, I haven't found the right combination of equipment. I have been in pain a lot lately in my back and butt". Finally, comfort was identified as an area for future wheelchair designs to work on with one participant stating he would like to see a chair that can "change with my body type. Form fit to me, I think this would make them way more comfortable".

Study participants, particularly those with quadriplegia, identified weight as one of the main factors determining satisfaction. One participant stated "Weight is a huge factor for me. I want it as light as possible for car transfers". Weight was also reported to be important related the participants' ability to climb hills and complete advanced maneuvering skills. One participant reported that he was happy with his wheelchair because "it is light enough that it does not make things like climbing hills, maneuver on tough terrain or trying to jump curbs more difficult for me."

Collapsibility was a theme voiced by many participants as a key factor in determining satisfaction with their wheelchair. This collapsibility theme had two main components. The first was the degree of difficulty related to breaking the chair down. One participant noted that the "latches for folding the back down are finicky" which makes his chair difficult to breakdown and frustrating as he is often required to do this multiple times a day. The other aspect to the theme of collapsibility related to how small the chair could become when broken down. One participant stated "if my chair were able to breakdown into a smaller unit then it would be easier to complete my car transfers, and it would do less damage to my vehicle.

My chair really trashes it!"

Aesthetics was the fourth theme identified from the qualitative interviews. The overriding aspect related to aesthetics was the participants desire to have their chairs make as small a visual impact as possible in their lives. One participant stated she was unhappy with her chair partly because of her front casters. She stated "my caster wheels are really big, I don't like the look of them. Now that I see more of what other people are using." Another participant stated where she would like to see the future of wheelchair development go when she said that someday she hopes that wheelchairs can be "completely formed to my body – so it looks like I have a set of wheels coming out of my ass."

The final theme extracted from the qualitative data was ease of use. This theme encompasses many aspects expressed by the participants such as maneuverability, wheeling efficiency, and the chair's ability to negotiate obstacles. These beliefs were demonstrated through statements such as "the ultimate test is can I get where I want to go? Can I fit under tables without hitting my knees? Can I go where I want without constantly thinking about the chair?" A woman with quadriplegia voiced her lack of satisfaction with her new wheelchair saying "I find this chair front heavy so I have to stop before I go over something. It is really difficult to wheelie which limits where I can go by myself."

Discussion

Quantitative results from the QUEST 2.0 and the PASPID questionnaires showed high levels of activity for phase II participants. The qualitative interviews and QUEST 2.0 results indicated that while highly active, this population reported lower levels of satisfaction with their everyday wheelchairs. When compared to participants in phase I of the study, phase II participants showed higher activity levels, and yet lower levels of satisfaction. This raises many questions for the consideration of practicing clinicians and future research.

Forty percent of the participants in this study reported a lack of therapist involvement in the prescription of their current wheelchair. They further reported having had no therapist involvement or formal seating assessment for any prescription since their very first; which in some cases was up to ten years ago. Their reliance on wheelchair vendors has resulted in a lack of formal assessment and therefore some of their complaints of poorly fitting wheelchairs. This raises questions of how therapists can maintain connections with wheelchair using individuals living in the community over the long term. These long-term relationships will help to ensure on-going education and assessment, and therefore the appropriate prescription and allocation of resources.

The study's population consisted of young, healthy, athletic, highly functional and independent individuals living in community. Their lack of therapist involvement often resulted in poorly fitting wheelchairs and dissatisfaction with their device. It appears their current functional abilities may compensate for the lack of proper fit. This raises questions around the concept of aging with a disability as it relates to changes in function over time. Therapists and clients alike need to consider the effects of aging on perceptions around appropriate mobility devices, as well as on-going therapist involvement in the prescription of those devices.

The lower satisfaction scores recorded through the QUEST 2.0 could be related to the demographics and physical activity levels of this population. As individuals living independently in community, they may test the abilities and limitations of their wheelchairs more extensively then other user populations. Activities such as "curb hopping", ascending and descending staircases and repeatedly breaking down their chairs for car transfers would equip this population with a comprehensive knowledge of the strengths and weaknesses in their current mobility device.

Conclusion

This study provides potential for future opportunities comparing satisfaction levels of new versus longer- term users, part-time versus full time wheelchair users, as well as gender differences and the influence on satisfaction levels.

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Personal Preferences for Completion of Daily Activities: Implications for Assistive Technology Use

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The appropriate use of assistive technology can facilitate occupational performance and promote independence (Scherer, 2001). However, previous research in this area suggests that non-use or abandonment of assistive devices is a common occurrence (Philips % Zhao, 1993; Scherer & Gavin, 1998). High rates of assistive technology abandonment are of concern due to costs to the individual and society.

Few studies have looked at the decision making process an individual undergoes around choosing to use assistive technology. When faced with completing a daily task, an individual has several alternatives: perform the task independently, receive assistance from another person, utilize assistive technology, or employ a combination of the three. The purpose of this study was to learn when and why an individual chooses one or more of these alternatives when completing a task.

Method

Participants: A snowball sampling technique was used to recruit eight participants who had varying functional disabilities and used a diverse range of assistive technology. For inclusion in the study, participants had either an acquired or congenital long-term disability, progressive or non-progressive, be at least 18 months post-injury or diagnosis, use assistive technology to complete part of their daily activities and be able to participate in an interview in English. Ethics approval was received from the relevant university and informed consent was obtained prior to the initiation of the interview. Eight participants with varying physical disabilities were recruited for this study. The assistive devices used by the participants were widespread and ranged from wheelchairs and modified vehicles to shower benches, universal cuffs, canes and leg braces.
Data Collection and Analysis: Semi-structured interviews were conducted in person. Participants were asked about their typical day and the occupations in which they participated on a regular as well as infrequent basis. They were asked about how they completed their activities, either with their own power, the assistance of another, with assistive technology or some combination of these means. They were further asked whether certain factors influenced their choice of how they completed an occupation and the role of assistive technology.
Interviews were audiotaped, transcribed verbatim and then analyzed using a constant comparative method. Initial coding was conducted by all investigators independently and later compared to determine agreement between coders. Once preliminary codes were agreed upon, overarching themes and subthemes were identified.

Results

Factors Influencing the Completion of a Task: Thematic analysis revealed the factors relating to the person, their environment and the occupation influence how an occupation was complete.
Completing an activity by oneself: Several participants discussed the importance of maintaining their independence as one of the primary reasons for completing an activity by themselves as it allowed them to regulate their occupations and achieve a sense of value and personal satisfaction. They felt that their physical abilities improved or were maintained by completing occupations themselves. Others thought that reliance on another individual or on an assistive device can lead to physical weakness. Completing a task independently can also make the process easier for an individual, if they found that directing another person required more effort than approaching the task themselves. Concern for others' well-being was also expressed by participants as a reason for completing an activity on their own, because they did not want to risk the health or safety of another individual.
Completing an activity with the assistance of another: Personal capacity was a very influential factor in the decision to receive assistance from another individual. Energy and fatigue were most commonly given as limiting factors. For other participants, the physical demands of the task led them to seek the assistance of others. The more energy required to complete a task, the more likely the participants were to ask for help. Time and weather also influenced the decision to seek assistance. If a task was considered to take too much time to complete or the weather was viewed as unfavourable, then the participants were more willing to seek the assistance of others. If the participants thought that the physical safety of themselves or another person was at risk by completing a task independently, then they would seek additional aid.
Completing an activity using assistive technology: According to the participants, one of the most important reasons to use assistive devices was to maximize independence. In particular, the experience of changes in function over the years led to using assistive devices in order to maintain and maximize occupational performance.
When choosing between seeking the assistance from another person versus using assistive technology, often the demands of the particular task would be the deciding factor. Participants made choices based on whether assistance from another or use of assistive technology was the most efficient process.

Discussion

The ideas that the participants expressed reflected the value they placed on completing occupations independently, the importance they placed on certain occupations over others (i.e., more energy was directed at completing valued occupations) and the influence of a variety of aspects of the environment on how they completed an occupation. Assistive technology was seen as an important enabler for many of these participants, although for one, it was viewed as a source of stigma. The findings from this current study can be used to assist health care professionals in understanding the complexity of the decision making processes around completing a task and using assistive technology. As this pilot study included only a few types of disabilities, further research could explore whether the findings are consistent with a more diverse participant sample.

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Acknowledgements

The authors wish to acknowledge the participants who shared their thoughts with us.

Towards Establishing the Responsiveness of the Seated Postural Control Measure (SPCM)

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Adaptive seating systems are widely prescribed by therapists to enhance the postural control of children with neuromotor disabilities who are unable to sit independently (Stavness, 2006; Harris & Roxborough, 2005; Washington, Deitz, White & Schwartz, 2002; Myhr & von Wendt, 1991; Hulme, Gallacher, Neisen & Waldron, 1987). Approximately 750 children with complex seating needs are referred to Sunny Hill Health Centre (SHHC) each year for adaptive seating services. The Positioning and Mobility Team (PMT) serves as a provincial resource for adaptive seating and mobility services for children and youth with postural control problems. The PMT also has a mandate to provide education and training to therapists across the province for seating and mobility issues. Many children referred to the PMT are seen through outreach visits to sites across the province. Clinicians from the PMT work closely with community-based primary care therapists to determine the most appropriate interventions for these individuals.

There is a need to have a tool that assists therapists in evaluating sitting posture and documenting changes in posture over time. Such a tool would also be of value in relaying the detail of information necessary between the PMT and remotely located community therapists (both in preparation for outreach visits and to summarize the results of the seating interventions). The tool could also be used in the education of therapists in regards to seated postural control. Currently there are no validated outcome measures to assess the relative effectiveness of various adaptive seating options, or to document changes in seated postural control over time. However there are several tools in development including the Functional Evaluation in a Wheelchair (FEW) (Mills, Holm, Trefler, Schmeler, Fitzgerald & Boninger, 2002), the Sitting Assessment Scale (SAS) (Myhr & von Wendt, 1991), the Sitting Assessment for Children with Neuromotor Dysfunction (SACND) (Reid, 1995), the Seated Anatomical Axis System (SAAS) (Crane & Hobson, 2006) and the Seated Postural Control Measure (SPCM) (Fife, Roxborough, Armstrong, Harris, Gregson & Field, 1993; Fife, Roxborough, Armstrong, Harris, Gregson & Field, 1991).

The Seated Postural Control Measure (SPCM) was developed by therapists at Sunny Hill Health Centre for Children in 1989. It is an outcome measure designed to objectively document postural alignment and functional abilities as it relates to sitting posture. Several studies have been conducted to establish reliability and validity of this outcome measure (Gagnon, Vincent & Noreau, 2005; Roxborough & Story, 2004; Gagnon, Noreau & Vincent, 2003; Fife et al., 1993; Fife et al., 1991)

The purpose of this study is to further validate the SPCM for use as a seating outcome measure by determining its capacity to detect clinically important changes (responsiveness). Several authors have discussed the importance of determining sensitivity to change for evaluative measures (Stratford, Binkley & Riddle, 1996; Guyatt, Walter & Norman, 1987; Deyo & Inui, 1984). The primary objective of this study is to assess the capacity to detect change by comparing SPCM change scores to a criterion measure of change, The Global Change Scale. The secondary objective is to determine the clinical importance of change detected to assist clinicians and researchers in score interpretation. The study has received external funding for a 3 year period through the BC Medical Services Foundation. It is currently in the final year of completion.

A prospective correlational research design was used to address these research objectives. A total of 120 subjects will be assessed using the SPCM on 2 occasions 6 months apart. The Level of Sitting Ability Scale (LSAS) developed by Chailey Heritage Children's Hospital (Mulcahy, Pountney & Nelham, 1988; Green, 1988) has been revised as the Level of Sitting Scale and is administered as part of the SPCM. 60 of those subjects' sitting posture are not expected to change (e.g. those with cerebral palsy), while the other 60 subjects have conditions where change in sitting posture is expected (e.g. those recovering from brain injury or those with a degenerative neurological condition). In addition to the SPCM, a Global Change Scale is completed by parents at the second session. The results of the SPCM are compared to parental report, as well as compared to therapist rating on a similar Global Change Scale. Two therapists rating the videotaped sessions are blind to the subject and the videotapes are presented in random order. The parent and therapist ratings are based on comparison of a short videotaped segment of each of the two sessions.

For the primary objective, It is expected that the outcome measure will be sensitive to change where there truly is change in postural alignment and/or function occurring, and that it will reflect no change where posture and/or function is stable over time. It is anticipated that the SPCM change scores will differentiate between the two different groups of children. The correlation between the SPCM change scores will be calculated to determine whether the hypothesized correlation of 0.45 is achieved. For the secondary objective, the distribution of SPCM change scores corresponding to parent-perceived and therapist-perceived global change scores will be examined.

As this study is still in progress, data presented at this Symposium will be a preliminary analysis using data of approximately 60% of the subjects. Data entry and analysis has yet to be completed by the time this paper was submitted. However a written summary of the analysis and results will be provided at the time of the Symposium. Please contact the first author for additional summaries.

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The Effect of Wheelchair Tilt on Seat and Back Pressure Distribution in Adults without Physical Disabilities: Influence of Anthropometric Variables.

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Jan Miller Polgar, PhD., OT Reg. (Ont.)

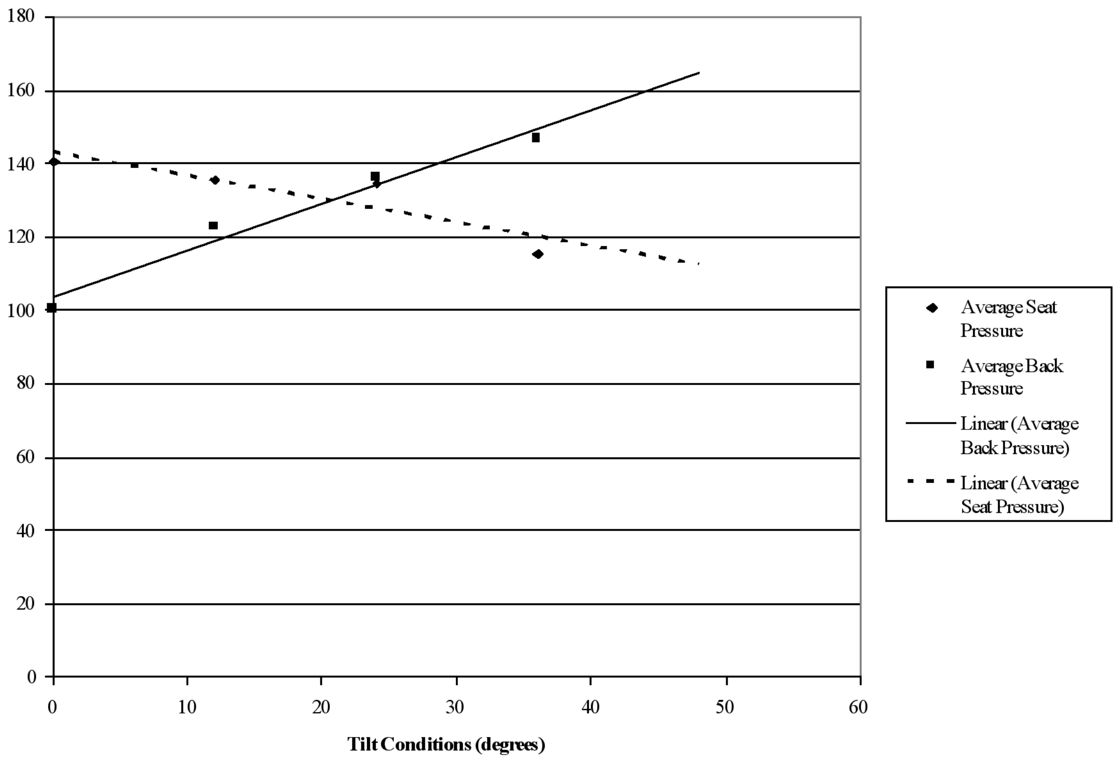

Figure 1. Relationship of seat to back pressure during tilt

Humidity and Temperature Measurements for Wheelchair Cushions

Noriyuki Tejima
Yoko Takahashi

Introduction

Wheelchair cushions have mainly been evaluated according to their pressure distribution and postural support. However, moisture and heat properties are also important criteria for comfortable cushions. For example, as it is sultry in summer in Japan, sitting cushions sometimes became wet after only an hour. This in turn makes cushion users uncomfortable and increases the risks for pressure ulcer development. In an early investigation by Stewart et al [1], humidity and temperature measurements of various cushions were measured only at the relatively cool room temperature of 21.5C with relative humidity ranging from 36 - 44% RH. The objective of this study is to clarify moisture and heat properties of cushions in daily use throughout the year.

Material and Methods

We experimentally measured humidity and temperature on a Solo PSV cushion (Varilite) under a subject's right ischial tuberosity a total of 109 times over a period from March 2005 to May 2006. During each session, both humidity and temperature were continuously measured for two hours with a TRH-7X (Shinyei Corp.) and the data recorded at every 30 minutes. The size of the THP-728 sensor is 25mm x 14mm x 2.8mm. We had previously confirmed that usage of a thin sensor enlarged the pressure under the ischial tuberosity only slightly. So we judged that it did not pose a high risk for causing decubitus ulcers if we used it carefully.

As it is claimed that the moisture and heat properties of a cushion can be altered with a cover, three cushion covers were used in this study: the original mesh-type cover for the Solo PSV with a cloth (Yumeron Corp.) which radiates infrared rays efficiently, the Tritex cover for the Jay Xtreme cushion (Sunrise Medical Corp.) and the Climatherm cover for the Vital Base Royal cushion (Vital Base AS). It is said that all the covers have good moisture properties. We had beforehand confirmed that changing the cover did not worsen the pressure distribution. The cushions with the various covers were used after allowing enough time to acclimatize in the experimental room.

The subject was a female wheelchair user, a nurse and could sweat on her hip. She understood the risks for decubitus ulcer development well and gave informed consent and entered the study. The measurements were performed in the daytime in the subject's house in Shiga Prefecture, which is located almost at the geographic center of Japan, without using a heater, air conditioner, humidifier or dehumidifier. The temperature in the experimental room was in the range of 17.5 - 32.1 C (63.5 - 89.8 F), and the air humidity was in the range of 29.6 - 88.1% RH. The subject wore clothes made of pure polyester.

Results

The experimental results of humidity were split into two groups and analyzed: 68 cases where the room air humidity is under 50% RH and 41 cases over 50% RH. The average values of humidity and temperature on the cushion are shown in Figures 1 and 2.

Discussions

The results showed that humidity and temperature on the cushion were scattered even in similar air humidity and temperature conditions. The wide distribution indicates that the moisture and heat properties of a cushion should be evaluated statistically. The temperature on the cushion surface increased by several degrees above normal body temperature in two hours.

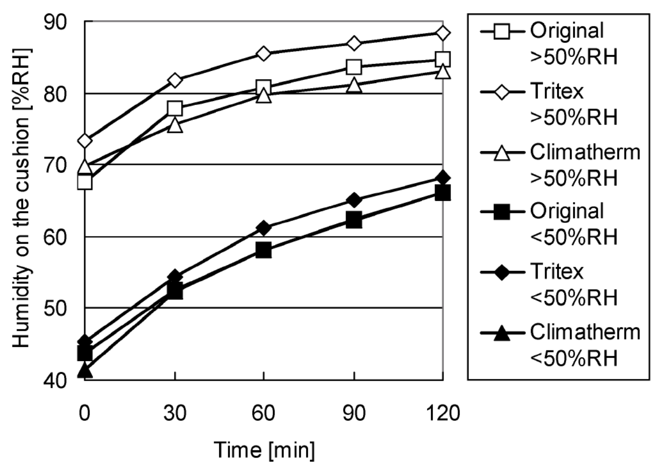

Figure 1. Humidity increases on the cushion surface in two-hour experiments.

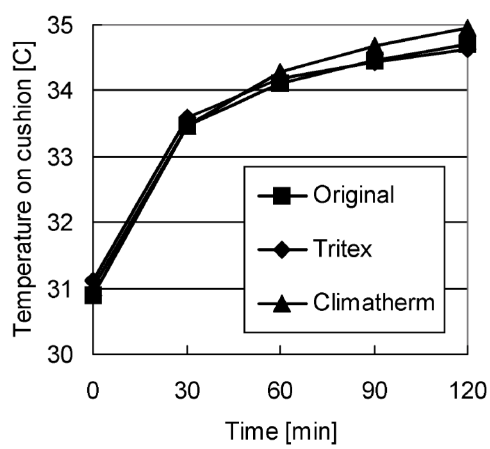

Figure 2. Temperature increases on the cushion surface in two-hour experiments

In high air humidity, the humidity on the cushion sometimes became almost 100% after one hour of sitting, and it was wet when checked by hand. On account of the saturation, the increase in relative humidity is not a proper parameter for estimating the moisture properties. In low air humidity, the humidity on the cushion continued to increase to more than 60% after two hours of sitting. As a short pressure relief “push up” on the wheelchair armrest had little influence upon the humidity on the cushions in our preliminary experiments, we think that experiments longer than two hours will be possible with low risks.

Cushion covers could not clearly be found to make any difference on humidity increases. From the results it is unclear which is true: that the moisture and heat properties are not altered by a cover, or that all three covers have equally good moisture and heat properties. In either case, the humidity on a cushion shortly becomes almost 100% in summer, even if a cushion cover with good moisture properties is used.

Acknowledgment

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Reference

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Load redistribution in standing, tilt-in-space, and reclining wheelchairs

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Adrianne Prysock, MS

Background

People at risk for developing pressure ulcers include those with limited mobility and impaired or absent sensation, among many other factors. People with spinal cord injuries are at great risk of skin breakdown as limited mobility and sensation are commonly associated with such injuries.

Variable position wheelchairs include tilt, recline and standing. Changing the position of the seating system impacts the pressures of the body against the surface of the seating system. Powered or manual tilt and/or recline are most commonly used to perform weight shifts for people who are unable to do them on their own to decrease potential for development of pressure ulcers. Standing systems are typically not considered as a means of relieving pressure off of the ischial tuberosities following prolonged sitting.

The relationship between the decrease in seated pressure and the degree of tilt and recline has not been defined even though the industry has adopted 45º- 60º as a standard maximum tilt. This study investigates load redistribution during the phases of tilt, recline and standing under the weight bearing areas of the body. This study will provide information about the magnitudes of loading on the seat and back in different degrees of tilt, recline and standing.

Methods

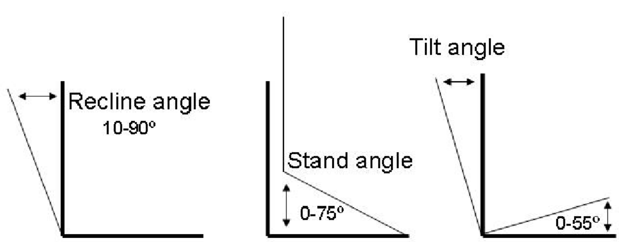


Figure 1: Angle definitions & ranges

Six able bodied (AB) subjects (2 male, 4 female) and ten subjects with spinal cord injury (SC) (8 male, 2 female) were used for the study.

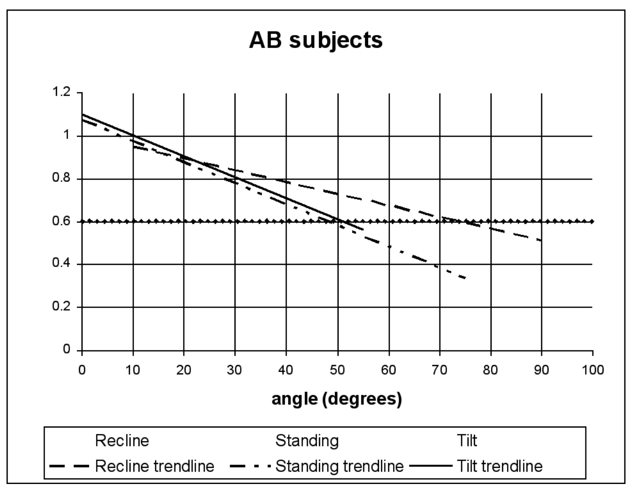
Subjects were transferred to a Levo Combi power stand wheelchair and adjustments were made for appropriate fit. To measure load, four Conformat 5315QL Tekscan pressure mats were placed behind the head and beneath foam under the back, seat and feet for the tilt/recline positions. The head mat was moved to behind the knee block in standing. Subjects were tested in 4 positions for each configuration in randomized order (Figure 1). Measurements were taken after the subject had been seated for 1 minute at each position. Pressure output was converted to force by multiplying average pressure by the number of sensels with pressures greater than 0 mmHg and by the area per sensel. Reported values were normalized to the maximum force for a given mat and seat configuration (recline/stand/tilt). A linear regression was performed to determine the relationship between the angle of recline, stand and tilt for all subjects and load on the seat.

Results

Results indicate a very strong linear relationship between the change in angle and the average load on the seat for each position for the SCI subjects (Table 1). A linear relationship also exists for the able-bodied subjects although the slopes were different from the SC subjects (Figure 2)

	AB R^2	SC R^2
Recline	0.78	0.96
Stand	0.88	0.94
Sit	0.84	0.91

Table 1: R^2 Values of angle vs. normalized force



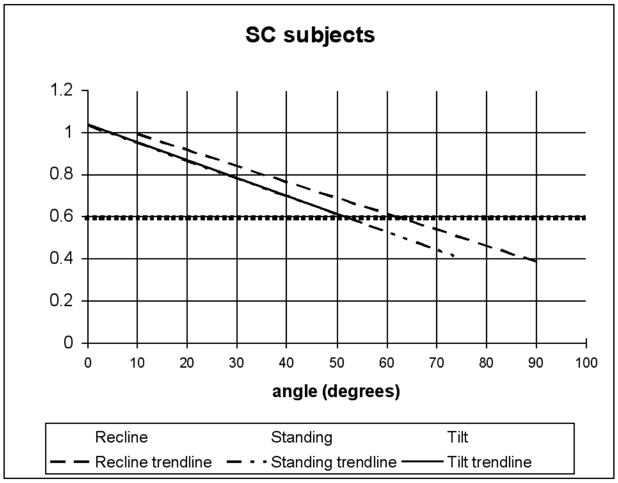


Figure 2: Linear regressions of the normalized load on the seat in recline, stand and tilt have different slopes for AB subjects (left) and SC subjects (right). Reference line represents 60% of maximum seat load.

Discussion

Over the ranges studied, a linear relationship exists between seat load and degree of recline, stand or tilt for both AB and SC subjects. However, the slope differed for AB compared to SC subjects indicating that load re-distribution differed across these 2 groups. The amount of unloading per degree of position change is indicated by the slopes of the lines. Comparison of unloading can be done using a reference line. For example, in SC subjects, unloading to 60% of maximum occurs after about 50º of tilt and standing and about 60º of recline. The maximum decrease in load on the seat occurred at full standing and full recline. In particular, a 42% decrease in seat load was found at 55º of tilt, 62% decrease in full recline and 62% decrease in full stand for SC subjects.

Conclusion

No research has identified the degree to which offloading needs to occur to prevent development of pressure ulcers on the buttocks. This study permits a simple comparison of how load is transferred during variable position strategies. Decreases in load on the seat occurred in a linear fashion over the ranges studied, so no threshold point could be identified to define an 'effective' tilt, recline or stand. The decrease in load in the end range of each position ranges varied between 42% to 62%. Additional study is needed to relate position changes to physiological effects to better discern how much position change is needed within a strategy. Clinicians and users should also be aware of to what degree position change is performed since not all users reach the end range of movement The results indicate that standing may be considered as a means of unloading the seat for a weight shift for people with spinal cord injuries. Compared to the maximum position in tilt and recline, standing provides a functional position from which to continue daily activities while unloading the seat.

The Effect of a Pressure Mapping Mat on the Buttock-Cushion Interface

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Introduction

Interface pressure (IP) mats are placed between a person and a cushion to measure the pressure at the buttock-cushion interface. However, it is possible that the presence of such a mat could change the interface being measured. An IP mat could bridge over support surface contours, reducing the effectiveness of the cushion and altering pressure distribution by preventing conformation of the cushion to the buttocks. The thickness and flexibility of the mats influence the extent of interference. In addition, this effect might not be constant across cushions or clients – cushion contour and material and subject anatomical geometry could change the sensitivity of the environment to the addition of the mat. The objectives of this study were to determine if the addition of an IP mat changes the pressure on and the immersion of a model as compared to the same conditions without a mat, if the different mats tested have different effects, if the effect varies depending on the construction of the cushion, and if the effect is consistent when measured with two different indenters.

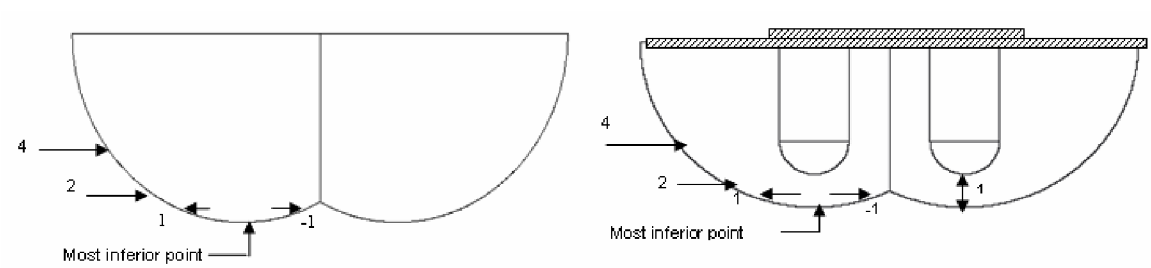
Methods

A buttock model has been designed to approximate the size and shape of the human buttocks. The model is 36 cm wide with ischial spacing of 11 cm. Two versions of this model were used to collect data, a rigid model and one model made of Elastsak gel with imbedded rigid cylinders to represent the ischial tuberosities (Figure 1).

Pressure data was collected at 5 points of interest as diagramed in Figure 1. The most inferior point of the model represents the ischial region of the human buttocks. The remaining sensors are positioned according to their vertical relationship to this inferior point. Pressure was measured with a custom made FSA sensor configuration consisting of ten individual FSA sensors with an active area of .3 in2 each. Two sensors were mounted at each point of interest. Calibration was performed before each data collection session by application of uniform pressure using an air filled bladder, following FSA recommended protocol. The accuracy of the sensors was tested immediately following each calibration, and the error was measured to be less than 10% at 100 mmHg. Four pressure mats and seven cushions were tested. The mats were the Tekscan Conformat, the Tekscan 5315, the FSA seat mat by Vista Medical, and XSensor seat system. The cushions tested are as follows: Jay Deep Contour, Action XAct Classic, Star, Tempermed, Cloud, 3-in HR45 foam, and 3-in HR 45 foam segmented into 2x2” squares extending 1” into the block.

Each model was fixed to a Zwick materials testing machine and positioned 13 cm from the rear edge of the seat cushion, or over the site-specific loading area, if present. A test load of 500 N was selected to represent the upper body weight of a 177 lb human. For each cushion and each mat condition, the setup was first preloaded to 550 N for 120 seconds. After a rest of 3 minutes, the system was loaded to the 500 N test load and held for 120 seconds. Then, the pressure was captured using the FSA sensors, and the height of the buttock model above the platen was recorded. Three trials were taken with each condition.

Figure 1: Model schematics



Results

On average, the presence of the mats resulted in the model immersing less into the cushion. With the rigid model, all mats resulted in a statistically significant decrease in immersion. With the gel model, the change was statistically significant only with the Tekscan Conformat and the FSA mat.

As a whole, the presence of an IP mat affected the magnitude of pressure in the IT region. The model type affected the direction of this change. With the rigid model, all mats resulted in a statistically significantly lower IT magnitude. However, when using the gel model, the presence of a mat increased values. IT pressure increases were statistically and clinically significant after introduction of the FSA, XSensor, and 5315 mats.

	Mean Immersion Difference from No Mat (mm)		Mean MagIT Difference from No Mat (mmHg)	
	Rigid	Gel	Rigid	Gel
Conformat	2.86*	1.27*	-16.02*	7.00
FSA	2.19*	1.59*	-38.02*	46.786*
XSensor	1.14*	0.28	-25.64*	21.143*
5315	1.19*	-0.06	-62.05*	39.929*

Table 2: Change in Height and Change in MagIT data after introduction of each mat. Statistically significant values (p<.05) are bolded and marked with a star.

The different mats had different effects on IT magnitude and immersion. The Conformat and the XSensor had a lower effect on IT magnitude. This may be related to the fact that both of these sensors were designed for conformability. The XSensor and the 5315 had a lower effect on immersion. This may indicate that immersion is more affected by mat thickness, as the XSensor and the 5315 are the thinnest of the mats tested.

The mats had different effects on different cushions. The most significant effects were seen on the air cushion, followed by the viscous fluid cushions and the foam cushions.

	Star	Cloud	Action	Jay	Foam	Tempermed	Segmented
Average Change in MagIT (mmHg)	57.90	45.18	27.35	17.21	19.81	14.13	3.65
Average Change in Immersion (mm)	3.19	2.00	1.56	2.23	1.16	1.18	1.12

Table 3: The change in MagIT is absolute value change, disregarding the direction of the change.

The main difference between the two models is their reaction to load. The rigid model maintains its shape during loading. The gel of the gel model deforms in response to the loads from the ischial cylinders and the cushion interface, resulting in a more peaked profile. We theorize that the gel model shape and loading profile results in a lower mat effect on immersion but results in an increase measure of interface pressure.

Clinical Significance

The presence of an IP mat was seen to affect both pressure magnitude and immersion. The change in immersion was not significant clinically (less than 2 mm), but it may play a role in changing pressure distribution. Different cushions are more susceptible to the mat effect than others. With a cushion that is significantly impacted by the presence on an IP mat, the pressures recorded by that mat may not reflect the actual buttock-cushion interface pressure.

Exploring Tools to Improve Pressure Ulcer Detection: Spectroscopic Assessment of the Blanch Response in Elderly Nursing Home Residents at Risk for Pressure Ulcers

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Background and Objectives

Pressure damage in intact skin is difficult to detect, particularly in individuals with dark skin, because color changes and tissue blanching are masked by the skin's pigmentation.1 Improved pressure damage detection in intact skin would have several benefits, including prevention of complications associated with higher stage pressure ulcers (PU), more accurate assessment of PU incidence and prevalence, and reduction of PU-related health disparities between light and dark-skinned individuals. A non-invasive technique known as tissue reflectance spectroscopy (TRS) may improve pressure damage detection by providing data on tissue hemoglobin and pigment content using light reflected from the skin.2-5 A "spectroscopic blanch response" may be detected in both light and dark skin by tracking the change in total hemoglobin concentration (tHb) that occurs when pressure is applied to the skin.2,5 Previous work by this research group demonstrated that the blanch response could be detected at the heels of light and dark skinned healthy participants using portable spectroscopy instrumentation.6 The objectives of the current investigation were to (1) assess the intra-rater reliability of tHb measurement at the heels of elderly individuals at risk for pressure ulcers, and (2) demonstrate that a significant decrease in total hemoglobin was detected when pressure was applied to the heel skin of at-risk individuals currently without PU.

Participants: Participants were 15 long-term care residents age 65 and older at risk for pressure ulcers (Braden Scale ≤18, Activity/Mobility subscale score total ≤5). Participants were enrolled in light, moderate, and dark skin color strata (n = 5 per stratum) based on matches of each participant's forearm skin to Munsell color tiles.

Bio-Optical Instrumentation: Skin reflectance data are collected using a system comprised of four major components: a spectrophotometer (Ocean Optics, Dunedin, FL, Model SD 2000), a 100W quartz tungsten halogen light source (Oriel Industries, Stratford, CT, Model 77501), a fiber optic reflectance probe (Fiberguide Industries, Caldwell, ID), and a laptop computer with data acquisition software. A custom-designed spring assembly was mounted onto the fiber optic probe to enable the examiner to apply gentle pressure of up to 120 mmHg to the skin, simulating the pressure applied to the skin during a clinical blanch test.

Data Collection: Three point spectroscopic blanch tests (PSBTs) were performed at one heel for each participant at bedside using a portable TRS system. The participant was placed comfortably in bed, typically in a semi-sidelying position. A sterile, latex-free transparent dressing (Tegaderm, 3M) was applied to the skin over the dorsal aspect of the heel of interest, followed by a piece of clear double-sided tape that minimized movement of the fiber optic probe during data acquisition. The fiber optic probe was then held in light contact with the participant's heel for 45 seconds, immediately followed by 45 seconds of gentle pressure application (~120 mmHg). A two-minute washout period followed each PSBT.

Spectroscopic Data Processing: Reflectance data were converted to optical density units using the formula log10(reference – dark) – log10(skin reflectance – dark). Optical density spectra recorded during the light contact and gentle pressure conditions were averaged within each condition to produce a single light contact and gentle pressure spectrum for each PSBT. A difference spectrum for each PSBT was calculated by subtracting the gentle pressure spectrum from the light contact spectrum. A semiparametric fitting approach, described by Sowa and colleagues7, was used to estimate the change in the relative concentrations of HbO2 and Hb that occurred when pressure was applied to the skin. Difference spectra were regressed against the extinction coefficients for oxyhemoglobin (HbO2) and deoxyhemoglobin (Hb) using data in the 510-610 nm range. The magnitude of the spectroscopic blanch response (tHb) was determined by summing the calculated values of HbO2 and Hb. Optical density data were analyzed in Matlab (v.6.5, Mathworks, Inc., Natick, MA).

Statistical Analyses: Analyses were performed in SPSS version 11.0.1 for Mac OSX (SPSS, Inc., Chicago, Illinois, USA). One-way analysis of variance (ANOVA) with Tukey post-hoc testing as needed was performed to explore differences in the magnitude of tHb between skin color subgroups prior to pooling these data. A dependent samples t-test was performed on the pooled data set and Wilcoxon signed ranks tests were performed on data in each of the skin color subgroups to determine if a significant decrease in tHb occurred when pressure was applied to the skin. The non-parametric Wilcoxon signed ranks test was chosen for subgroup analyses due to the small subgroup sample size (n=5). Intra-rater reliability of tHb measurement was described by the intra-class correlation coefficient (ICC), Model 38, using data obtained during the three PSBTs at the heel of interest for each participant. ICCs were calculated for the overall group and within each skin color subgroup and both single measure (ICC 3,1) and average measure ICCs (ICC 3,k) were reported.

Results: As expected, optical density in the visible region between 500 and 600 nm decreased with gentle pressure application in all skin color subgroups, indicating a decrease in tHb content with pressure application. The magnitude of tHb was statistically significant ($p<0.001$) for the overall sample and within each of the skin color strata ($p<0.05$ for all strata). The magnitude of tHb was not statistically different among the skin color subgroups, although visual inspection of the data suggested that the magnitude of change tended to be greater in darker skin. Intra-rater reliability for tHb measurement (see Table) was moderate for single measures (ICC range 0.61-0.77), and good to excellent for average measures (ICC range 0.83-0.91).

Table: Intra-Rater ICCs for tHb Measurement (95% Confidence Intervals in Parentheses)

	All Skin Colors (n = 15)	**Light Skin** (n = 5)	**Moderate Skin** (n = 5)	**Dark Skin** (n = 5)
Single Measure	0.61 (0.32, 0.83)	0.65 (0.09, 0.95)	0.67 (0.11, 0.95)	0.77 (0.28, 0.97)
Average Measure	0.83 (0.59, 0.94)	0.85 (0.23, 0.98)	0.86 (0.27, 0.98)	0.91 (0.54, 0.99)

Discussion

The findings above indicate that a significant spectroscopic blanch response can be detected at the heels of light, moderate, and dark-skinned elderly individuals at risk for pressure ulcers. These results are similar to those obtained in an earlier studies of spectroscopic blanch response assessment in healthy younger participants, suggesting that age-related skin changes and the presence of cardiovascular and other health conditions did not adversely affect the ability of spectroscopy to measure the blanch response. The ICC data demonstrate that the spectroscopic blanch response may be detected with moderate or greater intra-rater reliability in individuals of advanced age despite health conditions that place them at risk for pressure ulcers. ICC values for tHb in the current study are generally lower than those reported for our earlier pilot study, where ICCs exceeded 0.80 for single measures and 0.92 for average measures.6 Variability in the present study may have been greater due to difficulty achieving an optimal position for the examiner due to limitations in participants' range of motion and the setup of residents' rooms, spontaneous movement by participants during testing, and the inclusion of participants with medical conditions that may have affected circulation. Results of this study will assist in the development of clinical devices that use spectroscopic technology to detect signs of pressure damage in intact skin.

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Dumbo Project: Changing The Disability That Isolates Into "Tolerable" Diversity

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Introduction

The vesuvian area pertaining to the Sanitary Regional Institute Napoli 5 suffers a particular phenomena: an extremely high influence of children afflicted from SMA (in particular Werdning Hoffmann disease) much more than what indicated as per the OMS statistics. Therefore the Sanitary Regional Institute Napoli 5 wants to prepare a program to safeguard those kids, in order to grant them, first of all, an adequate home medical care. For the project realization it has been chosen the best seating postural system, in order to suit the specific needs due to this particular pathology, and this has been obtained with appropriated adjustments as well as options that permit to make the sitting unit a "personal" aid to the child : we would like to help him not only respect to his own pathology but also for all the other targets of the reha-project in whole. Into this situation gets justification the greatly wanted Fumagalli project: testing the kind of effects that the adopting of Mitico postural seating system will get in the life of children suffering heavy disability.

Beside that, further important purposes of the test are:

- To grant to the child suffering heavy disability and his family the best possible autonomy, reducing as possible their "solitude" due to the unavoidable pathology;
- To organize a labour-equipe for a multidisciplinary approach to the complexity of the pathology;
- To reduce the single caregiver's load.

Methods

The National Health System previously supplied to the child and his family the following items, as for the specific needs:

- Electromedical equipment for the maintenance of the vital abilities;
- Home Rehabilitation Therapy (FKT, LT, OT, PM);
- Nursing;
- Domicile Caregivers;
- Multiprofessional and sanitary Equipe for specific problems.

In a second time those children have been supplied with a Mitico seating postural system and, using some opportune monitoring schedules, one could appraise the effects of that system in the everyday life of both the child and also his family.

The monitoring schedules used were:

1. P.U.L.S.E.S. schedule for the enlistment criteria
2. postural test for the sitting position evaluation
3. Certain IQHL schedule for costs/benefits
4. evaluation schedule for the Mitico seating postural system
5. follow up schedule

Besides these instruments, it has been used for the Paediatric Clinical Evaluation (that monitorized the health level of the child) the value of the peripheral oxygen saturation under a double indication of value: first of all as absolute value for the oxygenation of the children having a compromised respiratory system, and then as indirect agent of evaluation for the best possible postural sitting positioning.

Results

Thanks to the above explained analysis we got the result that the children variable characteristics could have been valued and the right postural sitting positioning could be identified.
The use of a postural system as well as Mitico that, due to its own project characteristics, can be adjusted
to suit the different specific children's needs, together with the multi-professional équipe, made up of sanitary, nursing and public caregivers of the territory, allowed to hit the foreseen targets, and in particular:

- the child rehabilitation at home makes its and its family life of a better quality level;

- the everyday autonomy, at home and outside is increased;

- the measurement of the peripheral oxygen saturation of these kids has pointed out the correlation between the registered values and the time of using the postural system; beside that one could also appreciate a difference between the right sitting positioning and the sitting positioning with the best oxygenation.

Under the evaluation, Fumagalli could realize that the postural system Mitico has been accepted with interest by the families and the multi-professional team involved in the project; furthermore, in respect of the complexity of children' situation, the team has pointed out some critical points of the postural system that has been perfected, as per the structure sizes, the adjustments and further required optionals.

Conclusions

This project allowed to make aware both the parents and the nursing operators of the area that the problem in this area is heavy and requires a guarantee of an adequate autonomy.
The life prospect for these children have been increased, not only for the "age" but also for the quality.
The everyday use of a suitable postural sitting system allowed to the child to reach a seating position and to get part to the family life, that means better physical and also emotional life.
Furthermore, thanks to the unique aim of the Hospital and the nursing operators it could be possible to reach purpose with no less of forces, no responsibility overlapping and no defaults.

Ataxia-Teleangiectasia- a model for cooperation between a National Disease Center and an Assistive Technology Unit

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Introduction: Ataxia-Teleangiectasia (A-T) is a rare neurodegenerative disorder related to chromosomal breakage syndromes, caused by mutations in the ATM gene. The clinical manifestation is progressive cerebellar ataxia, dyspraxia and bradykinesis, oculomotor apraxia, as well as immune deficiency, radiosensitivity and a predisposition towards lymphoid malignancies.

In December 2004 the Israeli National A-T Center was founded in order to assess, treat and create general guidelines for managing A-T children. The uniqueness of the Israeli A- T population is its ethnic diversity including children of Moroccan Jewish, Bedouin, Druze and Arab origin.

Methods: 34 patients with A-T were assessed at the National A-T Center including multidisciplinary medical and social evaluation. Mean age for ataxia appearance was 1.5 year, and mean age for loss of ambulatory skills was 8.3 years. Nonambulatory and severely impaired children (15 patients) were referred to the Pediatric Rehabilitation Department-Assistive Technology Unit. Clinically we can see differences between children's functions. Due to these differences as well as the diversity of ethnicity a multidisciplinary assessment is taking place: occupational therapist, physical therapist, speech therapist. As a result of the evaluation a various recommendations is given such as walkers, standing frames, adaptive tricycles as well as Wheelchairs (manual or powered), computers and assistive communication devices.

The cooperation between the Israeli National A-T Center and the Assistive Technology Unit make possible the acquisition of the different assisstive devices.

Conclusion: The A-T center and the Rehabilitation Unit reached out to the community in order to assess the children's home and school environment. The recommendations were adapted to the child abilities as well as his cultural milieu. Professional caregivers were guidance. The cooperation between Rehabilitation Unit and the coordinator of the Medical Center is crucial in order to carry over the recommendations.

Designing Wheeled Mobility Devices for Remote Environments: A case study from India

Jon Pearlman, MSc

Designing assistive technology for people with disabilities is a challenging task for designers and engineers alike. This is, in part, due to the diversity of the user population—both in physical and functional characteristics. User involvement has long been a way to mitigate these challenges: the more involved the users are in the design and testing phases, the more likely the device will meet their needs and the needs of others with disabilities. User involvement, along with the involvement of other experts (physical and occupational therapists, mechanical and rehabilitation engineers, and even people involved with home modifications) are all important design-team members for new AT products. In this paper, we describe a novel strategy to organize this design-team approach on an international scale, using online questionnaires. Our specific goal was to design an electric powered wheelchair for India. As a way to gather design constraints and ideas, we developed a web-based questionnaire where wheeled mobility experts (users, engineers, clinicians, etc.) reviewed a series of photos taken by wheelchair users in India of areas in and around their homes where it was difficult to maneuver. From the questionnaire feedback, we were able to gather important advice on the necessary performance and features of a powered wheelchair for India.

Seating in the Third World

Delia "Dee Dee" Freney-Bailey, O.T.R./L., A.T.S.

Wheels for Humanity

Each year in the United States, tens of thousands of wheelchairs are discarded and end up in landfills.

An estimated 300,000 are retired into attics, garages, basements or closets

Non Profit organization based in North Hollywood, California
Coordinates with Hope Haven in Iowa
Accepts donations and picks up wheelchairs and equipment
Repairs and refurbishes to put them back into service
Works with in-country partners to meet community needs
No cost to people who need them
Teams of therapists, technicians, translators volunteer to travel and fit wheelchairs

China/Tibet

• Partner: Holy Love Foundation in Chengdu
• 240 wheelchairs
• Roadside evaluations

North Vietnam

• Partner: Bach Mai Hospital, Hanoi
• 150 wheelchairs including power wheelchairs and sport wheelchairs
• Town of Nam Dinh received chairs for their community

Ukraine

• Partner: Rivne City Territorial & Special Needs Education Resource Center
• 157 wheelchairs
• Worked in a Clinic with a doctor, nurse and physiotherapist

Trinidad

• Partner: Living Water Community
• 148 wheelchairs shipped and set up in a huge warehouse
• Busloads of children, adults and elderly received their first wheelchairs

Costa Rica

• Partner: Lions Club of Alajuela
• 328 wheelchairs
• Some people traveled 4 to 6 hours on public buses to receive a wheelchair

Uganda

• Partner: Rotary Club of Kampala East
• 145 wheelchairs
• Mulago Hospital, Pallisa Hospital, Kibuli Hospital
• Rotary Clubs of Masaka, Entebbe, Jinja, Iganga and the Adjumani District

China/Tibet



Uganda


North Vietnam


Ukraine



Trinidad



Costa Rica



Nighttime Positioning

Kelly Waugh, MS, PT

What is nighttime positioning?

Nighttime positioning is the specific therapeutic positioning of a person's body during sleep.

Why is nighttime positioning needed for some persons?

1. To improve the quality and duration of sleep
Many individuals with physical disabilities have a difficult time sleeping, due to an inability to change their position, abnormal muscle tone and movement, discomfort or pain, or because of difficulties with breathing or swallowing. This leads to poor sleep quality and duration – essentially, sleep deprivation - for both the disabled individual and their caregiver. Restorative sleep is essential for people with physical disabilities in order to help repair soft tissue trauma that may have occurred during the day (from abnormal postures and muscle spasticity), to optimize immune system functioning, to promote normal growth in children and to maximize cognitive and physical performance during the daytime.

2. To promote health and maintain safety during sleep
Some individuals with severe motor impairment also have significant health problems, and they require frequent attention during the night to keep them safe. For some individuals, basic physiological mechanisms such as breathing and swallowing are influenced by body posture and movement, as well as body position with respect to gravitational forces. Some individuals, such as those with cerebral palsy, are even at risk of becoming entangled in bedcovers or pillows because of uncontrolled movement patterns, leading to possible asphyxia.

3. To prevent or lessen the development of orthopedic deformities
Additionally, many individuals with neuromuscular impairment are at risk of developing orthopedic deformities such as scoliosis and hip dislocation that may lead to costly surgical interventions. Many of these persons spend much of their day and night in destructive, asymmetrical postures which may be facilitating the development of joint contractures, orthopedic deformities and associated health complications.

The concept of therapeutic positioning during the daytime is widely accepted. Many types of wheelchairs, seating systems and other pieces of adaptive equipment are used in order to help individuals with motor impairment maintain symmetrical, stable postures during the day, both to help them function but also to help prevent orthopedic complications. However, these same individuals may be spending 8-12 hours per day in bed, lying in asymmetrical, destructive postures which can negate the benefits of good positioning during the daytime. Therapeutic positioning during sleep can be especially effective because the person is not performing tasks which may increase muscle tone and abnormal movement patterns. Nighttime Positioning can therefore be a vital component in the overall 24-hour postural management and care of individuals with severe motor impairment.

What equipment options are available to help with nighttime positioning? Equipment options include simple, readily available items such as pillows and foam positioning bolsters or wedges, as well as more expensive mattress systems. The disadvantage of using pillows and foam wedges is that they often do not stay in place, especially when being used with an individual with spasticity or uncontrolled movement patterns. However, these low cost solutions may be sufficient for someone with low muscle tone, minimal movement or paralysis. For more precise and stable positioning, there are two adjustable mattress systems on the market that are specifically designed to provide nighttime positioning: the Dreama Nighttime Positioning Mattress, and the Symmetrisleep System.

How do I know what type of equipment will help?

It is highly recommended that an individual receive an evaluation by an experienced physical therapist prior to the recommendation or purchase of equipment for nighttime positioning. During this evaluation, the individual's specific nighttime problems and goals should be identified, and from this a determination is made as to which body position, or orientation (such as supine, elevated supine, sidelying or prone), is the most therapeutic and safe for the individual. Depending on the individual's physical presentation (body dimensions, joint range of motion, movement, muscle tone), the therapist can then help the team determine (sometimes by trial) the most appropriate equipment intervention.

What are the potential benefits of Nighttime Positioning?

In summary, the primary goal of Nighttime Positioning is usually to help a person maintain a stable, symmetrical, comfortable sleeping position throughout the night in order to:
• Increase health and safety during sleep by maintaining positions which prevent aspiration, choking and/or positional apnea, for clients at risk, allowing for safe swallowing and optimal respiration throughout the night.
• Increase safety during sleep by preventing persons from becoming entangled in bed covers or pillows, for those at risk
• Help maintain joint range of motion and reduce the risk of developing orthopedic deformities by increasing the number of hours the person spends in symmetrical, therapeutic postures
• Decrease joint stiffness and pain which results from sleeping in asymmetrical postures
• Minimize pressure areas on the body during sleep in order to improve comfort and sleep duration, as well as to decrease the risk of pressure sores for persons at risk.
• Improve the duration and quality of sleep, in order to promote optimum body system functioning and health, and improved physical and cognitive performance during the day.

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She's Sliding Again!

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Amy is an 85 year old woman who had a CVA 6 years ago. She has right sided hemiplegia. She has been referred to you for an assessment of her wheelchair. The current complaint of the staff in the Long Term Care Facility is that Amy is constantly sliding. Staff are concerned that she may develop pressure ulcers from her poor positioning, and that she may slide out of the chair. During your assessment you learn that Amy propels her wheelchair independently using her left foot and left arm.

• What do you believe is the root cause of the sliding?

• What would you prescribe to prevent the sliding?

Introduction

Sliding seems to be a common problem for clients who use wheelchairs and often results in secondary complications such as pressure ulcers and falls. Sliding in the wheelchair also often results in a referral to a therapist to "fix" the client's seating/wheelchair to prevent the client from sliding. While there are many approaches to addressing sliding, a thorough client assessment is critical in determining which solution will work best for the client and caregivers.

Assessment

One of the goals of the assessment phase is determining the root cause of the sliding. It is from this root cause, that an appropriate intervention can be determined. Key areas of assessment include:

- Tone/Spasticity: Increased lower extremity flexor tone, and/or hip extensor tone can lead to the client sliding.
- Passive Range of Motion: if the angles in the seating system are more acute than the client can tolerate, the client will slide forward to accommodate the wider hip to back angle
- Preferred Posture: Clients may have a posture in which they tend to sit which is not easily modified by the seating system. These postures may develop over time and can include: "the sacral sitter", "the leg crosser" etc.
- Current seating surface: Caregivers may have placed an incontinent pad on the cushion, or changed the set up of the chair. These changes may have an impact on the client's ability to maintain a functional posture.
- Sitting routine: The length of time the client is in the wheelchair, the type of terrine the wheelchair traverses etc can all affect seating posture

Observation and asking the client and caregiver questions are two tools which may help to determine the cause. Questions to ask may include:

- When did the sliding first become a problem/concern? (Was there a change in medical condition, living circumstances, caregivers etc?)
- When does the sliding occur? (Is there a time of day where the sliding increases? Does the sliding just occur when the client tries to propel the wheelchair? Does the sliding occur when the client is going over rough ground? Etc)
- How far does the client slide? (Has the client slid out of their chair? Does the client just slide an inch then stays in that position? Etc)
- What clothing does the client usually wear? (Some clothing materials tend to foster sliding)
- Where does the sliding initiate? (When observing the client slide does the movement seem to initiate in the lower extremities, trunk or elsewhere?)
- Does the wheelchair seem to fit the client? (Are the client's feet supported? Is the seat depth too long/too short? Does the chair appear to be too large/too small for the client?)
- Does the sliding appear to be a choice? (Some clients may slide during the day as a way to change their posture, or to get a caregiver's attention)

Intervention

When a client has a tendency to slide, often the temptation is to add a restraint; however this approach can actually increase the risk of injury. At times a pelvic belt or restraint may be needed to prevent the client from sliding or a as a cue for the client to reposition themselves, however it should not automatically be the first approach. The better approach is to match the intervention to the underlying cause. The following table, while not exhaustive suggests interventions which may be successful addressing specific issues.

Underlying cause of the sliding	Interventions which may be successful
• Tone and/or spasticity	• Consider referring the client to a physician for medical management of the spasticity • Try a fixed or dynamic tilt. Often altering the client's relationship to gravity will decrease the tone and spasticity • If the client's range of motion allows, establish a 90 degree seat to back angle or less • Consider the use of 90 degree footplates to decrease the thigh to calf angle • Consider increasing the contour of the cushion
• Fixed spinal or joint deformities limit the client's posture	• Ensure that the key angles of the chair (seat to back, and seat to footrest) match the client and do not "push" him beyond his comfortable range.

Underlying cause of the sliding	Interventions which may be successful
• Client prefers to sit in a posterior pelvic tilt, or sacral sit • Client appears to choose to slide	• Consider educating the client on the impact of their choice of posture • Consider accommodating this posture by increasing the seat to back angle or prescribing a tilt wheelchair
• Addition of an incontinence pad, changes to the seating system or cushions placed in the chair incorrectly	• Discussion with the client/caregiver as to why the changes were made to the system • Education of the client and caregiver regarding the correct placement of the cushion and/or the impact of adding an incontinent pad, or not removing the transfer sling
• Client is sitting up for long periods of time without an opportunity for a rest/change of posture	• Consider changing the schedule so that the client does not sit in their chair for long periods, but has an opportunity to rest • Consider the prescription of a tilt chair to enable the client's position to be changed (Educate the client and caregiver on its use).
• Client tends to slide when propelling the wheelchair	• Ensure the chair is at the correct height if the client is foot propelling • Consider the use of a pelvic belt • Increase the contour of the cushion • Ensure that the seat depth is correct • Consider whether or not the client may be a candidate for power mobility

When sliding is identified as a concern after there has been a change in the client's living situation or caregivers it is important to determine whether this is a new issue, or rather one which is just newly identified as an issue. The client may not have changed, but new caregivers may not know the best way to position that client.

Final Thoughts

If the client is not getting skin breakdown, or other negative consequences, and they are able to reposition themselves, then intervention may not be needed. If intervention is required, a careful assessment of the underlying cause will help identify the most practical interventions.

Amy's Solution:

On assessment the therapist identified that Amy tended to slide herself forward in the chair before beginning to propel to give her right leg more clearance behind her knee. She continued to move forward in the wheelchair with the effort of trying to propel the chair. The therapist shortened the seat depth on the left side, increased the contour of the cushion and added a pelvic belt to the chair. The seat to floor height of the chair was not changed as it was at an appropriate height for foot propelling. Staff report that Amy no longer slides in her chair.

Preserving Upper Limb Function in Wheelchair Users: Application of the Clinical Practice Guidelines

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Development of the Clinical Practice Guidelines on Upper Limb Preservation

Upper limb pain and injury is highly prevalent among persons with spinal cord injury (SCI), particularly those who rely on manual wheelchair propulsion as a primary source of mobility (1). Sole reliance on the upper limbs for activities important for maintaining independence, like transfers, weight relief and lifting and stowing a wheelchair in a motor vehicle likely contribute to the development of upper limb pain and injury. This is because our arms are designed for prehensile activities not weight-bearing tasks. Research shows that upper limb pain also becomes more prevalent as duration of time with SCI increases (2;3) and so there is a growing concern that because more individuals with SCI are living longer the prevalence of upper limb problems will continue to increase. The impact of pain can be devastating resulting in lower-quality of life, functional decline, decreased independence, and reliance on powered mobility (4;5).

In 2002, the Consortium for Spinal Cord Medicine whose member organization includes professional societies and organizations that specialize in spinal cord medicine, worked with the Paralyzed Veterans of America to start developing a Clinical Practice Guideline (CPG) that includes practical evidence-based information to help with preventing and treating upper limb pain and injury (6). The process began by appointing a panel leader (Dr. Michael Boninger), eight other experts representing different clinical rehabilitation specialties and consumer perspectives, and a ninth member who served as a research methodologist. The charge of the panel was to develop concise recommendations that a health-care professional could readily apply with their patients. The recommendations were based on supportive literature and expert panel experiences.

Little research exists that clearly documents how to prevent upper limb pain and injury and preserve function in wheelchair users. However, a fair amount of literature has looked at the relationship between wheelchair variables (e.g., type, setup, techniques) and development of pain and injury. While the guideline utilized this literature for some recommendations, additional support was obtained from the large body of literature dealing with ergonomics, a branch of engineering that studies the relationship between workers and the environment. The ergonomics literature provides a strong basis for practices and the same interventions that have been proven to reduce the incidence of pain and cumulative trauma disorders of the upper limbs in various work settings can be used to prevent pain and injury in SCI. Example recommendations related to this include: ‘minimizing the frequency of repetitive strain tasks’, ‘minimizing force required to complete upper limb tasks’ and ‘minimize extreme or potentially injurious positions at all joints’. These basic principles were used to derive specific recommendations concerning wheelchair use, transfer techniques, and equipment selection, training and environmental adaptations. Also contained in the guideline are recommendations related to exercise, management of acute and subacute upper limb injuries and pain, and treatment of chronic musculoskeletal pain to maintain function.

It is important to note that the CPG was generated based on the scientific literature that was available up to the year 2004. It is also a reflection of the expert panel’s professional opinions and those of the CPG peer reviewers (40+ rehabilitation professionals and consumers). It addresses the problem in global terms and because of its conciseness cannot address every unique situation. The recommendations themselves have not been validated and thus there are research opportunities to critically evaluate their clinical application. Nonetheless, these Clinical Practice Guidelines provide a starting point for which to begin to address the prevention and treatment of upper limb pain and injury in SCI.

Implementation of the CPG on Upper Limb Preservation

The central theme of the CPG is to offer guidance to health care professionals surrounding specific strategies to preserve upper limb function in clients with spinal cord injury (SCI). Much of the information contained in the CPG is pertinent to wheelchair users without SCI as well. Initially, review of the comprehensive information provided in the CPG may appear daunting, given there are 6 categories of interventions with 35 specific recommendations and nearly 150 references cited. However, a methodical approach to reviewing and understanding the information allows health care professionals to develop a reasonable and practical plan for clinical implementation of the CPG. As stated above, three basic principles were used to derive the specific recommendations – minimize frequency, minimize forces, and avoid extreme or potentially injurious positions at all joints. In addition to these three basic principles, there are three key themes under which the 35 recommendations can be grouped which are1) be proactive in prevention & treatment 2) provide appropriate equipment & support and 3) provide education & training to end users. Each of these key concepts will be further discussed with reference to specific CPG Recommendations (CPGRs).

1. Be proactive in prevention and treatment. Several CPGRs indicate that a proactive approach is critical in preserving upper limb function. The first recommendation is “educate healthcare providers and clients with SCI about the risk of upper limb pain and injury, the means of prevention, treatment options, and the need to maintain fitness.” Clearly, clinicians must be empowered with professional competencies in each of these areas in order to provide appropriate client services. Client functional activities, movement techniques, health status and risk for upper limb injury must be routinely assessed (CPGR #2). Management of acute upper limb injuries must be proactive as well with utilization of medical and rehabilitative approaches for non-traumatic injuries and pain and encouragement of relative rest (CPGRs # 19-23). Management of acute pain includes maintenance of ROM, utilization of alternative techniques when indicated, use of surgery only as a last resort (i.e. carpal tunnel syndrome or rotator cuff repair), stabilization of fractures, and appropriate planning for recovery time when surgical intervention is indicated (CPGRs #24-29). Management of chronic upper extremity pain requires comprehensive interdisciplinary assessment with regular monitoring of outcomes. Individuals with chronic pain who use manual wheelchairs should be encouraged to consider power mobility when appropriate. Psychosocial adjustment to secondary upper limb injuries should be monitored closely with treatment provided as needed (CPGRs #31-35).

2. Provide appropriate equipment and support. The provision of appropriate equipment includes considerations for wheelchair selection and configuration. Clients who use manual wheelchairs should be provided with a lightweight, high strength custom configured wheelchair (CPGR # 7). Rear wheel orientation must be strategically considered. In the horizontal plane, the rear wheel should be positioned as far forward as possible without causing the chair to be tippy (CPGR # 8). The forward rear wheel position is supported by the research literature with demonstrated decreased roll resistance (7), increased handrim contact (8), and propulsion with less muscle effort, smoother joint patterns and lower stroke frequency (9). Lower peak forces, less rapid loading of the pushrim, fewer strokes, and greater contact angles with the handrim have also been demonstrated with a forward rear wheel (10). CPGR #9 suggests optimal rear wheel vertical position with the elbow flexion angle between 100 and 120 degrees with the hand at top dead center of the pushrim, which is also supported by published research (10,11). Clinicians are encouraged to discuss the pros and cons of power mobility with individuals at high risk of upper limb injury. Seat elevation or a standing position is an appropriate consideration as well (CPGRs #6,13,34). In addition to appropriate provision of wheelchairs, upper limb preservation also requires that postural support, twenty-four hour positioning and environmental adaptations be comprehensively evaluated and addressed (CPGRs #11, 12, 22, 14).

3. Provide education and training to end users. Comprehensive client education is necessary surrounding the topics of risk for upper limb injuries, transfers, upper limb tasks, exercise and wheelchair propulsion. Our clients are empowered to help themselves when armed with information. Specific transfers techniques should be taught and utilized that minimize extreme joint positions and minimize upper extremity forces. Specific approaches include performing level transfers when possible, varying technique and lead arm, avoidance of the hand-flat position, and consideration of using a transfer assist device (CPGRs #5,15,16). Upper limb tasks, such as reaching, should also be performed with repetition and forces minimized while avoiding compromising joint positions (CPGRs 3-5). Exercise which incorporates flexibility, strengthening and conditioning should be targeted toward combating the effects of wheelchair propulsion. Specific suggestions include stretching of the anterior shoulder and chest muscles, strengthening the posterior shoulder and trunk muscles, and general fitness which contributes to weight management and optimized functional skills (CPGRs #17,18). Manual wheelchair propulsion is another key area of education and training specific to upper limb preservation. Clients must be encouraged to minimize the frequency of contact with the pushrim, reduce the forces applied to the pushrim, and to use smooth long strokes with a semicircular pattern of recovery (CPGRs #3,4,10).

Conclusions

Upper limb pain and injury is a significant debilitating problem for individuals who utilize a manual wheelchair for primary mobility. The CPG for Upper Limb Preservation provides a comprehensive list of recommendations for health care provider interventions surrounding this problem. A methodical approach in reviewing and understanding the CPG allows reasonable and practical clinical implementation of specific recommendations.

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Wound Care Protocol for Sitting Acquired Pressure Ulcers: Best Practice

Jillian Swaine, OT
Karen Lagden, RN, ET
Michael Stacey, MD

Sitting acquired pressure ulcers (SAPUs) are unique pressure ulcers that deserve to have their own protocol for assessment and treatment. This session will present the assessment protocol and provide the treatment guidelines according to the stage/grade of the wound, location and wheelchair seating system and alternate lying surfaces. The standardized wound assessment includes how to measure the length, width and especially the depth of the wound. Wound care dressings, debridement, signs of infection, and indicators for surgery will be highlighted. Vacuum assisted closure (VAC®) will be discussed. Wheelchair cushions designed specifically for wound treatment will be highlighted using case studies. Lying surfaces for treatment will also be included in the case studies.

The Non-Complaint Client

Linda Norton OT Reg.(ONT)

How can a health care provider manage the non-compliant clients who:

- Cancels appointments at the last minute....
- Refuses to follow the treatment plan as discussed......
- Does not use their new wheelchair and continues to use their old one, even though it is breaking down.....
- Books an appointment to seek advice, and then contradicts everything the health care provider recommends.

Introduction

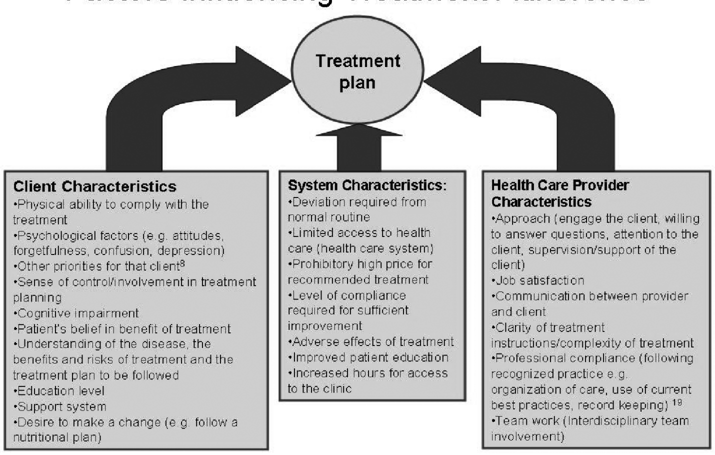
Clients who are labelled "non-compliant" can be frustrating for health care providers to manage. Some health care providers establish guidelines or contracts which may limit access to service for clients who are "non-compliant". This approach however, does not address the issues underlying the "non-compliant" behaviour.

Reasons for "Non-Compliance"

A literature review was conducted to examine the factors which influence treatment adherence. While the factors vary, they can be grouped into 3 domains: client factors, health care provider factors and system factors. These factors are presented in Figure 11.

Figure 1:

Factors Influencing Treatment Adherence



Client Characteristics

The client's physical ability to follow the recommendations is a primary consideration.
Clients with diabetic foot ulcers who have been told to do a visual check of their feet on a daily basis may not be able to follow this direction if they have vision deficits. This vision deficit may not yet be diagnosed.

Cognitive changes will also impact the client's ability to follow a treatment plan. Ensuring the plan and any education material is available in a number of formats (e.g. verbal discussion, hand outs, client education videos etc) will help to address this issue.

The client's family or support system has an impact on the progression of a disease2, 3, as well as the ability of a client to participate in a treatment program. Encouraging the client to involve their key supports in education sessions and treatment planning will help to ensure they are part of the team.

System Characteristics

The health care system may pose barriers to a client's participation in their health care. For example, in parts of Ontario there is a shortage of Family Physicians, which limits a client's ability to access primary care. In addition, some health services may not be easily wheelchair accessible, nor have the staff available to help with personal care needs as required.

For clients who are working, their schedule may not coincide with the health service unless the client takes time off. For some clients this may not be a possibility, particularly when multiple visits are required. Increased visits, or phone contact may be appropriate though as it has been shown that the closer a client is to their next doctor's appointment, the more compliant they are with taking their medications as prescribed.4

Health Care Provider Characteristics

The way that the health care provider approaches the client has a significant impact on the ability of the client to follow a treatment plan. Researchers wanted to find the most effective way to maintain resident functional mobility in a long term care facility.5 the residents, all of whom had been diagnosed with Alzheimer's disease, were assigned to either a mobility group, a reminisce group or a walking and conversation group. The researchers found that the best outcome was for residents involved in the walking and conversation group.5

Professional compliance, or how current the health care provider is with the best practices, and current research also impacts the adherence of a client. Health care providers who are current and able to bring the information to the client, can develop more informed treatment plans.

Compliance vs. Adherence

The term compliance, implies that the patient should follow the treatment plan established by the health care provider, because the health care provider is a professional and knows the best course of action for the client. The term adherence implies that the health care provider and client form a team who jointly develop a treatment plan which meets the needs of the client, and addresses the client's health concern. Treatment plans which are developed in this joint fashion are more likely to be followed.

Treatment Accommodation

Treatment accommodation has been defined as “the extent to which a standardized treatment approach can accommodate to the complex and unique demands of patients’ lives”6 and is concerned with three domains;

- the purpose/goal of treatment
- the content of treatment
- the method by which the treatment is delivered

Each of these domains must be in line with the client’s goals and perspectives. For example, if the client’s goal is to heal their pressure ulcer, however also wants to decrease the number of nursing visits, the choice of dressing must consider ways to increase wear time.

Keller and Carroll7 report that six specific actions increase client adherence:

- Keep the regime simple
- Write out the regime for the patient
- Motivate the patient and give specifics about benefits and time table
- Prepare the patient for side-effects and for optional course of action
- Discuss with the patient any obstacles to moving forward with the regimen
- Get feedback from the patient.

Fostering Adherence

How can a health care provider manage the non-compliant clients who:

- Cancels appointments at the last minute.... Investigate whether or not appointments can be scheduled at a more convent time, or in a different location. Ensure that the client has access to transportation/caregivers if required. Ensure the client knows that if they have not been following the treatment plan, they can still be seen to modify the plan.
- Refuses to follow the treatment plan as discussed......Investigate the underlying issue. Is the plan difficult to understand, too complication, require the client to make too many changes? Perhaps implementing the one change which would have the most impact on the client’s health concern would foster adherence.
- Does not use their new wheelchair and continues to use their old one, even though it is breaking down.....Engage the client in a conversation as to how the 2 chairs are different and why they prefer the older chair. Make changes as appropriate. Educate the client, and their family/supports as to why the new prescription is appropriate
- Books an appointment to seek advice, and then contradicts everything the health care provider recommends. Clarify the client’s goals and whether or not they are willing to make a change. Empower the client so they understand the impact they can have on their own health.

Summary and Recommendations

“Non-compliance” may actually be a symptom of a treatment plan which has not been designed in partnership with the client. The client factors, system factors and health care provider factors which may influence treatment adherence need to be identified and addressed with each client through open communication.

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When a Wheelchair is a Seat in a Motor Vehicle

Mary Ellen Buning, PhD

Today, clinicians need to know about the features that wheelchairs require in order to function safely within the transportation environment. Accessible public transportation, a primary area covered within the Americans with Disabilities Act (July 1980) creates access to the community for employment, healthcare, shopping and recreation. Accessible school bus transportation gets children who use wheelchairs to and from school (FMVSS 222, 1992 & SAE RP J-2249, 1996). Personal transportation vehicles can be modified in compliance with these same standards to secure both wheelchairs and their riders within a modified van. Each type of transit vehicle places different physical and performance demands on the wheelchair and its seated occupant.

Many wheelchair manufacturers have not developed WC19-compliant, crash-test wheelchairs with wheelchair integrated pelvic safety belts. They continue to label their products as “not for use as a seat in a motor vehicle” or “for securement of an unoccupied wheelchair only.” This situation calls for knowledgeable clinicians and suppliers who can advocate for clients who cannot transfer to vehicle seats with occupant restraints and who are willing to pressure policy and reimbursement streams.

This session will provide detail on the following:

- The feature set of the WC19-compliant, crash tested wheelchair along with resources for identifying currently compliant products and tools for increasing the demand.
- The 3 components of transit safety technology for a wheelchair seated passenger: 1) the WC19-compliant, crash tested wheelchair, 2) the four-point, strap-type or docking-type wheelchair securement systems, and 3) the three-point occupant restraint system.
- Resources for increasing your own knowledge, tools for developing presentations for bus drivers and wheelchair seated travelers or consumers, access to handouts, brochures and web addresses for client education.
- The current development of a RESNA position paper on the rationale for funding of the WC19-compliant feature on adult and pediatric manual and power chairs.

The RideSafe brochure, which follows, outlines the components of a transit safety system for a wheelchair-seated passenger. It is available as a PDF or as a print brochure at http://www.travelsafer.org/ . Crash videos, educational resources, frequently asked questions (FAQs) and a tool kit are available on the RERC website at http://www.rercwts.org/ .

For more information, contact:

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Augmentative and Alternative Communication (AAC) 101 The Basics for Success

Katya Hill, PhD

The client who doesn't use the new chair, and sits in the old wheelchair even though it is falling apart. The client who will not use the new cushion even though it will help manage their pressure sores. The client who complains that their wounds are not healing, yet refuses to follow the recommendations. These may be familiar examples of the "non-compliant" client. Unfortunately, the frustration clinicians feel may lead to discharge of these clients, rather than looking for ways to foster adherence.

Three general domains influence whether or not a client will adhere to the treatment recommendations: Client factors (such as whether or not they believe the treatment, recommendations are useful), Provider factors (such as whether or not we are satisfied with our jobs) and system factors (can the client afford to follow the recommendations). This workshop will explore how we can modify these factors to encourage clients to adhere to treatment plans and equipment recommendations.

Behind The Scenes- Things Clinicians Don't Know About Suppliers, But Should

Kay Koch, OTR/L, ATP

This is intermediate session, designed for clinicians, will shed some light on the rehab equipment cycle through the eyes of the supplier. Have you ever wondered what happens on the supplier's side after the equipment evaluation is over in your clinic? Have you wondered what the business side of the supplier looks like?

The work day of a CRTS/RRTS does not fall into the typical 8 hours. Often there are many things going on behind the scenes, like prior authorizations, finding the current physician for a signature, verifying a current address, and assembly of the new equipment from multiple manufacturers. Some clinics require the supplier to provide loaner wheelchairs that need to be assembled, fit and delivered. Often a home visit is required to ensure the access of the equipment recommended in the clinic. Some appointments require over an hour of driving to the home. This may be for a 15 minutes repair or adjustment.

The path from evaluation to delivery will be addressed. Multiple issues will be discussed on how the clinician and other team members play a role in this process even after the initial mobility and/or assistive technology evaluation. The critical features for successful justification letters will be reviewed. Lack of clear, concise medical justification for equipment is one of the biggest reasons why payers deny or delay approval of claims.

How understanding the funding source, its coverage requirements and coding for certain equipment is the responsibility of all team members involved with the evaluation. When products are denied there is not only the delay in providing the equipment, but often the supplier has to pay the manufacturer for the equipment before they receive funding from the payer source, as their equipment invoice may due. Some suppliers look to outside resources and consultants for assistance with these reviews.

Competitive bidding will also affect everyone, not only the supplier and the products available. This session will touch on this issue and how it might affect the rehab equipment delivery cycle.

There are many unbillable hours that go into providing rehab technology equipment. There is a real cost to providing the most appropriate technology that cannot be returned, yet the rewards are many. I hope this program will allow you to understand the rehab equipment delivery cycle from the supplier side.

Review of the purpose, use and content of the RESNA Position Papers on Wheelchair Seat Elevators & Standers

Julianna Arva, M.S., ATP

In Fall, 2005 the Rehabilitation Engineering & Assistive Technology Society of North America (RESNA) issued its first position paper regarding specific wheeled mobility and seating interventions. The first was on the application wheelchair seat elevators. By ISS 2007 at least one more paper, focusing on wheelchair standers, should be published, with more in development. These include but are not limited to: transportation, ultralight weight wheelchairs, tilt and recline, pediatric powered mobility. Any finalized and approved position paper is published on Resna's website.

A RESNA position paper is an official statement by the organization that, based on the consensus of experts, summarizes current research and best-practice trends in relevant areas. It may then serve to guide practitioners in the development and provision of interventions and further provide evidence based justification necessary to obtain funding for appropriate equipment.

These position papers are the first in the wheeled mobility and seating industry issued by an international professional organization declaring the medical and functional necessity of specific assistive technology devices. To have such statement is crucial for multiple reasons:

- It is the best summary of related scientific evidence currently available
- It adds "clinical evidence" in writing – which means when there is no research to back up a certain benefit yet clinical evidence suggests its appropriateness, now this is available as a professional statement from Resna
- It comprehensively reviews all benefits and disadvantages of these technologies based on a consensus of experts.

The position papers can be utilized in a variety of manners, including but not limited to:

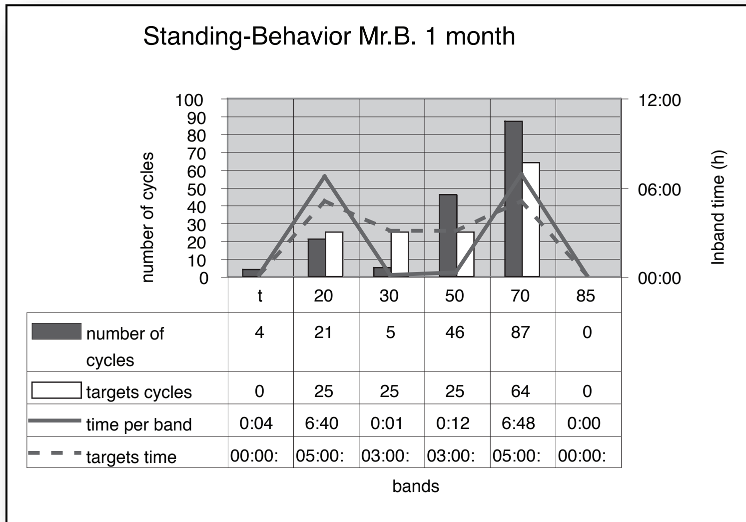
- As a teaching tool in colleges and universities
- As a teaching tool in the clinical setting, whether to help educate other team members or the client
- As support material to help obtain funding; the existing paper has been used on multiple occasions as back-up justification, and helped to overturn unfavorable decisions, even with funding sources with written policies excluding seat elevators.
- Help support lobbying efforts.

This session will present the RESNA position paper on Seat Elevators as well as Wheelchair Standers. In addition the development process for a RESNA position paper will be discussed. Finally, case examples of how the position papers have been utilized to overturn unfavorable funding decisions as well as to apply for coverage policies will be reviewed.

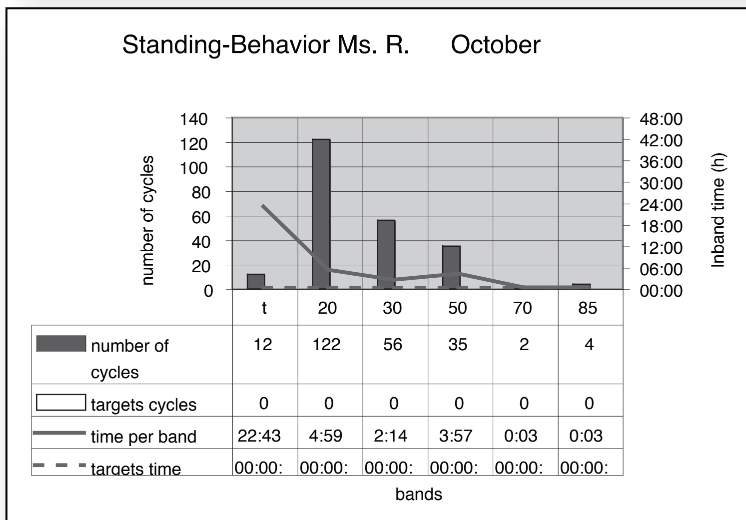
Quality of Life using Stand-up Wheelchair

Jürg Stoll, MSc PT

An increased Quality of life and improved functions in Activities of daily living are the major outcomes regarding wheelchair accommodation. Quality of life would be distinguished between daily activities, which are well described in the ICF (International classification of Functioning, Disability and Health) under the components Activities, Participation, Environmental- and Personal Factors (1), and Health related Quality of life which is depending on the individual state of health and restrictions because of secondary illness of wheelchair users. However, QOL can generally be defined as 'the value assigned to duration of life as modified by the impairments, functional states, perceptions, and social opportunities that are influenced by disease, injury, treatment and policy' (2).



Actual research shows a correlation between the presence or absence of secondary illness and Quality of life (3). In this investigation, secondary complications detected by the secondary complication questionnaire were compared with an adapted SF-12 questionnaire over a 2.5 year study period (4). The five most present complications (reported to be present more than 50% of the time), were leg spasms, leg joint stiffness, difficulty to cough, back pain and shoulder pain.



However, to reach or to obtain a high Quality of life, it seems to be helpful to influence healing or prevent secondary illness and their consequences. Different studies show an effect between verticalisation and less secondary complications (5, 6).

There is a lack of knowledge, regarding dose of verticalisation. For future research we need more information out of dose-response curves. For this reason, LEVO developed the LEVO monitor©.
To understand more about the effects of verticalisation and their consequences, there is a need for objective outcome measurement tools. The monitoring system measures, how many movements in which degrees of verticalisation the patient made. Such data is summarised per day and angle and can be stored over 2 years.

There are different levels of goals out of this measurement. For patients it is a training control over their daily verticalisation activity, for health care professionals it is a basis for an ideal communication with their patients to compare the activities with medical and functional benefits, and for scientists it is possible to measure the compliance from subjects into the study process.

Standing wheelchairs allow, integrating the needed daily dose of standing into the daily life activities. This is crucial for the motivation of patients to keep on with their individual verticalisation training over a long time.

In my presentation I will focus on the effects of verticalisation and standing on secondary complications and Quality of life. I will present different case reports with different verticalisation targets and standing behaviour. You will also get an introduction about the LEVO monitor© with data analysis and implementation of this knowledge into the daily practice.

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Evidence-Based Practice: The First Steps in Critical Review of the Literature

Teresa Plummer, MS, OT, ATP
Ann Eubank, OTR/L, ATP

Evidence-based practice promotes the collection, interpretation and integration of knowledge and begins with a critical review of the literature. The best evidence should be utilized to improve our clinical judgment, quality of care and future research. This session will assist in conducting a literature review, evaluating current literature and interpreting the findings as they apply to clinical practice. Evidence-based practice utilizes current research, therapist knowledge and client input to guide the intervention process. The concept of finding current research may be a daunting task to a novice. This course will present the fundamental steps to finding and utilizing current research.

This course will cover the basic strategies utilized to conduct a literature review using bibliographic data bases. Practical guidelines will be provided to assist the clinician in developing a clinical question to begin their literature search, as a first step in evidence-based clinical treatment.

The second step in developing an evidence-based clinical treatment is the literature review itself. This course will assist the clinician in conducting an internet based literature search. Current databases utilize key words to catalog their references. These keywords, also known as Medical Subject Headings (MeSH) are fundamental in utilizing greater precision to ascertain the most appropriate sources for a literature review. A review of how to determine MeSH terms will be presented.

Interpretation of research findings requires a basic knowledge of research methodologies. This course will provide a review of various research methodologies to aide the clinician in selecting the most appropriate and grounded literature. This step of critically reviewing literature requires a brief review of "levels of evidence" and will be discussed.

This course is designed for clinicians who are interested in evidence-based practice as a means of developing greater knowledge of current research, enhancing their interventions and skills. Additionally, this course is intended to assist clinicians in developing letters of medical necessity based on current research.

Whole-Body Vibration and Power Wheelchairs

Erik J Wolf, PhD

An extensive amount of literature exists that describes the detrimental health effects of populations exposed to whole-body vibrations (WBV) while in seated positions. These effects range from motion sickness, to muscle fatigue, to chronic low-back pain and musculoskeletal disorders.

Power wheelchair users are part of this population, however little research has been conducted to assess the amounts of WBV experienced by users or to determine if WBV exposure levels are potentially harmful.

The purpose of this study was to examine whole-body vibration during power wheelchair driving over an obstacle course to evaluate the extent of WBV exposure, and the possibility of secondary injury due to WBV exposure.

Twenty able-bodied subjects were recruited and tested two suspension powered wheelchairs: the Quickie S-626 and the Invacare 3G Torque SP. Both wheelchairs were tested with their suspension and with a metal insert to simulate a non-suspension power wheelchair. Subjects were asked to drive over an obstacle course consisting of six obstacles: deck surface, simulated door threshold, 2 inch curb descent, dimple strip, smooth tile surface, and carpet. Vibrations were measured at the seat below a standard foam seat cushion.

Results showed that suspension in powered wheelchairs reduces the amount of WBV during driving. The suspension settings in both the Invacare and the Quickie were significantly lower than the metal insert settings; however the reduction may not be enough to reduce the possibility of secondary injury.

The ISO 2631-1 Standard on Human Vibration defines an exposure limit that defines the amount of vibration that can be endured without the possibility of injury. As time of exposure increases the amount of tolerable vibration decreases, which is especially significant for power wheelchair users because of long exposure times. Future research should focus on collecting vibration data from power wheelchair users over extended periods of time.

A Biomechanical Analysis to Derive Pelvic Tilt from Seating Forces

Paul van Geffen, PhD Candidate
Bart H.F.J.M. Koopman, PhD
Peter H. Veltink. PhD

Abstract

Background: Among wheelchair dependent patients, a poor sitting posture is often seen which contributes to all kinds of physical problems during long term sitting. Because pelvic tilt is crucial for the adopted sitting posture the possibility to derive pelvic tilt from seating forces was investigated by means of a biomechanical analysis. Methodology: Pelvic angle was estimated based on equivalent 'two-force member' loading in which segment orientation equals force orientation. The equivalent contact force under the tuberosities were determined and successively compensated for pelvic mass, hip force and passive lumbar torque. Subsequently, equivalent force directions were calculated and compared with pelvic angle. Findings: Situations of minimal lumbar torque seemed an important condition for the possibility to derive pelvic tilt. Interpretations: Measuring seating forces seems useful to derive pelvic tilt and to individualise and control chair adjustments for wheelchair dependent patients.

Background

Among wheelchair dependent patients, a poor sitting posture is often seen [1] which contributes to all kinds of physical problems during long term sitting [2-4]. The inability to reposition implies that adequate variation in sitting posture can only be realized by changing the configuration of the chair. Important factors defining sitting posture are the orientation of the trunk, pelvis and thighs. Especially pelvic tilt is crucial for the adopted posture [5-8]. Contrary to pelvic tilt, desired thigh and trunk orientations can easily be invoked by proper adjustment of the seat and back support. For proper pelvic tilt however, information about the pelvic angle is needed. Gravitational forces of the upper body are guided through the pelvis to the seat and a relation between the pelvic tilt and seating forces is expected [9, 10]. When this relation is predictable, it might be possible to estimate pelvic tilt from seating forces and use this information to control sitting posture. The objective of the present study is therefore to investigate the possibility deriving pelvic tilt from seating forces by means of a biomechanical analysis.

Methodology

In figure 1A, a schematic representation is shown of an adopted sitting posture. Supporting the trunk just above the lumbar spine makes the pelvis function as the foundation for trunk support guiding gravitational forces of the upper body to the seat. Other forces exerted on the pelvis are the pelvic gravitational force and an extra force component in the hip joint exerted from the thighs. The individual pelvic segment including external forces acting on the pelvis is reflected in figure 1B. A passive joint stiffness was introduced for a limited range of lumbar motion [11]. The estimation of pelvic tilt (α) is based on 'two-force member' loading [12] in which segment orientation equals force orientation (figure 1C). A rigid body model was developed to derive F_{eq} for different ranges of pelvic angle (α), trunk angle (β) and thigh angle (γ). Analysis was done for an average male subject (length = 1.80 m, mass = 80 Kg). Static equations of equilibrium for the individual body segments were determined and the equivalent force angle (ψ_{eq}) was calculated for different ranges of α (15° – 55°), β (12°, 24° and 36°) and γ (0°, 12 °, 24° and 36°). The individual influence of the hip force, pelvic mass and lumbar torque on the force angle (resp. ψ_1, ψ_2, ψ_3) was also investigated.

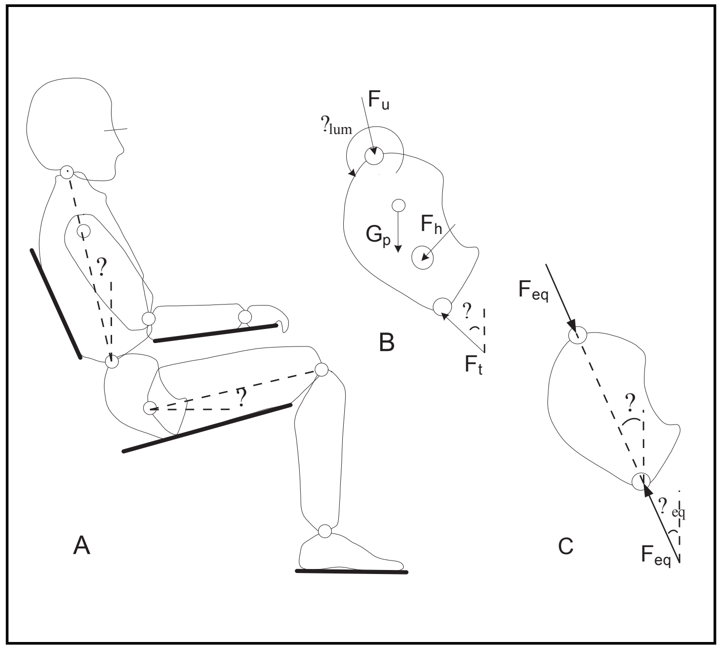
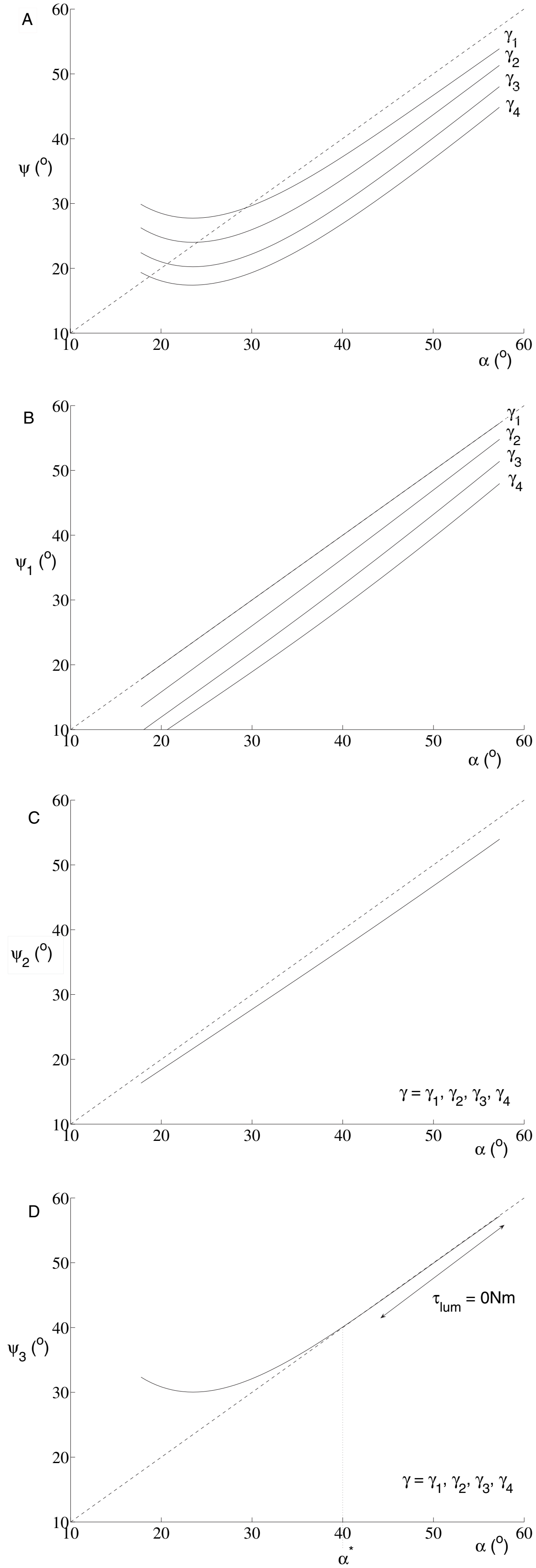


Figure 1. **A**: adopted sitting posture in which the trunk and thigh angle are defined as β and γ **B**: individual pelvic segment including external forces and the contact force angle (ψ). **C**: equivalent two-force member loading in which pelvic angle (α) equals the equivalent force angle ψ_{eq}.

Findings

Figures 2A-D show respectively ψ, ψ_1, ψ_2, ψ_3 for different ranges of α and γ when β was set to 24°. The oblique dotted lines refer to the situation when ψ_{eq} equals α. In figure 2A it is shown that ψ is greatly dependent on both α and γ and that therefore it is not possible to estimate α only from F_t. In figure 2B it is shown that different values of γ (γ_1 – γ_4) influenced F_{hip} and resulted in an offset difference. Compared to the oblique dotted line, figure 2C showed a small slope difference which was caused by the influence of pelvic mass. Contrary to a relatively small influence of pelvic mass, a significant influence of lumbar torque was shown in figure 2D. However, a range of minimal lumbar torque ($\tau_{lum} \approx 0$ Nm) is also shown in which ψ_3 equals ψ_{eq}. Minimal pelvic tilt within the range of minimal lumbar toque was defined as α^* and is reflected in figure 2D. So far, analysis was done in the situation that β was set to 24°. To investigate the influence of β, ψ_3 was also derived for different values of β (figure 2E). It is shown that changing β relative to α influenced τ_{lum} and resulted in different values of ψ_3 and also different ranges of minimal lumbar torque. To assure minimal lumbar torque, a limited lumbar angle (λ^*) must be preserved which could be defined as the difference between α^* and the specific β.



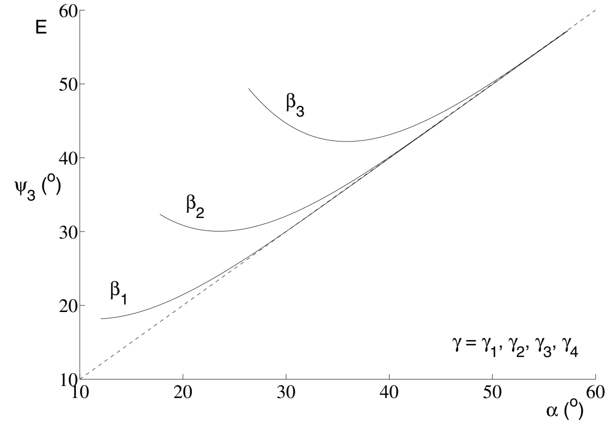


Figure 2. **A-D** show respectively ψ, ψ_1, ψ_2, ψ_3 for different ranges of α and γ when β was set to 24°. The oblique dotted lines refer to the situation when ψ_{eq} equals α. In figure **D**, range of minimal lumbar torque ($\tau_{lum} \approx 0$ Nm) is shown and it is reflected how α^* was derived.

Interpretations

The estimation of pelvic tilt was based on equivalent 'two-force member' loading in which segment orientation equals force orientation. The analyses showed a significant influence of lumbar torque on the possibility to derive pelvic tilt. Since knowledge about pelvic angle is needed for estimating lumbar torque, logically it is only possible to derive pelvic tilt when the presence of lumbar torque is prevented. It was shown that the introduced passive joint stiffness resulted in a range of minimal lumbar torque which is an important condition. To assure this condition, a limited lumbar angle (λ^*) must be preserved at all times. For clinical application, a concept for independent pelvis control in combination with the possibility to estimate hip force are essential to derive pelvic tilt from seating forces. Translating the seat in ventral-dorsal direction affects the orientation of the pelvis and can be used to control pelvic tilt. Hip force can be estimated by measuring the contact force under the thighs independent from the contact force under the tuberosities. A translating seat with force sensors in the front and back part of the seat satisfies the criteria of pelvic control en independent force measurement. Furthermore, to preserve the limited lumbar angle, assuring minimal lumbar torque, excessive seat translations must be coupled to back support tilt. Although experimental validation is necessary, measuring seating forces seems useful to derive pelvic tilt and to individualise and control chair adjustments for wheelchair dependent patients.

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An Experimental Analysis to Derive Pelvic Tilt from Seating Forces

Paul van Geffen, PhD Candidate
Bart H.F.J.M. Koopman, PhD
Peter H. Veltink. PhD

Abstract

Background: Among wheelchair dependent patients, a poor sitting posture is often seen which contributes to all kinds of physical problems during long term sitting. Because pelvic tilt is crucial for the adopted sitting posture the possibility to derive pelvic tilt from seating forces was experimentally analysed. Methodology: An adjustable and instrumented wheelchair was developed to analyse seating forces for different sitting postures. Contact forces on the front and back part of the seat were measured independently and mechanical analyses were done to calculate internal joint forces and torques. Based on equivalent 'two-force member' loading, pelvic tilt was estimated from the direction of the equivalent contact force under the tuberosities. Findings: A significant correlation between the equivalent force angle and pelvic tilt was shown. Furthermore, the presence of a lumbar extension torque was found for the total range of pelvic tilt. Interpretations: Previous study (part 1) concluded that minimal lumbar torque was necessary to derive pelvic tilt. Present results however, did not satisfy these criteria. It was suggested that healthy subjects used active trunk muscle control as an important mechanism involving comfort issues such as lumbar spine stabilisation and decubitus prevention. Elaborated experiments among patients with limited trunk muscle function are therefore necessary.

Background

Among wheelchair dependent patients, a poor sitting posture is often seen [1] which contributes to all kinds of physical problems during long term sitting [2-4]. The inability to reposition implies that adequate variation in sitting posture can only be realized by changing the configuration of the chair. Important factors defining sitting posture are the orientation of the trunk, pelvis and thighs. Especially pelvic tilt is crucial for the adopted posture [5-8]. Contrary to pelvic tilt, desired thigh and trunk orientations can easily be invoked by proper adjustment of the seat and back support. For proper pelvic tilt however, information about the pelvic angle is needed. In part 1, a biomechanical analysis to derive pelvic tilt from seating forces resulted in a method to individualize chair configuration. Although the conclusions seemed promising, experimental validation was essential and is therefore the main objective of the present study.

Materials and Method

Experiments were done with an instrumented wheelchair (IBIS Comfort Wheelchair) with build-in force sensors (ATI mini 45, ATI Industrial Automation, NYC, USA) in the front and back part of the seat (figure 1A/B). Different sitting postures could be imposed by changing the configurations of the seat, back support and footrests (figure 1A). Kinematic body and chair data were obtained using a six-camera VICON motion capturing system. Reflective markers were placed on the body and chair to determine the hip joint centre (HJC) [9], lumbar 'joint' centre (LJC), pelvic tilt (α), trunk angle (β), thigh angle (γ), seat angle (φ) and back support angle (ε). The global contact force and centre of pressure on the back part of the seat (F_b and cop_b) and front part of the seat (F_f and cop_f) were calculated and static equations of equilibrium for the pelvis and thigh segments were used to derive the internal lumbar and hip joint forces and torques. In part 1, it was already shown how pelvic tilt could be derived from the equivalent contact force angle (ψ_{eq}) in case of equivalent 'two-force member' loading (figure 1C/D). Various sitting postures, imposed by different configurations of the seat and back support, were analysed in the sagittal plane. Subjects (n=6) were asked to keep their arm folded and adopt a passive sitting posture to prevent redundant active trunk muscle control. Force angle (ψ), equivalent force angle (ψ_{eq}) and lumbar torque (τ_{lum}) were calculated.

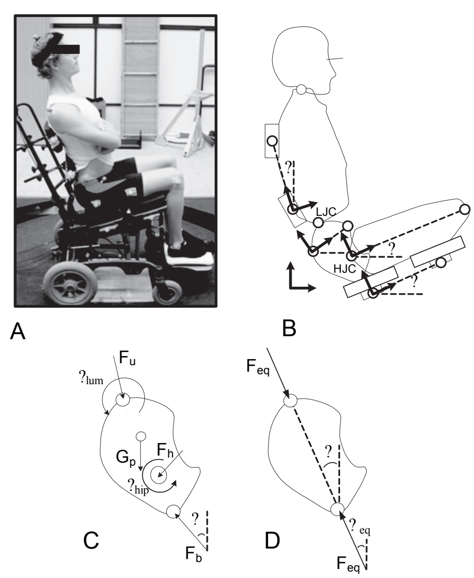
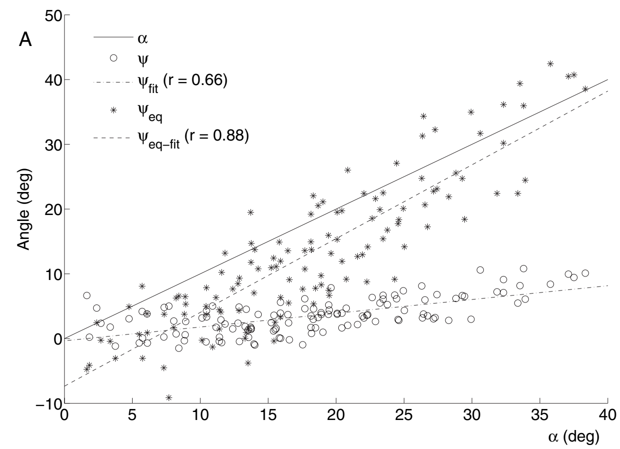


Figure 1. **A**: Experimental setup. **B:** Body and chair angles derived from the reflective markers. **C**: individual pelvic segment including external forces and the contact force angle (ψ). **D**: equivalent two-force member loading in which pelvic angle (α) equals the equivalent force angle ψ_{eq}.

Findings

The force angle (ψ) and the equivalent force angle (ψ_{eq}) are shown in figure 2A. For both variables, a linear fit (resp. r = 0.66 and r = 0.88) reflects the relation with pelvic tilt (α). The solid line refers to the situation when the measured force angle equals α. A relatively small influence of α on ψ is observed meaning that it is not possible to estimate pelvic tilt direct from the contact force under the tuberosities. For ψ_{eq} however, a more significant relation is shown. Figure 2B reflects the presence of lumbar torque for the total range of pelvic tilt. Both α and τ_{lum} are expressed as a percentage of its maximum. Interestingly, for the total range of pelvic tilt an extension torque was observed mainly.



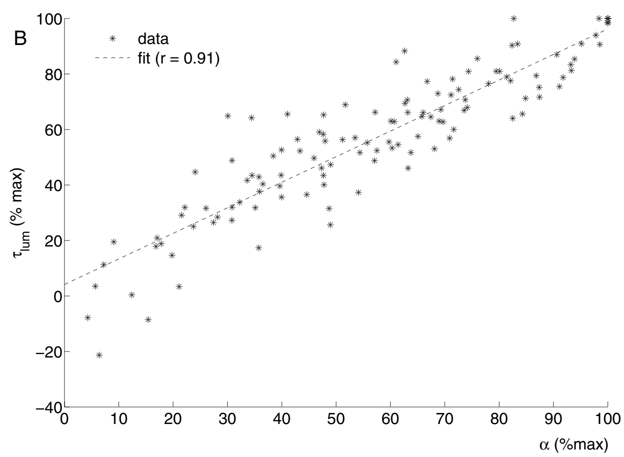


Figure 2. **A**: Positive correlations between pelvic tilt (α) and both the contact force angle (ψ) and the equivalent force angle (ψ_{eq}) are shown (resp. r = 0.66 and r = 0.88). **B:** for the total range of pelvic tilt (α) a positive correlated (r = 0.91) extension torque (τ_{lum}) was observed. Both α and τ_{lum} are expressed as a percentage of its maximum.

Interpretations

In the present study, the possibility to derive pelvic tilt from seating forces was experimentally analysed. Since the presence of lumbar torque greatly influences contact forces on the seat and that knowledge about pelvic angle is needed for estimating lumbar torque, it was assumed that situations of minimal lumbar torque are essential to derive pelvic tilt. A positive correlation is observed between pelvic tilt and the equivalent force angle. However, minimal lumbar torque was only present in situations of maximal pelvic anterior tilt indicating that excessive lumbar lordosis must be performed. Contrary to the implemented passive lumbar spine stiffness in the first study (part 1), these results do not show a range of minimal lumbar torque. Possible explanations could be that healthy subjects use their trunk muscle function involving comfort issues such as lumbar spine stabilisation and decubitus prevention. The mechanism preliminary to the development of pressure ulcers is the response of the body surface to the direction, magnitude and distribution of seating forces. Although, the exact physiological process remains unclear, researchers agree that the problem is directly related to the presence of sustained mechanical loading on skin and underlying tissue with high shear forces in particular [10]. Since lumbar torque greatly influences seating forces, shear forces can be regulated by actively control the amount of lumbar torque. This is supported by the fact that only little variation in ψ is observed indicating minimal shear forces under the tuberosities. Although it seems difficult to derive pelvic tilt for healthy subjects, among patients with limited postural stability however, it might still be possible since no trunk muscle function is present. Elaborated experimental studies among wheelchair dependent patients are therefore necessary to investigate the possibility deriving pelvic tilt from seating forces and for a better understanding in possible mechanisms involving seating comfort.

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Saturday, March 10, 2007

Adaptive Sports: Professional Roles in Supporting Athlete Participation and Performance

Kendra Betz, MSPT, ATP
Rory Cooper, PhD
Ian Rice, OTR/L
Brad Dicianno, MD

Objectives:

Upon completion of this 3 hour session, participants will gain knowledge and skills surrounding:

1) *Sports opportunities available to individuals with disabilities and role of sports in rehabilitaton*
2) *Considerations for equipment selection and training techniques*
3) *Presentation and treatment of sports related injuries*
4) *Seating interventions for adaptive sports equipment*
5) *Variations in sports equipment technologies via hands-on learning lab*

Part 1: Recreation Technology: Opening a World of Opportunity
Rory A. Cooper, PhD, FISA/PVA Chair and Distinguished Professor, University of Pittsburgh

Sports and Recreation are Important Modalities of Rehabilitation
- The more life is filled with things that interest us, the higher our satisfaction with our quality of life (Kielhofner, 1985).
- Since these volitional factors influence choice about action and behavior they have a key role in enabling an individual to adapt to disability and re-engage in life (Kielhofner, 1985).

Why Encourage Exercise?
- Learn confidence
- The Need For Exercise Alternatives
  Nearly 49 million Americans with disabilities (Jassen 1994)
  Need in disability population (Rimmer 1996)
  CVD Leading Cause of death (Kennedy 1986)
  Activity levels decrease after SCI
  Daily WC propulsion does not maintain fitness (Janssen 1994, Sedlock 1990)

Acceptance and Inclusion
- Recreation is a valuable strategy for inclusion in activities that are culturally valued (Buning, 1996).
- Sports and recreation creates an arena for continuing the gains of medical rehabilitation:
- challenging personally held ideas about disability and handicap
- testing out a new self-concept that includes acceptance of disability (Schlein et al., 1997)

Sports and Recreation Opportunities
- Lack of opportunity and information about adaptive fitness make it more likely that these same individuals will fall to the negative health consequences of inactivity, repetitive strain injury and obesity (Taylor et al., 1998, Rimmer et al., 1996, Heath and Fentem, 1997)

General Fitness and the Non-Elite Athlete
- Barriers to Exercise: Physical and Psychological
- Barriers Experienced by Able-Bodied
- Availability of Programs & Equipment
- Transportation & Accessibility barriers
- Functional & Physiologic Limitations (Cardio-respiratory system)
vPsychological (Depression)

National Veterans Wheelchair Games
- Started in 1981 at the Richmond, VA Medical Center.
- Largest annual wheelchair sporting event: 550-600 participants each year

National Disabled Veterans Winter Sports Clinic – Skiing & other sports
- Largest ski clinic in the world: 338 participants and 180 instructors in 2006
- Promote rehabilitation and reintegration byovercoming emotional, mental and physical challenges
- Allow every participant to experience success
- Broad array of equipment available, and constant development; fitting and modification on-site

Social Interaction and Athlete Development
- Sports build a sense of confidence and acceptance of disability (Cooper, 1990)
- Teamwork provides opportunities for learning about abilities and adaptations on and off the court.

Paralympic Movement
- The Paralympics, affiliated with the Olympics, offers the ultimate adaptive sports competition.
- Paralympic movement has had a positive impact on the perception of society regarding people with disabilities (Steadward and Peterson, 1999).

Paralympic Games
- International Paralympic Committee http://www.paralympic.org
- 26 Sports

Adaptive Sports Classification Systems (Cooper et. al. (2005)

- Able bodied athletics classification
- Age
- Weight
- Gender
- Professional /amateur
- Athletes with disabilities classification
- Same as listed above
- Ability/disability characteristics
  (a) nature and severity of the athlete's disability;
  (b) athlete's functional ability to perform skills associated with the sport; AND/OR
  (c) athlete's performances in previous competitions.

Sport and Recreation Across the Life-Span

- Sports can improve cardiovascular fitness among PWD. (Cooper et al., 2001)
- Opportunities for healthy sport and recreation are expanding (slowly)
- Adapting healthy life-style including activity is important. (SCI Clinical Practice Guidelines, 2005)

Part 2: Equipment and Training Considerations

Ian Rice, OTR/L, PhD Candidate, University of Pittsburgh

Athlete preparation for sports begins with everyday wheeling

- Efficient propulsion is impacted by wheelchair configuration, body positioning, conditioning
- Semi-circular wheelchair propulsion pattern corresponded with reduced stroke frequency, more time spent in push phase, more efficient (Boninger et al., 2002)

Key Elements of Chair Configuration

- Vertical Axle Position
- Rear Axle Fore-Aft Position
- Back rest / Foot rest
- Camber
- Seat Angle (Drop or Dump)

Rear Axle (Seat) Height

- Seat too high reduces pushrim contact angles, stroke frequency, efficiency, shoulder ROM

Rear Axle Fore-Aft Position

- Forward axle

- Lower stroke frequency to maintain the same speed
- Less rapid loading of the pushrims
- Increases push angle
- Reduces rolling resistance
- Accelerate more quickly
- Enhances mobility
- decreases: turning radius, downhill turning tendency, and castor flutter
- Facilitates popping wheelies and climbing curbs
- May help prevent injury

Pushing the Limits: Wheelchair Racing

- Huge push angle
- Solid hand contact
- Chair fits the body like a shoe fits the foot
- Aerodynamic positioning extensive shoulder extension and abduction during the back swing lead to increased hand speed at the impact energy transfer phase
- Camber increases stability and allows the athlete to reach the bottom of the push rims without hitting the top of the wheels or push rim

Racing vs. Everyday Stroke Contrast

- Push angle
- Maximize proportion of time spent in propulsion (PSP)
- Get a free ride off the push ring
- Hand speed

Contact

- Contact angle and friction between the glove and pushrim influence the efficiency of transferring energy from the body to the wheelchair. Speed of the hand and the pushrim must be coordinated.
- Hand speed must be greater than the pushrim speed in order to apply maximum impulse
- Consider glove variations

Positioning

- Gender
- Elevated Knees
- Breathing
- Balance

Supporting the Novice Athlete

- Goal oriented sports participation:
  diagnosis & prognosis directs activity options
- Provide education
- Travel
- Equipment management
- Safety
- Commitment to competitive sports
- Time, money, energy, etc.

Benefits of Sports Participation – Ian's Experience

- Developed extreme understanding of equipment fit, body, travel, living, independence, etc.
- Accelerates adaptive process – physically and psychologically
- Emphasis on ability not disability

Part 3: Injuries in Adaptive Sports

Brad Dicianno, MD, Assistant Professor, Medical Director, Center for AT, University of Pittsburgh

Training: what is known

- Athletes rely on each other
- About 2 hr/d, 4 workouts/wk, 40-60 mi/wk
- 2 weight training sessions/wk
- Elite: 1 hr/d, 7 workouts/wk, 70 mi/wk
- Few have regular stretching routines
- Seasonal schedules
- Most believe performance not related to weight

Cardiopulmonary Issues in SCI

- Large diameter muscle atrophy
- Paralysis of trunk musculature
- Diaphragmatic fatigue
- Reduced aerobic capacity
- Lower Ventilation (L/min) and VO2 Max (ml/kg/min)
- Decreased CV response to exercise
- Decreased BP (or pulse)
- Decreased CO
- Impaired shunting of blood to muscles
- Impaired Temperature regulation

Autonomic Considerations in SCI
- Impairments of
  - thermoregulatory capacity
  - sweating below the level of the lesion
- Athletes sometimes voluntarily induce autonomic dysreflexia (boosting)
  - increased oxygen utilization in the boosted state

WC Athletes vs. WC Non-athletes
- Fewer Physician visits
- Trend toward fewer
  - Medical complications
  - Hospitalizations

Acute Injuries
- Shoulder = 57%
- Sprains, strains, tendonitis, bursitis, etc.
- Lasts < 1 wk
- Blisters, lacerations
- Track, Road Racing, Basketball
- Increased # sports
- Increased training hrs/wk
- No greater risk for acute injuries than athlete without disability

Repetitive Strain Injuries
- Shoulder pain 31-73%
- Prevalence of CTS in WC athletes & WC non athletes 49-73%.
- Risk of ulnar n. injuries in weight training

Biceps Tendonopathy
- Tendon width evaluated by U/S
- Before and after WC rugby
- Increased width in heavier athletes
- Increased fluid in tendon post game

Collaboration on Upper Limb Pain in SCI (CULP-SCI)
- Traumatic SCI T2 and below
- Kinematic and Kinetic analysis of propulsion
- Nerve Conduction Studies
- Shoulder MRIs and Xrays

Force
- Athlete Weight related to force needed to propel (increases rolling resistance)
- Pushing with greater force = worsening median n. amp and latency
- Median latency worsens over time
- WC propulsion can require 70 N (Compare to 39 N in RSI)
- 50 kg cutoff for RSI (Weight of athlete + chair >>50kg)

Cadence
- Increased Push Frequency = lower median amplitude
- Decreased Push Frequency = greater wrist ROM = preserved median and ulnar amplitudes

  Some studies refute this
  - 1 Stroke/s vs. 1 Rep/30 s

    WC use 16 min/d vs. worker 8 hr/d

Recovery Patterns
- Semicircular Pattern

- Lower cadence
- More time in recovery
- uses more of pushrim
- *However, 6% decrease in efficiency

Wheelchair Setup
- Lightweight, better quality
- Axle Position
  - Forward with respect to shoulder
  - Decreased cadence, decreased rate of rise of force, increased push angle
  - Decrease distance between axle and shoulder
  - Greater push angle, force distributed over larger part of pushrim, decreased cadence

    *Avoid excessive abduction of shoulder
- Seat Height
  - Elbow flexed 100 to 120 degrees w hand on pushrim
  - OR Fingertips at center of hub

Athlete factors
- Weight
  - Correlated with # of Shoulder Xray and MRI abnormalities, related to median nerve injury
- Females more likely to have shoulder injury progression on MRI

When and where do injuries occur?
- during everyday activities: w/c propulsion, transfers, upper extremity tasks
- during sport participation: falls, skin compromise, improperly fit equipment

Sports Injury Treatment

Treating Thermal Irregularities
- Hypothermia: remove wet clothing,foil blankets DO NOT work, warm water compresses
- Hyperthermia: remove clothing, axillary temperature, cool water spray

Treatment & Prevention of Injury
- (Relative) rest, Ice, NSAIDs
- Warm Up/Cool down
- Hydration
- Tobacco, EtOH, diet
- Weight reduction
- Axle Position
- Propulsion Technique
- Diversify Athletic Training

Training
- Aerobic: Inspiratory Training 30 min/d
- Flexibility
- Endurance: Training for distance, e.g. 5K, Interval training—sprint, reduce speed, sprint, etc.
- Speed—reaction time, plyometrics
- Skill--specificity
- PeriodizationL Encourage peak performance right before season, divide the yr into intervals

Strength Training
- Anterior deltoid, triceps, pecs
- Large areas of fast twitch in deltoids
- Altered eccentric/concentric shoulder imbalances

You as the Coach
- Long, smooth propulsive strokes
- Keep elbow high at top of stroke

- Use as much of the pushrim as possible
- After pushrim release, let the hand drift below the pushrim
- Move axle higher and forward
- Avoid weight gain
- Diversify Training

Part 4: Seating Interventions for Adaptive Sports Equipment
Kendra Betz, MSPT, ATP, VA Puget Sound Health Care System

Why Provide Seating Interventions for Sports Equipment?
- Performance
- Comfort
- Postural Support
- Skin protection
- Joint preservation

Sports Equipment Utilized depends on . . .
- Specific event – equipment varies significantly for each sport
- Athlete goals for participation – recreation vs. competition
- Athlete experience – novice vs. accomplish
- Position on court / specific event
- Athlete classification
- Individual preferences

Professional Support for Athletes
- Understand specific features inherent to sports equipment
- Understand biomechanical movement patterns required for identified sport
- Provide support to optimize the athlete's success (i.e. Seating Interventions)

Seating for Sports: Comprehensive Evaluation Necessary
- Interview
- Medical background
- Physical Assessment
- Functional Evaluation
- Social Support
- Environmental Profile

Physical & Functional Evaluation Relative to Adaptive Sports
- Comprehensive mat evaluation: size, range, strength, tone, posture, skin inspection
- Functional skills: balance, coordination, transfers, sport specific skills
- Observe performance during the sport: live performance ideal; best simulation at minimum
- Recognize required seated position varies for most sports - different than seated position in w/c

Understand Seating Technologies Available for Sports
- Must specifically address the interface of seating supports with the sports technology
  - Standard products, partially customized products, highly custom products

Mobility Skills Associated with Adaptive Sports
- Transfers to/from sports devices
- Sport specific skills and techniques
- Equipment management
- Travel skills

Adaptive Sports Clinic: Program Development
- Interdisciplinary participation
- Comprehensive client evaluation & assessment
- Equipment trials essential
- Prescription of equipment with customization as needed
- Support/encouragement for goal oriented participation – provide resources
- Investigate funding options

Seating for Sports Equipment Case Studies
- Performance, comfort, postural support, skin protection, joint preservation
- Several case studies representing different sports will be utilized to demonstrate key points

Part 5: Adaptive Sports Live Clinic – Hands On Learning with Equipment

* A comprehensive list of references & resources will be provided at the session on Saturday.

Lower Extremity Edema Management Essentials

Mary Jo Geyer, PhD, PT, FCCWS, CLT-LANA

Objectives for Instructional Course:

After participation, the learner will be able to:

1. Briefly describe the anatomy & physiology of the lymphatic system and it's relationship to the vascular system

2. Explain the mechanisms regulating interstitial fluid balance and the causes of peripheral edema and lymphedema

3. List the primary factors that contribute to peripheral edema and l ymphedema in wheelchair-dependent individuals

4. Describe the key distinguishing features that are critical to the differential diagnosis of lower extremity lymphedema

5. Identify the components of the definitive treatment of lymphedema and their rationale as well as the indications, contraindications and precautions for treatment including interpretation of selected tests and measures

6. Demonstrate a basic understanding of the principles of compression therapy and the various methods available to reduce and retain lower extremity edema and lymphedema

7. Identify effective multimodal therapeutic interventions for management of wheelchair-dependent individuals with lymphedema and/or other forms of lower extremity edema

Methodology:

A case-based, interactive presentation style along with hands-on training in various compression therapy techniques will be used to enhance audience participation and develop clinical reasoning skills. Patient cases will be presented to encourage the audience to actively test their acquired skills in avoiding potential complications and selecting appropriate therapeutic interventions.

Session Description:

Clinicians frequently fail to appreciate the dynamic physiological forces governing tissue fluid balance and the central regulating role of the lymphatic system. An understanding of the lymphatic system is crucial to the differential diagnosis of lower extremity edemas. Distinguishing edema from lymphedema is important because treatment of the two conditions is different. Evidence supports the view that over time chronic inflammation and increased lymphatic load may lead to failure of the lymphatic system resulting in lymphedema1-7. Sequelae include an increased risk of infection and/or an increase in the amount of edema, factors that can only magnify the underlying impairments and functional limitations of individuals who rely on wheelchairs as their primary means of mobility.

This evidence-based instructional session will provide an overview of lymphedema including the following: lymphatic and relevant vascular anatomy, incidence and prevalence, known causes, signs & symptoms, common tests, clinical course, differential diagnosis, risk/predisposing factors, staging, prognosis, pathophysiology and current management. Following the didactic portion of the session, methods for assessment and multimodal management of edema and lymphedema will be presented in a hands-on lab format including the components of a lower extremity vascular exam, compression bandaging, compression garments and alternative devices.

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What's Hot and What's Not

Adrienne Falk Bergen, PT, ATP/S

The exhibit hall is a favorite intellectual watering hole where participants come to gather and ogle at all the new "stuff" from the manufacturers. It's a chance to poke around and pick apart equipment that may soon be part of an evaluation or report. There never seems to be enough time to peruse all of the fine equipment, and invariably that "show stopper" that everyone is talking about, is somehow missed.

This presentation will highlight the finest and even a few of the "huh?" mobility and seating fare. How to look at and analyze products will be infused within the format.

Pathophysiology of Specific Impairments and Disabilities: Common Technology Interventions

Brad E. Dicianno, MD

A comprehensive Assistive Technology (AT) assessment should always include a multidisciplinary team of clinicians who can assess the individual needs of the consumer and prescribe a device that meets not only his or her medical needs but also suits the individual's and family's lifestyle1. Without a proper clinical assessment, many medical issues that may affect AT prescription, acceptance, and overall health of the individual may be ignored.

Recently published clinical practice recommendations describe the importance of a comprehensive evaluation and its medical necessity2. The appropriateness and adequacy of the prescribed device is a function of its quality and customizable features3-6. Improper wheelchair configuration is a risk for accidents and secondary complications like repetitive strain injuries, skin breakdown, and pain1, 2. Configuration is important, regardless of disability. Yet, individuals have unique sets of medical problems, depending on their diagnosis and unique set of medical problems. Therefore an understanding of the medical issues surrounding a person's diagnosis is of utmost importance. Additionally, as individuals with certain diagnoses age, physical dependence often increases and medical needs change; hence, a proper understanding of prognosis is also important7.

The purpose of this lecture is to give an overview of some of the most common diagnoses seen in AT clinics and what medical problems associated with those diagnoses may need creative or unique AT interventions.

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The Need for Supplier Standards to Improve Quality and Appropriateness of Medical Equipment

Faith Saftler Savage, PT, ATP

The Medicare Modernization Act 2003 requires suppliers of DMEPOS (durable medical equipment, prosthetics, orthotics and supplies) and other items and services to comply with quality standards established by the secretary. CMS was in charge of the development of the standards. They hired Abt Associates Inc. to assist with writing the standards. The goal of the standards was to improve the quality of equipment being provided to Medicare recipients; to prevent fraud and abuse; and to use the standards in a competitive bidding program.

The challenges in developing quality standards were numerous and included:

- Complexity of home care
- Multiple needs of beneficiaries
- Need for integration of services
- Various sizes of supplier businesses
- Operation of capable, compliant, financially viable home care businesses
- Multiple locations and chains
- Personnel qualifications
- Limitations of accounting personnel and computer systems

Expected impact on the consumer would be to:

- Improve access to information/education
- Facilitate improved customer service
- Provide assurance that equipment is appropriate to medical need
- Provide assurance that equipment is of high quality
- Improve prompt delivery
- Provide assurance that conditions in home are appropriate and safe for equipment
- Improve education and training in use of equipment
- Provide guidance for follow-up

The requirements of the quality standards needed to be:

- Pertinent to beneficiary service quality
- Pertinent to supplier specialization
- Pertinent to Medicare requirements
- Able to meet the needs of accreditation

Early drafts of the standards included checklists and detailed written instructions. In September 2005, the first full draft of the standards was presented to the PAOC committee and made available for public comment. The standards were divided into 2 sections; business quality standards and product-specific service quality standards.

The business quality standards had 8 domains and covered business issues that were relevant to all companies involved with DMEPOS and included the areas of:

- Administration
- Financial management
- Human resource management
- Beneficiary services
- Performance management
- Equipment and safety
- Beneficiary rights and ethics and information management

The product-specific service quality standards covered 14 areas and were additional requirements needed based on particular products provided by a supplier. These included:

- Oxygen and oxygen equipment
- Invasive mechanical ventilation therapy
- CPAP and Bi PAP
- Intermittent positive pressure breathing (IPPB)
- Power wheelchairs
- Manual wheelchairs
- Diabetic equipment and supplies
- Customized orthotics and prosthetics
- Enteral nutrition therapy
- Electric and manual hospital beds
- Support surfaces
- Walkers, canes and crutches
- Commodes
- Bedpans and urinals

This group of standards covered preparation and inspection, delivery/set-up, training/education of beneficiary and caregiver(s), and follow-up. Since this was product specific, specific companies would comply with the specific products that they were involved with only. Public comments and PAOC committee comments were extensive and taken into consideration when CMS developed the final document.

The final quality standard document was published on August 14, 2006 and was condensed considerably from the original document published on September 26, 2005. The document continued to have a business service section and a product specific section but areas that included increased complexity or concern of recipient' health only were included in the product specific section. These included respiratory equipment, manual and power wheelchairs and custom orthotics and prosthetics.

The section on manual and power mobility devices discussed complex rehab and assistive technology. This section included the need for a supplier to employ at least one qualified rehab technology supplier (RTS) per location and one trained technician for service. An RTS must have one of the following credentials to be qualified:

- Certified rehab technology supplier (CRTS)
- Assistive technology supplier (ATS)
- Assistive technology practitioner (ATP)

This document did not clarify complex rehab and assistive technology. It did not explain why an RTS would have ATP certification instead of ATS certification that would be more appropriate as a supplier. These issues will be discussed with the group.

The quality standards were developed to assist businesses in clarifying good business practice in order to participate in the accreditation process. Long term goals include accredited businesses only participating in the competitive bidding program. In November 2006, CMS released the names of 11 organizations that will accredit providers who want to participate in national competitive bidding next year. These organizations include:

- JCAHO (Joint Commission on Accreditation of Healthcare Organizations)
- CHAP (Community Health Accreditation Program)
- ACHC (Accreditation Commission for Health Care)
- HQAA (Healthcare Quality Association on Accreditation)
- Compliance Team
- National Board of Accreditation for Orthotic Suppliers
- Board of Certification in Pedorthics
- Board for Orthotist/Prosthetist Certification
- American Board for Certification in Orthotics and Prosthetics
- National Association of Boards of Pharmacy
- CARF (The Rehabilitation Accreditation Commission)

Questions to be discussed during the course include the following:

- Will the accreditation process improve appropriateness of medical equipment?

- Will the accreditation process improve quality of medical equipment?
- How will the accreditation groups assess qualified RTS's?
- Will the US government save money if businesses are accredited?
- Are the quality standards useful for other health care systems?
- What is the best method to improve quality and appropriateness of medical equipment in all health care systems?

Excerpts for this program from presentation at CMS/PAOC Meeting September 26 – 27, 2005 in Pikesville, Maryland on Quality Standards and Competitive Acquisition of Certain Durable Medical Equipment, Prosthetics, Orthotics, and Supplies

Links to Draft Document (September 26, 2005), Final Document (August 14, 2006) and Public Comment Responses (August 14, 2006) can be found at http://www.cms.hhs.gov/CompetitiveAcqforDMEPOS/04_New_Quality_Standards.asp

Clinical Criteria for Body Support Systems

Linda Elsaesser, PT

The intent of this course is to demonstrate practical application of RESNA guidelines for the provision of seating and mobility devices and services using World Health Organization International Classification of Functioning, Disability and Health domains, International Standards Organization terminology, Disability Evaluation Under Social Security definitions and Centers for Medicaid and Medicare Services indications for coverage.

Despite the absence of clinical practice guidelines which incorporate evidence-based information, clinical prediction rules or outcome measures for the provision of seating and mobility assistive technology devices and services, providers including administrators, treating practitioners, health care professionals and durable medical equipment suppliers must daily be able to prescribe, recommend a plan of care and specify interventions that are aligned with funding determinations within an ever decreasing time frame.

At RESNA 2004, I presented a workshop that described development of a service delivery model for the provision of re/habilitation, seating and mobility assistive technology. At that time, I was providing consultative and direct service delivery in the context of an in/outpatient seating clinic. The rapid increase in the number of individuals seeking these services made it apparent that a separate department with its own criteria for performance excellence was required. Development of this department mandated strategic planning, a working knowledge of relevant legislation, standards and guidelines, and most importantly, the ability to define outcomes. Use of these principles continued to be relevant as I later transferred my services to a home and community-based delivery model.

Funding constraints have mandated an even greater emphasis on efficient provision of effective and satisfactory services. Use of a standard language and development of a clearly defined framework enables providers to discuss function, develop a strategy and identify functional outcomes that are understandable between all stakeholders and efficient by virtue of its clearly defined process. This course will demonstrate development of a model "Clinical Criteria for Provision of Body Support Systems" which utilizes practical application of existing guidelines, standards and regulations to identify health and well-being domains, define loss of function, assess needs, strategize and ultimately recommend wheel chair seating that meets coverage criteria. This algorithm is intended to function primarily as a framework with participants then using their own personal/clinical/supplier decision-making process to collaborate and ultimately select a specific product. It is recognized that this framework addresses only wheelchair seating and is intended to suggest a means of utilizing existing information in one context. It is anticipated that this model could be applied to other intervention approaches and will continue to evolve significantly along with advancements in research and clinical practice evidence.

There is international recognition that use of a standard language and framework improves "communication between different users, such as health care workers, researchers, policy-makers and the public, including people with disabilities". The World Health Organization International Classification of Functioning, Disability and Health is a classification and descriptor of health domains that includes body function and structure, activities and participation along with environmental factors. These descriptors can become a tool to provide a framework of functional outcomes and quality measures for the provision of seating and mobility assistive technology.

Disability Evaluation Under Social Security contains the Listing of Impairments that establishes disability. Use of this document to identify loss of function and neuromusculoskeletal disorders can then be linked to the Centers for Medicaid and Medicare Services Local Coverage Determinations for Wheelchair Seating. Assessment of indicators for patient medical necessity regarding sensation, tissue integrity, and postural alignment is correlated with seat and back cushion characteristics and then linked to funding coverage codes.

International standards for wheelchair nomenclature, terms and definitions remain under revision, however, review of working drafts reveals development of descriptors that are intuitive and transparent. The term postural supports includes the body support system "those parts of the wheelchair which directly support or contain the body of the occupant including the seat, back support, arm support and foot support assembly" eliminating the confusing use of the terms such as seatback. Other postural support devices are identified by the body part supported and then by the anterior, posterior, medial, lateral, inferior or superior direction of support. One example is using the term medial upper leg support to replace the terms abductor, pommel, medial thigh support, leg divider etc. The International Standards Organization web site has indicated that the voting version document was under revision and has now been identified as a new project.

In 1992, a reference manual titled Standardization of Terminology and Descriptive Methods for Specialized Seating by Dr's. Medhat and Hobson, was coordinated by the terminology task group of the wheeled mobility and seating special interest group-09 and published by RESNAPRESS. Due to the inconsistent and frequently nonexistent education received by clinicians and suppliers regarding assessment for assistive technology, this publication was implemented into daily practice as a means to clarify how measurements were completed and work requests for the technicians were generated. It is hoped that this publication will be updated and another standard "Wheelchair Seating-Part01-Definitions of Body and Seat Measures remains under development.

In 1997 development of the Guidelines for Knowledge and Skills for Provision of the Specialty Technology: Seating and Mobility was funded by the National Institute on Disability and Rehabilitation Research (NIDRR) of the US Department of Education, under grant#133A300328, National Guidelines for Education of Providers and for Continuous Quality Improvement in Assistive Technology. This document, developed by members of the Guidelines Development Committee of the RESNA Special Interest Group 9 (SIG09), identifies the "particular skills and knowledge that are needed beyond the basic skills of an Assistive Technology Practitioner or Assistive Technology Supplier. Although certification for this Seating and Mobility Assistive Technology Provider (SMATP) does not yet exist, this document provides a comprehensive description of the roles with tasks, skills and knowledge required for those providers who are functioning at this "specialist" level.

Today's climate of accountability and productivity demands that we move beyond our traditional roles as clinicians and not only utilize but embrace all available resources to improve efficiency and effectiveness yet maintaining that client satisfaction is paramount. While this proposed model has not been validated nor its impact analyzed, it is hoped it will provide a framework worth consideration through its application of existing guidelines, use of a standard language and identification of the relationships between intervention strategies.

Clinical Criteria For Provision Of Body Support Systems (with resources identified)
(A domain is a practical and meaningful set of related physiological functions, anatomical structures, actions, tasks, or areas of life.)

HEALTH DOMAINS (WHO ICF 2)	DISABILITY EVALUATION (DEUSS)	NEEDS ASSESSMENT (RESNA)	STRATEGIZE (DMEPSC LCD/PA)	IMPLEMENT (HCPCS)
Health and Well-Being (Health=lack of disease, disorder, injury or trauma Well-Being=a "good life" physical, mental and social aspects)	Inability to Ambulate Effectively	Comfort (Crane/Hobson)	General Use (patient has a wheelchair)	Seat E2601/2 Back E2611/2
	Risk Factors for development of pressure ulcers (CMS 100-07)	Prevention (CMS 100-07)	Skin Protection (current/history of pressure ulcer, absent/impaired sensation, inability to weight shift)	Seat E2603/4 and K0734/5
Body Function and Structure (Function=physiological and psychological Structure=anatomical parts)	Musculoskeletal and/or Neurological disorders	Significant Postural Asymmetries (LCD)	Positioning	Seat E2605/6 Back E2613/4 posterior E2615/6 posterior-lateral E2620/1 planar with lateral supports
		Meets both criteria	Skin protection and positioning	Seat E2607/8 and K0736/7
		Stabilize weakness and/or deformity (LCD for custom molded orthotics)	Custom Fabricated (patient meets criteria for SP&P and prefabricated is not sufficient)	Seat E2609 Back E2617
Activities and Participation (Activity=individual function Participation= involvement in society	Inability to perform fine and gross movements effectively	Changing and Maintaining Body Position (ICF)	Positioning Accessories and Wheelchair Options/Accessories (LCD) Postural Support Devices (WNTD)	Anterior/Posterior/Medial/Lateral/ Inferior and/or Superior: Head & neck, Shoulder, Back, Thoracic, Arm, Lumbar, Sacral, Pelvis, Leg, Knee, and Foot (WNTD)

IMPACT2 (Conceptualized by L. Elsaesser PT, ATP)

Resources:

- RESNA Guidelines for Knowledge and Skills for Provision of the Specialty Technology: Seating and Mobility 1997. Funded by the National Institute on Disability and Rehabilitation Research (NIDRR) of the US Department of Education, under grant #133A300328, National Guidelines for Education of Providers and for Continuous Quality Improvement in Assistive Technology
- World Health Organization International Classification of Functioning, Disability and Health 2001
- Disability Evaluation Under Social Security "Blue Book" January 2006 "It explains how each program works and the kinds of information a health professional can furnish to help ensure sound and prompt decisions on disability claims"
- NJ State Board of Physical Therapy Examiners Rule Adoptions Volume 38, Issue 2, Issue Date: January 17, 2006
- CMS (Centers for Medicare and Medicaid Services) Pub. 100-07 State Operations Provider Certification Transmittal 4 SUBJECT: Guidance to Surveyors for Long Term Care Facilities Tag F309 Pressure Sores 11-12-2004.
- CMS (Centers for Medicare and Medicaid Services) DMERC (Durable Medical Equipment Regional Coordinator now DMEMAC Medicare Adminstrative Contractor) LCD (Local Coverage Determination) and Policy Article
- Healthcare Common Procedure Coding System (HCPCS) standardized coding system to process claims for payment
- ISO (International Standards Organization) 6440:1985 Wheelchairs-Nomenclature, terms, definitions now under revision as ISO/NP 7176-26 stage date: 2006-03-22
- No Room for Discomfort January/February 2003 Rehab Management, Barbara Crane PT and Douglas Hobson PhD NIDRR grant #H133E990001
- The IMPACT2 Model 2004 Rehabilitation Research Design & Disability (R2D2) Center, UW-Milwaukee, www.r2dr.uwm.edu
- Volume 15.1/Summer 2003 Assistive Technology, A Review of Conceptual Models for Assistive Technology Outcomes Research and Practice, J.A.Lenker and V.L.Paquet

Effect of an educational research dissemination program on practice patterns for professionals recommending manual wheelchairs

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Stephen Sprigle PT, PhD

Purpose and Specific Aims:

The objective of this study is to measure the utilization of rehabilitation research training by measuring short and mid term impacts of knowledge, attitudes and behaviors of clinicians. Specifically, this project will determine the effect of a targeted evidence-based educational program on knowledge of manual wheelchair technology, clinician attitudes towards practice, and manual wheelchair recommendation practices (behaviors). The specific aims are:

Specific Aim 1: Compare the effects of training on knowledge and attitudes before, after and 6 months following an educational training program.

Specific Aim 2: Compare the effects of training on practice behaviors 6 months before and 6 months following an educational training program for utilization cohort subjects involved in the training program.

Background:

Keeping up with the rapid pace of change in the health care system and the development of technology has dictated that rehabilitation clinicians learn about ways to improve the quality of care over the course of their careers. Improvement in patient outcomes is often linked to the ability of clinicians to change and adapt new practices within their practice settings. There is particular interest in learning whether training actually works -- whether it results in clinicians' effecting positive changes in their clinical settings. There has been, however, remarkably little study of the association between the process of rehabilitation education and quality care. (1)

Assessing training effectiveness is complex and costly. There is fundamental difficulty in addressing the questions that need to be answered: what works, in what context, with which groups, and at what cost? Additionally, there are few proven methodologies.

The length of time needed for the evaluation, lag time between an educational intervention and follow up evaluation, lack of reliable objective measures, and the number of potential confounding factors increase the complexity of the issue under study. Challenges designing methodologies that can control for variations in training programs are vast. Variations include clinician knowledge, skills, and training; patient comorbidities and differences in severity of illness, and system level variables, such as policies and regulations influencing patient care practices and funding. For these reasons, health professionals are often reluctant to study the effectiveness of educational interventions.

Consequently, it is not surprising that research validating effective methods to train clinicians, influence practice patterns or impact patient outcomes is lacking (3). Systematic reviews (4-6)of the educational literature found that few robust evaluations of educational interventions exist. However, some studies concluded that continuing education can improve clinical performance and patient outcomes, and indicated which methods were best at evoking change in clinician behavior. Founded in the literature (4-7)and as written by Cantillon and Jones,

"The most effective methods derived from these reviews include learning linked to clinical practice, interactive educational meetings, outreach events, and strategies that involve multiple educational interventions (for example, outreach plus reminders). Less effective strategies include audit, feedback, local consensus processes, and the influence of opinion leaders. The least effective methods are also the most commonly used in general practice medical education- namely, lecture format teaching and unsolicited printed material (including clinical guidelines)." (8)

The four-level hierarchy of evaluation developed by Donald Kirkpatrick (1994) (2) outlines a model that sequentially moves through evaluation levels assessing training effectiveness: 1) reactions (satisfaction or happiness), 2) learning (knowledge or skills acquired), 3) transfer (transfer of learning to workplace) and 4) results (transfer or impact on society). Information from each prior level serve as a foundation for successive, more precise higher levels of evaluation but at the same time requires greater time, resources and budget allowances (2). Researchers in medical education are aware that the availability of funds for research and development is limited unless a link can be made between the proposed intervention and its impact on patient care, yet this link can be difficult to make.

An established body of literature indicates that a well-fitted seating and wheeled mobility system promotes a more functional posture, enhances independent mobility, improves comfort, and decreases the risk of pressure sores, postural deformities and repetitive strain injuries. Stakeholders report that competence, proficiency, and experience of therapy professionals evaluating and recommending wheelchairs and seating systems vary considerably (9-11). Failure of clinicians to understand the factors involved in evaluating individuals with mobility needs and matching the individual to the technology leads to difficulties recommending appropriate mobility devices.

Correspondingly, failure to understand the factors involved in prescribing an appropriate wheelchair and seating system often results in "technology abandonment, wasting of funding to replace poorly prescribed equipment and the consumer being without needed equipment" (12; 13). Unfortunately, experienced and/or specially educated professionals (physical therapists and occupational therapists) trained to provide seating and mobility recommendations can be hard to find (14). Providing effective educational programs that disseminate best practice and research evidence to elevate the level of clinical competency is needed.

Training Activities:
From needs assessment and program design, stakeholders were involved in the development and planning of this training research project. Training was specifically tailored for clinicians responsible for recommending manual wheelchair technologies who have limited exposure to manual wheelchair research, technologies and service delivery practices. Training participants and a control group were studied within a pretest-posttest design to evaluate the effectiveness of the training program.

Six training intervention programs were offered in locations based on input from the Statistical Analysis Durable Medical Equipment Regional Carrier (SADMERC). The SADMERC is responsible for collecting and analyzing data about durable medical equipment in all Durable Medical Equipment Regional Carrier (DMERC) regions in the United States for the Centers for Medicare and Medicaid Services (CMS). Locations for the six educational programs and control group were selected from a list of SADMERC- identified sites in need of education and training.

Evaluation of training impact:
This study evaluated training impact as evidenced by change in clinical knowledge, attitudes, and behavior (i.e., utilization practice patterns). The upper levels of Kirkpatrick's hierarchy for assessing training effectiveness are the foundation for developing three measures. Specifically, we are interested in learning how clinical practices recommending and specifying manual wheelchairs for clients with mobility impairments change following an educational training program.

Evaluation Criteria:
Knowledge (Kirkpatrick's level 2) was measured using a Knowledge Assessment Test. A multiple-choice test assessing knowledge of empirical research and "best practices" as related to manual wheelchair applications was administered before, immediately after (at the conference), and 6 months following the educational program. To ensure efficient test administration and maximize time allotted for the educational program, the test was designed to take only 20-30 minutes.

A Manual Wheelchair (MWC) Practice Questionnaire was used to explore transfer of learning (Kirkpatrick's level 3) resulting from the training program. The MWC Practice Questionnaire assessed attitudes in four areas, confidence, independence, leadership, and resourcefulness. Evaluation of transfer of learning attempts to answer the question, "Is the newly acquired attitude being used in everyday clinical practice?" We explored whether a change in attitude can be detected immediately following an intervention and, if so, whether or not a change persists 6 months later.

Finally, Work Product Reviews (WPR) investigated the impact of an educational program on practice patterns, specifically manual wheelchair recommendation and utilization practices. Measurement involved the appraisal of letters of medical necessity using a scoring rubric. The rubric assessed documentation in four domains, problem identification, feature match, solution selection and overall impression. Lastly, detailed manual wheelchair order forms were reviewed to survey the range of manual wheelchair features requested for a period of 6 months before and after the educational program. By design, one rater scored all WPRs. Intrarater reliability of the scoring process for the work product reviews (WPRs) revealed coefficient alpha values of .93 for the rubric and .95 for the feature match, indicating good reliability.

Study Enrollment:
A total of 160 subjects were enrolled in the study and 137 completed the study. Forty-eight subjects were enrolled in the utilization group and followed for 12 months- 6 months prior to and following the training intervention. Eighty-four subjects were enrolled in the conference only portion of the study (57 clinicians, 27 suppliers) and 28 were enrolled in the control group. A total of 23 subjects withdrew from the study or changed groups. The utilization group was used to collect all three measures – knowledge, attitude and behavior. The conference-only and control groups participated in the knowledge and attitude assessments.

Results:
The inclusion criteria for this study involved clinicians only; therefore initially we examined results from the demographic questionnaire eliminating suppliers from the analysis. Results showed no difference between the utilization group and conference only group for degree (entry/advanced), profession (PT/OT), years of clinical practice or years of seating and mobility services. A significant difference was found between groups for hours of seating and mobility service ($F=3.596$, $p=.031$) and professional development hours ($F=9.201$, $p=.000$). The utilization group reported more hours of weekly seating and mobility service (7.97 vs. 3.68) and more professional development hours per year (12.87 vs. 5.76) contrary to our recruitment plan.

Knowledge Score Results
Analyses of knowledge scores for the utilization group found no significant change in knowledge scores leading up to the training (6 mo pre, preconference). Similarly, the control group showed no significant change in knowledge scores over a 6 month period. These results indicate that score improvement was not due to time or practice with the test. A repeated measures ANOVA on pre- and post- knowledge scores of the utilization and conference-only groups showed a significant increase after training ($F=96.795$, effect size $d= 1.192$, mean pre-post difference = 2.271, standard deviation = 1.906). No interaction between group and time was found, meaning that the groups improved equally.

Also, we found significant, yet low correlations between the preconference scores and hours of seating and mobility service/week ($r=0.215$) and professional development hours/year ($r=0.194$). Knowledge scores improved following the intervention. However, none of the variables predicted who would have the most change before and after the conference. Future analyses will explore which variables predict who maintains the knowledge change over time.

Attitude Score Results
The MWC Practice Questionnaire assessed attitude scores in the domains of confidence, independence, leadership and resourcefulness. Because individual items on the survey had such divergent scales, they were transformed into standardized (z) scores for the purposes of analysis. A repeated measures ANOVA for the preconference and follow-up measures revealed a significant interaction between pre- and 6-mo post test and subject group for the confidence scores ($F=8.802$, d.f.=3,135, $p<.001$) and independence scores ($F=3.093$, d.f.=3,135, $p=0.029$). No significant interactions were found for the leadership and resourcefulness scores. No significant differences due to training were found for any of the attitude scores.

Work Product Review Results
Rubric analysis for 18 subjects has been completed to date. Each subject completed a different number of preconference and postconference work product reviews, therefore weighted totals were used for analysis purposes. The paired sample correlations for pre- and post-administrations for all sections were statistically significant and ranged from $r=.601$ to $r=.762$. Paired sample t-tests, with alpha level corrected for multiple testing, revealed no statistically significant changes for any section between pre- and post- administrations.

Feature Utilization Results

The range of wheelchair features prescribed by the 18 subjects before and after training showed a statistically significant correlation of $r=.824$, $p<.001$. A paired samples t-test indicated that more manual wheelchair features were prescribed following the educational program as compared to before($t=-2.620$, $p=.018$).

Discussion:

In general, knowledge scores showed a net gain over time. A significant improvement in knowledge scores was seen immediately following the training intervention however for all groups scores decreased six months following the course. We do not know if knowledge plateaus or continues to decline over time. Results showed that subjects with more hours of seating and mobility services per year and more manual wheelchair evaluations per year were more likely to retain their knowledge over time.

Overall, normalized attitude scores did not show any significant change before or after the training for confidence, independence, leadership or resourcefulness. A strong interaction between repeat and group for confidence and independence items was found. This indicates that some groups felt more or less confident or certain about evaluating and recommending specific manual wheelchair components but overall, there was no consistent change. Similarly, some groups felt more or less independent or self-sufficient recommending and specifying equipment, but overall, the training intervention was not associated with change. It may be that the impact of the training experience was mediated by the work setting of the target groups. Most subjects indicated that they experienced some sort of barrier to the provision of appropriate technology for their patients. The most commonly reported barrier was funding.

Work product reviews were submitted by subjects in the utilization group. By design we aimed to recruit therapists that had a responsibility for recommending manual wheelchairs but did not do a high volume of these types of requests. The extended portion of this study involved one year of subject commitment. Recruitment for this group was more difficult than anticipated. We found that therapists willing to participate in the extended portion of the study were those with more experience on average recommending equipment.

No significant relationship was found between experience and pretest rubric score. Yet, pretest rubric scores were most predictive of post test scores. A positive relationship was found between post test rubric scores and experience indicating that therapists with more experience had higher posttest scores. We plan to use these data to further examine the psychometric properties of the rubric including internal consistency and validity. Preliminary analysis indicates that the rubric has high test-retest reliability but may not be sensitive to change associated with the training. Alternatively, the impact of training may have been thwarted by the number or types of cases submitted, or by facility documentation systems that did not allow for changes in documentation processes.

Overall the feature match appeared to be a psychometrically good tool with good test-retest reliability and internal consistency. Weighted feature match scores did show a significant difference in features recommended before and after the training program as expected.

Conclusion:

This study showed positive changes in knowledge scores immediately following the training intervention. While the impact of learning diminished over the first six months following the training, knowledge scores remained significantly higher than before training. Attitude and behaviors were not significantly influenced by the training program. Utilization practices showed improvement in number of features specified following the intervention however quality of documentation did not show change. Additional psychometric development of the manual wheelchair questionnaire and the work product review measures (rubric, feature match) is warranted. While preliminary analysis revealed promising internal consistency and test-retest reliability, it is important to more fully determine the responsivity, validity and reliability of these newly developed measures to determine if results were due to the sensitivity of the measures or the impact of training.

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Wheelchair Seating: Tests, Measurement and Analysis, from the Test Lab to the Clinic

Stephen Sprigle, PhD
Evan W. Call, MS
Sharon Pratt, PT

Which cushion to choose? The choice gets greater and greater…

The need for in depth understanding of the performance of wheelchair cushions and their ability to protectively interact with the skin viability, posture, positioning, and functional performance is acute.
A review of the test methods currently part of the proposed ISO Standard for wheelchair cushions and other tests used in the laboratory are presented from the Assumptive stand point of how these measures potentially impact the user.
These tests include; Heat and Humidity Characterization in-vivo and in-vitro (thermocouple and photographic methods) Water Vapor Permeation, Measures of Envelopment including planar load distribution (adjustability test), Load Deflection and Hysteresis, Loaded Contour Depth and Overload Deflection (SADMERC), Frictional Properties and Impact Dampening.
The implications of these tests for the wheelchair users' benefit and the limitations of the current state of the science and practice will be discussed.

The purpose of this presentation is to leave the audience with an ability to be more critical as decision makers when it comes to appropriate seating product selection.

Wheelchair cushion materials and design will be the main focus of this presentation.

The different types of materials commonly used in seat cushions will be discussed with emphasis on the following mechanical properties:

1) Load Deflection, 2) Load Redistribution and 3) Heat and Water Vapor Dissipation.

1) Load deflection considerations
–Recovery
–Impact Damping
–Loaded contour depth
–Frictional properties

2) Load redistribution considerations
–Envelopment
–Off-loading and redirection
–Interface Pressure Distribution

3) Heat and Water Vapor Dissipation considerations
- Moisture:
  –Moist skin has higher coefficient of friction
  –Moist skin has reduced integrity
- Temperature
  –Increased temperature increases metabolic demands
  –Increased temperature may limit tissue's ability to withstand loading
- Controlling Heat and Moisture
  –The more someone moves, the less heat is a factor
  –Different material and designs have differing influences

Material combinations commonly used in wheelchair cushions
- Foam/flexible matrix: GeoMatt, Supracore, Fundamental
- Foam & Elastomer/gel: Southwest Technologies, Action
- Foam & Viscoelastic Foam: Maxus, Infinity, Ultimate
- Foam & Viscous Fluid: Jay, Cloud, Skil-Care
- Air: Roho, Star, BBD
- Air & Foam: Varilite, Nexus

Mechanical Properties of these materials
- Different materials accommodate body load in different manners

–foam and air: compression
–gel and viscous fluid: displacement
–cover (bladder and/or fabric): tension

Taking a closer look at these mechanical properties as they relate to seating

Load deflection
- Stiffness is a measure of deflection under a given load
  – Foam: Indentation Force Deflection
  – Elastomers and gel: durometer
  – Viscous Fluid: viscosity
  – Air: Internal air pressure
- The trick is finding the proper stiffness
  – Too stiff high loads 2º to poor deflection
  – Too soft bottoming-out 2º to over-deflection
- Material combinations used to accommodate various needs

Load redistribution
The ability of a cushion to manage loads on the buttock tissues impacts tissue health and comfort
- Techniques used include:
  – Envelopment
  – Redirection of forces (including off-loading)

Envelopment
- Capability of a support surface in deforming around and encompassing the contour of the human body.
- An enveloping cushion should have the ability to encompass and equalize pressure about irregularities in contour due to buttock shape, objects in pockets, clothing, etc.

Good buttock envelopment offered by a segmented cushion
- Envelopment from combination of viscous fluid and contoured foam base

Poor envelopment
- Hammocking caused by a taut, non-stretch cover
- High cushion stiffness

Redirection of forces

- Choosing where to apply loads on the body is commonly used in prosthetics and orthotics
- Several cushion designs use this approach to reduce ischial loading
  - Isch-Dish; Ride Designs
  - Contoured systems

Notes:

Measuring Heat and Water Vapor Dissipation

- Over 200 models of cushions are available in US
- Functional considerations tend to be more important than tissue integrity considerations
- No one cushion is best for all people
- Fact is, in the overwhelming majority of cases, a person could successfully use more than one type cushion

Heat Characteristics of Cushions

- Insulative value "R"
- Conductive Value "Q"
- Air flow
- Specific Heat

Cushions with Cooling Effect

- Gel Containing Cushions
  - Due to high thermal mass
- Air Flow Channels

Translating technical/mechanical property detail to clinical practice everyday decisions…

What does all this mean when selecting an appropriate wheelchair cushion?

The key mechanical properties will be reviewed in the language of postural stability ,skin integrity and function.

By attending this presentation, participants will be able to apply these basic principles and have a better understanding of how a cushion manages loads on the buttock tissues as well as how this impacts tissue health and comfort of the client. This in turn will enable each participant to become more analytical when it comes to appropriate seating product selection for the individual end user.

Seating the Unseatable

Kevin Phillips, CRTS

When faced with the challenge of assessing a very complex client for independent mobility, there are often so many question to answer that it's difficult to know where to begin. What is the client's potiential? Who will pay for it? How much time needs to be spent evaluating needs, trialing equipment, training the client? Who needs to be involved? Interviewed? Consulted? How long should the process take? This presentation shows gives an overview of the process that brought Francis from complete dependence to powered mobility in just a few weeks.

Francis is a beautiful, bright young lady of 24. Her outfit is always perfectly matched, and she has a wonderful sense of humor. She is also one of the most physically involved people you'll ever meet. Born with Cerebral Palsy, she is severely spastic, extremely high tone, distonic and often stuck in ATNR. Frances has been laying in a manual tilt wheelchair, tilted all the way back for most of her life. Francis thinks at thousand words a minute, but it takes her several minutes to get one word out of her augcomm device on her single switch scanner system. Recently Francis was thrilled to hear her doctor suggest that independent mobility in a power chair was a possibility. This presentation is a case study documenting the evaluation process that let to a successful outcome for modified independent mobility and improved augcomm access for the most challenging of clients, and will inspire you take on greater challenges in your own community.

Assistive technology adjustments in Ataxia-Teleangiectasia patients.

Etzyona Eisenstein, Ms. C. PT
Efrat Shenhod
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Introduction: Ataxia-Teleangiectasia (A-T) is a rare disorder with a progressive neurologic deterioration. It affects many systems and its clinical manifestation includes: Cerebellar Ataxia, dyspraxia and bradykinesia, oculomotor apraxia.
Usually, towards the second decade of life children are confined to wheelchair. Though cognition is preserved, patients suffer from severe learning disabilities due to dyspraxia , slowness of movement, dysarthria, and severe eye movement impairment. Rehabilitation aspects of these children usually focus on prevention of unnecessary secondary deterioration, The provision of appropriate equipment not well documented.
Methods: 15 A-T patients out of 34 known at the A-T National Center were referred to the Pediatric Rehabilitation Department- Assistive Technology Unit. Evaluation includes several procedures: 1) PEDI- questionnaire 2) muscle strength, and range of motion and endurance 3) coordination, tremor and involuntary movements 4) pulmonary vital capacity 5) According to the evaluation low and high tech assistive devices were assessed such as eating capabilities, walking ability, ambulation abilities – spatial maneuvering and problem solving regarding safety issues while driving a wheelchair (manual and powered); computer devices and assistive communication devices were recommended.
Results: Surprisingly, powered wheelchairs were less appropriate to be used by this population as a first chair, especially due to eye movement dysfunction and spatial orientation problems. Due to this decision several adaptation were made to enable the children to acquire skill maneuvering manual wheelchair.
Reading and communication dysfunction should receive special attention in device adaptation.
Conclusion: A-T children have unique abilities profile, which influence the therapist decision towards adapting assistive technology. According to this unique abilities there can be an evaluation and adaptation protocol, which improve function and quality of life.

Cases to Consider

Vicki H. Bunton, PTA

The objectives of this lecture series are to present several case studies to stimulate the thought processes involved in the selection of equipment given different facility environments, funding options and diagnosis. It is directed toward offering several cases that differ in living environment, options for payment and creative solutions provided by Carolinas Healthcare System seating clinicians. Fundamental knowledge of different patient populations, functional potential and the basic seating evaluation can be reviewed to ensure understanding of the outcomes for each case.

Our healthcare system is dedicated to provision of appropriate equipment to all of their customers despite funding. The involvement of a seating clinician can assist the primary treating therapist in both education of the client and staff given their individual needs, funding and discharge disposition.

Relationships with reputable dealers and manufacturer representatives are imperative to assist in supplying the seating clinician and therapy clinics with simulation and demo equipment. Without this equipment, therapists are not kept up to date with new technology and appropriate decisions cannot be made involving the treating team and patient. Use of simulation equipment that can be incorporated into the therapy program allows for improved goal setting/meeting and preparation for discharge home.

Funding is always an important consideration when performing equipment recommendations. Will the client discharge to a skilled facility, home or sub-acute rehabilitation facility? Our creative solutions will be reviewed and the audience will be encouraged to share their experiences for providing DME when funding is not available.

A proper fitting involving the seating clinician and the dealer is imperative to the optimal completion of the whole seating process. Here the chair and seating components will be added to best meet the physical and functional goals for the user. If change has occurred since the initial order, modifications to the set up or order can be completed with all team members in agreement. Finally, instruction of the user and caregiver/family/staff is very important to assure safe and effective use of all components.

Case studies will be presented to demonstrate the evaluation process, problem solving, justification to the funding source and end results for different types of users. Interaction from the audience will be invited to share experiences of their own and promote discussion of options that could have been considered.

Evaluation and Problem Solving

Adrienne F Bergen, PT, ATP

Evaluation for seating intervention is not a cut and dry process. The evaluation team needs to be flexible and able to integrate the goals of all of the parties while making everyone feel their input is valuable and respected. All of the players must be able to subjugate their own opinion as needed during the process. All must be able to hear the voices of those present and not present, vocal or silent.

Before anyone even makes an appointment for an evaluation funding should be identified. If funding only pays for a single visit it is critical that anyone who needs to be present come to that appointment. If the funding source restricts the consumer to a preferred provider it is important to have that person present, so that other suppliers do not waste their valuable resources in a session where they cannot help. Be sure that the consumer has a physician's referral if that is required. If the consumer does better during a certain time of the day be sure to consider that when making the appointment. In all cases be honest with consumers and caregivers who are seeking your help. Be sure that they understand that this is a first step and that the process may require extra visits. Explain that the evaluation will occur in a sequence- observation and discussion of existing equipment, physical assessment including a supine and seated mat evaluation, simulation, product trials, discussion of the findings, recommendations for intervention, specification of products features and finally product selection. Use the right vocabulary—this is an evaluation, the equipment may be specified and detailed, the equipment cannot be ordered until AFTER funding is secured.

The first step in performing an evaluation is to ask why the person is in front of you. What brought them to the evaluation? What is the expected result? In some cases the person will report that they have no idea why they are there, or respond that the therapist or doctor told them to come. In these cases the interview might begin with asking them to talk about the equipment they already have and how it works for them. While this is happening the team can observe the person's posture and function as well as what body language they might use as they talk about their seating and wheeled mobility equipment and the role it plays in their lives. (If the user is not able to participate in this aspect of the evaluation then there is usually a caregiver who can supply this information.)

During this part of the evaluation the team should ask the wheelchair user and/or the caregivers to demonstrate the best posture possible in the present seating environment. This usually requires some degree of repositioning. The discussion then continues while the team observes what happens to the person's posture over time. In many cases it helps to remove the person's shirt or atleast roll it up to expose the abdominal wall and some of the torso. This will allow the team to see how the pelvis and trunk are aligned. Observation of wheelchair propulsion and transfers can also happen during this time.

At the end of this portion of the evaluation the team should have a list of all the problems identified and the goals for the seating and mobility intervention. These goals must be realistic and if they are not someone on the team must say so to ensure that all of the issues are brought out and discussed honestly. This is also the time to prioritize the goals so that everyone is clear about what is most important to the consumer and/or caregiver as well as to the clinicians. Again it is critical to be honest so that everyone understands which goals are going to be worked on first.

The next step is the physical evaluation. The evaluator should explain exactly what they are going to do before doing it and ask permission to touch the consumer. Touching should be done slowly and gently with reassuring words. The evaluator uses this time to palpate the pelvic crests and ASIS to determine pelvic alignment and correctability in the existing equipment. The head, shoulders, upper extremities and torso should also be assessed to determine how much resistance there is to improved postural alignment and/or functional reach and grasp. Notes should be made and photographs taken if at all possible, viewing the person from the front and side with the wheelchair armrest removed.

The next step is the mat evaluation. The consumer should be evaluated for joint alignment and mobility in supine and later in sitting with accommodation made for any limitations that would affect pelvic posture in sitting. Sometimes it takes several people to align and support the person in supine and sitting to obtain the necessary information. During this portion of the evaluation joint range of motion and limitations are noted. At all times it is critical to stabilize the pelvis in its most optimal alignment and move the limbs through the range of motion up to the point where the pelvis begins to shift out of position. At this point the movement is stopped and the available range of motion recorded. In many cases it will be necessary to flex the knee past 90 degrees to eliminate the hamstring pull while flexing the hip to determine available range for sitting.

Once the linear and angle measurements have been taken it is time to simulate a seated posture. Simulation is an invaluable tool when making decisions regarding seating interventions. I rarely do any decision making or measuring without the use of a simulator. During the past few years the use of a simulator as a pure assessment tool has become confused with other tools we use to assess consumers in sitting. Many seating professionals use the Invacare Shape Sensor to position clients during the assessment process. Still others use frames with bead evacuation bags in place. The word simulation has been used loosely to describe all of these assessment tools. We need to be careful not to confuse the issue.

Simulation needs to be a generic process, which occurs after the mat assessment and prior to making seating decisions. Once a consumer is seated on a soft, flexible surface a surface decision has been made. Once a consumer is seated on a surface which creates contours to support their body a seating decision has been made. Simulation should be done at the first step in the decision making process, it should be planar in most cases, so that a clear view of the client can be had from all angles. During this stage the observer(s) need to make changes, observe the result of the intervention and when necessary take photographs to document the observations. At a minimum, the simulator "tool" must:

- allow for changes of seat depth and seat pitch,
- have a thin profile at the front of the seat to allow for accommodation of tight knee angles
- allow for seat/back and seat/calf angle changes
- accommodate windblown leg postures
- allow for clear viewing of spinal contours and alignment from both sides. This time on the simulator allows the consumer, caregivers and evaluators an opportunity to observe the consumer with the proposed intervention of angles and support components. Discussion can be had, the consumer can be challenged to use their arms, head, mouth and tongue for activities to see if the proposed posture works well.

A discussion of generic seating recommendations can be made and a discussion of the wheeled mobility base can begin. With the information gained during simulation goals can be solidified. The supplier can begin recommending products that might work for the consumer and some decisions can be made.

In many cases final decisions can be made at this point. In other cases product trials must occur to ensure that a functional system can be created for the client. Often the difficulty is finding trial components to mimic the simulation. Some clinics are lucky enough to have a simulator mounted on a powered mobility base, allowing simulation with mobility for severely disabled clients. For clients with lesser problems it may be possible to obtain a manual mobility base and use foam and triwall cardboard or trial seating to do the functional evaluation. In other cases the final product is a result of the skill of the supplier to translate the information from the simulator to the final functional product.
The following assessment story will help you to understand the value of planar simulation in the decision making process.

Asher

Asher presented at the clinic in his new manual wheelchair. He obtained this chair through an outside clinic and his school therapists were not satisfied with his posture. They had tried to discuss this with the clinic that provided the chair, but were concerned that they were not being heard. Two of my clients had canceled for the day, so I offered to go through an assessment process with Asher and take photos for them to share with the outside clinic.

Our usual procedure during an assessment is to carefully observe the client in his existing seating system after he is positioned as optimally as possible. We removed Asher's tray and observed him in his existing wheelchair and seating system. From the front it is obvious that he is sitting with a slumped posture (see photo 1). His pelvis is slightly posteriorly tilted, his trunk appears collapsed and his low tone is reflected in the broad abduction of both legs. He is having difficulty holding up his head. A side view confirms the poor posture (see photo 2).

Our next step is to remove some of his clothing and further observe his seated posture. Shirtless it is obvious that his trunk is very collapsed, with a protruding abdomen(see photos 3 and 4). He also slumps over to his right. Lower rib flare is seen, along with the continued broad abduction.

Asher had been provided with an antithrust seat and a biangular back. When the therapists working with him first expressed concern to the seating clinic they removed the influence of the biangular back, since his supine range of motion showed some limitation in mobility, and he was simply pulling forward of the biangular surface at the pelvis. We were concerned to see that the antithurst seat was very thick at the front, and had not been beveled back to accommodate for his calf muscle or his AFO (see photos 5 and 6). At this point we had not done a supine mat evaluation, so we did not know if he had tight hamstrings, which would have required a closed seat/calf angle. We later learned that he actually would have benefited from an 85-degree seat/calf angle, which is not possible without a beveled front on the seat. With the wheelchair's footplates in place we were disturbed to note that the heel cup pulled his foot forward of the front edge of the seat, pulling his knee out to a 95 degree seat/calf angle (see photo 7).

Asher was removed from his wheelchair and a supine mat assessment performed. In supine we found that he had limited pelvic mobility, and some hamstring tightness. In general, all ranges were within functional limits for neutral sitting.

The clinic's simulator has both planar surfaces and replacement frames with bead evacuation bags. We always do a planar simulation first, using our hands and the supports that accessorize the simulator to provide a way to assess the client's response to support. The simulator was set up for Asher based on the information gleaned from the mat assessment (see photo 8).

We placed lateral hip/thigh supports to try to control Asher's tendency to abduct his legs(see photo 9). These did not adequately control his position until we moved them forward to provide control to the end of his knees. (see photo 10). We then moved up to his trunk and attempted to provide adequate lateral trunk control. Although he responded fairly well, he required extensive controls and we quickly began to realize that in order to provide control as high in the trunk as he required it he might be candidate for a molded back cushion. In addition, we noted that wherever a lateral support ended he tended to flare out around it, both above and below(see photo 11).

Side views showed the lower abdominal collapse we had seen in his wheelchair. Here, however, with a clear, unobstructed view, we could see that he was actually collapsing in his mid trunk and then hyperextending above it (see photo 12). This made it difficult for him to find a good, functional placement for his shoulders and head. We began to use our hands to try and help him find a better place to center himself and activate his muscle groups for trunk co contraction. Filling in the area behind him to bring his shoulders over his pelvis seemed to solve some of his problems (see photo 13).

Further discussion lead to a conclusion that he would benefit from a simulation with molding bag, but we had run out of time. Recommendations will be sent to the outside clinic regarding the manual chair revisions, to improve his seating in this manual wheelchair. Revisions to his power wheelchair will be done in the near future, and the team will consider a molded back for that chair to improve his opportunities for head control to facilitate easier driving with his head array.

Photo 1: Asher's posture in his new seating system was very poor. He always appeared to be slumped in the seat.

Photo 2:This view shows his posture from the side.

Photo 3: It is almost impossible to assess wheelchair seating problems unless the client's clothing is removed or at least lifted up to expose the body to view. Notice that he leans to the left has lower rib flare and sits in broad abduction.

Photo 4: The side view shows his "abdominal collapse" symptomatic of low central tone.

Photo 5: Whenever you use a seat with a thick front profile it is important to cut back (undercut) the front so that there is room for the calf muscle, and/or brace segments.

Photo 6: This shows how his calf would hit the front wooden portion of the seat if his knee was at the proper angle.

Photo 7:It is important to look at the knee angle needed and the relationship of the front of the seat to any calf or heel supports that might pull the person's knee away from the angle determined by the mat assessment and simulation.

Photo 8: A planar simulator has components which are fully adjustable and allow the evaluators to view the client from all angles to determine his response to support.

Photo 9: Asher is placed on the simulator and observed.

Photo 10: It is necessary to extend the lateral knee support pads to the end of the knee for maximum control of excessive abduction.

Photo 11: Lateral supports are moved around to try and find the most optimum key points for control. It became obvious that full contact would be needed for maximum support.

Photo 12: Asher continues to show abdominal sag, with little activation of his flexors or extensors.

Photo 13: A combination of angular adjustments with a pad behind his shoulders to get better alignment of his trunk (shoulders over pelvis for a more "ready" position) creates some activation of his abdominals and tells us more about what we needed to know to plan his seating system.

Custom Seating: When And Where Do I Start?

Sheila Buck B.Sc.(OT), OT Reg. (ONT.), ATP

Custom Contoured Seating

Determining if your client requires a custom contoured surface is often seen as a challenge, but does not need to be. Customized seating can minimize the risk of peak pressures and shear on weight bearing surfaces, especially over bony prominences. It can also provide the best postural support and control where modular does not match the client's shape. By customizing the shape, it often decreases the need for additional lateral and anterior supports. Custom seating is good for prolonged sitting where postural support and pressure relief is required, or for clients with inadequate sensation. Specific shape contours can also prevent friction/shearing from occurring from downward migration often seen with modular systems. As a result, the client no longer needs to "hold on" and therefore this frees their hands for functional activity. Custom seating may often be one piece construction and therefore there are less pieces to lose. Accommodation and correction can be achieved as well as aggressive support where necessary. Due to the close contouring, there is also more proprioceptive input to the body which may assist in decreasing agitated movements.

There can be disadvantages to custom seating and therefore your assessment data may provide you with justification not to complete a full custom contoured system based on the following factors. It may be limited for growth or shape changes. If the fit is too close, it may interfere with compensatory movements or proprioceptive input may be too great creating reliance on the support surfaces. There may be limitations for transfers depending on the shape. Unfortunately, there is also a potential for pressure points resulting from improper positioning on highly contoured surfaces. Custom seating may also be labour intensive and therefore costly. As well there is limited trial time or ability to set up the system for active mobility prior to finished production.

Prescribing custom seating

As a therapist, you must

- be aware of basic posture and seating principles
- understand ergonomic and biomechanical principles for mobility
- complete a mat assessment
- test out and simulate posture and the support required to maintain that posture
- record wheelchair measurements after custom seating is complete to ensure fit into mobility base
- consider environmental factors and system functionality for the client and caregivers

The following critical pathway will help you identify the steps to follow when prescribing custom seating.

When assessing a client for custom seating it is important to look for potential areas that may be affected by alterations in their seated position. This may include at risk skin areas, tonal changes or contractures from long term tonal changes, reflexes (normal/abnormal) and the client's use of reflexes in postural support, bony protrusions, respiratory and circulatory changes or changes in body position and orientation in space, incontinence, swallowing, eating, drooling problems, the client's ability to sit unsupported, and finally the client's ability to reposition themself.

Custom seating may begin at the basic level of adding carved foam support to an already pre fabricated back shell. This is good for the client who requires minimal accommodation to back curvatures, but the overall shape of the back shell provides adequate support. This may also be seen as customizing an off the shelf cushion by adding additional adductor, abductor or obliquity pieces, or carving back one leg trough for discrepancies. Again this is good for the client who is more actively mobile or needs minimal adjustments in shape to match their contour or maximize their surface contact. If more aggressive accommodation is required, then foam in place molding may take place. Again a regular back shell may be used, but by pouring the foam around the client, a closer contact to the exact shape is achieved. Foam in place is not recommended for aggressive correction as it is difficult to maintain client alignment during the foaming process. Full custom contoured shaping can be done through a variety of mediums whether it be a molding frame (PRM, Contour U), molding bags (Ottobock), pin sensors or condensing/adhering a molding substance (Shurshape). All of these systems have the advantage of allowing for full accommodation as well as differing degrees of correction where required.

When considering whether or not off the shelf seating will work, or if you need to look at customizing the seating the following factors will assist in determining what seating is required.

Pressure:

Does the client have a pressure ulcer history and on observation are there areas of redness or scarring.

Does the client have asymmetry in weight bearing surfaces? Are there bony deformities that protrude? Is there any rib/pelvic creasing, or a rib hump that contacts one side of the back surface first? Consider tightness at the back of the knee (tight hamstrings), high pressure at the back of the head from extensor tone, high pressure on the feet (toes, lateral edges, ankles) from high tone or lack of movement, or shearing pressure on the ears from head rotation. It is also important to consider pressure that may occur from custom contoured seating that may interfere with ostomy sites, G-tube sites, bowel and bladder catheters, shunts, or baclofen pump below skin surface. Considerations for nutrition/weight fluctuations from surgery, illness or G-tube insertion will be important and there affect on the contact of the support surfaces. When completing custom seating, it may be useful to utilize pressure mapping on completion of the custom seating in order to fully discern pressure relief during molding of the contours and surfaces.

Dysphagia

It is important to consider the impact of positioning on swallowing and eating for your client. Therefore during simulation of the final position required, one must consider the position of head and neck as well as trunk elongation, abdominal pressure and alternate positions for feeding.

Accommodate	Correct
Pelvic Obliquity	
- add to high side to maximize surface support – lateral posterior edge to trochanter	- slowly add to low side to shift balance to midline - firmer support to increase shift
Posterior pelvic tilt	
- open hip angle	- optimal ischial support
- increased ischial well with pre ischial support	- maximize trough to ↓adduction
- leg trough: avoid too aggressive abduction	- surface materials - more friction
- seat angle based on fixed/flexible trunk position	- optimal thigh support
- maximum thigh support	
Anterior Pelvic Tilt	
observe for pubic compression of abductor pommel	surface materials higher friction
leg trough: avoid too aggressive adduction positioning	optimal thigh support
maximize thigh support	maximize leg trough to decrease abduction
seat angle for trunk position	
Rotation	
lengthen forward side of base to support thigh	maximize abductor/ adductor trough to maintain leg alignment
observe and lengthen ischial shelf/ well on forward side or reduce on opposite side	optimize seat depth/ height for function
accommodate leg trough for windswept position	
Kyphosis	
open seat/ back angle with sacrum support and relief for kyphotic area	provide sacral support and open for back extension above pelvic crest
provide tilt in seat/ frame and open angle of back to change orientation for visual field	avoid high backs with full lateral curvatures promoting shoulder protraction
Scoliosis	
support curvature to maximize pressure relief	3 pt. positioning, forces at apex of spine (not rib cage), and on opposite side high/ low
support to gain head in midline where possible	monitor ability to position in chair – interference of laterals on transfers/ clothing changes

Respiration

A client's breathing capacity may be affected by changes in seated position and therefore the degree of chest expansion and thoracic mobility must be assessed. If the client has a tracheostomy, the head and neck position is important to maintain for air flow. Often "straightening" the client may experience a tracheal shift resulting in impingement due to spinal changes. It is therefore recommended that pulse oximetry be utilized in order to see changes in oxygen levels with alterations in head/trunk positioning, and alternate activities.

Orthopedic changes

Past or future surgeries can change the client's ability to tolerate fixed positioning. Therefore it is important to determine if the client has or will have tendon releases, osteotomies, spinal fusions, rod placements, or pins/plates insertion or removal. Fractures that may be a result of osteoporosis or stress factures can be determine by available bone scans, bone densities or x-rays. X-rays will also assist in demonstrating ongoing dislocations. Clients must also be assessed for possible arthritis and resulting pain which may occur from immobile joints.

Caregivers

When completing a custom seating system, transfers and use of mechanical lifts and slings can become more difficult for care givers due to the close contact of the curvatures. It is important to consider how the transfer is completed prior to finishing a system in order to ensure that the transfer will be able to be completed and all slings can be removed after the client is in the chair. Custom seating can also impinge on catheter and condom drainage or urinal use if it is too contoured or these factors are not taken into consideration. Dressing a client can be more difficult if done in the seating system as the client cannot be shifted as easily. Custom seating systems are generally a little more difficulty to move and place in/out of a mobility base, and therefore the transport of system must be addressed prior to determining the type of seating to be completed. Lastly, it is important that the ease of cleanliness and durability be addressed as the integrity of the system will be affected by the ability to maintain the general hygiene of the product.

Seating Solutions

When completing any seating it is important to consider the prevention of abnormal postures, orthopedic deformities and/ or pressure problems. We also need to provide the ability to correct abnormal postures and functional orthopedic deformities that are flexible and will enhance function and heal/ correct the causes of pressure problems. Seating may also provide accommodation of abnormal postures and orthopedic deformities which are structural (fixed) in nature. Overall seating should provide comfort, enhance or preserve functional ability and ease of management.

The following solutions are suggested for custom contoured seating in relation to specific orthopedic conditions.

Rollin', Rollin', Rollin' . . . Get This Wheelchair Rollin' Selecting Access Methods for Power Mobility

Roslyn Livingstone, Dip COT
Nicole Wilkins, BSc, OT

Background:

Research has shown that providing power mobility to children with severe disabilities improves communication, cognitive, and psychosocial skills. As therapists, we know that early use of independent mobility equipment is beneficial in facilitating overall development. The literature also shows that the concern that power mobility will limit physical development is unfounded.1

Children with a variety of physical, sensory and cognitive challenges can benefit from use of power mobility equipment. Although limitations in abilities may be barriers to fully independent driving, use of a power wheelchair can be of benefit for many levels of driving ability.

Some children are able to drive a power wheelchair independently within a short period of time although they may require supervision as appropriate for their developmental level or age. Goals for these "independent drivers" may be to improve driving skills in different environments or situations.

Children who have multiple and complex disabilities are often not provided with power mobility experience. However, with an extended period of training and practice, they may develop basic driving skills. These "supervised drivers" may require a level of supervision or assistance for a substantial period of time or indefinitely.

Some children require constant assistance and may not ever develop independent driving skills. Very often, therapists tend to not give these children the opportunity to try power mobility based on their significant challenges. However, the use of power mobility with these "exploratory drivers" can facilitate their overall development such as learning about movement and cause and effect.

Access Assessment:

Prior to evaluating a child's ability to use power mobility, ensure the seating provides sufficient support while allowing for voluntary movement. Whether the child is driving with their hand, head or other body part, seating helps the child maintain a stable position while moving the body part needed for access.

Barker and Cook2 first described a systematic approach to access assessment in 1981 including control site selection (e.g. hand), interface selection (e.g. joystick) and comparative testing of control sites and interfaces. They first described the hierarchy of control sites as being hand, head, foot, arm and leg. Evaluation of the child's accuracy, quality and ease of movement was first proposed by Lee & Debra Jay Thomas3 in 1990.

We have applied this hierarchy to power mobility and developed our model seen on the next page. We are looking for which body part the user can voluntarily move in varying directions and with control. Using this model, the client's control site selection is done by considering the client's movements in the hierarchy of the hand, head/face, mouth, foot and other body parts. Some client's may need to use a variety of body parts to drive. When trialing the control sites and interfaces, consideration of accuracy, quality and ease of movement is vitally important. The model also reflects the need to trial proportional controls before digital (switch) controls as they provide 360 degrees of directional control and integrated speed control. The electronics are simpler and the cost is less but finer physical movements are required.

Once we have identified potential control sites (e.g. head), we would select the appropriate interface (e.g. rim control) and have the child try driving in a real power wheelchair. For some children, the control site may be obvious and may just require fine tuning such as repositioning a rim control further forward. For others, several comparisons of control sites and interfaces will be needed.

Depending on the level of ability and the current and future goals of the client, it is also imperative to apply the model to evaluate the client's ability to control the accessory switches. These switches are needed to operate power wheelchair functions such as on/off, mode, drive select, and power tilt etc. The evaluation of further control sites may be needed if the user needs to also operate or integrate the power wheelchair with other devices such as a computer, communication device or environmental controls.

Some checklists such as the Powered Mobility Program are useful for tracking children's progress and the level of adult assistance or supervision. However, we don't tend to use formal checklists or formal assessments to determine readiness, ability level or qualification for a power wheelchair. Instead, our team's philosophy is to assess the child in a real power wheelchair using fun motivating activities, and child directed exploration. We consider the level of family and community support, environmental factors, as well as the child's ability in the power wheelchair.

Funding through our governmental source is considered if the child demonstrates:

- intention and motivation to move
- can move the wheelchair forward, right and left
- has intentional release and stop on command or to avoid an obstacle
- has some safety awareness as appropriate for age

For many supervised and exploratory drivers who don't qualify for government funding, we consider options such as:

- loaning power mobility equipment
- using a joystick or switches with a manual wheelchair to teach directional awareness and control
- other mobility options such as a tricycle or walker
- reassess when skill level changes

Very often, therapists and clients base their power wheelchair decision on its physical appearance, size or indoor/outdoor performance. However, for children who use alternate interface methods (e.g. head control or switches) it is critical to FIRST trial a variety of manufacturers interfaces (i.e. not all proximity head arrays work the same on different wheelchairs). In addition, not all interface methods are available on every manufacturers wheelchair. The electronics vary widely and they need to be carefully matched to the client. For instance, some visual displays require literacy abilities and keen vision. Once the client's access method and preferred electronics are selected, THEN trialing the wheelchairs in a variety of indoor and outdoor environments is beneficial. Choosing particular features on various power wheelchairs may further narrow the selection. As always, client, family, and therapist preferences will affect all of these decisions.

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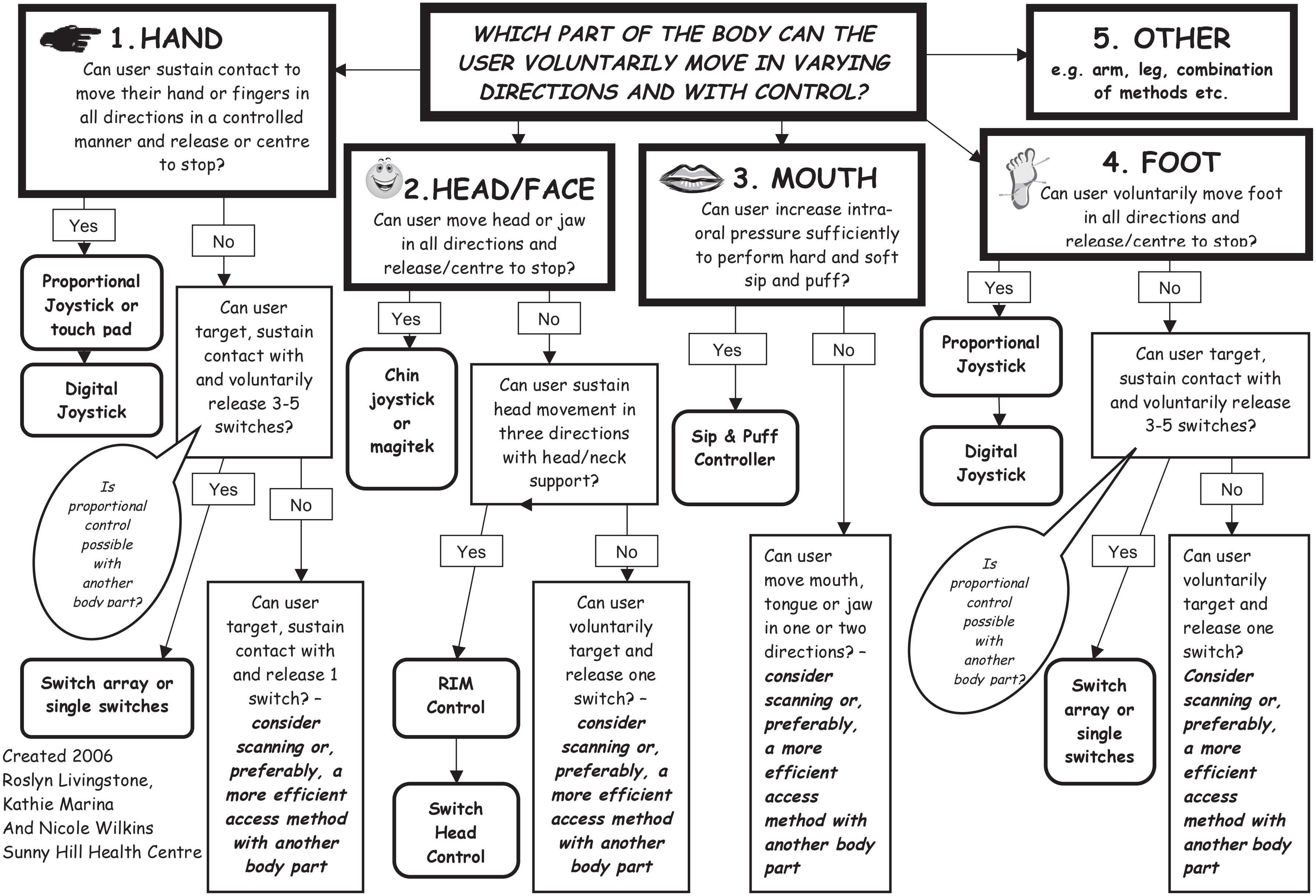
Access Assessment flow chart for power mobility



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Interactive Poster Sessions

Enabling safe powered wheelchair mobility with long term care residents with cognitive limitations

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Pamela J Holliday, BSc. (PT)
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Background

Mobility is essential to the health and quality of life of older adults. Many long term care (LTC) residents who are physically unable to propel a manual wheelchair do not have the option of using a powered wheelchair because their cognitive status creates a risk of injury to themselves and others. Current interventions to enable safe powered mobility are limited and these residents are dependent on caregivers to move them. The purpose of this research is to investigate the potential of an anti-collision powered wheelchair to enable safe and independent mobility in LTC residents with little independent manual wheelchair mobility and mild-to-moderate cognitive impairments. The study examines the effects of anti-collision powered wheelchair use on others living or working in the LTC environment. The results of this research will inform clinical practice and have implications for new mobility intervention options for LTC residents who are otherwise totally dependent on others for mobility.

Hypotheses

1) With personalised training, LTC residents with little independent mobility and mild-to-moderate cognitive impairments will be able to operate the anti-collision powered wheelchair. 2) Compared with the use of a manual wheelchair, use of an anti-collision powered wheelchair by these residents will a) increase their independent distance traveled as measured by distance loggers, and b) increase their performance and satisfaction with mobility goals. 3) Use of an anti-collision powered wheelchair by these residents will positively impact their psychological well-being. 4) Anti-collision powered wheelchair use by these residents will a) be perceived as safe by other residents and LTC staff, and b) not alter the staff's self-reported performance and satisfaction with work (e.g. level of work).

Methods

A multiple single subject research design is used to examine anti-collision powered wheelchair use by LTC residents. Studies are conducted in the following format: Phases A/B/C or A, where A is the baseline phase, B is the anti-collision powered wheelchair training phase and C is the anti-collision powered wheelchair use phase. Residents who are suitable for anti-collision powered wheelchair use after training continue to the C phase, and other residents return to the A phase. The effects of anti-collision powered wheelchair use on other LTC residents and staff are assessed by interviews.

Study Participants

A convenience sample of residents and staff from LTC at Sunnybrook Health Sciences Centre is being recruited. For the single subject studies, a minimum of seven residents will be tested. The inclusion criteria for residents include mild-to-moderate cognitive impairment as defined by Mini Mental Status Exam, and the resident must currently have and use a manual wheelchair but have little observed self-mobility. The exclusion criteria include a history of aggression leading to actual or risk of injury to self or others, and currently driving a powered mobility device. A minimum of 12 residents and 12 staff members will be interviewed to assess the impact on other LTC residents and staff.

Anti-collision Powered Wheelchair

The anti-collision powered wheelchair is the Nimble RocketTM Powered Wheelchair, enhanced with a sensor skirt surrounding the base of the wheelchair. The sensor skirt acts as a bumper and when contact is made with an obstacle, the sensors in the area making contact are triggered, and the powered wheelchair comes to a stop. Only movement away from the obstacle is allowed. Indicator lights, mounted beside the controller display the directions where movement is allowed. The technology was developed to have a highly reliable and sensitive sensor system to ensure that all bumps will cause the chair to stop and that bumps (such as with people) will be essentially undetectable to the person being touched by the chair. The system was also designed such that small diameter objects (e.g. 2.5 cm diameter cane) and objects in contact with the floor are readily and consistently detected by the sensors. The maximum forward driving speed of the powered wheelchair is also set at a speed appropriate for the LTC environment. If any part of the technology fails the powered wheelchair stops to ensure safety.

Outcome Measures

The primary outcome for the single subject studies is independent distance traveled by the resident, as measured by electronic distance loggers mounted on the resident's manual wheelchair and anti-collision powered wheelchair. Time-sampled observations including the frequency of self-initiated wheelchair movements, staff assistance required and collisions (for the powered wheelchair) are used to validate the data from the distance loggers. Secondary outcome measures include performance and satisfaction with mobility goals as measured by the Canadian Occupational Performance Measure (COPM) and psychological well-being as measured by the Psychosocial Impact of Assistive Devices Scale (PIADS).

Data Analysis

For the single subject studies, data on mobility collected from the distance loggers are plotted on line graphs and visually and statistically analyzed using celeration lines to identify changes between the phases. Data from the time-sampled observations are compared with the mobility data from the distance loggers. Results from the COPM and PIADS are analysed for clinically important changes. Interview data from other LTC residents and staff are transcribed and analysed using the method of content analysis.

Study Progress

We have equipped six powered wheelchairs with the anti-collision interface. Safety performance testing and risk analysis for the anti-collision powered wheelchairs are complete. Three LTC residents pilot tested the anti-collision powered wheelchair to acquire feedback regarding the acceptability, operation and utility of the anti-collision powered wheelchair. All residents operated the anti-collision powered wheelchair without incident, and feedback from residents, family members, and staff was positive. Data collection for the single subject studies is underway. Three LTC residents with mild-to-moderate cognitive limitations are currently enrolled in the single subject studies. Study results are pending. A patent application for the anti-collision interface is in progress.

Acknowledgements

Susan Gorski, Clinical Engineer, Gerry Griggs, Electronics Technologist, and Adam Sobchak, Industrial Designer, of the iDAPT Technology Research and Development Team, Toronto Rehabilitation Institute; Nimble Inc. for supplying RocketTM Powered Wheelchairs; and Canadian Institutes of Health Research (Operating Grant and Canada Graduate Scholarship Masters Award).

Using Qualitative Methods to Characterize Pushrim-Activated Power-Assist Wheelchair Users

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Aim:

To determine manual wheelchair users' experiences, attitudes, and beliefs regarding pushrim-activated power-assist wheelchairs (PAPAWs).

Background: PAPAWs combine features of manual and power wheelchairs [1]. Human power is delivered by the arms through the pushrims while electric power is delivered by a battery through two electric motors in the rear wheel hubs [2]. These motors can either magnify or reduce (i.e., brake) the propulsive force applied to the pushrims by the user [3]. The PAPAW has been found to reduce the strain on the upper extremities of manual wheelchair users [2, 4] and can be more energy efficient [5-8]. While the PAPAW is helpful for tasks that require more wheel torque, the PAPAW can be disadvantageous for skills that require greater control [1, 9], e.g. "wheelies". The purpose of this study was to examine the impact of PAPAWs in users' everyday lives.

Methods: Qualitative methods and ABA design (proposed N=30) were used. A) Pre-intervention: use own manual wheelchair wheels, B) Intervention: use power-assisted wheels only for eight weeks, and A) Post-intervention: return to use of own wheels for four weeks. Four open-ended interviews were conducted with each participant: (1) the day the participant received the power-assist wheels, (2 & 3) after four and eight weeks of using the power-assist wheels, and (4) after four weeks of being back in their own chair. This paper reports the results of the first seven participants to complete the study. All seven participants had ultralight manual wheelchairs upon entering this study.

Table 1 Candidates versus non-candidates for PAPAWs

Candidates	Non-Candidates
Has a caregiver. Caregiver available to load chair and remove/attach wheels	Need to have the ability to get their own chair in/out of car on their own
More severely disabled, unable to push chair, this or full power but Pawpaw preferable to full power because it can be taken apart	"Wheels *triple* weight of chair, when you are used to a 25 pound chair and all the sudden it's 70 - 75 pounds, you aren't as mobile"
Has a lift to load a wheelchair into the car so weight and disassembly are not issues	Can self propel chair
"Good for somebody like me . . . not to the point where I want a joystick to be the sole exercise that I get. But at the same time I want to be able to go through different terrains . . . not really comfortable with the wheels that I have now; doesn't want total dependence on the joystick . . . wants the exercise".	"Appearance made me more conscious of my disability"

Results

Thus far in the study, three participants have had an overall positive experience of the PAPAW and four have had a negative experience. Participants more likely to have a favorable assessment of PAPAW use typically had difficulty wheeling because of fatigue and/or environmental barriers (inclines, dirt, sand, gravel, etc.) and assistance (a lift) to get the chair in and out of the car. Participants less likely to have a favorable assessment of PAPAW were most active and physically fit and needed to load their chair into their car quickly and by themselves. Comments from all participants included concern about the increased width and weight of the power-assist wheels and limited battery life. Three participants felt weaker after eight weeks of PAPAW use, however returned to their previous strength within days of returning to their own wheels. One subject reported: "No dull ache in shoulders and upper neck [when using PAPAW] . . . [PAPAW] a way that I can prolong onset of pain and rotator cuff surgery/medication" while another reported: "Extra width caused me to hold my arms out a little wider to push which increased should pain".

Conclusion:

Preliminary data offer suggestions as to who may be a candidate for the PAPAW. See Table 1. A limitation of this study is that participants were restricted from choosing to use PAPAWs only in more demanding situations (e.g. up hills). Depending on what phase of the study they were in, participants had to either use manual wheels only or PAPAWs only.

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The Introduction and the Roles of The Japanese Society of Seating Consultants (JSSC)

Takashi Kinose & Hideyuki Hirose, PT, Mech. Eng.

The Japanese Society of Seating Consultants (JSSC) was established in June 2003 by some physical therapists (PTs) and occupational therapists (OTs) who are wheelchair (w/c) seating specialists. There are 5 sections (projects) in the JSSC: A: Education and Studying, B: Academic Research, C: Public Relations, D: Consultation, E: Products Evaluation. In this paper, I will introduce the origin and circumstances of the JSSC, some of our activities, spotlighting A and B projects, and our future tasks.

1. Member transition:

Presently (November 2006), members including member corporations are about 400, which has been increasing constantly every year: 04'=107 05'=232 06'=402. (PTs:165, OTs:173, w/c makers/ salespersons:32,rehabilitation engineers:3, social welfare staff:5, nurses:2, doctors:2, member corporations:13)

Table1. The History of the JSSC activities

2003.06	Established JSSC
2004.02	The first general meeting of Establishing JSSC
2004.12	Present situation of consulting and future tasks (Study group)
2005.01	The seating posture evaluation method (ISO16840 -1) (Research group)
2005.02	JSSC basic training course (lecture #1)
2005.07	Maintenance and management of regular w/c (Seminar #1)
2005.09	JSSC basic training course (lecture #2)
2005.10	Consultation at International Welfare devices Exhibition (Show)
2005.11	The first JSSC Symposium
2006.01	Adjusting technology of Modular w/c (Seminar #2)
2006.03	JSSC basic training course (lecture #3)
2006.05	Maintenance and management of regular w/c (Seminar #3)
2006.09	JSSC basic training course (lecture #4)
2006.10	The second JSSC Symposium
2006.11	Selection and Adjustment of w/c cushions (Seminar #4)
2006.12	Sitting posture measurement based on ISO (Study group)
2007.02	JSSC basic training course (lecture #5) ··· (a future plan)

2. The Introduction of some of The JSSC Activities:

A. Education and Study:
We provide basic and advanced study courses for members. The basic course includes biomechanics, mat evaluation, pressure ulcer and skin assessment, w/c adjustment for clients, and clinical practice. The advanced course, which is usually a one or two day seminar for seating professionals, teaches measurement methods of adjusting w/c and cushions for clients, selecting and adjusting methods of adjustable (modular type) w/c and w/c cushions in order to prevent pressure ulcers for w/c users.

A-1. Basic course:

In February 2005 the first seating basic course was held for three days with 60 participants. After that four basic courses were held in Tokyo (3times) and Kagawa (west side of Japan). The fifth basic course will be held in Shiga (west side of Japan) this year.
The basic three day course includes twelve lectures, which are 90 minutes each in duration.

Table2. The lecture details are:

1. Introduction of seating and handicapped persons ' living skills
2. Technical terms and seating ability classification
3. Biomechanics for understanding seating
4. Clinical evaluation of physical function
5. Understanding w/cs
6. Prevention and treatment of pressure sores
7. w/c cushion selection
8. Equipment for transfer to/from w/cs
9. Risk management in w/c use.
10. Understanding devices for seating positions
11. Present situation of seating for the handicapped persons
12. Present situation of seating in medical organizations

The purpose of the basic course is to increase technical knowledge of kinematics and seating technique.

A-2 Advanced Course: (1.5 days Seminar)

#1&3: "Present situation of regular w/c maintenance and management"
We will discuss the present situation and problems regarding regular w/cs. Some of the problems are: low tire pressure, malfunctioning brakes, no consistency in level of left and right footsuport in medical institutions and social welfare facilities. In addition, PTs & OTs' in those facilities lack of knowledge of w/c maintenance and management.
To solve those problems, a study group on maintenance technique and management of w/cs held a seminar. The outline of the seminar

#1 is the following:
1.History and background of Kakeyu Hospital's use of seating method
2.Construction of, kinds of, and devices for Tilt & Reclining w/c
3.Maintenance of Tilt & Reclining w/c
4.Relationship between client's physical function and the limits of Tilt & Reclining w/c adjustment

#2: "Selection and Adjustment of Modular w/c"
1.Case study: Selection and Adjustment of Modular w/c
2.Case study: Tilt Recline Modular w/c
3.Practicum: Adjusting Modular w/c
4.Problems and issues in introducing Modular w/c to medical facility

#4: Selection and Adjustment of w/c cushions (Practicum seminar)
1.Purpose of cushions and prevention of pressure sores
2.Selection and adjustment of cushions
3.Understanding cushions
4.Pressure measurement involved in cushion selection and adjustment
5.Case Study: Cushion Selection and Adjustment

B. Academic Research:

B-1 Method of evaluation of seating position (Research group)
The JSSC members hold study group on ISO16840-1, and study seating ability and body measurement method. Based on the ISO regulation TC173/SC1/WG11 (w/c seating), RPT Hirose and other members researching:

1.The measurement method of seating postures by using the ISO
2.Clinical application of the ISO posture measurement
3.Development and clinical application of posture measurement tools (devices)
4.Some of the research results will be presented in the next ISS.

3. Future Plans of JSSC:

In Japan the demands of seating technique is increasing parallel to assistive technology. But there are problems in using seating technology in Japanese medical and social welfare systems.

Prohibition of bodily restraints was instituted in March of 1999 by the Ministry of Health and Welfare. Without professional assessment the use of restraining belts with w/cs was prohibited. Elder Care Insurance was started to support senior citizen care. Since 2002 Doctor Treatment Plans were required for pressure sore treatment in medical facilities.

So the demand for PTs and OTs seating knowledge has increased. The JSSC is working hard to educate PTs and OTs to improve their knowledge and techniques to give very personal help to their clients.

Development of posture measurement instrument and its clinical application

Taro Kemmoku
Toua Gishi Kogyo co., ltd, CPO

1. Introduction
With the increase in the number of people using a wheelchair/seating system, concepts associated with seating and posture evaluation while seated have become important in health care. In 2000, the International Organization for Standardization (ISO) established the TC173 specification (Assistive Products for Persons with Disability: SC1, Wheelchair; WG11, Wheelchair Seating), and formally adopted the ISO16840 system for description of seating of wheelchair users and seating systems in March 2006. In this system, the absolute angle, defined as the angle of the gravity line and the body segment line, is estimated by palpation and measurement of several body points. We developed a handy prototype instrument (Fig. 1) for measurement of the angle of a seated body for use by healthcare staff, including physical and occupational therapists, and here we have investigated the reliability of this instrument.

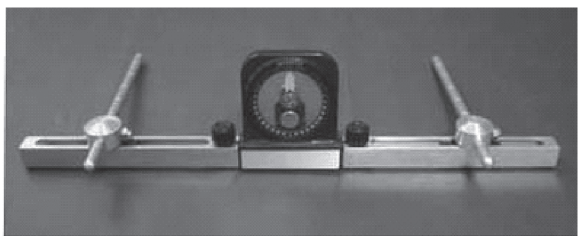

Fig. 1. Instrument prototype ver. 8 pelvic

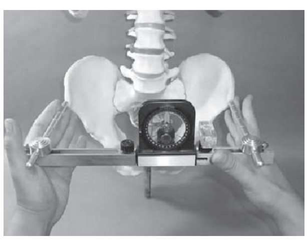

Fig. 2. Measurement of the pelvic line in the frontal plane

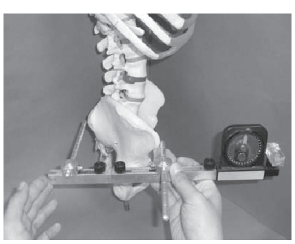

Fig. 3. Measurement of the line in the sagittal plane

2. Study Design
2.1 Subjects
The subjects were physical therapists (1 male and 4 females) aged 31±3.8 years old with occupational experience of 5.8±2.28 years. The subjects were healthy volunteers who received an explanation of the objectives and precautions prior to the study.
2.2 Objects to be measured
Metal models were prepared and measured in the frontal plane to produce uniform conditions; this included use of a measuring bar for the bone process. The models comprised upper and lower bars and 10 models were prepared. The default angles of the arms in the frontal plane were 0°, 2°, 4°, 6° and 8°, respectively (Fig. 4). The arm position was set without rotation and with rotation (15°) with respect to the direction of approach (Fig. 5

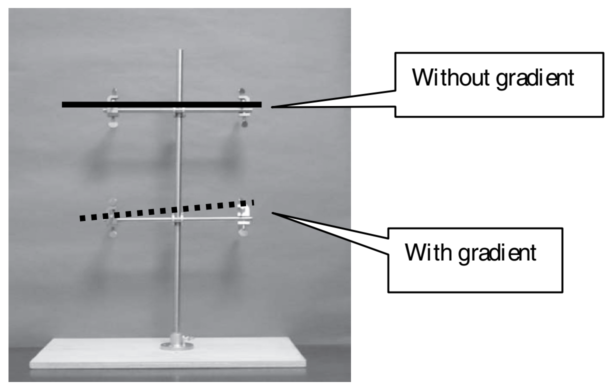

Fig. 4. Metal model (frontal plane)

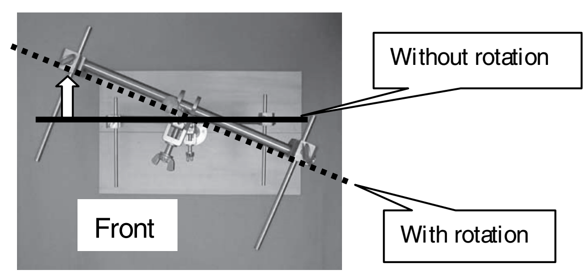

Fig. 5. Metal model (horizontal plane)

2.3 Measuring procedure

The subjects were given no information about the gradient and rotation of the metal bars. They placed the measurement instrument along a metal bar and read the gradient angle indicated in the central window. To prevent a subject from recognizing the gradient and rotation by visual observation, a T-shirt was placed over the metal models. To eliminate the effect of subject memory, the order of measurement was assigned randomly by a recorder. In making the measurement, the subjects were instructed to measure a model with the measuring instrument parallel to the direction of approach in the horizontal plane.

3. Results

Reliability assessment

The intra-rater reliability was assessed using the intraclass correlation coefficient, ICC (1,1), and the inter-rater reliability was assessed using ICC (2,1). The data were analyzed using SPSS ver. 13.0J, and the results are shown in Tables 1 to 3.

Table 1. Intra-rater Reliability.

	Subject A	Subject B	Subject C	Subject D	Subject E
1st measurement	0.917	0.805	0.472	0.787	0.78
2nd measurement	0.917	0.84	0.7	0.817	0.939
Correlation between 1st and 2nd measurements	**0.967**	**0.905**	**0.645**	**0.939**	**0.946**

Table 2. Inter-rater Reliability

1st measurement	0.679
2nd measurement	0.712
Correlation between 1st and 2nd measurements	**0.69**

Table 3. Deviation from the actual angle (unit: °)

	With rotation	Without rotation
1st measurement	0.94±1.62	0.82±1.72
2nd measurement	1.02±1.58	0.98±1.53
Total	**0.98±1.6**	**0.9±0.63**

4. Discussion and Conclusion

4.1 Intra-rater and inter-rater reliability

The results showed that the intra-rater reliability was > 0.9 in 4 of 5 subjects, and the reliability of the fifth subject improved on the second measurement compared with that on the first measurement; therefore, experience with the measurement approach is likely to improve the reliability. The inter-rater reliability was 0.69, which we categorized as "reasonably good"; however, it is likely that measurement experience will also improve the inter-rater reliability.

4.2 Deviation from the actual angle

The mean deviation from the actual angle was within 1°. This value varied more for measurement of a model "with rotation" than for a model "without rotation", but no significant difference was found.

4.3 Conclusion

The prototype instrument was confirmed to be useful for practice, based on the intra- and inter-rater reliability and the deviation of the measured angle from the actual angle.

5. Future issues

After making the measu
rements, the subjects complained that the scale was too fine to read. However, the central gradient meter cannot be replaced with a larger one because this would make the whole meter too large and unsuitable for practice. In addition, the use of a needle on the scale was found be too vague and increased the difficulty for the person making the measurement. Therefore, we will replace the current needle indicator with a digital indicator with large figures to keep the instrument compact and make it easier to read; we believe that this is the most important required modification.

6. Reference

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Headline of poster: Postural Management Consultation Service

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Background:

The State Social Security Centre of Assistive Technology in Iceland (SCAT) is currently developing a new service, postural management consultation that officially started in September 2005.
The idea of a postural management consultation developed over a long period of time. A level of frustration had developed both within the Centre and those working in the field. Often seating solutions were provided that did not meet the clients needs. The reasons could be multiple such as; the health professionals had different goals from the user, poor pre assessments or inefficient follow up etc. In order to address these issues a number of steps were taken, for instance by establishing a focus group, gathering information from users, and therapists and postural management services abroad etc.
The Canadian model of Occupational Performance was used as a framework developing and implementing the service and the Occupational Performance Process Model to guide the service pathways. Those models have been adapted to illustrate how the relationship between the client, environment, and occupation affect posture. The service aims to address postural needs through holistic, client centred practice with emphasis on multi-disciplinary teamwork.

Objective:

The postural management consultation service aim is to improve education and knowledge about postural management as well as being a support and a source of information for those involved.
Main goals:

- Enable the client to take informed decisions regarding his/hers postural management
- Act as a support and a source of information for those involved
- Increase user satisfaction
- Support teamwork within the field
- Improve awareness about the need for documentation and evaluation
- Simplify access to information and equipment
- Increase co-operation with suppliers of technical aids
- Encourage follow up
- Support research
- Reduce cost

Present situation:

A team of professionals, each with particular field of experience and knowledge provide the service. The service uses client-centred approach resulting in each case being different. Anyone can apply for the service by making appointment, sending e-mail or by a phone call. When a need for a consultation has been established the person involved needs to turn in assessment forms filled out by their own therapist or having them done by a therapist from the team. Assessment forms are available from the SCAT homepage. Necessary information is gathered and the user makes decisions about his goals.

In addition to addressing individual cases the service has thrown two courses regarding seating solutions and produced information booklets available from the SCAT homepage. It has become involved in teaching postural management in the Occupational therapy department at the University of Akureyri as well as initiating research within the field.

Conclusion:

The PMC service has taken its first steps and has already addressed some of its original goals. Series of short courses for health professionals have been held, material produced that is available on SCAT homepage, and the variety of solutions has increased. The response to the service has been positive, particularly from health professionals working in the field. The need for consultation is great and the client group has grown more than was expected. The occupational therapy approach has proved to be useful and user-friendly. The models chosen were helpful both in developing the service as well as implementing it. They were easily adapted to the services needs and gave a good frame of references. It is evident that in order to provide holistic, effective service it is necessary to have a multi-professional approach when addressing postural issues.

References:

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An occupational Therapy Perspective. Editor: Elizabeth Townsend.

Consumer's Discussion About Their Own Pressure Mapping Measurement is an Effective Method of Education to Prevent the Recurrence of Pressure Ulcers

Junko Niitsuma, PhD
De Maria Fernanda

Over the last seven years, we held a "Seating Clinic" as a collaborative effort between various hospitals and our research institute, the National Rehabilitation Center for Persons with Disabilities, Japan. Based upon two hundreds of cases from our seating clinic results, we are devising an easy to understand "How-to-seating clinic" management list for use by ordinary hospital staff. The goal of this research is to develop a management list designed to prevent pressure sores in individuals with spinal cord injury. The important aspects in making such a management list are as follows: 1) To determine the key core factors for preventing pressure sore recurrence and, 2) To obtain a good prevention ratio result using a minimum of staff. [Method] From individual clinic records, the records were stored to database. Eight (8) sampling factors were determined and computational analysis toward the database. [Results] The results were compared with the incidence of recurrence. We find that it is important not only to have good positioning but also for patients to understand their own risk factors and to educate individuals well concerning their own unique risk. Showing the result of pressure mapping measurement to individuals to answer their own risk, and discussing about method to solve their problems on pressure mapping, the individuals has known their risk and prevention method. [Discussion] In order to prevent the recurrence of pressure ulcers in active individuals with spinal cord injury, it is important to consider the following points. (1) Choosing a seating interface well-suited for the patient, preventing an uneven distribution of pressure mapping, and anticipating problems resulting from shear force. (2) The active individual with a spinal cord injury should understand their own risk and think about useful ways to prevent pressure sores. If the patient cannot clearly understand this, then the patient's helper must be advised.