37TH International Seating Symposium Proceedings

Showing Our Value

January 31, 2022 to February 2, 2022

RSTce
Department of Rehabilitation Science and Technology
Continuing Education
School of Health and Rehabilitation Sciences | University of Pittsburgh

ISS Course Director:
Mark R. Schmeler, PhD, OTR/L, ATP

Director of Continuing Education:
Rachel Hibbs DPT, NCS, ATP

David L. Lawrence Convention Center • Pittsburgh, PA • USA

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The University of Pittsburgh, Department of Rehabilitation Science & Technology Continuing Education Program (RSTCE) is the host of the 37th International Seating Symposium (ISS).

The ISS is the leading educational and scientific conference in the field of wheelchair seating and mobility as well as related technologies. The 37th ISS expects to host over 2,500 national and international attendees representing multiple countries and backgrounds.

The Symposium will include scientific and clinical papers, research forums, in-depth workshops, panel sessions, and an extensive exhibit hall. Presentations will address wheeled mobility and seating challenges in addition to solutions for people with disabilities across the lifespan. Conditions such as neuromuscular disorders, spinal cord injury and diseases of the spinal cord, orthopedic disorders, systemic conditions, obesity, and polytrauma will also be addressed.

The conference takes place January 31 – February 2, 2022 (pre-symposium workshops January 29 – 30, 2022) at the David L. Lawrence Convention Center in Pittsburgh, PA USA.

The 37th ISS features

Over 140 sessions including pre-symposium workshops, plenary sessions, instructional courses, papers, and posters.

A 127,000 square foot Exhibition Hall with over 130 exhibitors of products and services, with both public and attendee-only hours.

Audience

- Assistive Technology Professionals (ATP)
- Seating and Mobility Specialist (SMS)
- Rehabilitation Engineering Technologist (RET)
- Occupational Therapists
- Physical Therapists
- Educators
- Manufacturers
- Product Developers
- People with Disabilities
- Physicians
- Nurses
- Recreational Therapists
- Rehabilitation Engineers & Technicians
- Vocational Rehabilitation Counselors
- Researchers
- Policy Makers

Continuing Education Units

Up to 1.7 Continuing Education Units (CEUs) can be earned by individuals for attending 17 hours of instruction at the main ISS conference sessions. Additional CEUs are awarded for pre-conference workshops. (0.4 CEUs for half-day workshops, 0.8 CEUs for full-day workshops).

CEU Certificates

CEU Certificates are issued electronically via the ISS app and virtual attendee hub. Following each instructional session, a unique course code ("CEU Code") will be provided. These codes are used to verify course attendance.

During the event, attendees may complete course evaluations and input the CEU code to receive credit. The CEU certificates are prorated based on sessions actually attended in order to provide an accurate accounting of contact hours.

Information for Specific Credentials

The 37th ISS offers CEUs for courses that comply with University of Pittsburgh standards. All ISS sessions have an abstract, speaker bios, speaker disclosures of real or potential conflicts of interest, measurable learning objectives, and references to comply with most CEU standards.

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 stay current 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 they actually spent in the educational activity.

• Occupational Therapy Practitioners

The University of Pittsburgh/RSTCE is proud to announce their status as an American Occupational Therapy Associate Approved Provider (Provider #10503). The National Board for Certification in Occupational Therapy, Inc. (NBCOT) accepts the University's CEUs as PDUs for OTR and COTA re-certification. Individual State OT Practice Boards may have additional requirements.

• Physical Therapy Practitioners

As a CAPTE accredited program, the University of Pittsburgh School of Health and Rehabilitation Sciences is a pre-approved provider of CE for Pennsylvania PTs and PTAs. Physical Therapy practitioners outside of Pennsylvania should verify with their local practice boards to determine if there is reciprocity or if other necessary procedures are required to apply the University of Pittsburgh CEUs for their jurisdiction.

• Assistive Technology Professionals (ATPs)

In addition, RSTCE CEUs are accepted by the Rehabilitation Engineering & Assistive Technology Society of North America (RESNA) for certification and re-certification of the Assistive Technology Professional (ATP). The National Registry of Rehabilitation Technology Suppliers (NRRTS) also accepts the University of Pittsburgh CEUs for the Certified Rehabilitation Technology Supplier (CRTS) credential.

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Faculty

A

Freddy Alfonso Diaz
International Committee of the Red Cross
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IC26 | 2022-01-31 | 02:15 PM
Improving the Quality of Wheelchair Service in Colombia through a National Educational Initiative
1 Hour Presentation

Ana Allegretti, ATP, OTR/L, PhD
University of Texas Health Science Center San Antonio
allegrettial@uthscsa.edu

IC13 | 2022-01-31 | 01:00 PM
Implementation of the Functional Mobility Assessment in Brazil: A Pilot Project
1 Hour Presentation

Claudia Amortegui, MBA
The Orion Consulting Group, Inc.
claudia@orionreimbursement.net

IC02 | 2022-01-31 | 10:15 AM
Codes, Coverage, Products, and Innovation: Do These Words Work Together?
1 Hour Presentation

Sarah Anderson, OTR/L, OTD
The Ohio State University
anderson.3097@osu.edu

IC24 | 2022-01-31 | 02:15 PM
Implementation of a Personal Navigation System for Individuals with Disabilities: Barriers & Facilitators
1 Hour Presentation

Nancy Augustine, BSBA, MsEd
University of Pittsburgh
naugustine@pitt.edu

SS03 | 2022-02-02 | 11:00 AM
Global Perspectives on Wheelchair Policy
1 Hour Presentation

Martino Avellis, PT
Ormesa srl
martino.avellis@ormesa.com

PS03 | 2022-01-31 | 02:15 PM
Multisensorial Stimulation in a Vertical Standing for Visually Impaired Kids with CP
15 Minute Paper Presentation

Varun Awasthi, BS
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varun.awasthi@seattlechildrens.org

PO | 2022-01-31 | 5:00 PM
"We would be lost without this": A Visual Journey of Supportive Mobility Device Use by People with Cerebral Palsy
Poster Presentation

B

Deborah Backus PT, PhD
Shepherd Center
Deborah.Backus@shepherd.org

IC76 | 2022-02-01 | 04:30 PM
A Fall Prevention & Management Program for Full-time Wheelchair & Scooter Users Living with Multiple Sclerosis: Preliminary Findings
1 Hour Presentation

Viviana Baiardi, PT
Robert Hollman Foundation
viviana.baiardi8@gmail.com

PS03 | 2022-01-31 | 02:15 PM
Multisensorial Stimulation in a Vertical Standing for Visually Impaired Kids with CP
15 Minute Paper Presentation

Valeria Baldassin, PhD
SARAH Network of Rehabilitation Hospitals
204244@sarah.br

PS05 | 2022-02-01 | 10:15 AM
Low-Cost CAD/CAM System for Complex Seating Adaptations
15 Minute Paper Presentation

Jill Baldessari, OTR/L, ATP
Craig Hospital
JBaldessari@CraigHospital.org

IC32 | 2022-01-31 | 03:30 PM
Integrated Assistive Technology Features on Power Wheelchairs (RESNA Track)
1 Hour Presentation

Karen Missy Ball, ATP, PT, MT
PhysioBall Therapy, LLC
missyballpt@aol.com

IC46 | 2022-02-01 | 11:30 AM
Diverse Applications of Dynamic Seating: A Series of Case Studies
1 Hour Presentation

Nadim Barakat, BA
University of Virginia
nb4tt@virginia.edu

PO | 2022-01-31 | 5:00 PM
A Feasibility Study Assessing a Novel Fall Detection System Using Machine Learning and Computer Vision Techniques
Poster Presentation

PS05 | 2022-02-01 | 10:15 AM
A Novel Fall Detection System Using Machine Learning and Computer Vision Techniques
15 Minute Paper Presentation

Rebecca Barchus, SPT
University of Washington
rbarchus@uw.edu

PS03 | 2022-01-31 | 02:15 PM
Development and Implementation of a Longitudinal, Community-Based, Early Mobility Research Program for Children with Motor Impairments
15 Minute Paper Presentation

Leah Barid, ATP, OTR/L
Shepherd Center
Leah.Barid@Shepherd.org

IC32 | 2022-01-31 | 03:30 PM
Integrated Assistive Technology Features on Power Wheelchairs (RESNA Track)
1 Hour Presentation

Chelsea Barroero, SPT
University of Washington
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PS03 | 2022-01-31 | 02:15 PM
Development and Implementation of a Longitudinal, Community-Based, Early Mobility Research Program for Children with Motor Impairments
15 Minute Paper Presentation

Jody Bastien, OTD, OTR/L, SCEM, ATP
Department of Veterans Affairs
jody.bastien@va.gov

IC53 | 2022-02-01 | 11:30 AM
A Telehealth Model for Assistive Technology Assessments
1 Hour Presentation

Claire Behnke, DPT
Shriners Hospital for Children - Salt Lake City
cbehnke@shrinenet.org

IC86 | 2022-02-02 | 08:30 AM
On Time Mobility: A 23-Year Perspective
1 Hour Presentation

Alexandra Bennewith, MPA
United Spinal Association
abennewith@unitedspinal.org

IC49 | 2022-02-01 | 11:30 AM
My Wheelchair Guide: Manual Wheelchairs (A Smartphone Application)
1 Hour Presentation

Theresa Berner, MOT, OTR/L, ATP
Ohio State University Wexner Medical Center
theresa.berner@osumc.edu

IC52 | 2022-02-01 | 11:30 AM
Best Practices in Online Seating & Mobility Education
1 Hour Presentation

IC14 | 2022-01-31 | 01:00 PM
Shoulder Surgery: Therapists Role in Prevention and Preparation
1 Hour Presentation

IC28 | 2022-01-31 | 03:30 PM
Update on the Evidence: 2021 Revision of the RESNA Ultralight Manual Wheelchair Position Paper

IC88 | 2022-02-02 | 08:30 AM
Wheeled Mobility with Empathy During Pandemic: Strategies for a Calm Approach
1 Hour Presentation

Jennith Bernstein, PT, DPT, ATP/SMS
Permobil
jennith.bernstein@permobil.com

IC39 | 2022-02-01 | 10:15 AM
Playing to Learn: Importance of Self-Directed Mobility in Children
1 Hour Presentation

IC92 | 2022-02-02 | 08:30 AM
Providing Consumer Value and Innovation Through Evidence-Based Product Development
1 Hour Presentation

IC28 | 2022-01-31 | 03:30 PM
Update on the Evidence: 2021 Revision of the RESNA Ultralight Manual Wheelchair Position Paper
1 Hour Presentation

Kendra Betz, ATP, PT
VHA National Center for Patient Safety; University of Pittsburgh
kendra.betz@comcast.net

IC25 | 2022-01-31 | 02:15 PM
What Could Go Wrong? Evaluating Wheeled Mobility Adverse Events with an HRO Approach
1 Hour Presentation

IC72 | 2022-02-01 | 03:15 PM
Scoping Review Investigation of Complex Rehabilitation Technology and Next Steps
1 Hour Presentation

Madelyn Betz, MRT, BA
University of Pittsburgh
mab659@pitt.edu

IC72 | 2022-02-01 | 03:15 PM
Scoping Review Investigation of Complex Rehabilitation Technology and Next Steps
1 Hour Presentation

PS06 / 2022-02-01 / 11:30 AM
AT for Sports and the HAAT Model: A Case Study in Adaptive Skiing
15 Minute Paper Presentation

Michele Bishop ATP
Invacare
mbishop@invacare.com

IC79 | 2022-02-01 | 04:30 PM
Heads UP! Supporting Head Control and Access to AT: Using Bluetooth Connectivity and Seating for Task Engagement
1 Hour Presentation

Amy Bjornson ATP, SMS, PT
Sunrise Medical
amy.bjornson@sunmed.com

IC65 | 2022-02-01 | 03:15 PM
The Seat Cushion Micro Climate: Surface Temperature, Moisture, & Humidity Effects on Skin Integrity
1 Hour Presentation

Kristie Bjornson, PT, PhD, MS
Seattle Children's Research Institute
kristie.bjornson@seattlechildrens.org

PO | 2022-01-31 | 5:00 PM
"We would be lost without this": A Visual Journey of Supportive Mobility Device Use by People with Cerebral Palsy
Poster Presentation

Kathryn Blank, PT, DPT
Grand Valley State University
blankka@mail.gvsu.edu

PS03 | 2022-01-31 | 02:15 PM
Key Aspects of Power Mobility Interventions for Children: A Qualitative Study
15 Minute Paper Presentation

Sheila Blochlinger, PT, ATP
Children's Specialized
sblochlinger@childrens-specalized.org

Kath M Bogie, DPhil
Louis Stokes Cleveland VA Medical Center, Advanced Platform Technology Center
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PS04 | 2022-01-31 | 03:30 PM
Development of the High-Performance, Low-Cost Personalized Modular SquishINS Cushion for Value-Driven Pressure Relief
15 Minute Paper Presentation

IC01 | 2022-01-31 | 10:15 AM
Promoting Active Safety for Power Wheelchair Users with SCI: Recognition & Prevention of Inadvertent Lower Extremity Injuries
1 Hour Presentation

Linda Bollinger, PT, DPT, ATP
Sunrise Medical
linda.bollinger@sunmed.com

IC80 | 2022-02-01 | 04:30 PM
10 Things I Hate About You: Exploring the Relationship, Roles, and Responsibilities of the Team Members of a Seating and Mobility Clinic
1 Hour Presentation

IC27 | 2022-01-31 | 02:15 PM
Considerations for Dependent Mobility in the Pediatric Client
1 Hour Presentation

Brenda Sposato Bonfiglio, MEBME, ATP
University of Illinois at Chicago
bsposato@uic.edu

IC68 | 2022-02-01 | 03:15 PM
Supporting the Client: Extending the Impact of the ATP Through Client and Caregiver Training (RESNA Track)
1 Hour Presentation

Becky Breaux, MS, OTR/L, ATP
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becky.breaux@ucdenver.edu

PS06 | 2022-02-01 | 11:30 AM
Person-Centered Care in the Provision of Wheelchair Seating and Mobility and Complex Rehabilitation Technologies: A Review of the Literature
15 Minute Paper Presentation

David Brewington, PhD
Shirley Ryan AbilityLab
dbrewingto@sralab.org

IC77 | 2022-02-01 | 04:30 PM
Healthcare Quality Improvement Focused on Efficiency of Complex Wheelchair Procurement: An Administrative Case Report
1 Hour Presentation

David Brienza, PhD
University of Pittsburgh, Department of Rehabilitation Science and Technology
dbrienza@pitt.edu

IC30 | 2022-01-31 | 03:30 PM
Demystifying Seat Cushion Claims: How to use Performance Standards to Assess & Provide Evidence for Marketing Literature
1 Hour Presentation

Emily Buchman
Georgia State University
ebuchman@gsu.edu

PO | 2022-01-31 | 5:00 PM
Ultralight wheelchair for individual's with stroke: a preliminary study
Poster Presentation

Margaret Bujor
University of Virginia
mjb6ep@virginia.edu

PO | 2022-01-31 | 5:00 PM
A Feasibility Study Assessing a Novel Fall Detection System Using Machine Learning and Computer Vision Techniques
Poster Presentation

PS05 | 2022-02-01 | 10:15 AM
A Novel Fall Detection System Using Machine Learning and Computer Vision Techniques
15 Minute Paper Presentation

Mary Ellen Buning, PhD, OT, ATP/SMS
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me_buning@mac.com

IC49 | 2022-02-01 | 11:30 AM
My Wheelchair Guide: Manual Wheelchairs (A Smartphone Application)
1 Hour Presentation

Brian Burkhardt, MS, ATP
Eleanore's Project
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C

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IC03 | 2022-01-31 | 10:15 AM
Emerging Needs During the Pandemic & Innovation During Lockdown: Posture Management in ICUs
1 Hour Presentation

Susan Calyer, ATP, OTR/L, CAPS
ALS Regional Center, St. Peter's Hospital
susiecalyer@yahoo.com

IC23 | 2022-01-31 | 02:15 PM
Guidelines for ALS Therapeutic Interventions and Plan of Care
1 Hour Presentation

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fabiola.canal@cavenaghi.com.br

PO | 2022-01-31 | 5:00 PM
Transition of wheelchair models related to neuropsychomotor development: A case study.
Poster Presentation

Diane Carrillo, ATP, PT, SMS
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thrivesms@gmail.com

IC100 | 2022-02-02 | 09:45 AM
Telehealth for Mobility and Wheelchair Evaluation: An Observational, Evidenced-based Approach
1 Hour Presentation

Cathy Carver, PT, ATP, SMS
University of Alabama at Birmingham - Spain Rehabilitation Center
cathyhcarver@gmail.com

IC66 | 2022-01-31 | 02:15 PM
Closing the Gap for People Needing CRT Through Inpatient Rehab and Outpatient Collaboration
1 Hour Presentation

Nathan Casey, PT, NCS
Ohio State University Wexner Medical Center
nathan.casey@osumc.edu

IC95 | 2022-02-02 | 09:45 AM
Electrical Stimulation and Improved Seating Outcomes: Literature Review and Clinical Application
1 Hour Presentation

Chris Chovan, OTR/L, ATP, CA, PS
University of Pittsburgh Medical Center (UPMC)
chovanc2@upmc.edu

IC17 | 2022-01-31 | 01:00 PM
Bathroom Modifications: The Good, The Bad, & The Ugly
1 Hour Presentation

Daniel Cochrane, ATP, MS, MA
University of Illinois at Chicago
dcochr2@uic.edu

IC68 | 2022-02-01 | 03:15 PM
Supporting the Client: Extending the Impact of the ATP Through Client and Caregiver Training (RESNA Track)
1 Hour Presentation

Stephanie Cooley, ATP, OT, OTR/L
Inpatient Rehab
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IC96 | 2022-02-02 | 09:45 AM
Seating and Positioning Across the Continuum: Improving Outcomes
1 Hour Presentation

Lisa Cordero, ATP, PT
Home Medical Equipment/National Seating and Mobility
lgraziano@hmeny.net

IC80 | 2022-02-01 | 04:30 PM
10 Things I Hate About You: Exploring the Relationship, Roles, and Responsibilities of the Team Members of a Seating and Mobility Clinic
1 Hour Presentation

Filipe Correia
Stealth Products Inc
filipe@stealthproducts.com

IC16 | 2022-01-31 | 01:00 PM
The Link Between Dysphagia and Posture
1 Hour Presentation

Lisa Couzens, OT
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lisa.couzens@scu.edu.au

IC65 | 2022-02-01 | 03:15 PM
The Seat Cushion Micro Climate: Surface Temperature, Moisture, & Humidity Effects on Skin Integrity
1 Hour Presentation

Barbara Crume, PT, ATP
MountainCare Services
barbarac@mtncare.org

IC49 | 2022-02-01 | 11:30 AM
My Wheelchair Guide: Manual Wheelchairs (A Smartphone Application)
1 Hour Presentation

Theresa Crytzer, ATP, PT, DPT
University of Pittsburgh
tmc38@pitt.edu

IC101 | 2022-02-02 | 09:45 AM
Impact of Cardiopulmonary Function on Wheelchair Seating and Mobility in Adults and Children
1 Hour Presentation

Haidar Tafner Curi, OT
University Federal of S√£o Paulo
haidar.curi91@gmail.com

PS02 | 2022-01-31 | 01:00 PM
Investigation of Wheelchair Satisfaction & Related Service of Wheelchair Users in Brazil
15 Minute Paper Presentation

D

Elisa Da Riva, PT
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PS03 | 2022-01-31 | 02:15 PM
Multisensorial Stimulation in a Vertical Standing for Visually Impaired Kids with CP
15 Minute Paper Presentation

Aline Correa de Almeida e Silva, OT
SARAH Network of Rehabilitation Hospitals
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PS05 | 2022-02-01 | 10:15 AM
Low-Cost CAD/CAM System for Complex Seating Adaptations
15 Minute Paper Presentation

Sarah Dean, SPT
University of Washington
smdean12@uw.edu

PS03 | 2022-01-31 | 02:15 PM
Development and Implementation of a Longitudinal, Community-Based, Early Mobility Research Program for Children with Motor Impairments
15 Minute Paper Presentation

Alexandra Delazio, MS, BS
University of Pittsburgh
amd292@pitt.edu

IC30 | 2022-01-31 | 03:30 PM
Demystifying Seat Cushion Claims: How to use Performance Standards to Assess & Provide Evidence for Marketing Literature
1 Hour Presentation

Ashley Detterbeck, DPT, ATP, SMS
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IC08 | 2022-01-31 | 10:15 AM
How Complex are CRT users?
1 Hour Presentation

Brad Dicianno, MD, MS
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SS02 | 2022-02-01 | 08:30 AM
Large Data: Threat or Opportunity
1 Hour Presentation

Gerry Dickerson, ATP
NSM
gerry.dickerson@nsm-seating.com

IC57 | 2022-02-01 | 02:00 PM
A Different Approach to Documentation
1 Hour Presentation

IC40 | 2022-02-01 | 10:15 AM
Seating and Mobility Technology: What's Annoying & What's Fixable (RESNA Track)
1 Hour Presentation

Carmen Digiovine, PhD, ATP/SMS, RET
The Ohio State University
carmen.digiovine@osumc.edu

IC18 | 2022-01-31 | 01:00 PM
ATP Certification and Ethics for the New Era (RESNA Track)
1 Hour Presentation

IC52 | 2022-02-01 | 11:30 AM
Best Practices in Online Seating & Mobility Education
1 Hour Presentation

IC24 | 2022-01-31 | 02:15 PM
Implementation of a Personal Navigation System for Individuals with Disabilities: Barriers & Facilitators
1 Hour Presentation

IC72 | 2022-02-01 | 03:15 PM
Scoping Review Investigation of Complex Rehabilitation Technology and Next Steps
1 Hour Presentation

Kaitlin DiGiovine, BS
University of Pittsburgh
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PS02 | 2022-01-31 | 01:00 PM
Web-Based Transfer Training: Evidence for an Online Approach for Wheelchair Transfer Training
15 Minute Paper Presentation

Dan Ding, PhD
Human Engineering Research Laboratories, University of Pittsburgh, Department of Veterans Affairs
dad5@pitt.edu

IC45 | 2022-02-01 | 10:15 AM
Mainstream Smart Home Technologies for People with Physical Disabilities (RESNA Track)
1 Hour Presentation

Laura Dobrich PT, DPT
Western Pennsylvania School for Blind Children
laudobri@aol.com

IC101 | 2022-02-02 | 09:45 AM
Impact of Cardiopulmonary Function on Wheelchair Seating and Mobility in Adults and Children
1 Hour Presentation

E

Peterson Elizabeth, PhD, OTR/L
University of Illinois at Chicago

IC76 | 2022-02-01 | 04:30 PM
A Fall Prevention & Management Program for Full-time Wheelchair & Scooter Users Living with Multiple Sclerosis: Preliminary Findings
1 Hour Presentation

William Emfinger, PhD
Permobil
william.emfinger@permobil.com

IC82 | 2022-02-01 | 04:30 PM
Using Big Data to Improve Quality and Value for Multiple Stakeholders in Complex Rehab Technology (CRT)
1 Hour Presentation

Ana Endsjo, MOTR/L, CLT
Permobil
ana.endsjo@permobil.com

IC97 | 2022-02-02 | 09:45 AM
Adding ISO Standards to the Clinical Reasoning Process
1 Hour Presentation

F

Rachel Fabiniak, PT
Permobil Australia
rachel.fabiniak@permobil.com

IC85 | 2022-02-02 | 08:30 AM
Valuing Consumers' Choice and Control Within a Functional Based Insurance Funding System
1 Hour Presentation

Amanda Farrell
Safespaces
amanda.f@safespaces.co.uk

IC05 | 2022-01-31 | 10:15 AM
Modifications to the Home Environment & Beyond: Creating Safer Environments
1 Hour Presentation

Daniel Fedor, BS
VGM
dan.fedor@vgm.com

IC91 | 2022-02-02 | 08:30 AM
Telehealth Reimbursement Considerations for Wheelchair Evaluation
1 Hour Presentation

Heather Feldner, PhD, PT, PCS
University of Washington
hfeldner@uw.edu

PS03 | 2022-01-31 | 02:15 PM
Development and Implementation of a Longitudinal, Community-Based, Early Mobility Research Program for Children with Motor Impairments
15 Minute Paper Presentation

IC35 | 2022-01-31 | 03:30 PM
Evidence & Expertise: A Delphi Study to Develop Evidence-Based Guidelines for the Introduction of the Permobil® Explorer Mini
1 Hour Presentation

IC10 | 2022-01-31 | 01:00 PM
ON Time Mobility: Why Advocating for Movement Experiences for Children with Disabilities Must Move Beyond 'Early'
1 Hour Presentation

PO | 2022-01-31 | 5:00 PM
"We would be lost without this": A Visual Journey of Supportive Mobility Device Use by People with Cerebral Palsy
Poster Presentation

Eliana Chaves Ferreti
University Federal of S√£o Paulo
chavesferretti@gmail.com

PS02 | 2022-01-31 | 01:00 PM
Investigation of Wheelchair Satisfaction & Related Service of Wheelchair Users in Brazil
15 Minute Paper Presentation

Kathy Fisher, OT
Invacare Canada
kfisher@invacare.com

IC58 | 2022-02-01 | 02:00 PM
Considering Power Dynamic Positioning as an Essential Part of the Seating System
1 Hour Presentation

Kathleen Fitzgerald, PT, DPT, NCS
UAB Hospital/Spain Rehabilitation Center
khfitzgerald@uabmc.edu

IC66 | 2022-01-31 | 02:15 PM
Closing the Gap for People Needing CRT Through Inpatient Rehab and Outpatient Collaboration
1 Hour Presentation

Jackelyn Vannessa Flores
Universidad Nacional Mayor de San Marcos
jacky-flores@hotmail.com

PS02 | 2022-01-31 | 01:00 PM
Translation of the Wheelchair Satisfaction Questionnaire from English into Spanish
15 Minute Paper Presentation

Lina Marcela Florez Botero, PT
Servicio Nacional de Aprendizaje. SENA
lflorezb@sena.edu.co

IC26 | 2022-01-31 | 02:15 PM
Improving the Quality of Wheelchair Service in Colombia through a National Educational Initiative
1 Hour Presentation

Jasmine Fox, OT
Auckland District Health Board
jasminef@adhb.govt.nz

IC51 | 2022-02-01 | 11:30 AM
Showing our Values — Clinical Practice in Aotearoa New Zealand
1 Hour Presentation

Kit Frank, OTR(r)
Fundacion Jen Lee
bobkitfrank@gmail.com

PS01 | 2022-01-31 | 10:15 AM
Translation & Cross-Cultural Adaptation of the Wheelchair Components Questionnaire (WCQ) from English to Spanish
15 Minute Paper Presentation

PS01 | 2022-01-31 | 10:15 AM
Translation of the Aspects of Wheelchair Mobility Test into Spanish
15 Minute Paper Presentation

PS01 | 2022-01-31 | 10:15 AM
Translation of the Wheelchair Interface Questionnaire into Spanish
15 Minute Paper Presentation

Tammy Franks
National Safety Council
Tammy.Franks@nsc.org

Jack Fried, BS
University of Pittsburgh
jjf70@pitt.edu

IC89 | 2022-02-02 | 08:30 AM
The Value of Community Data in the Design, Testing, Selection, and Maintenance of Casters
1 Hour Presentation

Emma Friesen, PhD
Raz Design
efriesen@razdesigninc.com

PO | 2022-01-31 | 5:00 PM
Generating evidence for supported seating postures in mobile shower commodes and chairs: study protocol
Poster Presentation

IC70 | 2022-02-01 | 03:15 PM
Using Pressure Mapping in Mobile Shower Commode Chair Assessments
1 Hour Presentation

G

Deborah Gaebler-Spira, MD
Shirley Ryan Ability Lab
dgaebler@sralab.org

PO | 2022-01-31 | 5:00 PM
"We would be lost without this": A Visual Journey of Supportive Mobility Device Use by People with Cerebral Palsy
Poster Presentation

Sujay Galen, PhD, PT
Georgia State University
sgalen@gsu.edu

PO | 2022-01-31 | 5:00 PM
Ultralight wheelchair for individual's with stroke: a preliminary study
Poster Presentation

Mary Goldberg, PhD
International Society of Wheelchair Professionals, School of Health and Rehabilitation Science, University of Pittsburgh
mgolberg@pitt.edu

IC37 | 2022-02-01 | 10:15 AM
Dominican Republic Wheelchair Sector Policies and Practice: Successes, Challenges and Opportunities
1 Hour Presentation

IC55 | 2022-02-01 | 02:00 PM
Lessons Learned from the Development of the International Society of Wheelchair Professionals
1 Hour Presentation

Gloria "Gene" Gomez, MS
University of Pittsburgh, Center for Assistive Technology
geg86@pitt.edu

PS06 | 2022-02-01 | 11:30 AM
The Adaptive Driving Program at UPMC-CAT: An Inside Look at Clientele & Factors Influencing Their Fitness to Drive
15 Minute Paper Presentation

Carlos Goncalves, MEng
SARAH Network of Rehabilitation Hospitals
cwpg@sarah.br

PS05 | 2022-02-01 | 10:15 AM
Low-Cost CAD/CAM System for Complex Seating Adaptations
15 Minute Paper Presentation

Amy Grace, OTR/L, ATP
OSU Medical Center
amy.grace@osumc.edu

IC88 | 2022-02-02 | 08:30 AM
Wheeled Mobility with Empathy During Pandemic: Strategies for a Calm Approach
1 Hour Presentation

Elizabeth Green, OT, CDRS, CAE
ADED
elizabeth.green@driver-ed.org

IC98 | 2022-02-02 | 09:45 AM
Driver Rehabilitation: Providing the Right Service at the Right Time
1 Hour Presentation

Kaila Grenier, MS
Department of Veterans Affairs
grenier.kaila@gmail.com

IC53 | 2022-02-01 | 11:30 AM
A Telehealth Model for Assistive Technology Assessments
1 Hour Presentation

H

Eleni Halkiotis, ATP, OTR/L, MOT, OTR/L, ATP
Permobil
eleni.halkiotis@permobil.com

IC29 | 2022-01-31 | 03:30 PM
Back Support Configuration for Optimal Scapular and Pulmonary Function
1 Hour Presentation

Simon Hall
s.hall.crc@gmail.com

IC73 | 2022-02-01 | 03:15 PM
Fit for Future
1 Hour Presentation

Dawn Hameline, ATP, OTR/L
Mobius Mobility
dhameline@mobiusmobility.com

IC81 | 2022-02-01 | 04:30 PM
A Clinical Introduction to R & D: The How and Why Behind the Specs
1 Hour Presentation

Christine Hamstra, DPT, ATP
Motion Composites
c.hamstra@motioncomposites.com

IC12 | 2022-01-31 | 01:00 PM
Camber: Degrees of Performance
1 Hour Presentation

IC19 | 2022-01-31 | 02:15 PM
Changes with Age: Justification for Custom Manual Wheelchairs for the Geriatric Client
1 Hour Presentation

Kelsey Harrison, PT, DPT
Grand Valley State Univeristy
harriske@mail.gvsu.edu

PO | 2022-01-31 | 5:00 PM
A Qualitative Study Exploring Stakeholder Perspectives of Pediatric Standing Power Wheelchairs
Poster Presentation

Alyson Hendry MA, CCC-SLP
Speech and Movement, LLC
speechandmovement@gmail.com

IC35 | 2022-01-31 | 03:30 PM
Evidence & Expertise: A Delphi Study to Develop Evidence-Based Guidelines for the Introduction of the Permobil® Explorer Mini
1 Hour Presentation

Mary Kristina Henzel, MD, PhD
Louis Stokes Cleveland VA Medical Center

IC01 | 2022-01-31 | 10:15 AM
Promoting Active Safety for Power Wheelchair Users with SCI: Recognition & Prevention of Inadvertent Lower Extremity Injuries
1 Hour Presentation

Rachel Hibbs, DPT, NCS, ATP
University of Pittsburgh
rachel.hibbs@pitt.edu

IC83 | 2022-02-01 | 04:30 PM
Development of the Seating Mobility Index
1 Hour Presentation

Grace Hoo
Shirley Ryan AbilityLab
ghoo@sralab.org

IC77 | 2022-02-01 | 04:30 PM
Healthcare Quality Improvement Focused on Efficiency of Complex Wheelchair Procurement: An Administrative Case Report
1 Hour Presentation

Megan Huettner, PT, DPT
Grand Valley State University
huettnem@mail.gvsu.edu

PO | 2022-01-31 | 5:00 PM
A Qualitative Study Exploring Stakeholder Perspectives of Pediatric Standing Power Wheelchairs
Poster Presentation

J

Claire Jennings
Central Ohio Transit Authority
JenningsCH@cota.com

IC24 | 2022-01-31 | 02:15 PM
Implementation of a Personal Navigation System for Individuals with Disabilities: Barriers & Facilitators
1 Hour Presentation

Scott Jerome, MPT
Shriners Hospital for Children - Salt Lake City
sjerome@shrinenet.org

IC86 | 2022-02-02 | 08:30 AM
On Time Mobility: A 23-Year Perspective
1 Hour Presentation

Sarah Johnson, PT, DPT
Grand Valley State Univeristy
johnssa8@mail.gvsu.edu

PO | 2022-01-31 | 5:00 PM
A Qualitative Study Exploring Stakeholder Perspectives of Pediatric Standing Power Wheelchairs
Poster Presentation

Susan Johnson Taylor, OTR/L
Numotion
susan.taylor@numotion.com

IC78 | 2022-02-01 | 04:30 PM
Start with the Client: Increasing Your Value Through Client-Centred Practice (RESNA Track)
1 Hour Presentation

K

Karen Kangas, BS, OTR/L
Private Practice
kmkangas@ptd.net

IC15 | 2022-01-31 | 01:00 PM
The Challenges of Planning for Growth in Pediatric Seating
1 Hour Presentation

Patricia Karg, MS
University of Pittsburgh
TKarg@pitt.edu

IC30 | 2022-01-31 | 03:30 PM
Demystifying Seat Cushion Claims: How to use Performance Standards to Assess & Provide Evidence for Marketing Literature
1 Hour Presentation

Lisa Kenyon, PhD, PT
Grand Valley State University
kenyonli@gvsu.edu

PO | 2022-01-31 | 5:00 PM
A Qualitative Study Exploring Stakeholder Perspectives of Pediatric Standing Power Wheelchairs
Poster Presentation

PS03 | 2022-01-31 | 02:15 PM
Key Aspects of Power Mobility Interventions for Children: A Qualitative Study
15 Minute Paper Presentation

IC47 | 2022-02-01 | 11:30 AM
Motivate to Move: Promoting Parental/Caregiver Adherence to Early Power Mobility Programs
1 Hour Presentation

Anne Kieschnik, BSW, ATP, CRTS
NuMotion
anne.kieschnik@numotion.com

IC52 | 2022-02-01 | 11:30 AM
Best Practices in Online Seating & Mobility Education
1 Hour Presentation

Angie Kiger, M.Ed. CTRS, ATP/SMS
Sunrise Medical
Angie.Kiger@sunmed.com

IC07 | 2022-01-31 | 10:15 AM
"What do you mean it's not assisting you?!": Strategies to Increase Success with Power Assist
1 Hour Presentation

Sue King
Safespaces
sue.k@safespaces.co.uk

IC05 | 2022-01-31 | 10:15 AM
Modifications to the Home Environment & Beyond: Creating Safer Environments
1 Hour Presentation

Tamara Kittelson-Aldred, MS, OTR/L, ATP/SMS
Eleanore's Project
tamara@posture24-7.org

IC09 | 2022-01-31 | 10:15 AM
Made for Each Other: Kids, Custom Seating and 24-7 PCM
1 Hour Presentation

Jackie Klotz, BA
Permobil
jackie.klotz@permobil.com

IC92 | 2022-02-02 | 08:30 AM
Providing Consumer Value and Innovation Through Evidence-Based Product Development
1 Hour Presentation

Wendy Koesters, ATP, SMS
Ohio State University Wexner Medical Center
wendy.koesters@osumc.edu

IC14 | 2022-01-31 | 01:00 PM
Shoulder Surgery: Therapists Role in Prevention and Preparation
1 Hour Presentation

Kara Kopplin, BS
Permobil
kara.kopplin@permobil.com

IC97 | 2022-02-02 | 09:45 AM
Adding ISO Standards to the Clinical Reasoning Process
1 Hour Presentation

Ken Kozole, OTR/L, BSME, ATP
Shriners Hospital for Children - Salt Lake City
kkozole@shrinenet.org

IC86 | 2022-02-02 | 08:30 AM
On Time Mobility: A 23-Year Perspective
1 Hour Presentation

Victoria Krajenka, PT, DPT
Grand Valley State University
krajenkv@mail.gvsu.edu

IC47 | 2022-02-01 | 11:30 AM
Motivate to Move: Promoting Parental/Caregiver Adherence to Early Power Mobility Programs
1 Hour Presentation

Alison Kreger, PT, EdD
Wheeling University
aakreger@gmail.com

PO | 2022-01-31 | 5:00 PM
Interprofessional Education at an Assistive Technology Camp
Poster Presentation

Benjamin Krider BS
University of Pittsburgh
kriderbenjamin@gmail.com

IC89 | 2022-02-02 | 08:30 AM
The Value of Community Data in the Design, Testing, Selection, and Maintenance of Casters
1 Hour Presentation

Sze Wing Kwok, ATP, PT, NCS
James J Peters VAMC
szewing.kwok@va.gov

IC04 | 2022-01-31 | 10:15 AM
Telerehabilitation: An Effective Tool and its Validation Throughout the Continuum
1 Hour Presentation

L

Nicole LaBerge, PT, ATP
HCMC
Nicole.LaBerge@hcmed.org

IC08 | 2022-01-31 | 10:15 AM
How Complex are CRT users?
1 Hour Presentation

Katie Lach, PT, DPT
Grand Valley State University
kochanok@mail.gvsu.edu

IC47 | 2022-02-01 | 11:30 AM
Motivate to Move: Promoting Parental/Caregiver Adherence to Early Power Mobility Programs
1 Hour Presentation

Amy Lane, OT, CDRS
University of Pittsburgh
amy.lane@pitt.edu

IC98 | 2022-02-02 | 09:45 AM
Driver Rehabilitation: Providing the Right Service at the Right Time
1 Hour Presentation

Michelle Lange, OTR/L, ABDA, ATP/SMS
Access to Independence, Inc.
MichelleLange1@outlook.com

IC46 | 2022-02-01 | 11:30 AM
Diverse Applications of Dynamic Seating: A Series of Case Studies
1 Hour Presentation

IC69 | 2022-02-01 | 03:15 PM
Smart Wheelchairs: What's Available for Power Chair Safety?
1 Hour Presentation

Alfred Lee, ATP, MA
Veterans Affairs Administration-San Francisco HCS
Aslee06@gmail.com

IC87 | 2022-02-02 | 08:30 AM
Wheeled Mobility Assessment & Delivery: Has the Pandemic Changed this for the Better?
1 Hour Presentation

Karin Leire, MSc
Permobil
karin.leire@permobil.com

IC82 | 2022-02-01 | 04:30 PM
Using Big Data to Improve Quality and Value for Multiple Stakeholders in Complex Rehab Technology (CRT)
1 Hour Presentation

Joseph Lerchbacker, BS
Louis Stokes Cleveland VA Medical Center
jlerchbacker@aptcenter.org

PS04 | 2022-01-31 | 03:30 PM
Development of the High-Performance, Low-Cost Personalized Modular SquishINS Cushion for Value-Driven Pressure Relief
15 Minute Paper Presentation

IC01 | 2022-01-31 | 10:15 AM
Promoting Active Safety for Power Wheelchair Users with SCI: Recognition & Prevention of Inadvertent Lower Extremity Injuries
1 Hour Presentation

Meredith Linden, ATP, SMS, PT
Kennedy Krieger Institute
Lindenm@kennedykrieger.org

IC48 | 2022-02-01 | 11:30 AM
Virtual Reality as a Power Wheelchair Assessment and Training Tool
1 Hour Presentation

Matt Linsenmayer, DPT, ATP
The Ohio State University Wexner Medical Center
matthew.linsenmayer@osumc.edu

IC96 | 2022-02-02 | 09:45 AM
Seating and Positioning Across the Continuum: Improving Outcomes
1 Hour Presentation

Tanya Liu, PhD, PT
Riverside Community Care
tanyaliu@outlook.com

IC49 | 2022-02-01 | 11:30 AM
My Wheelchair Guide: Manual Wheelchairs (A Smartphone Application)
1 Hour Presentation

Sam Logan, PhD
Oregon State University
sam.logan@oregonstate.edu

IC10 | 2022-01-31 | 01:00 PM
ON Time Mobility: Why Advocating for Movement Experiences for Children with Disabilities Must Move Beyond 'Early'
1 Hour Presentation

Matt Lowell, PT
Shriners Hospital for Children - Salt Lake City
mlowell@shrinenet.org

IC86 | 2022-02-02 | 08:30 AM
On Time Mobility: A 23-Year Perspective
1 Hour Presentation

Sarah Lusto, ATP, PT, ATC
Kessler Institute for Rehabilitation
Sarah.Lusto@gmail.com

IC63 | 2022-02-01 | 02:00 PM
Standardized Seating: Can a Wheelchair Cushion Selection Algorithm Work?
1 Hour Presentation

M

Catherine Macleod
Georgia State University
cmacleod@gsu.edu

PO | 2022-01-31 | 5:00 PM
Ultralight wheelchair for individual's with stroke: a preliminary study
Poster Presentation

Matthew Macpherson
Fios DME Repair Training
matthew.macpherson@fiosdmert.com

Tracee-Lee Maginnity, OT
Permobil Australia
tracee-lee.maginnity@permobil.com

IC85 | 2022-02-02 | 08:30 AM
Valuing Consumers' Choice and Control Within a Functional Based Insurance Funding System
1 Hour Presentation

Rachel Maher, PT
Permobil Australia
rachel.maher@permobil.com

IC85 | 2022-02-02 | 08:30 AM
Valuing Consumers' Choice and Control Within a Functional Based Insurance Funding System
1 Hour Presentation

Tyler Mahncke
U.S. Rehab
tyler.mahncke@vgm.com

IC36 | 2022-01-31 | 03:30 PM
Functional Mobility Assessment Registry Data Updates
1 Hour Presentation

Steve Majerus, PhD
Louis Stokes Cleveland VA Medical Center
sjm18@case.edu

IC01 | 2022-01-31 | 10:15 AM
Promoting Active Safety for Power Wheelchair Users with SCI: Recognition & Prevention of Inadvertent Lower Extremity Injuries
1 Hour Presentation

Miriam Manary, BS, MS
University of Michigan Transportation Research Insitute
mmanary@umich.edu

IC20 | 2022-01-31 | 02:15 PM
RESNA Wheelchair Transportation Safety Standards (RESNA Track)
1 Hour Presentation

Amanda Manko, BS
University of Pittsburgh
amanda.manko@pitt.edu

PS04 | 2022-01-31 | 03:30 PM
The Effects of Aging on Wheelchair Seat Cushions of Various Material Constructs
15 Minute Paper Presentation

Julie Mannlein
University of Michigan
jyakaspt@med.umich.edu

IC83 | 2022-02-01 | 04:30 PM
Development of the Seating Mobility Index
1 Hour Presentation

George Marzloff, MD
Rocky Mountain Regional VA medical Center SCI/D Service
George.marzloff@va.gov

IC01 | 2022-01-31 | 10:15 AM
Promoting Active Safety for Power Wheelchair Users with SCI: Recognition & Prevention of Inadvertent Lower Extremity Injuries
1 Hour Presentation

Cara Masselink, OT, PhD, ATP
Western Michigan University
cara.masselink@wmich.edu

IC21 | 2022-01-31 | 02:15 PM
Maximizing the Impact of Rehabilitative Seating Services: The Importance of Follow-up
1 Hour Presentation

Chris Maurer, MPT, ATP
Shepherd Center
Chris.Maurer@shepherd.org

IC41 | 2022-02-01 | 10:15 AM
Mobility Devices as Environmental Factors: Using an ICF-Based, Clinically-Guided, Evidence-Backed Tool to Help Clients Choose a Device
1 Hour Presentation

Mandy McDonald, ATP, MS, OT/L
Shepherd Center
Amanda.Mcdonald@shepherd.org

IC41 | 2022-02-01 | 10:15 AM
Mobility Devices as Environmental Factors: Using an ICF-Based, Clinically-Guided, Evidence-Backed Tool to Help Clients Choose a Device
1 Hour Presentation

Gina McKernan, PhD
University of Pittsburgh
gina.mckernan@pitt.edu

IC54 | 2022-02-01 | 11:30 AM
Impact of the Assistive Technology Professional in the Provision of Mobility Assistive Equipment
1 Hour Presentation

Maureen Mclain, PT, DPT
Veteran Affairs Administration-Puget Sound HCS
Maureen.Mclain@va.gov

IC87 | 2022-02-02 | 08:30 AM
Wheeled Mobility Assessment & Delivery: Has the Pandemic Changed this for the Better?
1 Hour Presentation

Nancy McNamara, PT
Northern Suburban Special Education District
nmcnamara@nssed.org

IC31 | 2022-01-31 | 03:30 PM
Putting It into Practice: Applying What We Know about the Importance of Mobility in the School Setting
1 Hour Presentation

Jessica Meengs, PT, DPT
Grand Valley State University
delaneje@mail.gvsu.edu

PS03 | 2022-01-31 | 02:15 PM
Key Aspects of Power Mobility Interventions for Children: A Qualitative Study
15 Minute Paper Presentation

Karina Menezes Zakhia Guerra
Cavenaghi
karina@cavenaghi.com.br

PO | 2022-01-31 | 5:00 PM
Transition of wheelchair models related to neuropsychomotor development: A case study.
Poster Presentation

Curtis Merring, OTR/L
Permobil
Curtis.Merring@permobil.com

IC92 | 2022-02-02 | 08:30 AM
Providing Consumer Value and Innovation Through Evidence-Based Product Development
1 Hour Presentation

Sandra Metzler, PE DSc
The Ohio State University
metzler.136@osu.edu

IC24 | 2022-01-31 | 02:15 PM
Implementation of a Personal Navigation System for Individuals with Disabilities: Barriers & Facilitators
1 Hour Presentation

Anand Mhatre, PhD
University of Pittsburgh
anand.mhatre@pitt.edu

IC89 | 2022-02-02 | 08:30 AM
The Value of Community Data in the Design, Testing, Selection, and Maintenance of Casters
1 Hour Presentation

Erin Michael, PT, ATP/SMS
Kennedy Krieger Institute
Michaele@kennedykrieger.org

IC48 | 2022-02-01 | 11:30 AM
Virtual Reality as a Power Wheelchair Assessment and Training Tool
1 Hour Presentation

David Miller, MA, OTR/L, ATP/SMS
Permobil Americas
David.Miller@permobil.com

IC38 | 2022-02-01 | 10:15 AM
Exploring Alternative Drive Controls for Clients with Advanced Neuromuscular Diseases
1 Hour Presentation

Jean Minkel, PT, ATP
Independence Care System
jminkel@aol.com

IC69 | 2022-02-01 | 03:15 PM
Smart Wheelchairs: What's Available for Power Chair Safety?
1 Hour Presentation

IC78 | 2022-02-01 | 04:30 PM
Start with the Client: Increasing Your Value Through Client-Centred Practice (RESNA Track)
1 Hour Presentation

Steve Mitchell, OTR/L, ATP
VA Medical Center
stevemitchell@ameritech.net

PS04 | 2022-01-31 | 03:30 PM
Development of the High-Performance, Low-Cost Personalized Modular SquishINS Cushion for Value-Driven Pressure Relief
15 Minute Paper Presentation

IC33 | 2022-01-31 | 03:30 PM
Introducing CVT+: Using Images to Improve Complex Rehab Technology Outcomes Using Clinical Video Telehealth
1 Hour Presentation

IC01 | 2022-01-31 | 10:15 AM
Promoting Active Safety for Power Wheelchair Users with SCI: Recognition & Prevention of Inadvertent Lower Extremity Injuries
1 Hour Presentation

Brenlee Mogul-Rotman B.SCOT, ATP/SMS
Permobil
brenlee.mogul-rotman@permobil.com

IC29 | 2022-01-31 | 03:30 PM
Back Support Configuration for Optimal Scapular and Pulmonary Function
1 Hour Presentation

Danielle Morris, PT, DPT,PCS, C/NDT, ATP
Our Lady of the Lake Children's Hospital
daniellemorrispt@yahoo.com

Lindsey Morris, OTD
Human Engineering Research Laboratories, University of Pittsburgh, Department of Veterans Affairs
llm65@pitt.edu

IC45 | 2022-02-01 | 10:15 AM
Mainstream Smart Home Technologies for People with Physical Disabilities (RESNA Track)
1 Hour Presentation

W. Ben Mortenson, PhD, MSc, BScOT, OT
University of British Columbia
ben.mortenson@ubc.ca

IC61 | 2022-02-01 | 02:00 PM
Working with Users to Develop Active Mobility Strategies to Improve Community Mobility
1 Hour Presentation

Stacey Mullis
Permobil
stacey.mullis@permobil.com

IC97 | 2022-02-02 | 09:45 AM
Adding ISO Standards to the Clinical Reasoning Process
1 Hour Presentation

Sara Munera ATP, PT, WSP
Whee
sara@whee-educacion.com

IC26 | 2022-01-31 | 02:15 PM
Improving the Quality of Wheelchair Service in Colombia through a National Educational Initiative
1 Hour Presentation

PS02 | 2022-01-31 | 01:00 PM
Translation of the Wheelchair Satisfaction Questionnaire from English into Spanish
15 Minute Paper Presentation

N

Lisbeth Nilsson, PhD, OTR/L
Lund Univeristy
lisbeth.nilsson@med.lu.se

Carla Nooijen, PhD
Permobil
carla.nooijen@permobil.com

IC82 | 2022-02-01 | 04:30 PM
Using Big Data to Improve Quality and Value for Multiple Stakeholders in Complex Rehab Technology (CRT)
1 Hour Presentation

Linda Norton, OT, PhD, MScCH
Motion
linda.norton@motionspecialties.com

IC71 | 2022-02-01 | 03:15 PM
Virtual Visits for Seating and Mobility Assessments
1 Hour Presentation

Jordan Nourse
Georgia State University
jnourse1@gsu.edu

PO | 2022-01-31 | 5:00 PM
Ultralight wheelchair for individual's with stroke: a preliminary study
Poster Presentation

O

Nichole Orton, BS, MS
University of Michigan Transportation Research Institute
nritchie@umich.edu

IC20 | 2022-01-31 | 02:15 PM
RESNA Wheelchair Transportation Safety Standards (RESNA Track)
1 Hour Presentation

Joseph Ott, PhD
University of Pittsburgh
joseph.ott@pitt.edu

IC44 | 2022-02-01 | 10:15 AM
Wheels and Casters: It's How We Roll
1 Hour Presentation

P

Greg Paker, MBA
U.S. Rehab

IC36 | 2022-01-31 | 03:30 PM
Functional Mobility Assessment Registry Data Updates
1 Hour Presentation

Ginny Paleg, DScPT, PT
Montgomery County Schools

IC102 | 2022-02-02 | 09:45 AM
Using the HINE and GMA to Predict Equipment Needs
1 Hour Presentation

Jonathan Pearlman, PhD
International Society of Wheelchair Professionals, School of Health and Rehabilitation Science, University of Pittsburgh

IC37 | 2022-02-01 | 10:15 AM
Dominican Republic Wheelchair Sector Policies and Practice: Successes, Challenges and Opportunities
1 Hour Presentation

IC55 | 2022-02-01 | 02:00 PM
Lessons Learned from the Development of the International Society of Wheelchair Professionals
1 Hour Presentation

IC89 | 2022-02-02 | 08:30 AM
The Value of Community Data in the Design, Testing, Selection, and Maintenance of Casters
1 Hour Presentation

Jessica Pedersen, OTD, MBA, OTR/L, ATP/SMS
AbilityLab (Shirley Ryan)
jesspeders@gmail.com

IC46 | 2022-02-01 | 11:30 AM
Diverse Applications of Dynamic Seating: A Series of Case Studies
1 Hour Presentation

IC62 | 2022-02-01 | 02:00 PM
Outcome Measures to Assist in Decision Making and Demonstration of Product Success
1 Hour Presentation

Fabian Pedraza Quintero, CPO Cat I-ISPO
Servicio Nacional de Aprendizaje. SENA
fabianpedrazaoyp@gmail.com

IC26 | 2022-01-31 | 02:15 PM
Improving the Quality of Wheelchair Service in Colombia through a National Educational Initiative
1 Hour Presentation

Cynthia Petito, ATP, OTR/L, CA, PS, CEAC
National Seating & Mobility
cindi.petito@nsm-seating.com

IC17 | 2022-01-31 | 01:00 PM
Bathroom Modifications: The Good, The Bad, & The Ugly
1 Hour Presentation

Corinne Piren, MS, OTR/L, CHT
James J Peters VAMC
Corinne.Piren2@va.gov

IC04 | 2022-01-31 | 10:15 AM
Telerehabilitation: An Effective Tool and its Validation Throughout the Continuum
1 Hour Presentation

Julie Piriano, ATP, PT, SMS
Quantum Rehab
jpiriano@quantumrehab.com

IC18 | 2022-01-31 | 01:00 PM
ATP Certification and Ethics for the New Era (RESNA Track)
1 Hour Presentation

Teresa Plummer, OT, ATP
Belmont University
teresa.plummer@belmont.edu

IC35 | 2022-01-31 | 03:30 PM
Evidence & Expertise: A Delphi Study to Develop Evidence-Based Guidelines for the Introduction of the Permobil® Explorer Mini
1 Hour Presentation

IC99 | 2022-02-02 | 09:45 AM
Using a Participatory Action Research (PAR) Approach to develop content for the ISWP Wheelchair Educators Package
1 Hour Presentation

Robert Podoloff, BS, MS
Tekscan, Inc.
rpodoloff@tekscan.com

PS04 | 2022-01-31 | 03:30 PM
Development of a Custom, Flexible Force Sensor to Detect Patient Position & Movement in a Wheelchair
15 Minute Paper Presentation

Alba Polanco, MS
National Council for Disabilities (CONADIS) Dominican Republic
albairispolanco@gmail.com

IC37 | 2022-02-01 | 10:15 AM
Dominican Republic Wheelchair Sector Policies and Practice: Successes, Challenges and Opportunities
1 Hour Presentation

Gede Pramana, PhD
University of Pittsburgh
gede.pramana@pitt.edu

IC54 | 2022-02-01 | 11:30 AM
Impact of the Assistive Technology Professional in the Provision of Mobility Assistive Equipment
1 Hour Presentation

Mike Prescott, MA, MBA, PhD (candidate), BS
University of British Columbia
michael.prescott@ubc.ca

IC61 | 2022-02-01 | 02:00 PM
Working with Users to Develop Active Mobility Strategies to Improve Community Mobility
1 Hour Presentation

Jessica Presperin Pedersen, OTD, MBA, ATP/SMS
Shirley Ryan AbilityLab, Chicago, Illinois, United States
jpedersen@sralab.org

PO | 2022-01-31 | 5:00 PM
Generating evidence for supported seating postures in mobile shower commodes and chairs: study protocol
Poster Presentation

IC06 | 2022-01-31 | 10:15 AM
The RESNA Wheelchair Service Provision Guide
1 Hour Presentation

IC70 | 2022-02-01 | 03:15 PM
Using Pressure Mapping in Mobile Shower Commode Chair Assessments
1 Hour Presentation

Curt Prewitt, MS, PT, ATP
Ki Mobility
cprewitt@kimobility.com

IC94 | 2022-02-02 | 09:45 AM
Optimizing a Wheelchair: Taking Advantage of the Technology to Get the Best Outcomes, Now and in the Future
1 Hour Presentation

Curt Prewitt, ATP, PT
Ki Mobility
cprewitt@kimobility.com

IC67 | 2022-02-01 | 03:15 PM
The Wheel Story: The Impact of Wheels and Tires on Manual Wheelchair Performance and Propulsion Efficiency
1 Hour Presentation

Andria L. Pritchett
Numotion

Deborah Pucci, PT, MPT
Ki Mobility
dpucci@kimobility.com

IC94 | 2022-02-02 | 09:45 AM
Optimizing a Wheelchair: Taking Advantage of the Technology to Get the Best Outcomes, Now and in the Future
1 Hour Presentation

IC67 | 2022-02-01 | 03:15 PM
The Wheel Story: The Impact of Wheels and Tires on Manual Wheelchair Performance and Propulsion Efficiency
1 Hour Presentation

R

Lawrence Raymond, DPT
Johns Hopkins Medical
wound@hhmi.edu

Sue Redepenning, OTR/L, ATP. MN-AS
LiveLife Therapy Solutions
Sue@livetheraphysolutions.com

IC84 | 2022-02-02 | 08:30 AM
The ATP as the Case Manager (RESNA Track)
1 Hour Presentation

Kathryn Reid, PhD, RN, FNP-C, CNL
University of Virginia
kjb@virginia.edu

PO | 2022-01-31 | 5:00 PM
A Feasibility Study Assessing a Novel Fall Detection System Using Machine Learning and Computer Vision Techniques
Poster Presentation

PS05 | 2022-02-01 | 10:15 AM
A Novel Fall Detection System Using Machine Learning and Computer Vision Techniques
15 Minute Paper Presentation

Paulina Restrepo Arango
whee educacion
paulina@whee-educacion.com

PS01 | 2022-01-31 | 10:15 AM
Translation & Cross-Cultural Adaptation of the Wheelchair Components Questionnaire (WCQ) from English to Spanish
15 Minute Paper Presentation

PS01 | 2022-01-31 | 10:15 AM
Translation of the Aspects of Wheelchair Mobility Test into Spanish
15 Minute Paper Presentation

PS01 | 2022-01-31 | 10:15 AM
Translation of the Wheelchair Interface Questionnaire into Spanish
15 Minute Paper Presentation

PS02 | 2022-01-31 | 01:00 PM
Translation of the Wheelchair Satisfaction Questionnaire from English into Spanish
15 Minute Paper Presentation

Laura Rice, ATP, PhD, PT
University of Illlinois
ricela@illinois.edu

IC76 | 2022-02-01 | 04:30 PM
A Fall Prevention & Management Program for Full-time Wheelchair & Scooter Users Living with Multiple Sclerosis: Preliminary Findings
1 Hour Presentation

Mary Ann Richmond, MD, DVM
Louis Stokes Cleveland VA Medical Center
MaryAnn.Richmond@va.gov

PS04 | 2022-01-31 | 03:30 PM
Development of the High-Performance, Low-Cost Personalized Modular SquishINS Cushion for Value-Driven Pressure Relief
15 Minute Paper Presentation

Stephanie Rigot, DPT
University of Pittsburgh

PS02 | 2022-01-31 | 01:00 PM
Web-Based Transfer Training: Evidence for an Online Approach for Wheelchair Transfer Training
15 Minute Paper Presentation

Karen Rispin, BS
Assistive Technology Catalyst
karenrispin@ideasworld.org

PS01 | 2022-01-31 | 10:15 AM
Translation & Cross-Cultural Adaptation of the Wheelchair Components Questionnaire (WCQ) from English to Spanish
15 Minute Paper Presentation

PS01 | 2022-01-31 | 10:15 AM
Translation of the Aspects of Wheelchair Mobility Test into Spanish
15 Minute Paper Presentation

PS02 | 2022-01-31 | 01:00 PM
Translation of the Wheelchair Satisfaction Questionnaire from English into Spanish
15 Minute Paper Presentation

Gianna Rodriguez, MD
University of Michigan
giannar@med.umich.edu

IC83 | 2022-02-01 | 04:30 PM
Development of the Seating Mobility Index
1 Hour Presentation

Tina Roesler, PT, MS, ABDA
Motion Composites
tlroesler@aol.com

IC52 | 2022-02-01 | 11:30 AM
Best Practices in Online Seating & Mobility Education
1 Hour Presentation

IC90 | 2022-02-02 | 08:30 AM
The Pelvic-Spine Connection: The Key to Positioning and Function
1 Hour Presentation

Lauren Rosen, ATP, PT, SMS
St. Joseph's Children's Hospital of Tampa
Lauren.Rosen@baycare.org

IC39 | 2022-02-01 | 10:15 AM
Playing to Learn: Importance of Self-Directed Mobility in Children
1 Hour Presentation

Lisa Rotelli, PT
Adaptive Switch Labs
lrotelli@asl-inc.com

IC79 | 2022-02-01 | 04:30 PM
Heads UP! Supporting Head Control and Access to AT: Using Bluetooth Connectivity and Seating for Task Engagement
1 Hour Presentation

Peter Rubino, COTA/ATP
National Seating & Mobility
Peter.Rubino@nsm-seating.com

IC38 | 2022-02-01 | 10:15 AM
Exploring Alternative Drive Controls for Clients with Advanced Neuromuscular Diseases
1 Hour Presentation

IC99 | 2022-02-02 | 09:45 AM
Using a Participatory Action Research (PAR) Approach to develop content for the ISWP Wheelchair Educators,Äô Package
1 Hour Presentation

S

Andrina Sabet, ATP
Cleveland Clinic Children's Hospital For Rehabilitation
andrinasabet@gmail.com

IC10 | 2022-01-31 | 01:00 PM
ON Time Mobility: Why Advocating for Movement Experiences for Children with Disabilities Must Move Beyond ,'Early'
1 Hour Presentation

Samara dos Santos, BS
Universidade de Almeida e Silva
samaraeleuterio@gmail.com

PO | 2022-01-31 | 5:00 PMM
Transition of wheelchair models related to neuropsychomotor development: A case study.
Poster Presentation

Charles Sargeant
NSM
csargeant@nsm-seating.com

IC57 | 2022-02-01 | 02:00 PM
A Different Approach to Documentation
1 Hour Presentation

Richard Schein, PhD, MPH
University of Pittsburgh
rms35@pitt.edu

IC36 | 2022-01-31 | 03:30 PM
Functional Mobility Assessment Registry Data Updates
1 Hour Presentation

IC54 | 2022-02-01 | 11:30 AM
Impact of the Assistive Technology Professional in the Provision of Mobility Assistive Equipment
1 Hour Presentation

IC72 | 2022-02-01 | 03:15 PM
Scoping Review Investigation of Complex Rehabilitation Technology and Next Steps
1 Hour Presentation

Mark Schmeler, ATP, OTR/L, PhD
University of Pittsburgh

IC36 | 2022-01-31 | 03:30 PM
Functional Mobility Assessment Registry Data Updates
1 Hour Presentation

IC54 | 2022-02-01 | 11:30 AM
Impact of the Assistive Technology Professional in the Provision of Mobility Assistive Equipment
1 Hour Presentation

SS01 | 2022-01-31 | 08:30 AM
Opening Keynote
1 Hour Presentation

Wendy Schnare, SPT
University of Washington
schnarew@uw.edu

PS03 | 2022-01-31 | 02:15 PM
Development and Implementation of a Longitudinal, Community-Based, Early Mobility Research Program for Children with Motor Impairments
15 Minute Paper Presentation

Vittorina Schoch, PhD
Robert Hollman Foundation
v.schoch@fondazioneroberthollman.it

PS03 | 2022-01-31 | 02:15 PM
Multisensorial Stimulation in a Vertical Standing for Visually Impaired Kids with CP
15 Minute Paper Presentation

Allyson Schultz, PT, DPT
Grand Valley State University
schually@mail.gvsu.edu

PS03 | 2022-01-31 | 02:15 PM
Key Aspects of Power Mobility Interventions for Children: A Qualitative Study
15 Minute Paper Presentation

Britta Schwartzhoff, PT
Gillette Children's Specialty Healthcare
bschwartzhoff@gmail.com

Michael Seidel, ATP, CRTS
Numotion
mike.seidel@numotion.com

IC18 | 2022-01-31 | 01:00 PM
ATP Certification and Ethics for the New Era (RESNA Track)
1 Hour Presentation

IC84 | 2022-02-02 | 08:30 AM
The ATP as the Case Manager (RESNA Track)
1 Hour Presentation

Mary Shea, MA, OTR/L, ATP
Kessler Institute of Rehabilitation
sheamary27@gmail.com

IC46 | 2022-02-01 | 11:30 AM
Diverse Applications of Dynamic Seating: A Series of Case Studies
1 Hour Presentation

IC62 | 2022-02-01 | 02:00 PM
Outcome Measures to Assist in Decision Making and Demonstration of Product Success
1 Hour Presentation

IC06 | 2022-01-31 | 10:15 AM
The RESNA Wheelchair Service Provision Guide
1 Hour Presentation

Shaleea Shields
Merakey
sshields@merakey.org

IC24 | 2022-01-31 | 02:15 PM
Implementation of a Personal Navigation System for Individuals with Disabilities: Barriers & Facilitators
1 Hour Presentation

Alexander Siefert, PhD
SIMUSERV GmbH
siefert@simuserv.de

IC56 | 2022-02-01 | 02:00 PM
Introducing: Digital Validation of Design of Seating Interventions
1 Hour Presentation

IC43 | 2022-02-01 | 10:15 AM
The Effect of Whole Human Vibrations on Tissue Loads
1 Hour Presentation

Robin Skolsky, PT, ATP
Shepherd Center
Robin_Skolsky@shepherd.org

IC07 | 2022-01-31 | 10:15 AM
"What do you mean it's not assisting you?!": Strategies to Increase Success with Power Assist
1 Hour Presentation

Cynthia Smith, DPT, PT, ATP
Craig Hospital
cindy.smith.pt@gmail.com

IC62 | 2022-02-01 | 02:00 PM
Outcome Measures to Assist in Decision Making and Demonstration of Product Success
1 Hour Presentation

Emma Smith, ATP, OT, PhD
Maynooth University
emma.m.smith@gmail.com

IC78 | 2022-02-01 | 04:30 PM
Start with the Client: Increasing Your Value Through Client-Centred Practice (RESNA Track)
1 Hour Presentation

IC68 | 2022-02-01 | 03:15 PM
Supporting the Client: Extending the Impact of the ATP Through Client and Caregiver Training (RESNA Track)
1 Hour Presentation

Anna Sokol, RN
Motion Concepts
asokol@motionconcepts.com

IC64 | 2022-02-01 | 03:15 PM
The Complete Solution Approach: Seating for all that Matters in Long-Term Care & Community Health Care
1 Hour Presentation

Jacob Sosnoff, PhD
University of Illinois at Urbana Champaign
jsosnoff@illinois.edu

IC76 | 2022-02-01 | 04:30 PM
A Fall Prevention & Management Program for Full-time Wheelchair & Scooter Users Living with Multiple Sclerosis: Preliminary Findings
1 Hour Presentation

Jill Sparacio, ATP, OTR/L, SMS
Sparacio Consulting Services
otspar@aol.com

IC75 | 2022-02-01 | 04:30 PM
Custom Molded Seating: Option, Innovations, and COVID-19
1 Hour Presentation

Beth Speaker-Christensen, SLP/ATP
Shepherd Center
easc.slp@gmail.com

IC59 | 2022-02-01 | 02:00 PM
AAC for the ATP (RESNA Track)
1 Hour Presentation

Allison Speight, ATP, OT
Motion Composites
a.speight@motioncomposites.com

IC90 | 2022-02-02 | 08:30 AM
The Pelvic-Spine Connection: The Key to Positioning and Function
1 Hour Presentation

Andrea Stump, ATP, PT, NCS
OhioHealth
andrea.klusman@gmail.com

IC42 | 2022-02-01 | 10:15 AM
Improve Your Outcomes: Implementing a Wheelchair Clinic Follow Up Clinic
1 Hour Presentation

JongHun Sung, PhD, ATC
Idaho State University
sungjong@isu.edu

IC76 | 2022-02-01 | 04:30 PM
A Fall Prevention & Management Program for Full-time Wheelchair & Scooter Users Living with Multiple Sclerosis: Preliminary Findings
1 Hour Presentation

Catherine Sweeney, ATP, PT, SMS
Permobil
catherine.sweeney@permobil.com

IC74 | 2022-02-01 | 04:30 PM
Least Costly Alternative: The True Economic Value Provided When Appropriate CRT is Prescribed
1 Hour Presentation

Rachel Szymanski, MS, OTR/L, ATP
James J Peters VAMC
rachel.szymanski@va.gov

IC04 | 2022-01-31 | 10:15 AM
Telerehabilitation: An Effective Tool and its Validation Throughout the Continuum
1 Hour Presentation

T

Stephanie Tanguay, OT/L, ATP
Motion Concepts
stanguay@motionconcepts.com

IC58 | 2022-02-01 | 02:00 PM
Considering Power Dynamic Positioning as an Essential Part of the Seating System
1 Hour Presentation

Sally Taylor PT
Shirley Ryan Ability Lab
staylor1@sralab.org

IC77 | 2022-02-01 | 04:30 PM
Healthcare Quality Improvement Focused on Efficiency of Complex Wheelchair Procurement: An Administrative Case Report
1 Hour Presentation

Diane Thomson, MS, OTR/L, ATP
Rehab Institute of Michigan
diane.b.thomson@gmail.com

Giovanna Tono, PT
Robert Hollman Foundation
jotono00@gmail.com

PS03 | 2022-01-31 | 02:15 PM
Multisensorial Stimulation in a Vertical Standing for Visually Impaired Kids with CP
15 Minute Paper Presentation

Patricia Toole, MAT, MS OT, OTR/L, ATP, MOM
Clear Path Occupational Therapy PLLC
trishtooleot@gmail.com

Maria L. Toro-Hernandez PhD
International Society of Wheelchair Professionals
mlt47@pitt.edu

IC37 | 2022-02-01 | 10:15 AM
Dominican Republic Wheelchair Sector Policies and Practice: Successes, Challenges and Opportunities
1 Hour Presentation

IC55 | 2022-02-01 | 02:00 PM
Lessons Learned from the Development of the International Society of Wheelchair Professionals
1 Hour Presentation

Jennifer Tucker, PT, PCS
University of Central Florida
jennifer.tucker@ucf.edu

IC10 | 2022-01-31 | 01:00 PM
ON Time Mobility: Why Advocating for Movement Experiences for Children with Disabilities Must Move Beyond 'Early'
1 Hour Presentation

Patricia Tully, OTR
TIRR Memorial Hermann
trishtullyot@gmail.com

Liz Turnbull, OT
Auckland District Health Board
lturnbull@adhb.govt.nz

IC51 | 2022-02-01 | 11:30 AM
Showing our Values — Clinical Practice in Aotearoa New Zealand
1 Hour Presentation

IC34 | 2022-01-31 | 03:30 PM
The Development of a Competency-Based Framework for Wheeled Mobility & Postural Management Assessors in New Zealand
1 Hour Presentation

V

Bart Van der Heyden, PT
Private Practice/ SuperSeating
Info@super-seating.com

PS05 | 2022-02-01 | 10:15 AM
Content and Face Validation of a Novel Physical Seating Assessment Technique
15 Minute Paper Presentation

IC56 | 2022-02-01 | 02:00 PM
Introducing: Digital Validation of Design of Seating Interventions
1 Hour Presentation

IC16 | 2022-01-31 | 01:00 PM
The Link Between Dysphagia and Posture
1 Hour Presentation

Hayley VanBeek, PT, DPT
Grand Valley State University
macdonah@mail.gvsu.edu

IC47 | 2022-02-01 | 11:30 AM
Motivate to Move: Promoting Parental/Caregiver Adherence to Early Power Mobility Programs
1 Hour Presentation

Antoinette Verdone, ATP
ImproveAbility
antoinette@improveability.com

IC50 | 2022-02-01 | 11:30 AM
Smart Home Makeover Disability Edition (RESNA Track)
1 Hour Presentation

Paulina Michelle Villacreces MS
Pro-Movilidad
paulinavillacreces@gmail.com

PS01 | 2022-01-31 | 10:15 AM
Translation & Cross-Cultural Adaptation of the Wheelchair Components Questionnaire (WCQ) from English to Spanish
15 Minute Paper Presentation

Paulina Michelle Villacreces, MS
Pro-Movilidad
paulinavillacreces@gmail.com

PS01 | 2022-01-31 | 10:15 AM
Translation of the Aspects of Wheelchair Mobility Test into Spanish
15 Minute Paper Presentation

W

T. Sammie Wakefield, OTR/L, ATP Retired
Eleanore's Project
w.sammie@gmail.com

Kyle Walker, ATP, MHA
VGM Homelink
kyle.walker@vgm.com

IC11 | 2022-01-31 | 01:00 PM
Navigating the Telehealth Landscape in CRT: A Supplier's Guide
1 Hour Presentation

Weesie Walker, ATP/SMS
NRRTS
wwalker@nrrts.org

IC78 | 2022-02-01 | 04:30 PM
Start with the Client: Increasing Your Value Through Client-Centred Practice (RESNA Track)
1 Hour Presentation

Ginger Walls, ATP, MS, PT, NCS, SMS
Permobil
ginger.walls@permobil.com

IC82 | 2022-02-01 | 04:30 PM
Using Big Data to Improve Quality and Value for Multiple Stakeholders in Complex Rehab Technology (CRT)
1 Hour Presentation

Betsy Williams, MSLIS
Grand Valley State University
williab2@gvsu.edu

IC47 | 2022-02-01 | 11:30 AM
Motivate to Move: Promoting Parental/Caregiver Adherence to Early Power Mobility Programs
1 Hour Presentation

Amber Wise
Georgia State University
awise12@student.gsu.edu

PO | 2022-01-31 | 5:00 PM
Ultralight wheelchair for individual's with stroke: a preliminary study
Poster Presentation

Andrew Wolpert, PE
City of Columbus
ADWolpert@columbus.gov

IC24 | 2022-01-31 | 02:15 PM
Implementation of a Personal Navigation System for Individuals with Disabilities: Barriers & Facilitators
1 Hour Presentation

Lynn Worobey, PhD, PT, ATP
University of Pittsburgh
law93@pitt.edu

IC28 | 2022-01-31 | 03:30 PM
Update on the Evidence: 2021 Revision of the RESNA Ultralight Manual Wheelchair Position Paper
1 Hour Presentation

PS02 | 2022-01-31 | 01:00 PM
Web-Based Transfer Training: Evidence for an Online Approach for Wheelchair Transfer Training
15 Minute Paper Presentation

Melissa Wright
University of Michigan
mlwright@med.umich.edu

IC83 | 2022-02-01 | 04:30 PM
Development of the Seating Mobility Index
1 Hour Presentation

Y

Rebecca Yarnot, MS
University of Illinois at Urbana Champaign
ryarnot2@illinois.edu

IC76 | 2022-02-01 | 04:30 PM
A Fall Prevention & Management Program for Full-time Wheelchair & Scooter Users Living with Multiple Sclerosis: Preliminary Findings
1 Hour Presentation

Exhibitors

For the latest list of exhibitors, use the ISS Exhibitors QR code

A

Altimate Medical
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N

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Monday
January 31, 2022

IC01: Promoting Active Safety for Power Wheelchair Users with SCI: Recognition & Prevention of Inadvertent Lower Extremity Injuries

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Learning objectives

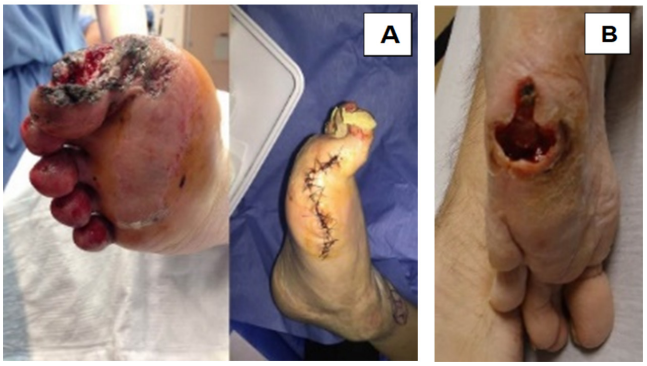
1. Describe typical patterns of lower extremity displacement-related injuries and power wheel chair features which may contribute to them.
2. Describe how to submit reports of injuries caused by inadvertent lower extremity displacement from the wheelchair footplates to fda programs such as the manufacturer and user facility device experience (maude) database and medsun.
3. Describe possible approaches to detecting lower extremity displacement from power wheelchair footplates.

Introduction

Wheelchairs are essential devices for people with spinal cord injury and disorders (SCI/D) providing mobility, independence, and higher quality of life. To do this, they must be compact and agile for community use; but, unfortunately, even optimally configured wheelchairs can be dangerous during operation by users who cannot feel, see, or easily reposition their lower limbs. Typical activities such as driving or propelling over rough terrain, in close quarters, or up a steep incline in a wheelchair can cause inadvertent lower extremity displacement (ILED) from the wheelchair footplates for persons with impaired position sense and motor control due to SCI. Spasms can induce ILED; and pressure-relieving maneuvers using power seating functions such as tilt also can displace the feet, which may not optimally align on footplates after returning to upright. When ILED from the foot plate occurs, injuries may result if the foot drags under the wheelchair, the lower limb collides with obstacles, or pressure points cause skin breakdown. ILED-related injuries have led to hospitalizations and may have contributed to death of people with SCI/D (Gorman, 2017) (Bowes, 2017). While use of restraints such as leg and foot straps or toe cups to secure the foot in place on the wheelchair may appear to be the most obvious solution, these are considered unsafe, impractical, and/or cosmetically unacceptable by some wheelchair users and seating specialists. Limb securement can prevent some users from independently transferring out of their wheelchairs and may cause falls and fractures, particularly if the wheelchair user has osteoporosis. Positional fixation is thus only suitable in certain clinical situations. ILED-related injuries have not been well described in the mobility or patient safety literature, and improved reporting on these injuries may benefit wheelchair users by encouraging innovation and promoting development of alternative market solutions to this problem.

ILED-related injuries:
About 3.6 million wheelchair users were identified in 2010 United States Census data, including approximately 2 million persons aged 65 and older (Brault, 2012). Incidence of lower limb injuries during wheelchair use is only partially characterized in the literature. The impact of these injuries nationwide is masked by deficiencies in our medical reporting systems, which limit data extraction, but are potentially profound. In the SCI/D population, Kirby (1995) summarized wheelchair-related adverse reports to the Food & Drug Administration (FDA): most commonly fractures, lacerations, and contusions/abrasions. However, these reports are most frequently provided by the manufacturers and the frequency of these occurrences may not reflect clinical or wheelchair user experience. Morse et al (2009) found that almost half (47.5%) of a chronic SCI cohort sustained tibia/fibula fractures requiring hospitalization. Of these, 6.7% occurred due to catching a lower extremity on a doorframe during wheelchair operation. The hospitalizations resulted in long stays, medical complications and often discharge to a nursing facility. A three-year survey by Chen et al (2011) found 54.7% of wheelchair users had at least one accident and 33% of power wheelchair users reported accidental contact with obstacles. Striking an object accounted for 4.8% of the injuries reported in a survey of injured wheelchair users treated in US emergency departments between 2002-2003 (Xiang, 2006). Wheelchair-related lower limb pressure injuries also have been reported (Paparone, 2013).

We previously described cases of ILED-related injuries in persons with SCI/D including fractures, amputations due to abrasions after dragging their feet on the ground, and pressure injuries due to the feet not sitting squarely on the PWC footplate (Henzel, 2014) (Henzel, 2016). After these initial reports, we have treated 17 patients with ILED-related injuries. We have seen four who required partial foot amputations due to abrasions, and two who required above knee amputation due to device-related pressure injuries sustained secondary to casting for ILED-related fractures. Eleven patients sustained lower limb fractures when the person's foot was either caught beneath the wheelchair or caught on a doorframe, wall, or other obstacle. Three then developed pressure injuries during fracture immobilization due to difficulty achieving pressure relief in casts, splints, and/or immobilization boots. Eighteen of these individuals with SCI/D were injured during power wheelchair operation. Numerous other patients developed isolated pressure injuries of the feet when the feet did not sit squarely on their wheelchair footplate.



"Injuries caused by inadvertent limb displacement during wheelchair use: an abrasion of the right great toe and foot before and after amputation, and a Stage 4 pressure injury at the fifth metatarsal head caused by foot inversion on the footplate"

Cost analysis for 10 Veterans with SCI/D admitted to the Louis Stokes Cleveland VA Medical Center (LSCVAMC) with ILED-related lower limb injuries. The estimated total monetary cost of these inpatient care episodes based on Decision Support System (DSS) discharge data ranged from $8280 to $474,330 (total $970,011, averaging $97,000/injury) with duration of hospitalizations ranging from 6 to 326 days. Maintaining independence and preferred living situation is highly valued by persons with SCI/D. The negative impact of ILED-related injuries on quality of life cannot be overstated.

The impact of these injuries nationwide is masked by deficiencies in our medical reporting systems, but the injury patterns above were consistent with those identified in our systematic review of ILED-related LE injury reports to the FDA Manufacturer and User Facility Device Experience (MAUDE) database reports between 2014 and 2018 (Whitford, 2021). The two most common mechanisms of ILED-related injuries identified (>75% of reports) were the foot slipping off the footplate during wheelchair mobility, followed by the foot being caught between the footplate and an environmental object. Most injury events occurred during power wheelchair use. activity. Single fractures were the most common type of injury identified (34.5%), followed by skin damage or infections (17.2%), multiple fractures (13.8%), amputations (6.9%), and multiple fractures with wounds (3.5%). The type of injury was not reported in 24.1% of reports. This may be because only 7% of the reports were voluntary and the majority were mandated manufacturer reports, there were no direct ILED-related injury reports to the MAUDE database by healthcare providers. Manufacturer reports typically attributed injuries to end user error.

PWC design and impact on risk of foot and lower limb injury:
Optimal specifications for a wheelchair are achieved by selecting the most appropriate configuration that meets as many user needs as possible with the least number of concessions by considering the user's cognition, physical condition and living space. However, there is no such thing as a perfect wheelchair. It is likely that some power wheelchair features which improve functionality also increase risk of lower limb injuries.

Footplate and powerbase design choices can improve maneuverability in tight spaces, but also impact foot positioning and limb retention on the footplate. Many modern PWC designs utilize center-mount legrests to shorten chair length and create tighter turning radii to improve device agility and maneuverability. However, center-mount footplates hold the feet closer together than the previously common swing-away legrests due to positioning and clearance requirements relative to the wheels.

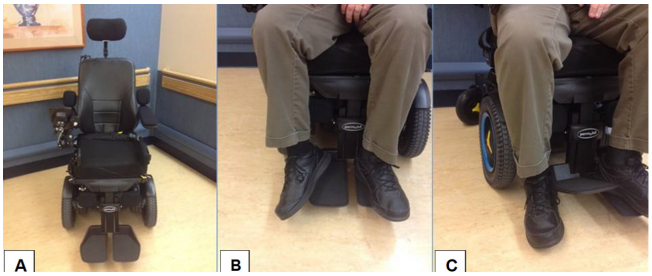
Front wheel-drive PWCs with center-mount footplates provide the best positioning and ergonomic functionality because the wider spacing of the front wheels allows maximal footplate surface area for foot placement and containment with relatively minimal risk for the feet to come off the side of the footplate.

Mid-wheel drive power wheelchairs are most prescribed because they have the smallest turning radius, which optimizes mobility in tight spaces. However, the footplate width must be narrow on these chairs because when driven onto a platform lift or vehicle ramp, the front casters can rotate to be only 11-12" apart. If prescribed with wider footplates to optimize foot positioning, the legrests must angle upward for the footplate to clear the front casters. This increases effective chair length, its turning radius, and risk that the user's feet contact the environment during tight turns. An alternative is the narrower footplate which fits between the front casters and reduces chair length, but this provides less foot support and due to angulation from the hips and knees to the feet, users' feet are prone to coming off the footplates.

In addition to width concerns, most footplate designs do not extend the full length of the average adult male foot; and in close quarter maneuvers, toe contact with adjacent objects can pivot the foot without the insensate user's knowledge.

Footplate attachments at center-mounted legrests require flat foot position on the footplate and cannot be customized for joint contractures and spasticity which may cause foot inversion or eversion and place the foot at risk of displacement or pressure point development.

Center-mounted footplates also provide scant lateral support to stop paretic thighs from externally rotating at the hip, as shown in Figure 2. Lateral thigh supports may fix this problem but may not be available depending on payor source (Groah, 2014). Some power wheelchairs lack fore and aft calf-pad adjustability to support the lower leg, which increases leg position instability if the user's feet come off the footplate. The availability of these wheelchair features may thus change the risk of lower limb injuries from ILED.



"A three photo series of a front wheel-drive power wheelchair with center-mounted footplate by itself, showing a user sitting with externally rotated hips and foot eversion on the footplate, and showing the user's limb falling off the footplate and at risk for injury."

Positioning in wheelchairs with power tilt and recline and leg elevation provides pressure relief and lower limb fluid redistribution for users who cannot perform weight shifts using their own muscle strength due to paralysis. For such users, Sonenblum and Sprigle (2011) showed that a tilt of 45°-60° is needed to achieve effective restoration of blood flow to the ischial areas. This extent of tilt changes power wheelchair geometry: in tilt, the center-mounting post lengthens as the knee hinge opens to avoid pushing the user back in the chair. The soles of the user's feet typically separate from the footplates, and the heels may rest on top of the footplate hinge creating unintended pressure points. As the PWC tilts or reclines, spasms or gravity may also pull the limbs off the footrest. After return to an upright position, the feet may no longer sit squarely on the footplate and need repositioning, an action which the user with paralysis may not be able to perform independently.

"A three photo series of a front wheel-drive power wheelchair with markers showing the increased length of the center-mounted legrest between the knee joint and the footplate when changing position from fully upright to full tilt with legrests extended."

Application of restraints such as toe cups, and/or leg or foot straps to secure the lower limb in place on the footplate is relatively common among wheelchair users and may be provided by the seating specialist or constructed by the user. These methods of limb securement may not be appropriate for all clinical situations and are considered to be unsafe by some seating specialists. Limb fixation impedes transfers out of the wheelchair and may cause falls for users with incomplete injuries and reduce independence for users with poor trunk control. Fractures are a risk if a power wheelchair user has osteoporosis and utilizes tilt with extending legrests. Muscle spasms also can alter foot and leg position. Additionally, as illustrated in Figure 3, the wheelchair legrests extend when a power wheelchair is in optimal weight-shifting tilt. Thus, with feet secured, there is potential for fracture or other injury during forcible muscle spasms due to the positional fixity of the feet along with osteoporosis or osteopenia at the distal femur and proximal tibia. Some users also report finding limb restraints to be cosmetically unacceptable. Positional fixation causes additional problems in some users and are only suitable in certain situations.

An optimally configured wheelchair usually requires a compromise between the user's positioning needs and functional mobility. The incidence of foot mispositioning during wheelchair use has not been defined; however, when users' feet come off footplates, adverse outcomes have occurred. Foot mispositioning can occur when the wheelchair is at rest or during mobility, but also may be occurring during or after power tilt for pressure relief. Questioning users about foot mispositioning events, injuries, and "near misses" will allow the seating specialist to collaborate with the user to optimize the user's safety and functionality in their wheelchair and preserve their health and quality of life.

Medical device incident reporting:
Medical device manufacturers and importers have been required to report all device-related deaths, serious injuries and certain malfunctions to the United States Food and Drug Administration (FDA) since 1984, but in the face of widespread under reporting, Congress enacted the Safe Medical Devices Act in 1990 to increase the information that the FDA and manufacturers receive about serious medical device problems. Medical devices are any items that are used for the diagnosis, treatment, or prevention of a disease, injury, or other condition and is not a drug or biologic (FDA, 1996)].

Medical Device Reporting (MDR) is a post-market surveillance tool used by the United States Food and Drug Administration (FDA) to track device-related deaths, serious injuries, and malfunctions. This allows detection of potential device-related safety issues, monitoring of device performance, and performance of risk-benefit analyses of the medical devices (FDA, 2020).

Mandatory MDR is required for manufacturers, importers, and device user facilities (hospitals, ambulatory surgical centers, nursing homes, outpatient diagnostic facilities or outpatient treatment facilities which are not a physician's office) using the electronic medical device reporting (eMDR) process using the FDA Electronic Submissions Gateway or Form FDA 3500A (FDA, 2014).

- Manufacturers must report to the FDA when their devices may have caused or contributed to death or serious injury, or if their device has malfunctioned and is at risk of contributing to a death or serious injury if the malfunction were to recur.
- Importers must report to both the FDA and the manufacturer when they learn that a device may have caused or contributed to death or serious injury but must only report to the manufacturer if an imported device has malfunctioned or would be likely to contribute to death or serious injury if the malfunction recurs.
- Device User Facilities must report device-related deaths to both the FDA (instructions) and the manufacturer when a suspected device-related death occurs. Medical device-related serious injuries are only required to be reported to the manufacturer but must be reported to the FDA within 10 days if the manufacturer is unknown. User facilities and healthcare professionals are not required to report device malfunctions to the FDA but can voluntarily advise the FDA using the MedWatch online portal or by submitting Form FDA 3500 under the FDA Safety Information and Adverse Event Reporting Program: MedWatch Online Voluntary Reporting Form (fda.gov).

Voluntary MDR of device-related adverse events or product problems is encouraged for all healthcare professionals, patients, caregivers and consumers, who can submit voluntary reports of significant adverse events or product problems through the MedWatch portal MedWatch Online Voluntary Reporting Form (fda.gov) using FDA Form 3500 for healthcare professionals and FDA Form 3500B for consumers/patients/caregivers. Voluntary report data requested includes patient demographic information, the type of report (e.g., adverse event or product problem), adverse event outcome, date of event, and event description. The MedWatch program data is public and searchable using the Manufacturer and User Facility Device Experience (MAUDE) database which compiles medical device reports submitted to the FDA by mandatory reporters (manufacturers, importers and device user facilities) and voluntary reporters such as health care professionals,

patients and consumers. Although the MAUDE data is a valuable source of information, it is a passive surveillance system which is limited by potential submission of incomplete, inaccurate, untimely, unverified, or biased data. In addition, the incidence or prevalence of events cannot be determined from MDRs alone due to under-reporting of events, inaccuracies in reports, lack of verification that the device caused the reported event, and lack of information about frequency of device use (FDA, 2021).

The FDA also uses the Medical Product Safety Network (MedSun), an adverse event reporting program launched in 2002 by the U.S. FDA's Center for Devices and Radiological Health. The network includes a sample of ~350 hospitals, nursing homes, outpatient clinics and home health agencies nationally to help rapidly identify problems related to medical device use, provide a laboratory for research into understanding medical device problems as used in the clinical environment and provide actionable feedback to the specifically trained and motivated risk managers and clinical patient safety officers on their reported issues. MedSun reports are searchable, and the primary goal for MedSun is to work collaboratively with the clinical community to identify, understand, and solve problems with the use of medical devices. If interested in joining the MedSun Network, call 1-800-859-9821 or e-mail medsun@fda.hhs.gov (Engleman, 2012).

Approaches to ILED from wheelchair footplate detection:
Active safety measures to improve automobile control and prevent crashes now common in automobiles include features like blind spot warning, forward collision warning with automated emergency braking, and pedestrian alerts. However, "smart" wheelchairs utilizing sensors for active safety for power wheelchair users are still not a commercial reality today. Currently, safe wheelchair use depends on users consistently implementing safe operation techniques, which requires intact vision, cognition, and impulse control among other functional abilities. Smart footplate position sensing and feedback could serve as the basis for developing active safety interventions to address the unmet clinical need for real-time prevention of lower limb injuries during PWC use. We will describe the VA-patented FootSafe system which combines force and proximity sensors with a wirelessly connected smartphone application to provide continuous real-time monitoring of foot position on the footplate, can help quantify the incidence of ILEDs, permits users to report injuries or call for help. We will also discuss other environmental sensing systems such as LUCI & Braze Mobility, which are SYNERGISTIC with FootSafe.

Conclusion

ILED-related LE injuries and secondary complications occur at an unknown frequency but at high cost to the person with neuromuscular disorders such as SCI/D and the healthcare system. Prevalence is difficult to define. Mechanisms by which people with SCI sustain lower extremity injuries should be reported and analyzed to determine if they are preventable. Incorporating active safety measures into PWC design or accessories may help prevent or minimize the potentially injurious effects of foot displacement

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Conflict of Interest

Drs. Bogie, Henzel, Majerus and Mr. Mitchell are co-inventors of VA-sponsored “Smart foot position sensor for power wheelchair users, and systems and methods of using same.” US patent 11,083,652. Issued August 10, 2021.

IC02: Codes, Coverage, Products, and Innovation: Do These Words Work Together?

Claudia Amortegui, MBA

Learning objectives

1. Describe 4 key requirements in documentation as they relate to obtaining funding for certain higher-level equipment, which typically have a high denial rate.
2. Compare and contrast the non-covered items vs. up-charges vs. upgrades and name the 3 key differences.
3. Identify at least 3 types of rehab equipment that can be provided as upgrades or up-charges to the end-user.

It should not be surprising that when it comes to funding, the complex rehab technology (CRT) industry is working with some antiquated insurance codes. Not only are they insufficient for most wheelchair options, but it's not really any better for the wheelchair base codes. The issue with the insurance codes affects everyone: clinicians, wheelchair providers, and end-users. Inappropriate codes lead to improper reimbursement rates; they also could affect coverage policy for specific items. Adding fuel to the fire, is the fact that innovation can be stifled due to lack of funding assurances. In these cases, everyone loses. How can we as an industry resolve this coding issue? We can no longer expect that the end-user will automatically receive the higher-level product ordered, when their insurance simply won't pay or won't pay enough. The argument for proper coding and coverage policy needs to be addressed by all people involved: clinicians, wheelchair providers, and the end-users themselves. We need to discuss the Who, What, How and When of obtaining the right products for the end-user. This conversation is for all of those involved. This conversation covers current products, but it also affects the possibility of future innovations. The history of certain products and their associated funding codes must be understood. The available "tools" to work within the problem for some products needs to be known. This will afford end-users the possibility of obtaining the best product for their independence, functionality, and safety in their wheeled mobility. Clinicians documentation and supporting evidence for the use of certain products is critical. It needs to be understood what should be included in the documentation and from whom. Provider ATPs need to also know what documentation is acceptable and how to communicate to the end-user and/or their caregivers the process of trying to obtain specific products. Both the clinicians and the provider ATPS also need to know when a product is "denied," if that denial is an internal company review denial or truly a Medicare/funding source denial. What products can be provided as an "upgrade" or billed with the miscellaneous code, K0108? What needs to be documented by the clinicians and how should the providers handle such orders? What has been or will be denied and why? How do we educate funding sources to not only cover certain items, but also reimburse at an acceptable level? When there is no funding, what is the provider able to do to supply the specific item(s)? These are all questions that will be answered based on current policies and regulations. It is time, that people stop assuming things will be taken care of and that we all take responsibility for improving the funding world for CRT.

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IC03: Emerging needs during the pandemic and innovation during lockdown: Posture Management in ICUs

Rosaria E. Caforio, O&P, Inventor, Designer, Author

Learning objectives

1. List at least two benefits and two damnages related to pronation
2. Describe at least three actions to prevent and manage the consequences of pronation
3. Relate the function and principle of use of the seven group of elements that compose Helix®

Introduction

During the first phase, the COVID-19 pandemic forced citizens, governments, institutions and businesses to quickly reshape and adapt to a constantly changing situation, experimenting new ways and new areas of intervention, not without difficulties. This work will illustrate the development of Helix®(Pat.Pending), an innovative modular total-body prone positioning system developed by Pro Medicare using its background and experience of over 25 years in seating and positioning to manage prone posture of ARDS patients hospitalized in intensive care units during March 2020 lockdown in Italy.The device will be introducted together with its features and principles of applications and technology. In addition, the pronation technique and its benefits will be explained, together with its controindications as well as pronation-related consequences and how them can be prevented and managed. Finally, other areas of pronation application will be reviewed.

The Background:

The use of pronation in addition to mechanical ventilation for patients with Acute Respiratory Distress Syndrome (ARDS) had already been a recognized and recomanded clinical practice at least since 2013 but COVID-19 made it an emerging need with many implications for patients and clinical staff. The Acute Respiratory Distress Syndrome (ARDS) is one of the worst complications of COVID-19. ARDS affected 5% of people infected by COVID-19 and the treatment of these people in ICUs required the use of mechanical ventilation combined to long cycles of prone positioning to improve oxygenation and reduce mortality rate. Due to the high number of patients requiring this treatment, intensive care units were faced with another emergency, to carry out pronation treatments that require a lot of staff as well as well trained staff. Despite benefits of pronations countless the damages related to it as pressure sores, traumas, muskuloskeletal damnages, edemas . Pro Medicare after offering his experience and background to help during first phase (end of February and along March) of pandemic to the whole its clinical network and to the government, the last Sunday of March 2020 it has been received a phone call by an Universitary Polyclinic launching a call for help to manage the positioning of pronated patients in ICUs with countless pressure sores and to alleviate the physical and organisational workload of the clinical staff. So started the fast development of Helix®.

The Concept:

A modular total-body system for pronation comprising multiple sub-systems which are also modular. An entire system to allow together, the containment, relief and distribution of body pressures, the postural alignment of the body segments and the whole body, then the decompression of the ribcage, diaphragm and head, the relief of the lower limbs and knees, then the elbows. The individualised and relaxed support of the whole patient will be obtained with the combined and harmonious use of each element and subsystem.

Inputs for Development:

A total body prone modular adaptable positioning system able to adapt to gender, morphologycal, anthopometric and mass differences, able to fit, allignes, reposition both body segments and individually whole the patient body, able to deloads and suspends body prominences and whole body loads and alleviate abdominal – diaphragmatic – sternal- lung pressures individually, able to allow to support individually head inclination and rotation avoiding pressure points and conflict with other devices, able to allow face inspections, as well as able to be placed on different kind of mattress, able to be used for many patients, able to be applied minimizing time for application, physical efforts and number of staff, able to be stocked ad organized faster and transferred throughs beds.

The Product:

A total body prone positioning system for patients whose height is between 160 cm (5 feet 2.99 Inches) and 190 cm (6 Feet and 2.8 Inches) made up of a modular structure composed by seven groups of indipendent, modular and adjustable components with non slip base and six flexible and non slip mats as base (see Fig.1): -Head support group of four elements (replicants a Helix) and four external sub-elements with flexible/non slip mat -Elbow joints support and containment group of four elements each one composed by sub elements and flexible/non slip mats -Sub claviculars support group of two elements each one composed by sub elements and two external sub elements with flexible/non slip mat -Thorax support and containment group of two elements each one composed by sub elements -Hip joints support and containment group of two elements each one composed by sub elements -Knee joints support and containment group of four elements each one composed by sub elements and flexible/non slip mats -Legs support and containment/feet deload group of two elements and two external sub-elements Elements componing each group covered with removable covers disinfectable, washable, sterilizable. All the elements are made of polyurethan and polyethylene foam combining different features as density, high resistance, shape memory. Each group component is identified with colors and numbers. Each group component has available its disposable non woven covers/sleepers The product is provided on a mobile station (for storing and transporting) where it is identified with colors and numbers the place for each group of elements (see Fig.2). On the top of the mobile station it is printed a chart with all the group picture identified by colours and the numbered steps to simplify application operations (see Fig.3). The product is provided with a picture of a skelethon with elements and group drawings to show where each element should be applicate (see Fig.1). The product is provided with a tutorial.

Figure 1. Picture of a Skelethon with Elements and Group Drawings

Figure 2. Picture of a Mobile Station

Conclusion

Helix® was donated to two hospitals. In August 2020 Pro Medicare applied to be part of eligible suppliers of the national plan for the reorganisation of the hospital network, which foresaw an increase in ICUs and SubICUs care beds to increase the national health system's response to the covid-19 emergency, its application was accepted in November 2020. Since November 2020 several ICUs spreads in Italy are using Helix® after training without claims reported. Furthermore, in November 2020 Pro Medicare was selected between more than 400 Italian companies together with 24 others to benefit of technical assistance to increase production capacity funded by the International Development Agency USAID in the framework of the programme USAID INVEST: Supporting the private sector's response to COVID-19 in Italy. In May 2021 Helix®' inventor/Designer/Author Rosaria E. Caforio was accepted to join the Intensive Care Society Innovation Network (UK) and introduces Helix® to the Network in July.

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Conflict of Interest

I, Rosaria E.Caforio, have an affiliation with Pro Medicare Srl based in Italy.I am the managing director of the company and I have ownership interest in it,also I am part of the ownership and inventor and designer and author of both patents for invention and design submissions for the product refer

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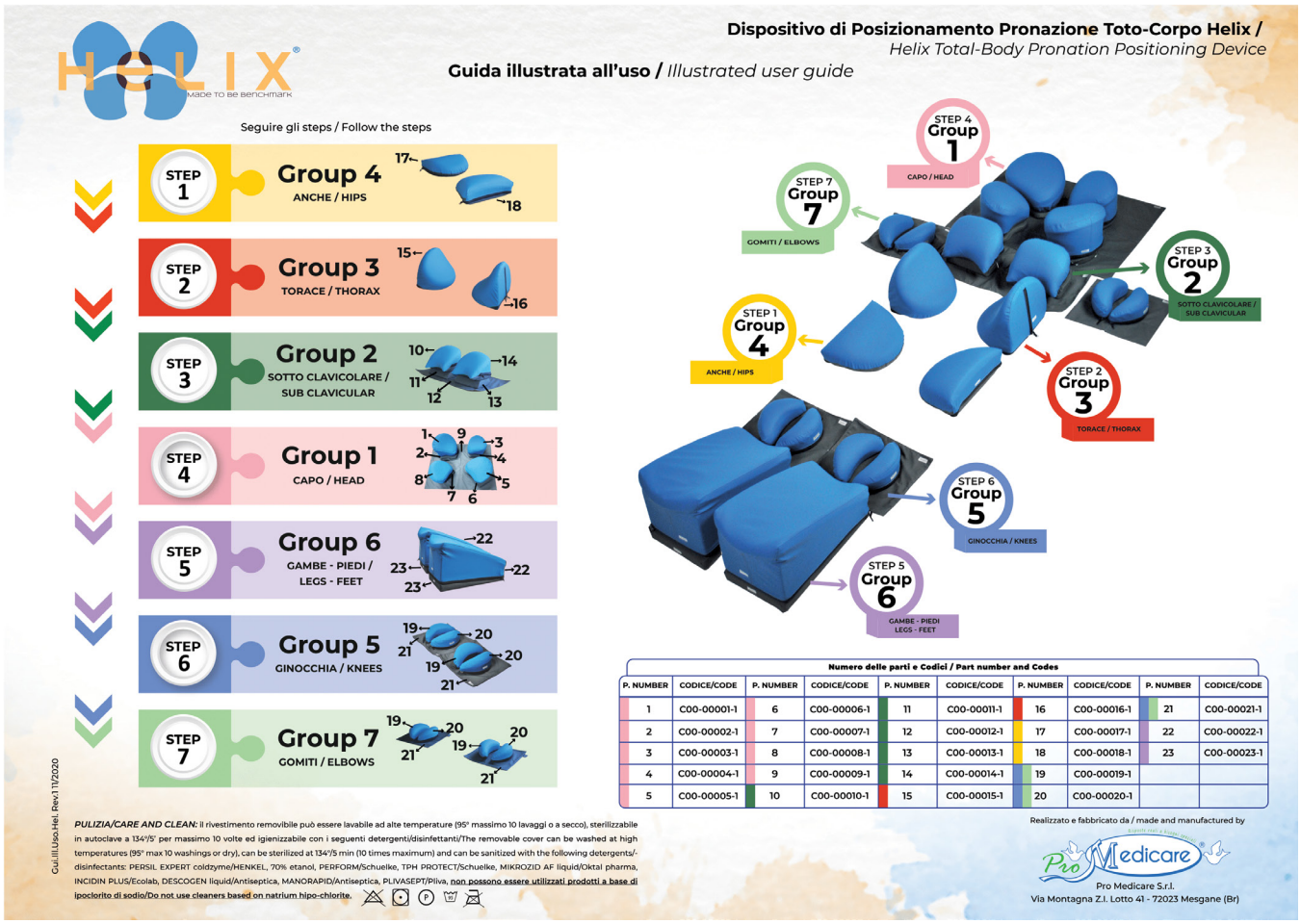

Figure 3. Chart Identifying Colours and the Numbered Steps

IC04: Telerehabilitation: An Effective Tool and its Validation Throughout the Continuum

Sze Wing Madeline Kwok PT, DPT, NCS, ATP
Rachel Szymanski MS, OTR/L, ATP

Learning objectives

1. Describe the role of telerehabilitation technologies for PTs and OTs when caring for the SCI/D, ALS, MS population
2. Identify at least two advantages and two limitations when providing interventions and services through telerehabilitan
3. Discuss the future uses of telerehabilitation technologies in the rehabilitation clinic post COVID 19 timeframes

Introduction

This presentation will describe the expanding role of telehealth technologies in the Veterans Administration (VA) over the past few years. Telerehabilitation usage for individuals with spinal cord injuries/diseases (SCI/D), multiple sclerosis, and amyotrophic lateral sclerosis (ALS) have grown exponentially at VA facilities nationwide since the COVID-19 pandemic. It will describe the usage of telerehabilitation technologies for different physical therapy and occupational therapy clinics. The presentation will delve into how the telehealth technologies are being used in one to one therapy sessions, educational sessions, home evaluations, seating and mobility assessments, group exercise programs, assistive technology prescriptions, and peer support groups. The future direction and possibilities in telerehabilitation programs will also be discussed.

Telehealth has become an expanding field over the past decade. The World Health Organization (WHO) affirms the efficacy of telehealth as an effective service delivery model for rehabilitation professionals. With the development of advanced technologies, the possibilities of its use in the clinic have increased. However, there has been some resistance from clinicians and patients, preventing widespread use. However, as an emergency response to the COVID-19 pandemic, telehealth usage has grown exponentially. This presentation will include a brief history of how the VA has been an early adopter of telehealth and how the utilization has grown in the past year to meet the demands and needs of our staff and veterans. We will review how physical therapists and occupational therapists utilize telehealth technologies in the evaluations, treatment, and follow-up appointments specifically for the SCI/D, ALS, and MS population.

There will be specific case examples in telehealth technology uses in the seating and mobility clinic, for accessibility and home evaluation, for durable medical equipment training, assistive technology prescription and training, as well as for rehabilitation treatment and exercise purposes for our specialty neurological population.

The outcomes of the local VA programs will be discussed (i.e. visits, service access, patient satisfaction, standardized tests and measure outcomes, etc.). As programs continue to develop in the VA as well as in the private sector, there will be a discussion on some possible future development. There is also a need for research to build evidence in outcomes and develop guidelines to support telerehabilitation practices. Literature states that the research will likely need to look at population and health outcomes, service access, cost and cost effectiveness, and the experiences (e.g. satisfaction) of clients and practitioners.

Conclusion

Telerehabilitation technologies and programs have existed for a number of years with sporadic use. However, the COVID-19 crisis has been a catalyst for our VA and other healthcare institutions to go virtual. It pushed clinicians and patients to be adaptable and to embrace the use of telehealth technologies during a time when social distancing was preferred. Likely, it will transform how rehabilitation clinics will look. Telerehabilitation as well as other methods of virtual care are here to stay and will likely be complementary to hands on, in person care.

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Conflict of Interest
No conflicts have been disclosed

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IC05: Modifications to the home environment and beyond. Creating safer environments.

Sue King, Business Development Director
Claire Platt, Marketing Manager
Amanda Farrell, Senior Product Advisor

Learning objectives

1. Describe 3 wellbeing benefits for children with complex needs of providing a modified environment using a Safespace
2. List 3 environments where a Safespace could effectively be utilised.
3. Describe potential cost savings of installing a safe space modification in the home

Introduction

This seminar explores the challenges faced by children with complex needs and their families and shows how adaptations in the home can be designed to alleviate these challenges to create a safer home environment.

Home modification as a way of supporting children with complex needs to live safely in the family home is an innovative approach which has been gaining ground in the UK since 2001. This approach is now being transferred to a range of other environments e.g schools, respite etc thanks to a growing body of supportive research.

The seminar explores how creating a safe, modified environment can support children with complex needs and severe learning disabilities and their families. The session explores home adaptations and offers a number of case studies demonstrating how a Safespace (a customised safe or sensory room), supports children with challenging behaviours, sensory processing disorders or sleep issues. We explore the positive outcomes which include increased safety, improved sleep and reduction in medication. Importantly the session will also explore how a Safespace can be used as a tool for the development of behaviour self-management skills for children who display challenging behaviours and provide an alternative to restrictive interventions.

Case studies are supported with relevant and recent research that looks at the wider benefits including how investing in a customised home modification can yield a 5 fold ROI through the saving of public funds.

Conclusion

Providing children and young people with complex needs with a custom made modification to the home can have a significant impact on the whole family and beyond. The benefits are significant and include increased safety, improved sleep and a reduction in medication. Research has also shown that customized home modifications which benefit the whole family and enable a child or young person to remain at home, can yield a 5 fold return of investment of public money.

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Conflict of Interest

No conflicts have been disclosed.

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IC06: The RESNA Wheelchair Service Provision Guide

Mary Shea-Stifel, MA, OTR, ATP
Jessica Presperin Pedersen OTD, MBA, ATP/SMS, FAOTA

Learning objectives

1. Identify why the wheelchair and seating system industry needs a wheelchair service provision guide.
2. Identify each of the components of the wheelchair service provision process.
3. Identify 3 strategies to improve their clinical practice of wheelchair service provision.

Introduction

Despite the significant number of people who are using wheelchairs and many "experts" in the field of wheeled mobility and seating in 2008, there was no "official" framework for the provision of wheeled mobility and seating equipment and services in the United States. At times, we still have consumers who receive inappropriate equipment that compromises their ability to reach their full functional potential, does not allow for progressing or changing needs, results in pain and discomfort related to sitting, pressure injuries, or injuries that result in emergency room visits. In many situations, the wheelchair service provision process stops at wheelchair prescription or at delivery of the wheelchair and consumers do not fully understand how to use their wheelchair in all their environments and maintain their equipment. Challenges to getting appropriate equipment can be financial, lack of access to qualified professionals and stakeholders who do not fully understand the process.

In addition to assessment and prescription, providing a client with an appropriate wheelchair requires a full spectrum of services. In 2008-2010, a group of RESNA members formed a committee, led by Mary Shea-Stifel to develop a best practice guide for wheelchair service provision. After over two years of weekly, one-hour conference calls with the entire group and with sub-groups in the later phase, we developed the Wheelchair Service Provision Guide that was initially presented at the International Seating Symposium in March 2011. The "Guide" was reviewed by a 2nd group of stakeholders, submitted to the RESNA board for review and approval and in 2013, was published on the RESNA website.

The purpose of the Wheelchair Service Provision Guide is to provide a framework for best practice by identifying the essential steps necessary for the appropriate provision of a wheeled mobility device. The methodology was validated by literature review and content developed by a panel of 14 stakeholders and reviewed by a second panel of 4 stakeholders, all with expertise in wheelchair service provision. In alphabetical order, the original committee was Stan Arledge, ATP, William Armstrong, ATP, RET, Michael Babinec, OTR/L, ATP, Brad Diciano, MD, Carmen DiGiovine, PhD, ATP, RET, Trevor Dyson-Hudson, MD, Jessica Presperin Pederson, OTD, ATP, Julie Piriano, PT, ATP, Teresa Plummer, PhD, MSOT, OTR, ATP, Lauren Rosen, MPT, ATP, Mark Schmeler, PhD, OTR/L, ATP, Mary Shea, MA, OTR, ATP, Jodie Stogner, PT, ATP, and Kelly Waugh, PT, ATP. The Wheelchair Service Provision Guide is now over 10 years old and a review and update is necessary. Most of the original stakeholders have been meeting three times each month for the past year to review the current evidence and concepts to update this guide. Today's presentation will present the updated Wheelchair Service Provision Guide to receive feedback from this audience to maximize its validity. After future review and edits, the "Guide" will be submitted to a second group of reviewers and then the RESNA board of directors for their review and approval. The overall goal of the Wheelchair Service Provision Guide is to inform future stakeholders and advocate for best-practice.

The Wheelchair Service Provision Guide begins with an updated review of the literature and identifies the essential steps for wheelchair service provision: Referral, Assessment, Equipment Recommendation and Selection, Funding and Procurement, Product Preparation, Fitting, Training and Delivery, Follow-up Maintenance and Repair, and Outcome Measurement. Three case studies are then presented to illustrate application of eight components of Wheelchair Service Provision with different populations in different service delivery settings. These are an adult male with spinal cord injury in a wheelchair clinic in a rehabilitation hospital practice setting, a young adult with cerebral palsy in a rehabilitation department in a hospital practice setting and a client with cerebral vascular accident in a home care setting.

[The Wheelchair Service Provision Guide Components

- Referral
  - Identification of Need
  - "Referral" to a Qualified Professional
- Assessment
  - Current Technology & the Environment
  - Current Technology Used for Mobility
  - Environments of Use
- Assessment
  - Environments of Use
    - § Family, Social Support & Caregivers
    - § Attitudes towards the Disability & Technology
  - Activity and Participation
  - Body Function and Structures
- Equipment Recommendation & Selection
  - Equipment Trial/Equipment Simulation
  - Client Funding Education & Exploration
  - Documentation
- Product Preparation
- Fitting, Training & Delivery
  - Fitting
  - Training and Delivery
- Follow-up, Maintenance & Repair
- Outcome Measurement
  - Throughout the process
  - Efficacy of the process and the product]

The wheelchair service provision process is consumer centric and the stakeholders include consumers, family members, caregivers, researchers, medical doctors, clinicians, physical therapists, occupational therapists, rehabilitation engineers, and durable medical equipment (DME) suppliers.

The committee is made up of a group of stakeholders who represent all aspects of this industry: consumers, researchers, clinicians from various practice settings (private practice, school-based, adult rehab, pediatric, manufacturer, funding, education, tele-rehab and group home), DME suppliers, rehabilitation engineers and physicians. The current committee is Stan Arledge, ATP/SMS, Mike Babinec, OTR/L, ABDA, ATP, Brad E. Dicianno, MD, Gerry Dickerson, ATP, CRTS, Trevor A. Dyson-Hudson, MD, FASIA, Elizabeth Gauen, BS, ATP, Jessica Presperin Pederson, OTD, MBA, ATP/SMS, Julie Piriano, PT, ATP/SMS, Mark Schmeler, PhD, OTR/L, ATP, Mary Shea-Stifel, MA, OTR, ATP, and Jodie Stogner, PT, ATP/SMS.

At this time, the committee has reviewed current literature and reviewed and updated each step of the guide: Referral, Assessment, Equipment Recommendation and Selection, Funding and Procurement, Product Preparation, Fitting – Training and Delivery, Follow Up, Maintenance and Repair, and Outcome Measurement to insure content validity. We are now looking to coordinate a second level review by a smaller group of stakeholders. Please contact us if you have interest in being a second level reviewer.

Conclusion

The Wheelchair Service Provision Guide intention is that it will continue to inform best practice, inform policy and will assist with the education of all stakeholders about optimal provision of wheelchair services in all practice settings.

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Additional Learning Resources

www.resna.org
https://www.resna.org/Portals/0/Documents/Position%20Papers/RESNAWheelchairServiceProvisionGuide.pdf

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Conflict of Interest

Mary Shea-Stifel has no conflict of interests.

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IC07: "What do you mean it's not assisting you?!" Strategies to Increase Success with Power Assist

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Learning objectives

1. List at least five key questions to answer during the complex rehabilitation technology evaluation to determine if a pow
2. Distinguish between 3 different styles of power assist systems and propose a situation when each style is appropriate
3. Articulate at least three objective strategies to incorporate into the equipment selection process to improve the client

Introduction

Since the first ultralight weight wheelchair (ULWC) was invented close to 40 years ago researchers, engineers, and manufacturers have worked to design equipment that will improve the users' overall quality of life and decrease the negative impacts wheelchair propulsion can have on their body. In the past decade power assist-wheels and other e-Mobility devices have revolutionized how individuals propel their ULWCs and been linked to improving the lives of many people who use them. Determining which power assist device is appropriate and successfully implementing that device into a person's life can be as complicated as it is life changing. With that said, understanding the individual as a whole and the equipment options available will greatly increase the likelihood of recommending a power assist device for a user that will in fact assist them.

The negative impacts of propelling an ULWC can have on a user's body has been well documented via research studies and clinical data. In an effort to combat the potentially negative impacts, numerous resources have been created to educate not only the clinicians, but also the wheelchair user, on topics such as methods to preserve upper limbs and proper set-up of the wheelchair. For decades the primary option available for a client who wanted to preserve their body or experienced a decrease in function to the point where he/she could no longer propel a manual wheelchair was transitioning to a power wheelchair. Making the move from manual to power is not a decision to be taken lightly and often times might be put off for numerous reasons such as financial, personal goals, self-image, accessibility of home, etc.

Electronic devices that can be added onto a manual wheelchair to improve a client's ability to utilize his manual wheelchair independently have become very popular. Worldwide the options and styles have expanded greatly in the past 10 years. From devices intended to be utilized simply for recreation to ones designed to be used in all facets of everyday life and beyond, the options available are vast.

Along with the positives associated with the surge in the options and the popularity of such devices in general, it is also important to be aware of the potential stumbling blocks and outcomes. The difficulties associated with finding and securing the best device for a client may include; the evaluation teams familiarity with the equipment, opportunity for trials with different types, functional ability to utilize independently (set-up, attachment, operating, disassembly, basic maintenance, etc.), funding, required motor and cognitive skills, ability to utilize across all environments, proper training, etc.

During this session we will review the primary styles of eMobility and power assist devices currently on the market. In addition we will spend time discussing the evaluation process as it relates to these devices, including whether or not this type of system is appropriate to even consider for the client. A review of the most recent literature focused on power assist and eMobility will be presented as well as real case examples of lessons learned and success stories.

Conclusion

A power assist or e-Mobiity device has the potential to significantly improve the independence of a client and their overall quality of life. However, that same device also has the potential to be abandoned by the user secondary to it being more of a burden than assist. In order to assist clients with selecting the proper device and options, it is vital that the transdisciplinary teams take a thorough and holistic approach. Throughout this session various techniques will be reviewed with the goal of inspiring new approaches to lead to increased positive outcomes with power assist.

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Conflict of Interest

I, Angie Kiger, have had an affiliation with an equipment, medical device or communications organization during the past two calendar years. I am employed full time by Sunrise Medical US, LLC as clinical educator. I do not intend to promote or endorse any particular brand or product.

IC08: How Complex are CRT Users?

Nicole B. LaBerge, PT, ATP
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Learning objectives

1. Discuss how medical complications in general affect overall healthcare costs
2. Identify the (5) most common medical complexities and co-morbidities that occur in mobility device and CRT users
3. Describe a functional activity that promotes medical well being and can prevent complications caused by prolonged sitting

Introduction

The able-bodied population has been extensively researched, demonstrating that those who spend >8 hours/day sitting are at higher risk for cardiovascular disease, diabetes, certain cancers and even death. The typical user of CRT (Complex Rehab Technology) is likely to sit for >8 hours/day as well. We often assume that when a person is seated in a mobility device, they will have medical complexities and co-morbidities related to their diagnosis. But are our assumptions correct?

Prolonged sitting time has been associated with a graded increase in risk for mortality among sedentary adults; for the able-bodied population, those who spend >8 hours/day sitting are at higher risk for cardiovascular disease, Type 2 diabetes, certain cancers, depression and even mortality. Similar behaviors are seen in a full-time wheelchair user who spends on average 10.6 hours/day seated. A comorbidity has been defined as 'any distinct additional entity that has existed or may occur during the clinical course of a patient who has the index disease under study. Previous research has identified the common comorbidities or secondary conditions such as decubitus ulcers, osteoporosis, joint deformities (especially hip joint adduction contracture) can result from prolonged wheelchair use found that only 30% of those with rare metabolic, neuromuscular or neurological diseases using power wheelchairs did not have any comorbidities.

Comorbidities have been studied in different populations based on diagnosis. Children and adults with Cerebral Palsy (CP) who utilized power wheelchairs were identified to have sixteen comorbidities, with asthma and osteoarthritis as the most common; pain, spasticity, contractures, hip problems, pressure sores, depression, edema and (kypho)scoliosis were also present. People with Duchenne Muscular Dystrophy, as they age, have major clinical issues including fractures, (kypho)scoliosis, cardiopulmonary involvement and pain. Previously, the occurrence of 13 secondary health conditions (SHC) commonly seen in SCI (neuropathic pain, musculoskeletal pain, pressure ulcers, problematic spasticity, autonomic dysreflexia, hypertension, edema, neurogenic heterotopic ossification, pneumonia, UTI, urinary incontinence, fecal incontinence and constipation) were identified and found that 98.5% had at least one SHC; the median total number was 4 conditions, and that minimizing the impact of these should be a priority in the long-term care of persons with SCI.

Pressure ulcers, one of the main secondary health outcomes of spinal cord injury, have a significant impact on health, functions and quality of life. The incidence of pressure ulcers for those that utilize wheelchairs was found that >54% of those with a SCI had a current pressure injury or a history of one. More than two-thirds of SCI manual wheelchair users report suffering or having suffered shoulder pain and those that begin using a wheelchair as an adult experience greater shoulder pain than those that started using one as a child. Most research has focused on pain caused by wheelchair propulsion, but evidence is also present that those with SCI that use crutches or canes, or motorized wheelchairs, may be at similar or greater risk for shoulder disorders leading to pain.

All of these medical complexities contribute to the high cost of healthcare.

The presenters recently completed a retrospective study that reviewed the data over the course of 11 years and 330 mobility devices users. The healthcare system that was utilized was a Level 1 Trauma center in urban Minneapolis, Minnesota USA. In the past, research has focused on a particular diagnosis and the complexities that occur with it. This study included all medical diagnoses that would qualify someone to receive a mobility device, and all mobility devices types (manual wheelchairs, scooters/POVs, power wheelchairs and power wheelchairs with integrated standing).

Ten (10) common comorbidities found in those that use mobility devices were investigated: history of falls, bowel issues, digestive issues, spasticity, history of wounds, respiratory issues, cardiac issues, incontinence, edema/swelling and pain. High cost incidents such as Emergency Department (ED) visits, hospitalizations, and Urinary Tract Infections (UTIs) were additonally counted for the number of occurrences one year prior to the PT evaluation, and one year after the PT evaluation for a mobility device.

For full results of this research study, please see the article published here: http://dx.doi.org/10.1080/17483107.2021.1969453

The action of standing has been researched and demonstrated medical benefits such as reduced spasticity, maintained and improved BMD (bone mineral density), improved ROM, reduced risk for contractures, improved respiration and cardiac function, reduce pain, and improved bowel and bladder function. Standing has also shown to increase independence with ADL completion, increased participation in school and work environments, and improved psychosocial wellbeing. In the research study presented, the group of individuals that received a standing power wheelchair demonstrated lower comorbidities than those that maintained a seated position in their respective device. The presenters believe that the usage of integrated standing power wheelchairs as a medical intervention has the potential to decrease comorbidities and improve overall quality of life.

Conclusion

This retrospective study completed by the authors, found that 92% of mobility device users across all diagnoses, had at least three significant comorbidities or medical complexities that directly affected their overall health and

wellbeing. 100% of mobility device users had at least 1 comorbidity. Pain was overall the most common reported comorbidity across all device types. Standing and integrated standing power wheelchairs should be considered as an attainable solution to promote healthier functioning and prevent these complexities from becoming potential hospitalizations and extensive healthcare costs.

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Conflict of Interest

None

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IC09: Made for each other: Kids, Custom Seating, and 24-7 Posture Care Management

Tamara Kittelson, MS, OTR/L, ATP/SMS

Learning objectives

1. Describe factors affecting the ribcage, spine, pelvis, and hips in growing children and adolescents.
2. Distinguish between therapeutic and destructive lying and sitting postures related to the spine, chest, and pelvis.
3. Describe how to interpret information gained from posture analysis to create a therapeutic 24-7 positioning plan.

Introduction

Children and youth with chronic motor impairments often develop distorted body shapes as they grow. An early childhood diagnosis may not be progressive but will likely lead to secondary complications like joint contractures, pelvic obliquity/rotation, scoliosis, and kyphosis. These postural deviations will negatively impact health and function over time, requiring increasingly complex wheelchair seating as posture deteriorates, moving away from symmetry and midline orientation. Early adoption of custom seating combined with 24-hour Posture Care Management (24-7 PCM) can positively interrupt this scenario. Custom seating and 24-7 PCM promotes healthy alignment, development, growth, and function through a foundation of body symmetry that supports stable posture. This approach not only applies to kids but for people of all ages – early intervention is for everyone.

All kids, with or without mobility impairments, grow, develop, and change. Moreover, aging begins from the day we are born. Secondary complications related to physical impairments arise – like scoliosis, kyphosis, pelvic obliquity/rotation, and joint contractures. These negatively impact motor control, skin integrity, cardio-pulmonary function, digestion, oral-motor control/swallowing, visual field, and communication.

Longitudinal change and the aging process are unavoidable. Recognizing this, aids in understanding the value of early intervention, and how mobility, posture, and function, are inextricably linked. While implementing early self-initiated mobility and standing frame-regimens is promoted, using custom postural support solutions that could help that same population is often delayed. Professionals and parents don't recognize implications of early postural asymmetry red flags, or if they do, wait and hope they will be "outgrown" or disappear with therapy.

It's crucial to understand what is happening and what will happen to the body. By analyzing synergies between sitting and lying postures, likely future outcomes become apparent – like a crystal ball. Targeted, individualized postural support both in and out of the wheelchair, with family and caregiver investment can then positively influence that future and improve long-term outcomes.

Lying is the first and foundational human orientation, the only one available at birth. This remains the case for some people throughout their lives. Sitting develops next. Many people with motor impairments are able to sit in an upright orientation, with greater or lesser degrees of support tailored to individual needs. Standing is the last orientation to be achieved. Note the progressively smaller base of support ranging from a broad foundation in lying, to sitting, to narrowest, that of standing.

Conducting a supine mat evaluation is best practice during wheelchair evaluations, however correlating destructive elements between lying and sitting postures are not always recognized and acted upon. Lying in habitual asymmetrical lying postures while resting or sleeping, over months and years, fosters pelvic obliquity/rotation and scoliosis that complicates seating later. All human beings have postural tendencies, but most can choose to easily move in and out of them independently. Those who cannot, tend to spend too much time in asymmetry without variation and develop postural deviations. Take early postural asymmetries seriously – they will not typically "go away" as gravity has its way with the body.

As with three human postural orientations, there are three seated postural tendencies to understand relative to seating.

Anterior

Figure 1. Anterior

Lateral/Rotational

Figure 2. lateral/ rotational

Posterior

Figure 3. lateral/ rotational

Seated function involves both activity and rest. Activity may be fine motor (eating, computer work, driving a power chair) or gross motor (wheelchair propulsion, athletics, getting dressed). Everyone needs rest, as a break from activity and the force of gravity. For some people a rest-oriented posture is most appropriate. Seated postural supports must allow for all of these functions (rest, fine motor and gross motor activity) throughout the wheelchair rider's day, with demands varying from person to person.

Proximal stability promotes symmetry and midline orientation as the foundation for fine motor activities; some adaptive asymmetry is normal. Seating for gross motor activities must incorporate the same principles, recognizing that larger movements with higher levels of exertion result in postural deviations related to adaptive asymmetry. This is not a problem if re-positioning into more symmetrical midline orientation for rest is easy - a focus to be kept in mind, for humans are not constantly active. Without a stable, midline oriented resting posture the upright individual is at the mercy of gravity – which will always win.

A posterior tendency is best for rest and the least destructive long-term, with appropriate external pelvic and trunk support. It provides a base for fine and gross motor activity if well designed. The anterior and lateral/rotational tendencies will become destructive over time if not appropriately addressed.

Most people start life with symmetrical body shapes and flexible joints. For some this does not last. When not appropriately supported, lying and seated asymmetrical postural tendencies become destructive as the body distorts under prevailing forces of gravity and time, flattening like a "Human Sandwich". Positional plagiocephaly, for example, results from a baby's head resting on a flat surface over long periods.

The human body is resilient. With frequent and varied position changes it typically returns to its original symmetrical shape. With limited movement, eventually it does not bounce back, and asymmetrical postures are established. A small imbalanced position recurring over months and years, progresses to further asymmetry and distortion. Soft tissue adapts, ligaments overstretch, joints contract, or sublux/dislocate under prolonged stretch. Unsupported body parts are pulled as gravity compresses the whole body against the surface. In sitting, a smaller foundation gives gravity more advantage, requiring extra support to keep the body upright.

Gravity can be harnessed to promote a stable and balanced body by including 24-7 PCM with early assessment and consideration of custom seating. Analyze posture for symmetry, midline orientation and overall alignment during mat assessments, looking at all orientations. Take small asymmetries seriously as harbingers of things to come. A lying strategy to comfortably support and align the body while fostering good sleep, will pay off in successful seating outcomes. Consider custom early - why wait until posture deteriorates when early action can yield better outcomes?

Conclusion

Seating evaluations and interventions too often solely focus only on the wheelchair, and not enough on a rider's life and positioning outside the wheelchair. Custom seating is often overlooked when working with children and youth whose postural deviations are thought to be minor and transient – yet are likely to progress over time. Early adoption of custom seating in concert with therapeutic positioning outside the wheelchair can potentially support better long-term outcomes, by preventing/limiting the destructive impacts of gravity over time on the human body. These interventions must start early, ideally before deterioration of posture becomes glaringly evident and effects function, health and wellbeing and quality of life.

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Conflict of Interest

This material was developed as an independent consultant with support from Ride Designs.

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PS01.1: Translation of the Aspects of Wheelchair Mobility Test into Spanish

Kit Frank, OTR
Paulina Restrepo, MS
Paulina Villacreces, MS

Learning objectives

1. Participants will be able to describe the Aspects of Wheelchair Mobility Test, (AWMT) as a method of collecting validated data on how well a wheelchair rolls forward for its user in common environments of use.
2. Participants will understand the benefit of having the AWMT in Spanish and the protocol necessary to appropriately translate a questionnaire into another language.
3. Participants will understand how to collect user-centered data on the ease of rolling, using the Aspects of Wheelchair Mobility Test, and record data from the test.

Introduction

Validated outcomes measures are essential to facilitate appropriate wheelchair provision. The Aspects of Wheelchair Mobility Test (AWMT) provides user-centered data on the ease of rolling in commonly encountered rolling environments. The AWMT has qualitative and quantitative aspects giving it the strength specific to mixed methods studies. Participants roll for four minutes on tracks that model three different commonly encountered rolling environments. Distance traveled in four minutes is measured. After completing each track, participants complete a question that includes rating difficulty or ease on a visual analogue scale as well as a qualitative explanatory comment. The AWMT has now been translated into Spanish.

Literature review: The AWMT has been used to compare different types of wheelchairs using repeated measures ANOVA [1,2]. Content and construct validity and test re-test reliability have been confirmed for the AWMT [3]; In addition, discriminatory validity, or the ability to meaningfully discern differences of interest, has also been supported [1,2]. The numerical data from distance traveled and the visual analogue scale response have been found suitable for parametric statistical analysis. Comparative studies have shed light on strengths and weaknesses of different types of wheelchairs, and these studies have sparked design changes [1,2]. Translation into Spanish makes the AWMT more broadly available since there are over 500 million Spanish speakers worldwide [4]. Spanish is increasing rapidly in prevalence and importance in the United States and is of interest for effective health care in the US and many other countries [5]. There are guidelines that have been developed for the translation of health-related questionnaires [6,7].

Purpose: The purpose of this study was to appropriately translate the AWMT into Spanish. Methods: There are two aspects to the translation of the AWMT. The written instructions for the four-minute roll tests in the three rolling environments were directly translated by a professional translator, then reviewed and revised by our translation team. Guidelines for the translation of health-related questionnaires were followed for the participant follow up question for each rolling environment. Two forward translations were completed by professionals for whom Spanish was their mother tongue. Both were biomedical engineers who had completed graduate school in the USA and gone back to work with assistive technology in their home countries, one in Colombia and one in Ecuador. The two translations were reconciled by the translation team. A professional translator back translated the reconciled document into English. The two translators, a clinical moderator, and the developers of the AWMT again reconciled the translations. A final debriefing, proofreading and approval resulted in the current Spanish version of the questionnaire aspect of the AWMT.

Discussion: Additional study is needed to confirm the validity and reliability of the AWMT. Due to COVID epidemic restrictions, although this is planned, we have not yet been able to use the Spanish version of the AWMT in a field study.

Conclusion

The AWMT is now available in Spanish. It is now possible for wheelchair professionals to use the AWMT to give Spanish speaking wheelchair users a voice in studies to do with the mobility their wheelchairs provide in common rolling environments.

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Additional Learning Resources

English and Spanish versions of the AWMT are available for free download at: https://www.atcatalyst.org/awmt

Acknowledgments

We would like to acknowledge the organizations and individuals we worked with in Ecuador, and Columbia.

Conflict of Interest

No conflicts have been disclosed

PS01.2: Translation of the Wheelchair Interface Questionnaire into Spanish

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Paulina Restrepo Arango, MS
Paulina Villacreces, MS

Learning objectives

1. Participants will be able to describe the use of the Wheelchair Interface Questionnaire (WIQ) as a method of collecting validated data from wheelchair professionals on the appropriateness of a wheelchair for its user.
2. Participants will understand the benefit of having the WIQ in Spanish and the protocol necessary to appropriately translate a questionnaire into another language.
3. Participants will understand how to use the WIQ to collect user-centered data on the appropriateness of a wheelchair for its user.

Introduction

The quality of the interface between a wheelchair and its user includes not only the physical interface, but also the interface in all aspects of daily life. Wheelchair professionals have a unique ability to use their broad base of experience and training to evaluate this interface [1]. The Wheelchair Interface Questionnaire (WIQ) was developed to provide this data in a validated form. It is intended to augment, not replace, feedback from the wheelchair user [2.3]. The translation of the WIQ into Spanish will enable its use by Spanish speaking wheelchair professionals to improve wheelchair services where they work.

Literature review:
The WIQ has been validated in English for reliability and content validity [1,2]. The vision for this tool was intended to be global and to include improved wheelchair provision in under-served populations. It produces data with sufficient granularity and detail to shine light on specific problems. The characteristics of the questionnaire data are particularly suitable for analysis and publication. Numerical data has been found suitable for parametric statistical analysis and is accompanied by explanatory comments for qualitative analysis. Initial versions were used in studies done in Kenya, which provided data to facilitate funding for wheelchair replacement or modification and for changes in wheelchair design [3]. A step toward broader global use is the translation of the WIQ into Spanish with over 500 million native speakers; it is the official language in 20 sovereign states and has over 40 million speakers in the United States [4,5]. There are guidelines that have been developed for the translation of health-related outcomes measures [6,7].

Purpose:
Our purpose was to appropriately translate the WIQ into Spanish.

Methods:
Following translation guidelines, initial translation was done by two native speakers of Spanish, one from Columbia and one from Ecuador. Both were biomedical engineers who had completed graduate studies in the USA, and who were working in the field of assistive technology in their home countries. Each independently completed the translation of the WIQ into Spanish. The two translations were then reconciled through discussion and comparison in the presence of a clinical moderator. The reconciled translation was back translated into English by a qualified professional translator. The translations were again reconciled. This process concluded with debriefing, proofreading, and approval by the initial developers of the WIQ.

Discussion:
Due to COVID epidemic restrictions, field testing has been delayed. A study in Guatemala, which will look at inter-rater reliability and discriminatory validity of the Spanish version of the WIQ, is in its initial stages.

Conclusion

The WIQ is available in Spanish. It can now be used by the many Spanish speaking wheelchair professionals around the world to improve local wheelchair provision.

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Additional Learning Resources

1. English and Spanish versions of the WIQ are available for free download at: https://www.atcatalyst.org/wiq

Acknowledgments
We would like to acknowledge the organizations and individuals we worked with in Ecuador, Columbia and now in Guatemala.

Conflict of Interest
No conflicts have been disclosed.

PS01.3: Translation and cross-cultural adaptation of the Wheelchair Components Questionnaire (WCQ) from English to Spanish

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Karen Rispin, Manager of the Assistive Technology Catalyst
Kit Frank, OTR (r), Founder, Fundación Jen Lee
Paulina Restrepo Arango, Biomedical Engineering

Learning objectives

1. Learn and understand the steps to properly translate instruments to another language, such as questionnaires.
2. Describe and use the WCQ as an outcome measure to collect data to evaluate a wheelchair's maintenance condition.
3. Learn about the benefits of translating instruments to Spanish, specifically the WCQ and its implications for rehab.

Introduction

This paper provides a translation and cross-cultural adaptation of the Wheelchair Components Questionnaire (WCQ) from English to Spanish. The WCQ is an outcome measure that has been used in several studies (Rispin, DiFrancesco, et al., 2017; Rispin, Dittmer, et al., 2017; Rispin, Riseling, et al., 2017) to assess the maintenance condition of wheelchairs. Results have led to repair or replacement of components to avoid accidents and breakdowns and to changes in product design to improve wheelchair durability (Rispin, DiFrancesco, et al., 2017; Rispin, Dittmer, et al., 2017; Rispin, Riseling, et al., 2017). Validation studies have supported the WCQ as a reliable method of assessment indicating reliability and internal consistency (Rispin, DiFrancesco, et al., 2017; Rispin, Dittmer, et al., 2017). The translation of the WCQ from English to Spanish followed the guidelines for translation for health-related questionnaires (Behr & Sha, 2018; Sperber, 2017).

There is a higher incidence of disabilities in low-income countries (WHO, 2011). About 80% of people with disabilities live in low-income countries (WHO, 2005). Globally, 75 million people are in need of a wheelchair and only 5-15% of those have access to one (WHO, 2018). There is a global need for wheelchairs, especially for populations of low-income resources (Eide & Øderud, 2009).

Selecting an appropriate wheelchair can allow users to become more independent and be able to participate in their communities; create greater opportunities for education and work; and, overall enhance the user's health and quality of life (Ameratunga et al., 2009; Eide & Øderud, 2009; May-Teerink, 1999; Rohwerder, 2018; United Nations, 1993; WHO & USAID, 2011).

Few wheelchair specific outcomes measures have been translated and validated in Spanish for cross-cultural studies (Sperber, 2004); and few studies have been done to assess wheelchairs provided in low-income countries and how they fit the user and his/her environment (Pearlman et al., 2008). There is a growing need for translated and validated outcomes measures in Spanish like the Wheelchair Components Questionnaire (WCQ), to carry out research studies that represent the needs of low-income Spanish-speaking populations and their environmental conditions. The purpose of this study was to translate the WCQ from English to Spanish, and to validate the translation with Spanish-speaking users.

The WCQ was developed as an outcome measure for therapists and wheelchair providers to evaluate the wheelchair maintenance condition at different points in time, after the wheelchair has been fitted to the user. The WCQ is a short questionnaire consisting of eight questions that apply to the majority of manual wheelchair components and uses a language that is culturally specific, simple, and clear.

The translation of the WCQ followed the Guidelines for translation of the Rome Foundation research and diagnostic questionnaires - Adult questionnaires. These guidelines follow a cross-cultural translation process that not only focuses on language, but also on the cultural adaptation of the outcomes measure, with the aim of achieving a "cultural" translation as opposed to a "literal" or word-for-word translation (Sperber, 2004, 2017). The original WCQ questionnaire was translated to Spanish by two professionals and then reconciled into a single version with the help of a clinician monitor. The reconciled Spanish version was back translated to English by a professional translator. The clinician monitor and the two translators compared the two English versions to validate the translation and agree on a final translation. The final translated questionnaire will be part of a cognitive debriefing session in Guatemala with wheelchair users. After the debriefing session a final version of the WCQ will be reconciled. The final translated questionnaire of the WCQ in Spanish will be available at: https://www.atcatalyst.org/resources/research-tools/wheelchair.

During the translation process, it was emphasized that the final translated outcomes measure was to be used by people of different ages and educational levels in Spanish speaking countries, therefore the language used had to be appropriate. The use of simple language, commonly used vocabulary that can be understood regardless of educational level, culture, or ethnic background, was stressed throughout the translation process.

The translation involved two professional translators whose country of origin is Colombia and Ecuador. During the translation process, it was noted that some word terms were more often used in one country than the other, and vice versa; likewise other word terms were used in both countries and had the same meaning. Consensus was reached to use

a word that was more widely used in colloquial Spanish. Where consensus couldn't be reached, we opted to use the two most frequent terms used, for ease of understating.

Currently, a cognitive debriefing session is being conducted in Guatemala with wheelchair providers and users to evaluate the translation of the WCQ in terms of "clarity, cultural adaptation, language level, and acceptability" (A.D. Sperber, 2017). We are also planning to test for interrater reliability and discriminatory validity. The cognitive debriefing involves going over each of the questions of the outcomes measure with wheelchair providers and users to receive their feedback in terms of comprehensibility of the questions and whether any changes are needed for the translation. After the cognitive debriefing, the professional translators and the clinician monitor from steps 1 & 2, will incorporate the changes to the final version of the WCQ.

This study discussed the translation of the WCQ from English to Spanish following the Guidelines for translation of the Rome Foundation research and diagnostic questionnaires - Adult questionnaires. While the translation process followed rigorous steps for translation, the WCQ-Spanish needs to be validated within Spanish-speaking populations.

In order for the translation of the WCQ to have technical equivalence, it is necessary that both the original and translated versions yield comparable data. This can be obtained by testing the translated outcomes measure's reliability and comparing it to the reliability obtained for the original version. We hope that in the near future we can use this outcomes measure to conduct research studies within the Spanish-speaking populations.

One of the bigger questions we have since finishing the translation of the WCQ, is how can we make it available to as many as possible Spanish-speaking countries? How can we increase an awareness of these outcomes measures, so that together we can build a repository of research studies that are available to everyone, , everywhere in the world, so that they are not just lost in translation?

Conclusion

The translation of an outcomes measure like the WCQ from English to Spanish can allow Spanish-speaking countries to collect data that helps them make informed decisions when it comes to selecting an appropriate wheelchair. Data collected from research studies, can provide evidence-based information about wheelchairs that represent the needs of wheelchair users and the environment and conditions in which they live in. Having access to an outcomes measure like the WCQ can allow for longitudinal studies to be conducted on-site, and provide evidence-based information to wheelchair manufacturers to enable wheelchair design and components improvements. The use of the WCQ could also allow manufacturers to ensure that suppliers in low-income countries have additional components that frequently damage, to ensure that the components can be repaired or replaced in case of failure.

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Conflict of Interest

No conflicts have been disclosed.

IC10: ON Time Mobility: Why Advocating for Movement Experiences for Children with Disabilities Must Move Beyond "Early"

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Heather Feldner, PT, PhD, PCS
Jennifer Tucker, PT, DPT, PCS
Sam Logan, PhD

Learning objectives

1. Define ON Time mobility as a novel framework for mobility intervention for children with motor impairments
2. Compare and contrast developmental trajectories in children with and without the experience of self-initiated mobility
3. Identify 3 unique developmental mobility training experiences that can be facilitated by or replicated with mobility technology

Introduction

What do we really mean when we say "Early" Mobility in this field? We have used this term "Early" to describe technology intervention for younger children (preschool age) as opposed to waiting until later childhood. This was an essential distinction by pioneers like Charlene Butler and others to advance access to mobility technology for younger children at a time when they had historically been excluded, as well as an opportunity to demonstrate the developmental and social benefits of mobility. However, we argue that decades later, use of this term creates an unintended tension between the philosophy and evidence within Early Intervention that supports targeted opportunities at key developmental stages with infants and toddlers who have known delays or are at risk for delays in the future.

When we intervene "early" at 36-48 months of age with mobility technology, regardless of whether it is powered or manual, high or low tech, we are actually late relative to the mobility and learning opportunities that arise in children without disabilities around 4-6 months of age. At this stage, we have missed critical opportunities across months and years to support equity in interaction and engagement of children with disabilities. Thus, the operational definition of "early mobility" may actually contribute to inequitable treatment of children and their families despite its proactive roots. In thinking deeply about this language as more than just semantics, we call for a shift in practice, technology design and policy to create and fund solutions that are timed to support the multimodal mobility experiences starting in the first year of life, such as physical movement and mobility technology use.

ON Time mobility is a framework for expanding mobility's role in culture, industry, and practice. The following are key principles of ON Time mobility:

1. Timing: Recognizing the onset of mobility is within the first year of life rather than equating delayed or absent mobility with the delay or absence of walking.
2. Urgency: Promotes urgency as self-initiated mobility is a catalyst for all domains of development
3. Multi-modal: Encourages a variety of mobility opportunities to close the gap upon learning and play.
4. Frequency: Necessitates equality in the frequency of mobility opportunities for all children regardless of mode of mobility.
5. Sociability: Supports the necessity of self-initiated mobility within socially enriched environments as a means for developing and sustaining meaningful relationships.

At its core, mobility is a human right. Rights-based documents support this view of mobility, including The United Nations Convention on the Rights of the Child (1990) and Convention on the Rights of Persons with Disability (2006). These conventions center on development, equality of opportunity, play, self- reliance, equitable access, active participation, and the fullest possible social integration, including technologies and supports to enact these rights. The ON Time mobility framework provides a perspective centered on these rights. As a practical example, when daily mobility is passive through chronic stroller use, restricted by readiness criteria, or constrained to clinical environments, a child's rights are compromised by a shift from self-reliance to sustained dependence. A framework of ON Time mobility acknowledges and responds to the inequality of the wait and see approach, pushing back against the acceptance of passive mobility, funding constraints, delayed or lack of access to mobility technologies, and the absence of universally designed, assistive and rehabilitative technologies that are engineered to meet the unique needs and environments of this population.

As shown in Figure 1, when a delay or disability becomes apparent, a distinct and inequitable mobility trajectory emerges based on how mobility is prioritized and enacted (in isolation vs. with social engagement), and the subsequent developmental opportunities and constraints. These contrasting mobility contexts may lead either to learned agency and self-efficacy (along the top trajectory), or learned helplessness and learned providership (on the bottom trajectory).

Conclusion

Within our industry, there are many strong advocates that are actively fighting the multitude of constraints. A shift to an ON Time Mobility perspective adds to this fight by providing a framework for the development of action steps that outline ways that clinicians, manufacturers, and suppliers in this industry can influence our culture and perceptions of mobility and disability with families and policymakers, and each other. This presentation will utilize this framework to discuss and identify action items that fuel both a professional and cultural shift towards a more urgent, rights-based human rights provision of mobility opportunities for infants and toddlers.

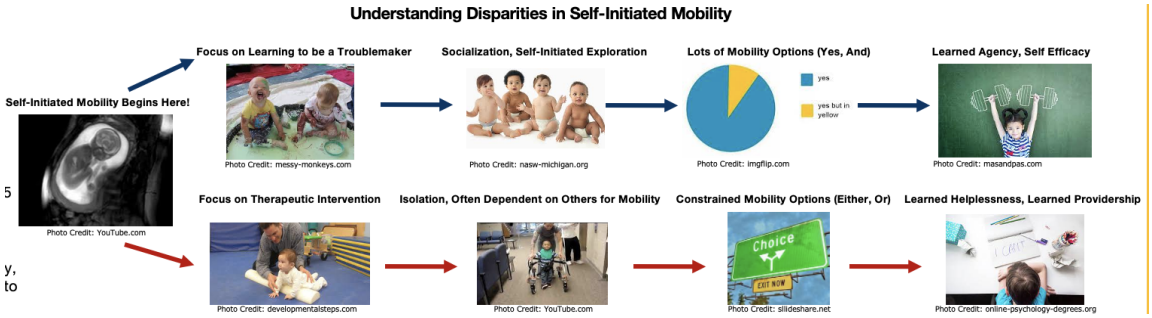

Figure 1.

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IC11: Navigating the Telehealth Landscape in CRT: A Supplier's Guide

Kyle J. Walker, MHA, ATP

Learning objectives

1. Understand the key elements to determine if telehealth is appropriate for your client and service needed.
2. Explore the three (3) main areas telehealth may be utilized in in complex rehabilitation technology.
3. Gain at least 2 resources for future reference when evaluating opportunities in telehealth.

Introduction

This course is designed for the CRT provider but may also be useful for the practitioner involved in the procurement and provision of mobility equipment in today's landscape. In light of the global pandemic known more commonly as COVID-19, the traditional healthcare delivery model has been challenged to provide care in new and innovative ways aimed to keep people safe while at the same time providing equally or better care. With the growth of virtual platforms, an opportunity emerged in our complex rehab industry. This course will provide insight into historical application and research done in this space and help you to make informed critical decisions to evaluate if telehealth is appropriate for the end user based upon their need as well as insight into operational efficiency improvements in the health delivery model.

Nearly 20 years ago researchers at the University of Pittsburgh starting investigating methods to conduct healthcare services remotely trying to identify if care could be provided in non-traditional methods and then analyze the results for future implications and just recently have had several papers published on their latest findings (Bell, 2020). Fast forward to 2019, our world is in turmoil and we are facing one of the deadliest pandemics our world has ever seen known as COVID-19.

We as a world explored so many ways to live in a new "normal" society. We socially distanced ourselves, we dawned gowns, gloves, masks, and face shields and tried to figure out how we triage the critically ill patients while at the same time trying to figure out how to provide care to our already medically fragile clients with assistive technology needs.

Over the past 20 years technology has continued to advance at phenomenal rates in industries from agriculture to healthcare. Virtual platforms have been used for years now to connect people all around the world to conduct business and engage in social conversations, but in light of the public health emergency we saw a tremendous emergence in the adoption of these service from entities in the healthcare sector trying to figure out how to provide care in this new world (Koonin, 2020). Services ranging from physical medicine to mental health and beyond.

In order to do so, Centers for Medicare and Medicaid Services (CMS) temporarily allowed remote or virtual services to be conducted on non-traditional platforms and by non-traditional practitioners (CMS, 2021) which allowed entities along the healthcare spectrum to explore and participate in telehealth services, of which are stakeholders practicing in assistive technologies.

As this allowance has remained, more and more questions have surfaced asking questions such as "are these virtual services (modalities) applicable to our clientele"? If so, "how the heck do you do it"? And "are there operational improvement opportunities from these platforms?" This course was designed to address those questions and many more, but it is not the end all, be all.

Many things must occur in order for these modalities to continue to be a viable option ranging from continuance of insurance coverage policies allowing these methods, patients still seeing value in these services, to research yet to be compiled evaluating the effectiveness of cares. However, regardless of these billable services in the United States, there are non-billable services that are potentially equally as exciting in the forms of home and environment evaluations to service and repair. In fact, there are assistive technology providers utilizing these technologies today and they are showing great results which are decreasing the patient's down time, increasing patient satisfaction, and anecdotally decreasing their health risks and expenditures.

As patients and providers continue to look for different (better) ways to receive and provide care telehealth may just be one of them. Companies from big insurers in the United States to small independent providers are investing in these platforms (Commins, 2021) and I believe this will in time overcome the "trend" hurdle and be a viable option for many health services and potentially a standard of practice, but only time will tell.

Conclusion

As it goes in our industry nothing is easy and can sometimes be downright "complex", but there is an opportunity to challenge the traditional methods to provide care in non-traditional settings. We are in an age where technology can be used advantageously for the sake of patient care as well as in business operations. Yes, there is much to still do to ensure the outcomes while using virtual methods are significant, but the data we have thus far including patient experience is promising and I implore you to at the very least explore the possibilities.

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IC12: Camber: Degrees of Performance

Christie Hamstra, PT, DPT, ATP
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Learning objectives

1. List 3 benefits of cambered rear wheels on a manual wheelchair.
2. List 3 limitations of cambered rear wheels on a manual wheelchair.
3. Name 2 populations, outside of wheelchair athletes, that can benefit biomechanically from cambered wheels on their daily

Introduction

Manual wheelchair set-up is a complex process that can be the difference between equipment satisfaction or abandonment. Many things can be done to maximize the performance and function of the user. Some features include proper sizing, appropriate options and accessories, caster selection and rear wheel set-up. Set-up pertaining to the rear wheels involves, wheel and tire selection, horizontal and vertical position, spacing and camber. Cambered wheels are most often associated with adapted sports, though some of the best candidates do not even participate in sports. Often overlooked, there are populations outside of wheelchair sports who would greatly benefit from cambered wheels on their daily chairs. Here we will explore the biomechanical benefits, limitations, applications, and special considerations for specific populations of cambered rear wheels on ultra-lightweight manual wheelchairs.

Camber is the measurement of the angle of a set of wheels in relation to the ground, or the angle of the wheel on the sagittal plane2. If a wheel is perpendicular to the ground, the camber is zero. If the top of the wheel is angled in towards the wheelchair and the bottom of the wheel is further away, this is known as negative camber. Negative camber is what is typically seen in the wheelchair industry. Common degrees of camber on a manual wheelchair range from 0° to 8° with the most common selections for an everyday wheelchair ranging from 0-3°. Camber in sport wheelchairs can be upwards of 24°2.

Depending on the wheelchair there are different ways camber is applied if it can be applied at all. Basic standard wheelchairs may not allow for cambering of the rear wheels, and this should be taken into consideration when selecting a mobility base. It is also important to investigate if camber can be changed once selected. Most changes to the camber will require tools and possibly new parts, but due to changes in client needs and environment this might need to be an option when selecting a mobility base.

Advantages of Camber:
There are mechanical and environmental advantages to having camber on a manual wheelchair5. When looking at body mechanics, adding camber to the rear wheels places the hand rim closer to the user's body. This can decrease shoulder abduction therefore decreasing shoulder strain during propulsion3. The hand rim is also placed in a better position for a more natural push stroke allowing the user to push down and out for improved body mechanics4. With this change in position camber can increase turning speed and acceleration and can redirect forces coming up through the wheelchair making the ride smoother for the user2.

As camber increases, the width of the wheelchair across the bottom increases, adding lateral stability. This is useful when navigating lateral slopes or when frequent sideways movements are occurring. With this wider base of the wheelchair, fingers and hands are protected when navigating through tight spaces as the lower part of the wheel will hit an obstacle, not the top where the hands are naturally positioned.

Limitations of Camber:
When selecting camber, it is important to be aware of the potential drawbacks. Although the increased footprint can assist with stability, it can limit environmental access. Field knowledge of wheelchairs demonstrates that for every 2 degrees of camber, the overall width of the wheelchair is increased by approximately 1" (2.54 cm) and possibly more if spacing, or a larger tire diameter is required. Excessive camber may also cause the wheels to rub against armrests, sideguards, or the user. Also, reduced traction and uneven tire wear can occur due to camber.

Camber Across Populations:
The above benefits can be translated across many populations. By assessing all aspects with a particular client, optimal camber can be determined. If feasible, a minimum of 2-3 degrees camber is advised for average users

Conclusion

Although not an option in all categories of manual wheelchairs, camber is one simple way to customize a wheelchair to allow for many mechanical and environmental advantages. Camber should not only be reviewed as a possible feature when selecting a mobility base, but then should be individually set-up based on the specific user and their environment. If the limitations do not restrict the user camber can be a small detail that can increase performance, ensure user satisfaction, and increase health and independence for the lifetime of the user.

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Conflict of Interest

Christie Hamstra is a paid full-time employee of Motion Composites, a wheelchair manufacturer and is monetarily compensated for providing educational content related to such products.

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IC13: Implementation of the Functional Mobility Assessment in Brazil: A Pilot Project

Ana Allegretti, PhD, OTR/L, ATP

Learning objectives

1. Describe the need of the implementation phases of the FMA in Brazil
2. Describe the importance of the cultural adaptation of the FMA and UDS
3. Learn what are the barriers and facilitators of implementing an outcome measure into clinical practice

Functional mobility is necessary to perform activities of daily living and for community participation for everyone, especially for persons with disabilities (PWD). To assess functional mobility, consumer satisfaction and functional changes, clinicians need to use a reliable assessment. The functional mobility assessment (FMA) instrument is a self-report outcomes tool designed to measure effectiveness of wheeled mobility and seating (WMS) interventions for PWD. The FMA has been validated in the United States (Kumar, et al., 2012) and in Brazil (Paulisso et al., 2020). The FMA fills a gap of tools which assess mobility, as it is applicable to the entire range of mobility devices, such as wheelchairs, crutches, walkers, canes, scooters, and prosthetic limbs (Paulisso, et al, 2019). The objective of this study is to show the phases of the implementation process of the use of the FMA and the universal data set (UDS) in Brazil. The universal data set is comprised of a set of demographic questions. It has been used in conjunction with the FMA in the US. As part of the implementation process, we believe that it is important to collect the same type of demographic data in different countries, for a future comparison. However, some of the demographic data, does not apply in Brazil. For example, in Brazil there are no “K codes” and power wheelchair codes, therefore, there is a need to translate and perform a cultural adaptation of the UDS to meet the Brazilian reality. There is a need in Brazil to adopt the use of a validate outcome assessment in the field of wheeled mobility to measure consumer satisfaction. A group of clinicians were invited to participate in this pilot implementation phase. The group of five clinicians representing different stakeholders- academia, private practice, public practice and a wheelchair vendor were included.

The implementation phases included:
1. cultural adaptation of the UDS;
2. establishing a protocol;
3. testing the protocol;
4. Refining the protocol.

Regular meetings were scheduled via ZOOM. The group discussed the translation and cultural adaptation of the UDS. The group also established the protocol to be tested, with the intent to be universally feasible for private and public practices. This is an ongoing project. Barriers and facilitators will be detected. Since this is an implementation project, it is expected the need to be refined.

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IC14: Shoulder Surgery: Therapists Role in Prevention and Preparation

Wendy Koesters, PT, ATP/SMS
Theresa Berner, MOT, OTR/L, ATP

Learning objectives

1. Participants will list 3 shoulder injuries that manual wheelchair users are at high risk for.
2. Participants can name 3 special tests to rule in sub acromial impingement based on clinical prediction rules.
3. Participant will identify 4 functional concerns to address in preparation for optimal independence and health for manual

Introduction

Aging with a disability, specifically for those in a wheelchair, has significant challenges that can be exaggerated in complexity, earlier age of onset and resulting negative impact on independence in comparison to able bodied individuals. Research has supported with the higher demand on the upper body for manual wheelchair users, often results in pain and injury of their shoulders. The need for repair vs. replacement is a difficult option to pursue with the high risk vs. reward implications on independence with transfers, self-care, mobility, and skin health.

Therapists have the unique position and skill set to aide our neurologic clients early on in preventative strategies and exercise programs for shoulder preservation. Also, when injuries arrive, we can aide in optimizing independence- even if this means preparing for surgery. With initial assessment, it is key we learn our client's lifestyle, goals and priorities with equipment configuration. Example questions and manual wheelchair measurements to better understand our client's include: Key questions on daily use:

- Transfer style- floor, uneven height, approach angle
- Lifestyle needs: work, children, access to tables/desks
- Doorways that are challenging for access
- Can you enter / exit your home independently
- How to you reach for things at home and office?
- Driving and transfer style/goal
- Fears- (stability)
- Active in community, sports
- Where is chair used majority of time-aka terrain?
- Impact of spasticity on hip and foot positioning?
- Skin integrity-current and history
- Pressure relief strategy and independence in monitoring your skin

Outcome tools I advocate to use pre and post therapeutic intervention – be that equipment, activity modification, exercise or referral to advanced medical intervention- include the Wheelchair User Shoulder Pain Index, Functional Mobility Assessment, and Wheelchair Skills Test. Key guidelines used with wheelchair configuration include weight distribution to axle vs. entire frame with client's hands on rim; wheel access / push length; transfer style with attention to length of frame for stability- clearance of tire-grab / hold to frame in front of seat; and postural stability both seated and during propulsion.

Many seating therapists have advanced neurologic skill sets, but may not have confidence in orthopedic assessment and intervention. I challenge you to "up your game" for confidence with special tests specifically with special tests including clinic prediction tools, focused strength training, stretching for pain management - Confidence with orthopedic assessments and interventions are key for early detection of dysfunction and intervention. Example of an upper extremity screen with clinical prediction rules to assess, establish baseline, and opportunity for client education on concerns / risk with orthopedic deficits is included in the attachment. Also included in attachment is a handout for education for at risk or identified concerns for warning signs, and daily habits for preservation. Literature supported exercise plans for strength training posterior shoulder girdle with wheelchair users is attached as a starting point for activity and home program. Considerations for transfers, equipment needs and self-advocacy in preparation for a shoulder surgery are also roles a seating therapist should be confident to provide if the above strategies were initiated too late or injury severity prevents therapeutic intervention.

Conclusion

Early intervention, education, and ongoing equipment assessment are key features to case study successes reviewed in this course. Positive outcomes can occur if / when surgery is the only course of action and therapists can aide both pre and post recovery to promote functional success and client confidence. Understanding your client's priorities, home set up, support network, and equipment needs are key areas to optimize independence and mobility for a lifetime.

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Additional Learning Resources

1. Handouts to be provided at course:
2. Wheelchair User Shoulder Pain Index outcome measure
3. Upper Extremity Screen special tests - clinical prediction rules included
4. Client summary for Shoulder screen and suggestions for areas of concern, activities to avoid, exercise, and contraindications
5. Client education handouts: wheelchair maintenance
6. Equipment comparison grid for documentation of modifications vs. new and client education

Conflict of Interest

No conflicts to disclose. Commercial products will be shown in case studies but not a specific manufacturer promoted.

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IC15: The Challenges of Planning for Growth in Pediatric Seating

Karen M. Kangas, OTR/L

Learning objectives

1. Identify at least two parameters of seating which assist the family in postural management of their child.
2. Identify at least two parameters of seating which assist the child in more active seating and independent task engagement.
3. Identify two flexible seating components which can help both in postural management and provide real support as a child.

Introduction

Pediatric seating is complicated. Seating for pediatrics must work for the family and its management of the child in her/his daily activities. However, the child also needs seating which supports her/him to be independent and engaged in tasks. These systems are rarely able to be a single seating system., consequently, compromises must be made, or multiple systems must be provided.

Children are not small adults.

All children grow. No one can predict how much or how quickly a child will grow. Anticipation of growth is almost always inadequate. Yet, due to a lack of knowledge and falling under the spell of "funding restraints" chairs are provided with the caveat of this is "a chair which grows" However, a chair's frame's "growth" (expansion), and seating products' "growth" (alteration in sizes) has not been based on scientific studies of growth , much less been responsive to the growth adjustments which occur in children with disabilities.

A simplistic "smaller" approach is utilized. The majority of pediatric equipment is simply a cut down version of an adult product, currently available. This simple idea that children are just smaller, is fatally flawed.

Nor have the frames of chairs even taken into consideration the prognosis of various medical diagnoses, does a child have huge tone surges, does a child use a ventilator, does a child have a long bus ride to school? Also, is the child under two, under 5, an adolescent? With chair's funding being described as "must be for 3-5 years" how does a 2 year old use a chair for a 7 year old? And since when did "funding" identify the medical necessity of equipment needed for the support of a child's health throughout a day?

Singularly, the most critical feature of any seating and mobility product for any person is its adequate FIT. And most of our current seating systems are not fitting the children they serve. Building in "growth" often in reality is a system too large, too wide, too tall, or its opposite, too small, too narrow, too restrictive.

How does a therapist help the child's family through this maze of challenging information? How do we plan for independence when a child still needs to be managed a lot of the time, and the family must have a system to work for them as adults?

First, we must recognize that most of the seating and mobility studies utilized in equipment development have been identified as being needed by adults who have paraplegia or quadriplegia.. This is significant as individuals with these diagnoses have partially desensate bodies. Looking at the musculoskeletal system and identifying how to prevent pressure wounds, is primary. In extension then working with adults who have sensate bodies, but who have degenerative diseases, some alterations are easier to assist.

But in pediatrics, most the children in need of wheeled mobility and adaptive seating have sensate bodies, and growing bodies. This changes everything.

The next most critical difference, is that children require adults to care for them. Seating and mobility systems need to assist adults in providing the most basic, care of feeding their child, managing their respiratory status, and transporting them safely throughout the day and throughout the community.

For many children, the adults in their environment will need systems to assist these children as they grow into adults and as adults. This type of seating can be identified as "imposed" seating or seating for postural management. This seating encourages relaxation of the body and a supportive resting posture, supporting the child in her own tactile processing system. The seating needs to hold the child in a safe position, in postures that support respiration, swallowing, and adequate resting symmetrical postures.

This type of seating is also utilized in the general population of all children, now observed in available car seats, strollers, and feeding chairs, newborn swings, bouncers, and body slings.

However, this is not the type of seating that supports children in developing control of their own bodies, or seating for postural control. Seating that supports the growth and use of the body must be less restrictive, provide adequate pelvic stability (which is not pelvic stillness, but rather pelvic mobility) and supports the use of the child's vestibular processing system or the use of gravity within the body to use the body for isolated extremity control and task engagement. This seating is not for relaxation, but instead is needed for cognitive development and learning, active girdle engagement, and requires the ability to move within the seating system independently.

Postural control systems need to provide opportunities for the most movement, yet maintain support, and are planar in nature. Postural management systems look for relaxation and symmetry and are contoured in nature. This is because, when the human body is in contact with the surfaces of external support, the bigger that surface is, the more the body will relax "into" that support. Hence contouring and more surface contact relax the body.

Many times, when planar systems are discussed, a traditional model or over 25 years ago, comes to mind. A wooden base, with an inch of foam on it, or the top of a therapy height adjustable bench. But a planar seating system can use the latest and most comfortable of foams, but not be contoured, and offer support and opportunities to move.

With removeable hardware, for pommels, trunk laterals, hip guides, and straps, a planar system could be utilized for increased postural control opportunities. However, the high back, now a constant feature in all pediatric systems, itself, prevents opportunities for a child to develop head control, trunk rotation and pelvic stability (mobility). That high back is critical for safe transport so the child will not have their head drop between the back of the chair and a headrest. That high back is a feature in all car seats and strollers as it is a feature of relaxation, and body contact.

But, this very feature, the covering of the scapulae, and the pelvis and shoulder girdle being held in the same position, totally negates the body's ability to control any extremities independently, (this includes the head). Head control can develop, as children grow, and change, but it can't develop without vestibular processing, or an active relationship to gravity, that means movement, and pelvic weight bearing with trunk rotation and girdle separation (shoulder girdle and pelvic girdle NOT in the same position). This posture is supported if the lower extremities also are able to be on the ground, or the floor. How many of our pediatric systems are supporting our children's bodies with their feet on the floor, allowing for rotation in the body and weight shifts, and the ability of the child's body to move forward towards and activity for task engagement.

One of the biggest challenges to the body of a child with a disability is the challenge it places on the child's individual experience in active body exploration and use. Keeping the body in a relaxed posture all day, does not support the bodies own development.

Can we create systems which both assist a family in their need to manage a child's body and also support the child's need to using her own body? It is a challenge. It does not always work. It is helpful if there is more than a single seating system for children. Seating which supports mobility, and growth, and seating which supports the adult's need to assist the child. Right now, unless as therapists we advocate for truly adequate pediatric seating, we will be forced to look at compromises.

First of all, support the obtaining of a system which fits the child now. Currently frames of seating systems are too wide as the hip guides and their hardware is too wide. Subsequently, the trunk supports are too thick and wide and the child's upper extremities are not well supported. The actual hardware of the trunk support falls right under the child's axilla, forcing the upper extremity to separate from the body in shoulder external rotation, which then causes the trunk to actually collapse and the head to lose control. This occurs because there is no true pediatric hardware nor pediatric trunk pads. Pediatric systems are using adult hardware, and adult foam thickness, with a simple difference of length.

Using this larger hardware and depth of pads, causes the seating to be much larger than the child's body. Then, when the pelvic belt is added, and attached at a 45 degree angle to the seat pan, it is way too wide, and slides and falls, not supporting the pelvis adequately.

With a back higher than the child' s shoulders, the chest harness is also difficult to manage. The chest harness pulls up instead of over the body, pulls up to meet the high back, and then is unable to adequately support the trunk.

Solutions: Evaluate where the child's body is now. Seating must fit the child's body now. Is every piece of hardware, removeable, adjustable? Is the family included in the choices of system's frames, do they meet their needs of postural management? Can a system's frame grow? They used to, why can't a frame be smaller, and then have parts that can be added to the frame to allow for growth?

Compare systems. A thick comfortable planar seat, and a small pommel, and adequate high guides can indeed work as well as a contoured system, and can be removed to allow the child during the day to engage in more positions of postural control.

Recognize that as a child grows, and a system doesn't fit, their medical status as regarding their seating has changes. Equipment is funded to support a child's body due to medical necessity. That includes adequate respiration, swallowing, skeletal support, and skin integrity. If a system is too small, it does not support any of the above needed body postures and functions. It then must change.

Conclusion

Making compromises in adequate seating for children is a challenge. Families must be able to feed their children, transport them safely, and manage them in their homes and in the community. However, children also need opportunities to develop adequate postural control. We must support that need as well. As a therapist who treats primarily children with the most complex bodies, too much of their days are spent in "relaxation" and their bodies literally fighting their seating systems so that the child can be more engaged in task and activity throughout her day.

I am committed to teaching all of us more about how pediatric seating must change. Car seat seating is not enough. Children need high chairs, car seats, strollers, cribs, toilet chairs, and independent mobility. Children grow, growth cannot be predicted. (Adults may gain weight or lose weight, but frames remain the same size, this is not true of children).

Seating must fit, seating must support, and children will grow. Their seating must fit and must support them through all their growth and not compromise their ability to be engaged in the world of activity and learning.

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Conflict of Interest

None

IC16: The Link Between Dysphagia and Posture

Filipe Correia
Bart Van der Heyden, RPT

Learning objectives

1. List a seating intervention benefiting clients with dysphagia the pre-oral/anticipatory phase,oral,pharyngeal and esopha
2. List 2 validated clinical dysphagia assessment tools which can be used for measuring outcomes after seating intervention
3. Describe the physiology of the pre-oral/anticipatory phase,oral phase,pharyngeal phase and esophageal phase and the vari

Introduction

Dysphagia or experiencing difficulties in any of the main stages of the eating, drinking and swallowing process poses a problem for many wheelchair users with neurological conditions. The incidence rate of dysphagia is found to be as high as 37 % in stroke populations and the prevalence of dysphagia was found to be as high as 90 % with individuals suffering from Parkinson's disease and ALS and 34 % with clients suffering MS. The Agency for Health Care Policy and Research (AHCPR) estimates that one third of the clients with dysphagia develop pneumonia and that 60.000 individuals die each year from such complications. (1,2,3,4)

Swallowing is a systemic process which consists of different phases: a pre-oral / anticipatory phase, an oral phase, a pharyngeal phase and an esophageal phase. Any structural, physiological or neurological disturbance in the swallowing process my cause dysphagia. Each of these 4 phases can be influenced by seating and postural interventions. (5,6)

When sitting in a wheelchair, the risks of muscle tension, sputum, reduced swallowing function, and aspiration are also elevated by tilting the trunk and sitting on the sacrum (7)

This presentation will focus on the physiology and pathophysiology of each phase and postural interventions during wheelchair seating influencing oropharyngeal dysphagia. Assessment techniques and evaluation tools for dysphagia will be presented and by means of case studies, the techniques and interventions will be illustrated.

Conclusion

Wheelchair positioning techniques such as adjusting the position of the trunk in addition to the position of the head was shown to potentially be important in enabling exertion of maximum tongue pressure. Appropriate postural adjustment is advisable for eating safely. By means of case studies, assessment techniques, evaluation tools and seating interventions for dysphagia will be presented.

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Conflict of Interest

Bart Van der Heyden is the owner of private physical therapy practice 'de Kine' and SuperSeating, a company providing clinical services and T&E services for health care professionals
Filipe Correia is a consultant in the Rehab industry, he serves as the European and Latin American Business Develop

IC17: Bathroom Modifications: The Good, The Bad, & The Ugly

Cindi Petito, OTR/L, ATP, CAPS, CEAC, CLIPP
Chris Chovan, OTR/L, ATP, CAPS, ECHM

Learning objectives

1. Participants will learn two UD barrier-free bathroom solutions to maximize function throughout the life span.
2. Participants will identify three common barriers and solutions in bathrooms for aging adults who use mobility devices.
3. Participants will learn how to measure bathrooms including three common bath products for CRT patients.

Introduction

The bathroom is one of the most common areas of the home requiring some level of accessibility or modification to maintain one's safety and increase their function and independence. Additionally, according to a National Institute on Aging (NIA) study, more than a third of seniors over the age of 65 slip and fall each year – 80 percent of those falls occur in the bathroom.

Individuals who are either aging-in-place or making life-altering adjustments due to a traumatic injury or progressive illness need to continually engage in their home environments safely and functionally. License and certified medical professionals (LCMP), such as occupational and physical therapists, have the knowledge and skill set to evaluate an individuals' functional abilities including, but not limited to, mobility, bathing, grooming and toileting. As part of the complex rehab technology (CRT) team, LMCPs and ATPs work together to recommend the use of aids to daily living, durable medical equipment, and other complex rehab technology equipment to assist in carrying out these daily tasks independently and safely. Too often the equipment recommendations made by the CRT team and the home modification recommendations made by an accessibility team are not effectively communicated throughout the continuum of care. Strictly using ADA guidelines without individual consideration and communication can be costly to individuals, families, or insurance providers when these guidelines create barriers to function.

Measuring the client in the occupied equipment and the bathroom to prepare for use of the occupied equipment is critical to maximizing independence, safety, and functional outcomes (Ainsworth & De Jonge, 2011). Clients who require total care and depend on caregivers will need to be part of the bathroom assessment process to ensure they are able to safely carry-out care with the recommended equipment and bathroom modifications. There are several low-cost simple accessibility solutions which provide safety and prevent falls in the bathroom for individuals who are high risk; however, some of these solutions may look "institutional" and not aesthetically pleasing. More recently, manufacturers have designed aging-in-place products, such as grab bars, shower seats, and flooring which match different designs, colors, and patterns in existing bathrooms. For situations where a bathroom modifications and construction are required, there are several design solutions for small and large bathrooms that convert standard bathrooms to incorporate level entry (zero entry) showers, roll under sinks, and accessible toilets. Before completing any level of bathroom modification, the products being installed or the client-occupied equipment such as a rolling shower commode must be assessed. This assessment should include but not limited the dimensions of the occupied equipment and how the individual will transfer to/from and operate the equipment.

Conclusion

It is essential to the effectiveness of any modification that the individual (and caregivers) and the activity being completed must be evaluated in addition to the physical environment being measured. When equipment is recommended, the client occupied measurements are critical to maximizing independence, safety, and functional. Additionally, the importance of communication across the continuum of care, cannot be stressed enough.

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Conflict of Interest

Chris Chovan – no conflicts have been disclosed
Cindi Petito – no conflicts have been disclosed

IC18: ATP Certification and Ethics for the New Era (RESNA Track)

Julie Piriano, PT,ATP/ SMS
Michael Seidel, ATP, CRTS
Carmen Digiovine, PhD, ATP/SMS, RET

Learning objectives

1. Identify 3 goals of certification.
2. Explain the process for filing a complaint.
3. List 5 standards of practice and how they may be violated.

In the team approach to the provision of Complex Rehab Technology (CRT) RESNA certification of the supplier as an Assistive Technology Professional (ATP) is mandatory for many third-party payors. This includes the requirement to follow a Standard of Practice (SOP) and Code of Ethics (COE). While the roles and responsibilities of each team member may differ, the mandate to “do no harm” is paramount in the discharge of your professional obligation. This course will examine the unique roles of the clinician and supplier Assistive Technology Professional, review the RESNA SOP and COE documents, illustrate what may be considered a violation and provide participants with tools to protect the integrity of the certification process, resulting credentials and protect the individuals with disabilities we serve.

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PS02.1: Translation of the Wheelchair Satisfaction Questionnaire (WSQ) from English to Spanish

Paulina Restrepo, BS
Karen Rispin, MS
Sara Múnera, PT, MS, ATP, WSP.
Jackelyn Vanessa Florez Botero, PT.

Learning objectives

1. List different aspects to measure wheelchair users satisfaction.
2. Describe three benefits of having the WSQ translated to an additional language (Spanish).
3. Understand how the process of translating a questionnaire into another language was developed.

Introduction

Wheelchairs are the most common assistive or mobility devices for enhancing mobility with dignity. Nevertheless, only a minority of those in need of wheelchairs have access to one, and of these very few have access to an appropriate wheelchair (WHO et al., 2008). If assistive devices, including wheelchairs, are to be improved, user feedback is essential. Unfortunately, in Spanish-speaking countries there are not many questionnaires that allow this type of Patient Reported Outcomes Measures. The objective of this research was to conduct the translation of the Wheelchair Satisfaction Questionnaire (WSQ) to Spanish, to be applied to the Spanish speaking population using a wheelchair.

Due to the high costs of individualized wheelchairs and the high demand of users who need them, in some developing countries, most users of assistive technology are not direct consumers; therefore, they do not have direct economic input on wheelchair characteristics. If assistive devices, including wheelchairs, are to be improved, user feedback is essential. The estimated satisfaction with the characteristics of the product is of great importance and interest in the development of service delivery organization and the development of a well-functioning prescribing process, including the follow-up. (Moscoso Alvarado et al., 2019; Samuelsson & Wressle, 2008).

The WSQ consists of 17 questions. Sixteen questions address explicit aspects of user satisfaction with wheelchair function and the final question addresses overall satisfaction (Bane et al., 2019). The focus of the WSQ is specifically on satisfaction with the wheelchair. The questionnaire is set up in a way that enables feedback on each wheelchair part with the goal of providing information which can enable repairs, modifications, and/or change (Letourneau University, 2020).

The objective of this research is to conduct the translation of the WSQ to Spanish, to be applied to the Spanish speaking population using a wheelchair.

Translation process

The permission to translate the original WSQ to Spanish was received from the creator and holder of the original version of the questionnaire. The methodological procedures for translation and cultural adaptation of the WQS as suggested by Rome foundation were used (Sperber, 2017). A flowchart of the process of translation and cultural validation is shown [insert figure 1]. A multidisciplinary team from different countries of Latin America composed the expert group leading the translation processes. All Spanish researchers composing the expert group are fluent both in Spanish and English language. Further, one official bilingual professional translator performed the backward translation.

For the forward translation process, two translators (bilingual, native speakers of the target language) working independently of each other translated the WSQ English version into Spanish, based on the original English version.

The two forward versions were consequently revised and compared by the two translators who participated in the forward translation, together with the clinician monitor. Discrepancies in language were discussed until a shared consensus was reached for the drafting of the first translated version in Spanish.

The backward translation was carried out by a professional translator, fluent in Spanish and English with experience in medical translation, but was not familiar with the original WSQ English version and remained blind to it throughout the translation process. He translated the first Spanish version back into English. The original WSQ and the back-translated version (both in English) were compared on two dimensions, similarity of language (literal translation) and comparability of interpretation (cultural adaptation) and discussed to draft a version relevant to Spanish context corresponding to the original English version. This resulted in the 2nd revised Spanish version that was subsequently used for cognitive debriefing.

Testing of the final target language version with a panel of six wheelchair users to assess the translation in terms of clarity, cultural adaptation, language level, and acceptability. Following this, the translators and the clinician monitor went over the debriefing notes and decided whether to make changes to the questionnaire based on the users' comments.

A comparison process between the two translations showed some linguistic differences. Comparing the original English version with the backward translation some discrepancies were found. During the comparison process some introduction questions related to the wheelchair were found to be longer but nevertheless had the same meaning.

Additionally, through the questionnaires some words were found with the same meaning but different grammar. However, these words did not seem to change the intended meaning. A number of modifications were made to the questionnaire, based on the user suggestions.

A limitation of the WSQ is that it is only available for wheelchair users who are able to read and write in English or Spanish. It is yet to be validated for completion by caregivers. This means that basic education and fluency in those languages are needed, making it unavailable to many in indigenous communities, as well as to those who are non-verbal or have some cognitive or motor disabilities. Further work to validate the WSQ for completion by

caregivers or facilitators would somewhat ameliorate this limitation. Feedback from wheelchair professionals on the appropriateness of a wheelchair to its user can also be helpful. The Wheelchair Interface Questionnaire is such a tool which is also being translated into Spanish (Rispin et al., 2019). Using the two tools together can give a more complete picture of the function of a wheelchair for its user.

The cognitive debriefing of the Spanish WSQ version supported the validity of our translation, with high agreement within and between raters. The WSQ was tested on six wheelchair users as the Rome Foundation translation suggests. However, this is a small sample size. For future work a larger study is planned to confirm the reliability and to establish the responsiveness of the Spanish WSQ in Spanish speaking countries. Currently, the original WSQ has not been translated to any other language, so translation into other languages is also needed.

Conclusion

A comprehensive translation process of the WSQ showed that the final version of the Spanish WSQ is valid regarding the language and context.

Despite the limitations of the study and the need for more studies, the WSQ is now available in Spanish. The results obtained in this study provide data on the changes made during the questionnaire translation process.

Clinicians and providers in Spanish speaking countries now have a valid method to measure a wheelchair user´s satisfaction with their wheelchair. They will be able to make informed decisions when prescribing the use of wheelchairs, when designing or creating new ones and in the follow up.

The use of the WSQ will improve the results of clinical research and practice which have a direct impact on the patients' quality of life.

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Additional Learning Resources

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Conflict of Interest

No conflicts have been disclosed

PS02.2: Web-based transfer training: evidence for an online approach for wheelchair transfer training

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Stephanie Rigot, DPT, PhD
Lynn Worobey, PhD, DPT, ATP

Learning objectives

1. List and understand at least two ways a proper transfer positively influences an individual's body mechanics and quality.
2. Compare the training required to use the TAI versus the training required to use the TAI-Q. Include benefits of each.
3. Identify three benefits of online direct to user transfer training for individuals with spinal cord injuries.

Introduction

Transfers are often ranked, by wheelchair users, as one of the most important skills to maintain independence.(1-4) However, due to barriers to in-person transfer training, many individuals may not have proper transfer techniques, which can result in upper extremity pain and injury.(5, 6) This study aims to show the benefits a web-based direct-to-user transfer training program which includes improvement to an individual's transfer technique while also avoiding the many barriers in-person transfer training present.

Background:
Individuals who use a wheelchair cite the ability to perform a transfer as one of the most important skills to maintain independence.(1-4) Due to the high frequency of transfers performed and the large forces placed on upper extremities during a transfer, there is an increased risk for upper limb pain and overuse injuries; however, these negatives can be minimized with proper transfer techniques.(1, 6, 7) Unfortunately, many individuals do not receive sufficient education and therefore there is a high prevalence of individuals whose transfer techniques are not adequate.(1, 5, 8, 9) Online transfer can allow individuals to have access to quality transfer education and thus improve their transfer techniques while avoiding many barriers individuals face when accessing in person transfer training. (8, 10)

Purpose:
Our study evaluates the effectiveness of web-based, direct-to-user transfer training in improving transfer quality, as measured by the Transfer Assessment Instrument Questionnaire (TAI-Q).

Methods:
Study Design:
Individuals were randomly assigned to the wait-list control group (WLCG) or immediate intervention group (IIG).
As shown in figure 1, at baseline both groups provided demographic information and performed and assessed a single baseline transfer using the TAI-Q.

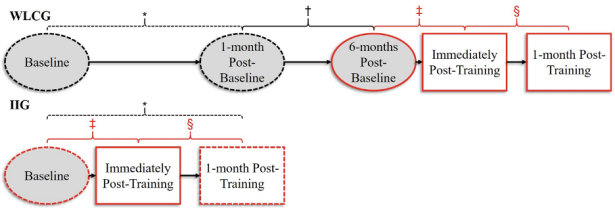

Figure 1: Study timeline for participants in the WLCG (top) and IIG (bottom). Pretraining timepoints are shown as gray ovals and post training time-points are shown as white rectangles. Timepoints used in the between-group comparison are represented by a dashed outline, whereas times used in the within-group comparison are shown with a red outline.

Figure 1.

The WLCG was then asked to perform two additional transfers, 1month and 6months after baseline but before they received training. The IIG group, however, received training immediately after their baseline transfer. Both groups were asked to perform and assess a transfer immediately after they received training and 1 month after training.

Transfer Assessment:
After completion of each transfer, individuals self-scored the transfer using the TAI-Q, which is a valid and reliable self-report measure used to assess the quality of a transfer.(11,12) TAI-Q scores range from 0-10 with higher scores reflecting better ergonomics and technique. (11, 13) Transfer Intervention: The web based direct to user transfer training was designed to focus on the three phases of a wheelchair transfer as outlined by the TAI-Q: wheelchair set up, body setup up, and flight/landing.(12, 14) This training is self-paced, and can be accessed on any device with internet access. It includes interactive aspects, videos, pictures, and words to allow the user to receive the information in multiple formats.

Data analysis:
To evaluate the effect of the training among the IIG compared to the WLCG, a 2-way repeated measures analysis of variance(ANOVA) was used to compare between group baseline and 1 month (WLCG postbaseline and IIG post training). A paired t test was used to evaluate changes from 1 to 6 months postbaseline for the WLCG. A 1-way ANOVA was conducted for only the WLCG group prior to intervention to assess the extent improvements were attributable to test-enhanced learning rather than training.

Results:
Figure 2 compares the TAI-Q scores of the WLCG and IIG group at baseline and 1 month after baseline. When comparing the WLCG and IIG at baseline and 1 month, the effects of time (F=23.5; p0.99)

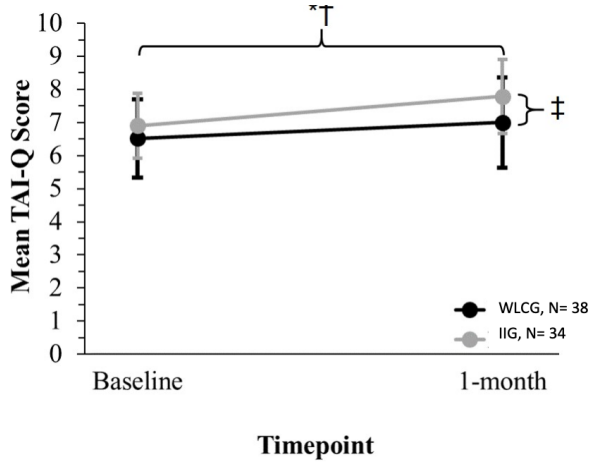

Figure 2. Mean TAI-Q scores with SD error bars for the WLCG and IIG at baseline and 1 month after baseline. The IIG group receives training during this time; however, the WLCG does not receive training.

Figure 2.

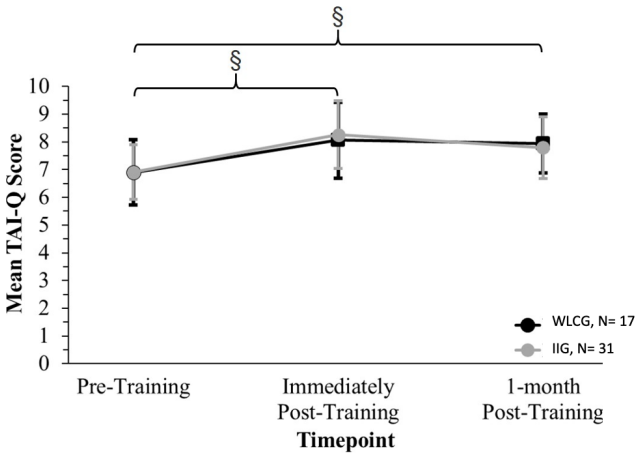

Figure 3. Mean TAI-Q scores with SD error bars for the WLCG and IIG over the pre-training, immediately post-training, and 1month post-training timepoints for the within group analysis

Figure 3.

Discussion:

After completing a direct-to-user, web-based transfer training module, participants improved their transfer quality and maintained the improvement through the following month. Past studies have shown that repetitive training opportunities may increase training retention, thus this training may be beneficial to ensure retention, even if individuals received training previously.(15) An unexpected finding of this study was the significant increase in TAI-Q scores among the WLCG between baseline and 1month assessments, when no training was received. When the reliability of the TAI-Q was assessed it was found that participants tend to underestimate the quality of their transfer, resulting in lower scores.(16) Therefore, it is possible that the increase in TAI-Q scores among the WLCG, may be due to underestimated scoring at baseline and higher, more accurate scoring at 1month. The TAI-Q is designed such that a perfect score is representative of optimal transfer ergonomics and biomechanics.(13) Thus, the items of the TAI-Q itself, may provide some degree of training to the participant, particularly if the participant has received transfer training previously, which could also explain the increase in TAI-Q score in the WLCG. At 6months pre-training, the TAI-Q scores were statistically similar to the 1month assessment, so any effect from repeated scoring of the TAI-Q should be negligible from the third assessment onward. Nonetheless, the WLCG further improved their transfer technique after receiving the web-based training module, indicating the training had an additive effect to any improvements made solely by self-assessing transfers with the TAI-Q.

Unlike previous studies where individuals performed transfers with clinicians present to ask questions or provide assistance, this study was completed entirely in a participant's home environment and with similar conditions to those in which the training is intended to be used.(16, 17) Henceforth, individuals had the opportunity to practice and assess their transfers in their own home, making the training more applicable to their everyday life. (12) Finally, with the onset of COVID-19 there are greater health risks to attending in-person training; therefore, this online transfer training has become more relevant and necessary. Individuals can remain home and reduce exposure to COVID-19 while accessing this transfer training and being assured of the quality and benefits of this transfer education. Based on the results of this study, an online direct to user transfer training program appears to be an effective way for an individual to improve their transfer quality and body ergonomics while performing a transfer as scored by the TAI-Q.

Conclusion

The direct-to user web-based training and repeated transfer self-assessments are effective in improving transfer quality for at least 1month post training. This type of training may be useful in sustaining high-quality transfers long-term, which may decrease the risk of injury and pain and increase quality of life. In addition, there is a growing demand for online education with the onset of COVID-19, this delivery of education may allow for an individual to receive the benefits of quality transfer education while avoiding old and new barriers to in-person training.

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Additional Learning Resources

http://www.upmc-sci.pitt.edu/transfers

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Conflict of Interest

No conflicts have been disclosed

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PS02.3: Investigation of Wheelchair Satisfaction & Related Service of Wheelchair Users in Brazil

Haidar Tafner Curi, OT
Eliana Chaves Ferreti

Learning objectives

1. Describe the importance of assessing the level of wheelchair user´s satisfaction related to wheelchair and service delivery in brazil.
2. Describe that there is a difference between public service delivery and private service delivery in brazil related to users' level of satisfaction.
3. Describe the importance of following the 8 steps recommended by the world health organization to promote a higher level of wheelchair user satisfaction.

The overall aim of this study was to investigate the level of satisfaction of wheelchair users with their wheelchair as well as their experience with related wheelchair service in the city of Santos (São Paulo, Brazil). The specific aim was to compare the level of satisfaction of individuals who received their wheelchair through a public health system and a private wheelchair service delivery. Thirty-seven wheelchair users responded to a socio-economic demographic questionnaire, and the Quebec User Evaluation of Satisfaction with Assistive Technology (B-Quest) questionnaire. The results showed that the overall satisfaction with the wheelchair characteristics was moderate (3.5; ± 1.0), and service was low (2.4; ± 0.89). The two items 'repair and maintenance' (1.91; ± 1.32) and 'follow-up'(1.54; ± 1.14) were the questions with the largest number of 'not very satisfied' users. The total B-Quest score was 3.1 (± 0.83). The three most important wheelchairs items selected by the users were ''Safety', 'Durability' and 'Comfort'. Differences were found in the individual's level of satisfaction between the two types of wheelchair service delivery model (public and private) regarding to wheelchair satisfaction (p=0,038) and total B-Quest score (p=0.037). Individuals who purchased their wheelchair privately were more satisfied with their wheelchair (3.84; ± 0.74) than the ones who received their wheelchair through a Public Health System (3.11; ± 1.15). One of the greatest challenges and opportunities is to increase the awareness of the 8 steps recommended by the World Health Organization in the Brazilian public wheelchair service delivery of all the parties involved.

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IC19: Changes with Age – Giving You the Justification for Custom Manual Wheelchairs for the Geriatric Client

Christie Hamstra, PT, DPT, ATP

Learning objectives

1. Identify 2 musculoskeletal changes associated with the normal aging process.
2. Recognize 2 distinct adjustments to a manual wheelchair to counteract musculoskeletal changes.
3. Identify 2 specific ultralightweight characteristics for justification for geriatric client.

Introduction

Geriatric clients are often provided with a non-custom manual wheelchair (MWC) with little to no ability to tailor or adjust. Reasons why this happens vary widely. The client may be semi-ambulatory, and the wheelchair is selected to fill a temporary need only. The therapist may not feel comfortable completing an evaluation for a custom MWC. Funding sources may include "highly active" or "independent mobility" as guidelines to obtain ultralightweight manual wheelchairs and a geriatric client may be overlooked if the practitioner doesn't think they meet those criteria. Although funding for custom equipment for geriatrics varies greatly geographically, many clients are not offered the option of custom equipment. However, recommendations for evaluation and funding for custom MWC are easily justified for the geriatric population when normal aging progression and specific wheelchair features are understood. We will review these aspects here.

Aging Process Changes in Strength, ROM, and Posture

Muscle strength decreases with advancing age, due to loss of muscle mass known as sarcopenia, and is usually greater in the lower extremities (LE) than in the upper extremities (UE). This decrease in skeletal muscle related to advanced age is known as a primary cause of loss of independence and falls in the geriatric population2. Another example is shoulder muscle volume was found to be significantly reduced in older adults compared to younger adults. 7 MWC users rely on shoulder muscles for propulsion and therefore age-related changes in shoulder muscle volume can be detrimental to continued propulsion and independence.

Shoulder pain and dysfunction also increases when starting MWC use after skeletal maturity.6 Because of this, combined with the aging process, use of a MWC may cause shoulder pain earlier than with a younger client, therefore optimum set up and prevention through prescription is necessary.

Spinal changes occur with aging. One example of this is thoracic kyphosis, often causing forward head posture (FHP). Goda et al3 discussed FHP in wheelchair users as increasing chances of aspiration, which could lead to further medical issues, including pneumonia and ultimately death. The elderly disabled population with this combination of kyphosis and FHP have lower physical function and independence with mobility. Recommendations to counteract these postural changes include an inclined back, solid or otherwise, and a pelvic belt to prevent sliding. The ability to change the back angle may not be an option in lower levels of MWC, often prescribed to a geriatric client.

The aging process causes musculoskeletal and postural changes in trunk and UEs, which will significantly impact a client's ability to independently propel an MWC. For example, decreased fluid levels in intervertebral discs, especially lumbar and thoracic areas, are associated with aging and cause decreased flexibility4. If an MWC is to be provided to a geriatric client as a mobility device for independence, it must be set up optimally to ensure the best possible outcome.

Recommended MWC and Justification

It is well understood that multiple shoulder muscles are required for MWC propulsion, making it one reason MWC users have such a high incidence of shoulder pain and/or dysfunction. Due to the high demand on the musculature of the shoulder and the impact this has on the wheelchair user there are clinical recommendations for proper wheelchair set up. The RESNA position paper on The Application of Ultralightweight Manual Wheelchairs discusses, "The most appropriate manual wheelchair for individuals with disabilities who will utilize the wheelchair for an extended period is a properly configured, fully customizable wheelchair of the lightest weight possible."5 The MWC often provided to geriatric clients does not meet these recommended criteria.

A fully adjustable, ultralightweight MWC is recommended and will have the ability to be customized to the needs of the individual. These individual adjustments include an adjustable axle, so the center of gravity can be moved forward. When a client has thoracic kyphosis with FHP, shoulder weakness and decreased ROM, a forward placed axle will allow them to access more of the rear wheel for a larger propulsion stroke as well as place most of the body weight over the rear wheel for more ideal weight distribution.

Other adjustments available on an ultralightweight manual wheelchair are back and seat angle adjustments, independent of each other, and wheel camber. A back angle adjustment, slightly open can allow for accommodation of trunk weakness or limitations in trunk or hip ROM, and a slightly closed angle can allow for better wheel access if necessary. Seat angle and position can be individualized, allowing specific seat to floor heights for transfers, or super low for foot propelling. Finally, camber is an option to further customize positioning of rear wheels in relation to UEs in a geriatric client. Having the wheel positioned more closely to the user will allow for improved maneuverability due to improved position. All these individual adjustments allow better positioning and better access to the wheels, allowing the client to be better positioned for independence.

Multiple studies looking at MWC use in long-term care settings make recommendations for custom, individually configured wheelchairs compared to facility-provided wheelchairs. Brienza et al1 completed a study where the intervention group (individually configured wheelchair) showed improvements in safe and effective mobility and increased functionality compared to those which were not custom fit. They also discussed that an adjustable axle was important as it allowed the user to be more maneuverable in a smaller space.

Conclusion

Understanding how aging physically affects the body opens the door to understanding how to qualify the client for an ultralightweight manual wheelchair. A full wheelchair seating evaluation, addressing the individual needs of the client, including frame, seat, and back, is recommended and fully justifiable when looking at how aging changes posture, strength, and ROM. “One size fits all” should not be used for a geriatric client who will utilize the wheelchair for an extended period. A custom manual wheelchair fit to client specifics can provide optimum outcomes and hopefully better quality and quantity of life.

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Conflict of Interest

Christie Hamstra is a paid full-time employee of Motion Composites, a wheelchair manufacturer and is monetarily compensated for providing educational content related to such products.

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IC20: RESNA Wheelchair Transportation Safety Standards

Miriam Manary, MSE
Nichole Orton, MSE

Learning objectives

1. Students will gain a basic understanding of the 4 RESNA transportation standards
2. Participants will understand the wheelchair characteristics needed for use as a vehicle seat.
3. Attendees will learn how to locate and identify crash tested hardware from manufacturers.

Introduction

To promote safer and more accessible transportation for people who use wheelchairs as vehicle seating, RESNA developed voluntary standards that establish design and performance criteria as well as labelling and literature requirements for wheelchairs, wheelchair tiedowns and occupant restraint systems (WTORS), third-party wheelchair seating, and wheelchair spaces. The standards apply safety principles from the automotive industry to the situation where the wheelchair serves as a motor vehicle seat. The standards were developed by the Committee on Wheelchairs and Transportation (COWHAT) by key stakeholders including manufacturers, clinicians, policy makers, transportation providers, auto safety researchers, and people who use wheelchairs. The standards comprise RESNA Volume 4, Wheelchairs and Transportation. ISO has mirror standards that have similar intent but some differences that will be noted. This session will provide an overview of these standards and their application.

When practical, people who use wheelchairs should transfer to conventional vehicle seating and make use of available occupant protection systems. When transfer is not an option, using equipment that complies with RESNA Volume 4 standards improves safety and usability. Three of the RESNA Volume 4 standards, WC18, WC19 and WC20, cover equipment that can be used in any vehicle, so a level of crashworthiness comparable to passenger vehicles is required. WC18 – Wheelchair Tiedowns and Occupant Restraint Systems (WTORS) covers hardware that secures the wheelchair to the vehicle and provides a lap & shoulder belt to protect the wheelchair-seated rider. The most common WC18-compliant systems are four-point, strap-type systems but docking systems are also included. All WC18 compliant WTORS must be complete and include a seatbelt. WC18 systems must be robust and adjustable for a range of occupants, allow good fit of the seatbelt, be compatible with WC19 wheelchairs, meet the applicable federal requirements for seatbelt hardware and allow for easy, correct use. WC18 WTORS must pass a severe frontal crash test intact, limit movement of the WC and occupant, keep the occupant/wheelchair upright, and permit the occupant and wheelchair to be freed after the crash without tools. Compliant hardware must be labeled with a WC18 logo. The instructions for use must include information consistent with relevant best safety practices. The ISO mirror standard for WC18 is 10542-1. The main difference between the standards is the clearer definition of failure in the performance requirements.

WC19 – Wheelchair Used as Motor Vehicle Seats covers a range of wheelchair types, including manual wheelchairs, strollers, power wheelchairs, and 3- and 4-wheeled scooters. The standard requires compatibility with four-point strap type tiedowns and labeled securement points. Sharp edges that can injure riders or cut tiedown and securement belts are prohibited. Because seatbelt fit and proper use are a common problem, WC19 wheelchairs must provide the option of a crashworthy wheelchair-anchored lap belt. Although not widely used, a wheelchair-mounted crashworthy lap belt improves seatbelt fit, reduces dwell time, and eliminates the need for transportation providers to encroach on the rider's personal space to route belts. Standardized hardware on the wheelchair-anchored lap belt allows connection to WC18 shoulder belts to create a full lap and shoulder belt system. For wheelchairs designed for children under 50 lb (22 kg), a crashworthy, five-point harness, like those in child safety seats, is required. WC19 wheelchairs must pass a frontal crash test without structural failure or allowing excessive excursion of the wheelchair or rider. The wheelchair must stay upright and support the occupant in an upright posture without significant downward collapse during impact testing. The wheelchair must be able to be secured quickly and the tiedown straps need to route directly from floor to wheelchair securement point. The standard includes a rating system for the ease of using a vehicle-anchored seat belt and the resulting quality of seat belt fit and to comply with the standard, the wheelchair must achieve at least an "acceptable" rating for both. To assure lateral stability, the wheelchair must not shift more than 40 mm sideways when subjected to a 45-degree tilt test. The labeling and instruction requirements include a logo marking and information consistent with best safety practices.
The ISO mirror standard for WC19 is 7176-19. The main difference between the standards is the requirement for an optional wheelchair-anchored lap belt.

WC20 – Wheelchair Seating Systems for Use in Motor Vehicles recognizes that many wheelchairs are not purchased from a single manufacturer but instead are created by pairing specialized seating from one company with a frame from another company. This standard applies to third party seats, back supports and attachment hardware and uses a generic surrogate wheelchair frame to create a "wheelchair" for testing. The WC20 requirements mirror those of WC19 that relate to the seating system. The performance criteria for the crash test include excursion limits, prohibition of sharp edges and broken parts, and good support of the rider. WC20 seating cannot prevent easy application of the seat belt and must allow good fit. WC20 seating is required to be labeled with a logo and the standard includes instructions and labels. The ISO mirror standard for WC20 is 16840-4. The main difference between the standards is the definition of hardware failure. The fourth Volume 4 section, WC10, covers vehicle spaces on large, accessible transit vehicles where the likelihood of a crash is very low and independent use by the person in the wheelchair is prioritized.

WC10 - Wheelchair Containment and Occupant Retention Systems for Use in Large Accessible Transit Vehicles, Systems for Rearward Facing Passengers addresses rear-facing wheelchair spaces in large heavy vehicles where passengers are allowed to stand during travel, as in a city bus. The standard includes overall dimensions for the

wheelchair station, handhold geometry, and features that limit forward, lateral, and rear movement of the wheelchairs under conditions that simulate the forces associated with heavy braking and turning. The standard also establishes dimensions for a vehicle-mounted head and back support in the wheelchair space. The standard requires the space to be free of sharp edges and have padding to protect the rider. The standard also specifies floor friction. WC20 includes labelling, warnings, and instruction requirements. The ISO mirror standard for WC10 is 10865-1.

Conclusion

The RESNA Wheelchair Volume 4 standards aim to promote safer and easier transportation for people who stay in their wheelchair for motor vehicle travel. The standards cover WTORS, WC, wheelchair seating and wheelchair spaces in vehicles. While these standards can be used to promote safer travel, they cannot be used to deny transportation services. Prescribing and using hardware that complies with RESNA Volume 4 improves safety parity between wheelchair-seated and conventionally seated passengers, but the implementation of these standards can be limited by stakeholder knowledge levels, willingness of clinicians to prescribe compliant hardware, availability of products, third-party payer practices and transportation provider training level.

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Conflict of Interest

No conflicts have been disclosed.

IC21: Maximizing the Impact of Rehabilitative Seating Services: The Importance of Follow-up

Cara Masselink, PhD, OTRL, ATP

Learning objectives

1. Attendees will relate the main results of two studies examining the service delivery process of wheelchairs in a dedi
2. Attendees will relate common healthcare and organizational barriers to providing follow-up services to strategies to
3. Attendees will examine their own clinical barriers to providing follow-up services and formulate a plan to improving.

Introduction

Writing the equipment recommendation is the most important part of wheelchair recommendations, often serving as an endpoint for physical and occupational therapists in the wheelchair procurement process…or is it? Specialty wheelchair clinic clients have reported a decrease in satisfaction after evaluation (Suzuki, Lockerte, & Braun, 2000), and long insurance approval processes may impact equipment delivery (Dicianno et al., 2018). Skilled follow-up sessions focusing on equipment fit, function, and use have the potential to maximize the outcomes of equipment recommendations. This session will present evidence describing what happens after the equipment recommendation, and activities that should be covered in effective follow-up services will be described. A group discussion will explore health-care policy, organizational, and clinical barriers and solutions to providing follow-up services.

Seating and mobility services aim to match a person with an appropriate wheelchair that maximizes their health and function and are supported by an intricate process for complex rehabilitation technology equipment (Arledge et al., 2011; World Health Organization, 2008). Stakeholders throughout the process include the clinician and/or physician skilled in wheelchair seating, the rehabilitation technology supplier from the durable medical equipment (DME) supplier and, most importantly, the client and their care team although external factors, such as the funding source policies and organizational policies, interact as well (Eggers et al., 2009). Although client satisfaction may be adequate after the evaluation, reported long insurance approval processes and decreases in client satisfaction after evaluation suggest that the external factors may impact the client's outcome of wheelchair seating services (Dicianno et al., 2018; Suzuki et al., 2000).

Steps of the process after equipment recommendation include insurance approval of the equipment order, device ordering and delivery, fitting of the product to the client, education and training (Eggers et al., 2009; Greer et al., 2012). Although, it isn't clear if many follow-up visits occur (Greer et al., 2012). Yet, wheelchair users that underwent an active review of their current wheelchair were more likely to address issues for their wheelchair, which decreased accidents (Hansen et al., 2004). Furthermore, the interaction of the stakeholders during the equipment request review may change what is delivered, in which case the wheelchair equipment should be examined at delivery by the recommending therapist to ensure appropriate fit and function (Masselink et al., 2021). In a comparison of recommended and delivered manual and power wheelchair bases, cushions and backs of varying complexity (examined by healthcare common procedure coding system codes), significant differences in each category of equipment were found (Masselink et al., 2021). However, therapist follow-up after wheelchair service delivery is not required by funding sources and often presents with many challenges organizationally, especially in dedicated seating clinics where the wheelchair user often attends ongoing therapy with another therapist in an inpatient or outpatient clinic, or school.

Given the role that follow-up visits may have in preventing wheelchair related accidents and injuries, attention should be given to make this time worthwhile. Addressing the wheelchair user's seating comfort, maneuverability, transportation, and safety will not only cover the wheelchair in that moment, but also serve as an education for items the wheelchair user should examine periodically in the future (Hansen et al., 2004). In addition, training of specific skills the wheelchair user may need or advising on maintenance programs should be an important part of this visit, with referral for further clinical or supplier support as needed (Kirby et al, 2021; Wheelchair Maintenance Training Program, 2017).

Unfortunately, many barriers also exist to even schedule a follow-up appointment. In many instances healthcare policies for clinical services do not easily support maintaining an open clinical encounter for the amount of time required to wait for the equipment delivery. Productivity requirements for clinicians may reduce the clinician's ability to complete paperwork required to keep the encounter ready. Communication may break-down between the clinician and DME supplier, resulting in the clinician not knowing when the wheelchair seating and mobility equipment is delivered. Differences in time amounts scheduled for follow-up and evaluation may be difficult to manage in a dedicated seating clinic, and transportation for the wheelchair and the wheelchair user may increase difficulty of pursuing a timely follow-up. However, the benefits of follow-up visits indicate the necessity of problem solving these barriers. A few possibilities exist, for instance, telehealth visits may reduce transportation barriers while also allowing the clinician the ability to see the client using their mobility device in their home environment (Carver et al., 2021). Examining the scheduling structure of evaluations and follow-ups may reveal some flexibility to accommodate these appointments. Furthermore, if many clinicians feel that healthcare policy inhibits their ability to follow-up, maybe now is the time to examine alternative policies for "consultative" clinical appointments such as these.

Conclusion

The evidence regarding follow-up visits support that these services are integral to maximizing outcomes in complex rehabilitation technology provision. The procurement process is complex with many opportunities for things to go wrong, so follow-up will not only reinforce education provided in the evaluation session, but also ensure that what was recommended, was what was received. If it wasn't, the clinician can determine the optimal fit for the wheelchair and seating that the client needs to be healthy and function in what they received, making alterations as necessary. Furthermore, it is important to understand if, and why, clinicians do not often follow-up with their clients, and/or the troubles they have doing so. These answers will help guide the avenue for future changes, to decrease barriers and optimize the wheelchair user's functional mobility.

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IC23: Guidelines for ALS Therapeutic Interventions and Plan of Care

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Learning objectives

1. Identify common phenotypes that might be encountered in a typical ALS case and present a comprehensive treatment plan fo
2. Identify typical equipment needs encompassing low and high technology, mobility needs, and MRADL needs for any person.
3. Identify typical symptom management of a person with ALS, including as related to pain, upper and lower extremity weakness.

Introduction

There continues to be a significant dearth of knowledge specific to the care and treatment for those with ALS in terms of therapeutic interventions. Frequently, Acute Care, Home Care and Community Therapists institute programs that are not only unhelpful, but detrimental to the progression of the disease. This session will provide in depth, practical information for progressive therapy treatment plans for persons with ALS, inclusive of the many variants of onset, symptoms or progression encountered. Education will include brief and simple backgrounds on Diagnosis, Medications, and Phenotypes commonly seen, and then focus on Goal Oriented Treatments in all potential areas seen including but not limited to: Functional Mobility, Seating and Positioning, Symptom Management, Pain Management, Respiratory Decline, Equipment Recommendations, Assistive and Augmentative Communication Devices, and Home Modifications that relate specifically to ALS.

The initial portion of the hour will be spent discussing basic Diagnosis and theories for potential Causes of ALS. Criteria for diagnosis, multiple Phenotypes for presentation of symptoms, and how certain Past Medical History diagnoses affect outcomes will be reviewed.

Medications that have shown some efficacy for ALS Treatment and some Symptom Management Medications will be reviewed. Also, Typical Symptoms that present with initial diagnosis as well as ongoing with progression of the disease, and Frontal Temporal Lobe Dementia (FTLD), Pseudobulbar Affect, and how Smoking will affect outcomes as well as Veterans with ALS.

To be presented in discussion format:

- Problem List With Actions typically seen in most ALS cases
- Pain and how to manage, how it affects outcomes
- Hypermetabolic State of ALS: definition and how to manage Fatigue as a symptom and a cause
- Falls, strategies to decrease and management after Sensory symptoms especially Numbness and Tingling
- Equipment needs for all stages of the disease
- Poor UE Functional Use and how it translates to overall functioning
- Home Accessibility specifically for ALS
- Coverage of Equipment by insurance as well as grants, etc.
- Resources for assistance
- Power Mobility Devices for ALS
- Impaired Mobility Related Activities of Daily Living and how to prioritize
- Difficulty with Bed Mobility and Comfort in Bed
- Pressure Injuries-how to prevent, and how to manage
- Impaired performance of Activities of Daily Living
- Education-what to focus on and what to let go
- Exercise with ALS: Primary goals/focus of PT and OT…in the Hospital, as an Outpatient, and at home

Solutions we have at the Albany ALS Center:
Grants, Equipment Loan Closet, Links for New Equipment, Links for Used Equipment

Conclusion

At the conclusion of this course, participants will leave with a thorough knowledge of how to recognize ALS even if that is not their patient's presenting diagnosis, create a comprehensive treatment plan that will enable therapeutic interventions through the progression of the disease as well as the continuum of care, and enhance the quality of life of their patient.

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2. www.MDA.org
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Conflict of Interest

NONE

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IC24: Implementation of a Personal Navigation System for Individuals with Disabilities: Barriers & Facilitators

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Learning objectives

1. Understand how implementation science applies to the use of new technologies and educational programs in communities.
2. Understand how community mobility relates to navigation, transportation, and access for those with cognitive deficits.
3. Identify 3 facilitators and 3 barriers to the implementation of a personal navigation system in a mid-size urban city.

Introduction

The overall goal of the SmartColumbus: Mobility Assistance for People with Cognitive Disabilities (MAPCD) program is to increase the frequency of novel trips for individuals with disabilities and develop their community navigation skills. Personal navigation is a foundational skill that leads to increased potential for education, employment and other life skill activities. Technology can play a critical role in developing and supporting personal navigation skills (Livingstone-Lee et al., 2014; Stock et al., 2013). Therefore, in order to address the barriers and facilitators to developing community navigation skills we leveraged implementation science which focuses on the study of methods to support the uptake of evidence-based practice (Bauer et al., 2015). This workshop will identify opportunities for the implementation, maintenance, and evolution of accessible transportation and personal navigation technology within mid-size city regions, via a panel discussion with stakeholders.

Individuals with disabilities often have difficulty accessing public rights-of-way (sidewalks, street crossings), shared use paths, and public transportation while traveling from one location to another location. Being unable to access these forms of transportation safely and independently decreases one's ability for community integration and inclusion. Without this community access, a social exclusion effect is created (Wasfi et al., 2016). Furthermore, the lack of efficient transportation available to these individuals creates barriers to gaining and maintaining employment in the community (Noel et al., 2016). Therefore, the availability of accessible transportation for individuals with cognitive disabilities is an important part of eliminating barriers and creating employment opportunities.

The Smart Columbus program, a $40 million city-wide grant award from the United States Department of Transportation (USDOT), involved several individual projects including Mobility Assistance for People with Cognitive Disabilities (MAPCD). The City of Columbus, the Central Ohio Transit Authority (COTA), and The Ohio State University (OSU) partnered on the MAPCD project. The intent of this project was to evaluate the implementation of smartphone technology and a travel training program to minimize transportation barriers and enable independent travel on a fixed-route bus service for individuals with cognitive disabilities. The stakeholders involved in this project included individuals with cognitive disabilities (travelers), their caregivers or community supports (travel partners), and research/project personnel (program instructors).

To reduce barriers and increase independence for individuals with cognitive disabilities, the AbleLink Smart Living Technologies Wayfinder 3 system was used as the technology-based personal travel assistant. The WayFinder system is an easy-to-use, safe, and efficient ecosystem that includes four components: (1) the WayFinder app (iOS and Android), (2) the WayFinder Specialized Media for Assisting Route Travel (SMART) Route Builder (web), (3) the SMART Route Library (web) and (4) the SMART Travel Manager (web). It was designed to assist those with cognitive disabilities who have difficulty independently travelling to desired locations and includes many of the key features that address personal navigation and access to public transportation. The key features include cueing, customizable instructions, and real-time tracking. (Davies et al., 2010; Stock et al., 2013; Livingston-Lee, 2014; Stock et al., 2019). Individuals with disabilities typically used the smartphone app, while travel partners typically used the computer-based route builder, route library, and travel manager.

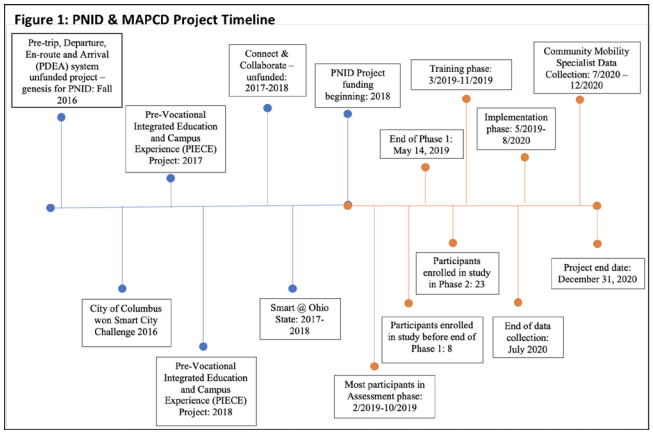
In conjunction with the WayFinder system, a personal navigation training program for individuals with cognitive disabilities was developed for implementation on a fixed route bus service: the Personal Navigation for Individuals with Disabilities (PNID) education program. The PNID education program included an initial assessment of abilities and experience with transportation, five training sessions, and satisfaction surveys. The training sessions addressed safety, public transportation, smartphones, the WayFinder app, and transportation via a fixed bus route. The travelers' satisfaction with training sessions and competency with public transportation while using the WayFinder app were examined via several quizzes, task analyses, and satisfaction surveys. COTA provided significant resources and support to travelers and travel partners throughout the project including sessions at its indoor training facility, bus passes, and access to buses for the creation of travel training videos.

The individuals with cognitive disabilities who participated in this project were diverse in terms of their cognitive impairments and their experiences with personal and public transportation. And the program structure and presentation were customized based on the unique needs of the individual participants. The travel partners played a critical role in supporting personal navigation for individuals with disabilities. During the PNID program, travel partners assisted with the traveler's training activities, created routes on the route builder, and stored the routes in the route library. The travel partners completed training activities on the WayFinder app, the SMART Route Builder, SMART Route Library and SMART Travel Manager (i.e.,

tracker). The travel partner feedback was critical to the implementation of the WayFinder system and was given to AbleLink to address ongoing issues with updates to the SMART Route Builder, route library and travel manager.

The development and implementation of the PNID education program was based on the Replications Effective Programs (REP) framework in implementation science, which includes four phases: pre-conditions, pre-implementation, implementation, and maintenance and evolution (Kilbourne et al., 2007; Ramsay et al., 2019). The MAPCD project addressed the pre-conditions of the PNID education program in collaboration with the Nisonger Center, the City of Columbus, and COTA. The MAPCD project then completed a polit-test of the PNID education program as part of the pre-implementation phase.

Figure 1: PNID & MAPCD Project Timeline



The pre-conditions and pre-implementation phases assessed the potential for large-scale implementation, maintenance and evolution in other geographical locations and transportation settings.

The PNID program and MAPCD project directly addressed the need for independent transportation. However, numerous barriers and facilitators to implementation were identified. The barriers included physical access to the fixed route bus service, familiarity with technology, and travel partner engagement. The facilitators included access to the WayFinder system and COTA facility, creation of a comprehensive training program, and collaboration among stakeholders.

Figure 2: Lessons Learned and Recommendations for Implementation:

- Interprofessional collaboration among the professional stakeholders is key.
- The travel partners that were the most successful were also community specialists for a local agency that supports individuals with developmental disabilities.
- Future implementation of emerging technologies should provide additional training and support for community specialists.
- Community specialists that already have travel training experience are ideal for the travel partner role, enabling them to best assist the traveler and fade support over time.
- Important to leverage existing resources in the community.
- The most appropriate organization to fund the technology and training may not be a local transit authority, but rather a human

Conclusion

The barriers and facilitators identified in the MAPCD project indicate that the traveler's personal factors, the support of the travel partner, community resources, and technology functions influence the successful implementation of travel training, navigation technology, and fixed route transportation among individuals with cognitive disabilities. The development and implementation of the PNID education program addressed the pre-conditions and pre-implementation phases of the REP framework. The identification of barriers and facilitators throughout the project, through the lens of implementation science and the REP framework, provides insight on additional considerations and needs regarding community mobility, transportation, navigation, and technology access for individuals with cognitive deficits. The PNID education program and MAPCD project provide a framework for future training and implementation of transportation and navigation programs, both regionally and nationally.

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Additional Learning Resources

1. To learn more about the MAPCD and PNID projects and find helpful resources and videos, please visit our website at: https://u.osu.edu/smartcbus/.
2. To learn more about the Smart Columbus Initiative, please visit their website at: https://smart.columbus.gov/.
3. To learn more about the WayFinder System, including services and pricing, please visit the AbleLink Technologies website at: https://www.ablelinktech.com/.

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IC25: What Could Go Wrong? Evaluating Wheeled Mobility Adverse Events with an HRO Approach

Kendra Betz, MSPT, ATP

Learning objectives

1. Describe the five foundational characteristics of high reliability organizations (HRO).
2. Discuss three reasons that reporting actual and near miss incidents supports safety awareness for wheeled mobility and seating interventions.
3. Outline two scenarios where concepts from hro and just culture can be directly applied to the field of wheeled mobility and seating.

Introduction

Adverse events involving wheeled mobility devices often result in detrimental consequences for the consumer ranging from minor inconvenience to catastrophic injury including death. Evaluating safety events and concerns with an approach aligned with High Reliability Organizations (HRO) supports awareness of the factors leading to an actual or potential adverse event and identification of the options to prevent or mitigate the same from happening again. Implementation of a Just Culture for all organizations and professionals involved in the wheeled mobility service delivery process further supports a safety focused approach that is advantageous for consumers and the professionals involved in their care.

Evaluation of adverse events is an essential professional activity in healthcare. While often challenging to acknowledge and discuss, all healthcare professionals are responsible for awareness of risks, reporting of actual and avoided safety events, and participating in the analysis of incidents to support improvements that prevent harm to patients. The same priority and advocacy for a culture of safety applies to the wheeled mobility and seating industry. Examples of safety concerns related to wheeled mobility and seating include device malfunction and failure (Henderson et al., 2020), device quality challenges (Gebrosky et al., 2018), frequent falls (Sung et al., 2019), skin compromise (Sprigle et al., 2020), acute and chronic musculoskeletal pain and injury (Beirens et al., 2021), and transportation related challenges (Hu et al., 2020). While safety incidents related to wheeled mobility and seating have been reported and studied, it is highly likely that the actual number of safety events is under reported.

Evaluating safety events and concerns with an approach aligned with High Reliability Organizations (HRO) supports awareness of the factors leading to an actual or potential adverse event and identification of the options to prevent or mitigate the same from happening again. HROs are defined as entities that experience fewer than anticipated accidents or events of harm, despite operating in highly complex, high-risk environments (Weick and Sutcliffe, 2015). The implementation of HRO principles has become a priority in the healthcare industry (Veazie et al., 2019), with concepts for promoting safety embraced by the World Health Organization, The Joint Commission, and the Agency for Healthcare Research and Quality in the United States. The priority for HRO implementation for healthcare is consistent with other high risk, high stakes industries including aviation and nuclear power. In 2019, the Veterans Health Administration initiated a nationwide roll-out for HRO implementation for the entire system of care. The implementation strategy is based on the following descriptors excerpted from the VHA High Reliability Organization (HRO) Reference Guide (Department of Veterans Affairs, 2021).

3 Pillars:
1. Leadership commitment;
2. Culture of Safety;
3. Continuous Process Improvement.

5 Characteristics:
1. Sensitivity to operations;
2. Reluctance to simplify;
3. Preoccupation with failure;
4. Commitment to resilience;
5. Deference to expertise

7 Values:
1. It's About the Veteran;
2. Support a Safety Culture;
3. Commit to Zero Harm;
4. Learn, Inquire, Improve,
5. Duty to Speak Up;
6. Respect for People,
7. Clear Communications.

The following is an expanded direct excerpt from the VHA HRO Reference Guide that supports discussion of the direct application of the five characteristics of HRO to wheeled mobility and seating applications. The five principles are derived from HRO the book series on Managing the Unexpected (Wieck and Sutcliffe, 2015).

1. Sensitivity to Operations: Focus on Front Line Staff and Care Processes: Be mindful of people, processes & systems that impact patient care

2. Preoccupation with Failure: Anticipate Risk – Everyone is a Problem Solver: Have a laser-sharp focus on catching errors before they happen and predicting and eliminating risks before they cause harm

3. Reluctance to Simplify: Get to the Root Causes: Get to the root causes of the problem, rather than settling for simple explanations

4. Commitment to Resilience: Bounce Back from Mistakes: Bounce back from mistakes, get back on track and prevent those mistakes from happening again

5. Deference to Expertise: Empower and Value Expertise and Diversity: Rely on those with the most knowledge of the situation at hand, regardless of rank, hierarchy, position, or other factors

Examples are for direct application of the five HRO characteristics to wheeled mobility and seating scenarios and will be used to facilitate an interactive exercise during the session.

The implementation of a Just Culture for all organizations and professionals involved in the wheeled mobility service delivery process further supports an HRO approach that is advantageous for consumers and the professionals involved in their care. When a just culture exists, people are empowered and encouraged to speak up with a concern, report mistakes or close calls without fear of punitive response and receive respect and appreciation for their contribution to safe systems regardless of their professional role or title. HROs prioritize a just culture to encourage event reporting with the goal of organizational improvement. When an incident is reported, the evaluation is focused on the event, not the people involved, to support a learning and systems improvement environment. All event types require in-depth evaluation:

Close Call:
An event or situation that could have resulted in an adverse event but did not, either by chance or through intervention. Such events have also been referred to as near miss events or potential events.

Adverse Event:
An untoward incident, iatrogenic injury, or other unintended harm directly associated with care or services. Sentinel Event: A] patient safety occurrence that involves death, serious permanent physical or psychological injury, or severe temporary harm and intervention is required to sustain life.

Various systems exist for adverse event reporting depending on the healthcare organization and the respective country managing reporting systems. The VHA utilizes the Joint Patient Safety Reporting (JPSR) system to manage actual adverse events or close calls. The United States Food and Drug Administration (FDA) hosts the MedWatch system that encourages voluntary adverse event reporting by health professionals, patients, and consumers. Details about MedWatch are available at www.fda.gov/safety/medwatch-fda-safety-information-and-adverse-event-reporting-program. The FDA also hosts the public facing Manufacturer and User Facility Device Experience (MAUDE) database representing events that have been submitted. MAUDE www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfmaude/search.cfm

In the U.S., The Joint Commission issues official alerts to highlight outcomes of evaluations and investigations that carry significant impact for appropriate healthcare practices. As an example of The Joint Commission's commitment to HRO and safety cultures, they issued a Sentinel Event Alert titled, The essential role of leadership in developing a safety culture. The report highlighted common leadership failures as 1) not supporting safety event reporting, 2) no response to reporting of safety problems, 3) not addressing staff burn-out, 4) refusing to prioritize and implement safety recommendations, and 5) allowing intimidation of staff that report.

Several landmark resources highlight approaches for prioritizing safety and managing adverse events in healthcare. The Institute of Medicine published To Err Is Human: Building a Safer Health System (Kohn et al., 2000). One premise highlighted is that human error is inevitable, is not a behavioral choice and cannot be avoided by anyone. Another is known human nature to drift through the continuum from vigilance to complacency which creates or enhances the opportunity for mistakes. Definitions of human error related to human behavior guide determination for the extent of coaching or disciplinary action.

Human Error: Occurs with an inadvertent mistake, cognitive slip or lapse that causes an outcome other than intended.

At Risk Behavior:
Occurs when competent professionals develop unhealthy norms. Behavioral choices are shortcuts, routine rule violations. Risk is not recognized; or recognized but believed to be justified.

Reckless Behavior:
Occurs when an individual makes a behavioral choice to consciously disregard a substantial and unjustifiable risk.

The interaction of the person in the work environment creates a focus on the system as a potential critical deficit that can lead to adverse events. The Swiss Cheese Model emphasized in the book, Human Error (Reason, 1990), demonstrates how the circumstances of the environment, people, culture, and technology interfaced with single or multifaceted disturbances can create error tolerant systems that lead to the mishap or adverse event. Human factors principles for systems designs require critical consideration in mitigating circumstances than encourage or instigate errors. Effective communication strategies amongst all involved stakeholders are essential in managing actual incidents and avoiding potential adverse events and is a fundamental premise of implementing and sustaining a just culture. The analysis of a professional's behavior related to an error or potential error compared to the culture and system in which they are required to work indicates the responsibility and accountability for the error and the appropriate actions. All principles of and recommendations are directly applicable to safety with service delivery in wheeled mobility and seating.

Conclusion

The wheeled mobility and seating industry must function as an HRO with a Just Culture to coordinate and provide safe and appropriate care to our clients. Given their extensive needs and the multitude of complex assistive technologies they require to participate in home, school, work and community activities, affiliated professionals have a responsibility to understand and incorporate the HRO pillars, characteristics, and values to facilitate safety in all aspects of our work. Resources exist for education, implementation, safety event reporting and evaluation, and readily available data. Multiple publications highlight the high frequency and negative consequences of adverse events that impact people who use wheeled mobility devices. Responsibility for promoting safety and mitigating safety incidents must be shared amongst clinicians, manufacturers, suppliers, researchers, educators, clients, and their caregivers to advance our industry to become a High Reliability Organization.

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The author has no conflicts to disclose.

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IC26: Improving the quality of wheelchair service in Colombia through a national educational initiative

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Learning objectives

1. List 3 barriers wheelchair users face accessing appropriate wheelchairs and services in Colombia
2. Understand how the process of creating an education curriculum as a National effort in Colombia was unfolded
3. Propose 3 actions to move forward the quality of the wheelchair sector in Colombia

Introduction

An appropriate wheelchair is the primary means of mobility for around 70 million people in the world, this device allows them to perform different activities of daily living as well as to go to school, to work, and engage in social life. Unfortunately, in countries like Colombia, 85% of those needing a wheelchair do not have access to one. One of the reasons why wheelchairs are not delivered is due to the lack of trained personnel. Particularly in Colombia, rehabilitation professionals lack the necessary skills to deliver appropriate wheelchairs.

By the request of the healthcare ministry, a National effort started in Colombia in 2018 to improve the quality of wheelchair services. In 2019 a systemic approach has started to improve the wheelchair sector in the country.

Colombia is an upper-middle-income country in South America with a population of 50.3 million people. Over 25% live in poverty (DANE, 2018). 60 years of armed conflict have left over 8,5 million victims (Unidad de víctimas, 2020), 7.9 million displaced people, and 12,074 landmine victims (Alto comisionado para la Paz, 2021), (Agencia de la ONU para los refugiados, 2017). Is a democratic country with advanced rights for people with disabilities, but in practice, they continue to have poorer outcomes compared to those without disabilities such as limited access to health, education, and employment, among others.

Previous research has found an overall lack of systems thinking approach with most of the legislation relating to assistive products in Colombia and little reflection of the policies' implementation in reality. The assistive technology user's perspective emphasizes that users and families lack information about assistive products and the related policies in place, appropriately informed professionals on this topic, and a service delivery system are not common practice, and few provide user-centered services. Additionally, the healthcare coverage denies financing of these products, resulting in a legal appeal. This situation can be more challenging for those living in rural areas (Toro et al. 2019).

In Colombia, a national effort has started to improve the quality of wheelchair service provision. Figure 1 describes the timeline and activities to date. [insert figure 1]

In 2018, the Ministry of Health (MoH) requested the National system of education in Colombia (SENA) the development of a training program that could allow national wheelchair manufacture in order to improve access to this product and related services. SENA and the International Committee of the Red Cross Colombia Delegation (ICRC-Col) proposed the visit of an international expert from the NGO Motivation UK, in order to assess the potential of SENA to offer such a training program considering the country's context and needs. The subject matter expert from Motivation UK recommended that SENA could create a program similar to the Certificate Course in Wheelchair Technology from TATCOT.

In order to better understand how this training program works, a group of representatives from ICRC-Col, SENA, and a local wheelchair manufacturer went to TATCOT. The trip allowed them to understand that there was no link in increasing local manufacture and improving access to wheelchairs if other elements such as training, regulation of products, and services were not tackled.

In order to have a more systemic approach to this topic, and to include other organizations, a Mobility National Workshop, and stakeholders' meeting was held in November 2019. Whee, a Colombian company working in assistive technology education was invited to facilitate the meeting with ICRC-Col and SENA. The design of the workshop allowed participants to discuss how wheelchair delivery, wheelchair quality, training, education, and partnerships work in the country and to find facilitators and barriers for each. Two previous stakeholder meetings were held in 2017 and 2018 in other regions of the country, but this was the first one to have representation from the government as well as educators, rehabilitation centers, local vendors, and importers.

The main outcomes of this National Workshop are divided into:

- A deeper understanding of how wheelchair service provision (WSP) works in the country:
  - WSP in Colombia is not working in the appropriate order, sometimes the prescription is done before the evaluation.
  - Rehabilitation practitioners are not appropriately trained and user evaluation is done differently by different professionals, without any standardized method.
  - There is no clear funding path to access wheelchairs in the country.
  - WSP is fragmented, there is no follow up and no particular professional working with a user, so the wheelchair that is delivered to the user may not be the same wheelchair that was prescribed
  - There is no way to evaluate the quality of a product. This is even more challenging for those living in rural areas.
- Specific activities that should be held to improve wheelchair service: o Service regulation should be made based on the WHO 8 steps for WSP and roles of different

rehabilitation professionals should be held with a special focus on rural areas.
  - Product regulation should be in place for both national and imported products. International standards should be held on the national level to measure product quality.
  - Stakeholders should work together and have a common language on WSP.

As a group, it was decided that education for wheelchair stakeholders was a fundamental first step.

Another meeting was held in November 2019, this time focused on education, to understand the different skills and knowledge needed by all of those who are part of WSP based on the WHO 8 steps, and to brainstorm in training modalities and existing courses. Stakeholders in the meeting were: Universities offering PT, OT, P&O, and local and international vendors that provide training.

Different education curricula will be developed for technicians, clinicians, and wheelchair service administrators. Technical roundtables will be held in the country in order to define minimum standards of practice, skills, and knowledge. This curriculum will be used by the national government to standardize the stakeholders' roles and activities in wheelchair service provision.

As a parallel activity, the MoH, started the development of a "Manual of good practice and sanitary requirements for WSP in Colombia". This manual opens the doors for the regulation of the products, services, and personnel. In August 2021, MoH requested stakeholders to review the manual, give feedback and agree on future legislation based on the manual to be issued and implemented within the next couple of years.

Conclusion

There have been some key elements, lessons learned, and challenges on this national effort to improve the quality of wheelchair service in Colombia:

- Key elements: Government and other stakeholders' involvement and the system's thinking approach have been fundamental for this to become part of a national agenda and to work from different perspectives instead of focusing all efforts on one specific topic with low impact for wheelchair users.
- Lessons learned: It is important to understand the pace of the project implementation based on the availability of stakeholders.
- Challenges:
  - COVID-19 modified the priorities of all governments and it was not possible to fulfill the scheduled activities during the pandemic.
  - Even though all workshops and activities held with different stakeholders were based on international guidelines, it has been challenging to implement international standards on the national level.

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Conflict of Interest

Speakers have been working in Colombia in the development and implementation of all the strategies shared in this session.

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IC27: Considerations for Dependent Mobility in the Pediatric Client

Linda Bollinger, PT, DPT, ATP

Learning objectives

1. Identify three ways in which delays in development in the pediatric client may impact wheeled mobility system recommendations.
2. List three emotional considerations when recommending dependent mobility bases for the pediatric client.
3. Identify three components of a dependent mobility base that can address the potential needs of the pediatric client.

Introduction

As a child develops and ambulation is delayed or not expected, there are many considerations to make with regard to dependent mobility bases. The equipment selection can have a big role on the child's development as well as the family/caregiver and support team. During this one- hour educational session, participants will learn about considerations to keep in mind when recommending dependent wheeled mobility devices for the pediatric client, including the psychosocial effects for child and family with dependent mobility.

This presentation will focus on pediatric development and the equipment that can be used when milestones are not achieved. We will discuss seating systems, standers, gait trainers and mobility devices and the benefits of using of using positioning equipment for pediatric development.

The session will present the benefits of proper positioning along with the considerations for dependent mobility when independence is not an option. It will also look at the benefit of providing dependent mobility when independent wheelchair mobility is not achieved. The participant will also become familiar with the positioning needs that can be met with various dependent mobility devices. Attention will be given to the needs of positioning in both mobility and non-mobility devices.

We will explore the impact of dependent mobility to the child and family when the child's milestones are not achieved in a timely manner. The participants will be given opportunity to discuss the communication needed with family and caregivers when dependent mobility devices are recommended. Emphasis will be on using equipment to improve the child's quality

Conclusion

It is the intent of this presentation to have the participant achieve a greater understanding of the need for early mobility, even when independence is not likely. The participant will become comfortable in discussing options with the family with regard to dependent mobility.

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Conflict of Interest

Linda Bollinger is a Pediatric Sales Specialist working for Leckey/Sunrise Medical.

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PS03.1: Development and Implementation of a Longitudinal, Community-Based, Early Mobility Research Program for Children with Motor Impairments

Rebecca Barchus, SPT
Chelsea Barroero, SPT
Sarah Dean, SPT
Wendy Schnare, SPT, Heather A. Feldner, PT, PhD, PCS

Learning objectives

1. Identify three developmental or social benefits of powered mobility device use for children with disabilities.
2. Discuss two challenges related to the provision of alternative devices such as modified ride-on cars.
3. Discuss two methods for gathering real-time mobility technology use data without the need for researcher presence.

Introduction

Mobility is essential for all children to access their world and participate in the community. However, a complex landscape exists for clinicians and caregivers supporting this goal for children who may benefit from mobility technology, including negative perceptions of wheelchairs and a lack of understanding of real-world use patterns. Modified ride-on cars (ROCs) represent one early powered mobility alternative to improve self-directed mobility and socialization, but have their own design and implementation challenges, and studies to date have all been short term.

Literature Review:
Mobility plays a vital role in development, and powered mobility is a meaningful intervention for children with disabilities and their families in order to improve participation at home and in the community. The onset of mobility offers young children with disabilities a opportunity to self-initiate exploration of their environment, rather than relying on a caregiver, which leads to increased independence with mobility. In turn, this leads to improved development in the areas of cognition, social interaction, and communication for the child. However, barriers to the introduction of powered mobility for young children include a primary focus on walking as a preferred mode of mobility, shortcomings in the availability of developmentally inspired pediatric mobility technology options, and negative perceptions of conventional options like wheelchairs.

Purpose:
This study had three aims: 1) Investigate the feasibility of using natural language processing tools to monitor social communication patterns in children using ROCs; 2) Implement a custom data logger to remotely measure ROC use patterns within home and community environments; and 3) Evaluate the impact of ROC use on child and family perspectives of disability, technology, and social-emotional development across a one-year period.

Methods:
We conducted a longitudinal, mixed-methods, observational study with children with CP or developmental delay ages 1-4 years old and their caregivers. Each child was provided with a customized ride-on car for use at home and in their community over one year.

- Aim 1: Families captured day-long audio recordings using the Language ENvironment Analysis (LENA) natural language processing system.
- Aim 2: A custom data logger and companion Arduino program was constructed and integrated into the ride-on car's electrical system to remotely and automatically monitor car use patterns (switch activation, distance traveled, accelerometry data, and geospatial location.)
- Aim 3: In-depth, semi-structured interviews were conducted at baseline, mid-study, and post-study. Quantitative and qualitative surveys, adapted for pediatric populations, were also used to measure disability attitudes across four domains (Disability Pride, Exclusion/Dissatisfaction, Social Model Orientation, and Medical Model Orientation), obtain favorability rankings for ROCs and traditional PMDs, and describe associated characteristics of these devices. Data analysis was conducted using SPSS v26 (IBM, Armonk, NY) and custom coding programs through Python and Octave for quantitative data, and a combination of NVivo qualitative coding software (QSR International, Melbourne, AUS) and hand coding for qualitative data.

Results:
15 families completed the study, this analysis represents a subset of data from 4 children for Aim 1, 5 children for Aim 2, and 11 children from Aim 3.

- Aim 1: It was feasible to remotely monitor the natural language environment for children with CP and families, including those children with altered speech production or who were pre-verbal. LENA accurately captured child vocalization counts (CVC), adult word count (AWC), and Conversational turns (CTC). All three metrics varied over time, but average scores were consistent with each child's Communication Function Classification System level.
- Aim 2: Data was successfully logged for all participants. The Ride-on cars were used relatively infrequently on average, which was consistent with caregiver reports. Activity was noted approximately 30% of the time that the cars were charged (M=29.9%, SD=0.38), with the longest periods of non-use occurring in winter months. Overall, cars were used one day per week on average. Between families, cars were driven on 25 separate days on average (M=24.8, SD=20.14) with an average total of 54 hours (M=53.8, SD=32.65) of car activity per family. Bouts ranged from 1-60 minutes in duration, with 59% occurring in 1-10-minute increments. Play sessions typically included 1-5 driving bouts and ranged from 5-70 minutes.
- Aim 3: Four themes emerged from the data: (1)'Mobility begets agency' describes aspects of child-led exploration, freedom, and choice-making; (2)'Connections are promising...but' describes optimistic but varied caregiver perceptions of development and roles/influence of ROCs; (3)'Balance between work and play' describes the importance of play in social-emotional development and

perceptions of ROCs as both toy and therapeutic device; and (4) 'Stigma breaks down...so do the cars' describes a reduction in perceptions of stigma and improved inclusion with simultaneous design challenges and barriers to ROC use. Attitudes towards disability largely remained stable, apart from a significant increase in respondents' Social Model Orientation (p=.002). Favorability rankings toward ROCs (Pre: 86.7 [SD: 18.6], Post: 88.3 [SD: 28.6]) were higher than those of traditional PMDs (Pre: 80.0 [SD: 30.3], Post: 81.7 [SD: 19.4]), but rankings for traditional PMDs increased post-study. A greater use of positive descriptors was associated with ROCs (Pre: 73%; Post: 65%) compared with traditional PMDs (Pre: 58%; Post: 57%), however, there was an overall decrease in negative descriptors associated with the latter post-study.

Discussion:
Children and caregivers viewed ROCs as both fun and therapeutic, consistently identifying perceived benefits for children's social-emotional development, but more varied responses existed regarding the role of ROCs in facilitating communication. Feasibility of using remote natural language processing methods to understand communication patterns during ROC use was demonstrated, but further research is needed to determine whether ROC use impacts these metrics. Despite the reported benefits and an initial high amount of use, overall use patterns across time fell and remained low, though feasibility of creating and integrating a custom data logger for remote use monitoring was also demonstrated.

Conclusion
Early exposure to PMDs may impact perceptions of disability and mobility technology. It is important for clinicians, manufacturers, and ATPs to be aware of attitudes toward disability and potential stigma affecting PMD consideration and use among caregivers of children with disabilities. Also, factors to promote ROC use as well as dosage parameters must be explored, as frequency of use remains low. The introduction of a ROC may help introduce powered mobility as a positive solution to facilitate exploration and participation, however it is only a temporary solution with inherent design flaws that may impact family usage. More mixed-methods research involving ROCs and other powered mobility devices is needed.

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Conflict of Interest
There are no conflicts of Interest to report.

PS03.2: Key Aspects of Power Mobility Interventions for Children: A Qualitative Study

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Jessica Meengs, PT, DPT
Allyson Schultz, PT, DPT

Learning objectives

1. List 3 key aspects of power mobility interventions for exploratory power mobility learners that were uncovered in this qualitative study.
2. List 3 key aspects of power mobility interventions for operational power mobility learners that were uncovered in this qualitative study.
3. List 3 key aspects of power mobility interventions for functional power mobility learners that were uncovered in this qualitative study.

Introduction

Power mobility use provides numerous benefits to children who have mobility limitations. Simply providing a child with a power mobility device may not allow the child to independently move and participate in daily life activities; children often need power mobility training opportunities to ensure successful participation. Research suggests there are 3 different groups of pediatric power mobility learners: exploratory, operational, and functional (Field & Livingstone, 2018). Research exploring the key aspects of power mobility interventions to meet the unique needs of each learner group has not yet been conducted. The purpose of this study was to explore key aspects of power mobility interventions for children in each pediatric power mobility learner group (Kenyon et al, 2020).

Participants:
Twenty-nine participants, from five different countries and representing 3 participant groups, partook in the study: (1) Children ages 8-18 years who used a power wheelchair (n=9); (2) Parents whose children ages ≤ 18 years who used a power wheelchair (n=7); and (3) Therapists and therapist researchers experienced in the provision of pediatric power mobility training (n=13).

Methods:
Data in this modified grounded theory study were gathered through face-to-face interviews conducted either in-person or via Zoom©. Prior to the onset of the study, specific interview guides, developed for each participant group using iterative processes, were piloted with non-participants, and modified based on feedback. Digital recordings were transcribed verbatim. Initial coding using a predetermined coding schema based on characteristics of the 3 power mobility learner groups was completed independently by 3 researchers. Data pertaining to intervention activities for each learner group were then coded to reflect the essence of each intervention activity. Patterns within the data were uncovered and codes were collapsed into thematic categories reflecting key aspects of intervention within each learner group. Thematic categories were then cross-referenced across the 3 learner groups to detect aspects of intervention pertinent to more than one learner group. All discrepancies were resolved through discussion amongst researches until agreement was achieved. Member checks and inquiry audits were used to ensure trustworthiness of the findings.

Results:
Key aspects of power mobility interventions for each of learner group as well as fundamental aspects of power mobility intervention applicable to all learner groups emerged in the data. Sample key aspects included: (1) For exploratory learners: Encourage child-led learning and Promote accidental activation of the access method; (2) For operational learners: Build vocabulary for safety and Encourage navigational problem-solving; and (3) For functional learners: Encourage self-advocacy skills and Facilitate typical childhood roles. Fundamental aspects pertinent to all pediatric power mobility learner groups included: Collaborating with others, Setting-up equipment, Playing, Providing practice opportunities, and Ensuring Safety.

Discussion:
Concepts in the existing literature support many of the key aspects of power mobility interventions that emerged in this study (Nilsson & Durkin, 2014; Nilsson & Durkin, 2017;

Conclusion

This study highlights both the similarities and differences in power mobility interventions for each of the 3 power mobility learner groups. Further research is needed to evaluate the clinical application of the key aspects of intervention identified this study.

Since being submitted for presentation at the International Seating Symposium, originally scheduled for March 2021, this study has been published in Developmental Medicine and Neurology (Kenyon et al, 2020).

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Conflict of Interest

No conflicts have been disclosed for any of the authors.

PS03.3: Multi Sensorial Stimulation In a Vertical Standing For Visually Impaired Kids With CP

Martino Avellis, PT
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Elisa Da Riva, Paediatric PT
Vittorina Schoch, PhD

Learning objectives

1. Describe the sensory difficulties for children affected by CP and visual impairments
2. Advise the upright position with the vertical stabilizer as a rehabilitation tool
3. Consider the importance of the multisensorial stimulation for those kids with a sensory deprivation

Introduction

In many clinical descriptions of children affected by CP, we, as Physioterapists, have to face visual impairments or blindness, with sensory deprivation and difficulties in the psychomotor area. Kids affected by visual impairments find it particularly hard to keep an upright posture even with the aid of vertical stabilizers; this makes it more difficult for them to improve their trunk/head control and lower limbs loading. Their perception of motion and of their own bodies is also often altered.

Purpose:
The multisensorial stimulation is really important for visual impaired or blind kids to give them an experience of sensory perception and improve their compliance.

Number of Subjects And Materials/Method:
10 children have been involved in the research; all of them were affected by visual impairment and multidisability (CP, Dysmethabolic Syndrome, Genetic Syndrome, etc.). The age range was from 21 up to 48 months. The subjects group was splitted in two sub groups, according these inclusions criteria:

- Children treated at Robert Hollman Foundation (both Centers in Cannero Riviera and Padua)
- Visual impairment with visus less of 2/10
- Cerebral Palsy as well as other kind of pathologies with low psyco-motor skills (GMFCS II-V), even in course of diagnosis.

We used the APP Multisensorial Standing for the trials, a vertical stabilizer that provides a sensory stimulation while the subjects keep the standing position. The multisensorial standing can be connected to an electronic device (e.g., tablet, smartphone, PC, radio…) which provides to the kid audio and visual stimulation, while spreading the vibrations produced by the sound in the whole frame thanks to an electronic hardware placed under the footplate. Our aim was to analyze the differences in compliance, attention, motivation, gratification and performances between the two configurations (just with audio and with audio/pallestesic stimuli).

Figure 2.

Each kid could handle a big switch (on/off) put on the standing's tray for six minutes; the switch was connected to a radio or tablet device, (turning on and off the radio depending on their feelings); if the subjects were unable to press the switch by themselves, we helped and assisted them. We looked at how many times the kids activated the switch and how was their compliance. They were asked to push the on/off switch which turned on/off a radio device. After that, the radio was connected to the Multisensorial Standing hardware, in order to produce, beside the audio stimuli, also the vibratory feedback.

The kids have been videorecorded during activities keeping the standing position in the Multisensorial Standing. We showed to the children for 3 minutes (if they needed them) what they had to do and how the switch worked, for both configurations (with music and with music plus vibrations). Then we left the subjects to use the switch freely for 6 minutes, observing their reactions. When there were any difficult for the children to figure out the task, we helped the kids to push the switch every 30 secs, by supporting the arm and doing the task together. From these observations some factors have been pointed out:

- Switch use time (secs)
- Switch using times numbers (n°)
- Subjective satisfaction feedback;

The proposed stimuli have been administrated for two consecutive days and reversed, that is first with music and vibrations and after that with just music. This method administration has been thought to have 4 different groups of children which have been subjected to the stimuli in different way and time (Matching Cross).

Qualitative remarks description:

- Most of the children improved the awareness, alertness and the personal acceptance by adding the vibrations as stimulus with the music (pallestesic stimuli), showing this through smiles and vocals. Some of the subjects, beside vocals, tried to hold the beat with the hands. The more we proposed known songs and music (known for the kids),

the better results we achieved. For most of the subjects the head control improved and some of them asked (through vocals) to have again the vibratory stimulus;
- One of the group showed a great compliance after just the first explanation about the proposal;
- One subject was not able to hold the awareness about the stimuli, showing that he didn't like them; probably, he had either a very low alerted feeling or tiredness because of the new posture.

Results:
As outlined in Figure 3, comparing the two different group, we have 30% increase in the activation time (secs) with music and vibration.

	MUSIC		MUSIC AND VIBRATION	
Group 1	SECS WITH HELP	SECS SELF	SECS WITH HELP	SECS SELF
B1	95	0	115	0
B2	14	22	36	29
B3	0	169	0	151
B4	0	114	0	197
B5	24	130	44	124
Group 2	SECS WITH HELP	SECS SELF	SECS WITH HELP	SECS SELF
B1	0	123	30	155
B2	0	319	26	215
B3	0	255	0	264
B4	0	30	0	158
B5	60	156	0	96
Average per secs	19,3	131,8	25,1	138,9
Delta%			30%	5%

Figure 3.

The kids activated the switch up to 30% more with the multisensorial stimulation configuration than with the simple audio stimulus, improving their compliance, too. In the second administration there were less switch activations: the hypothesis was that the children wanted to listen to the music for a longer time; with both stimuli (music and vibrations), the switch activations were lesser than just with music and that was really interesting. It seemed that the children wished to extend as much as possible that nice time.

According to the satisfaction form, a higher percentage of children showed a good feeling with both stimuli; this could be interesting to get deeper in a new research, evaluating the motor skills improvement after some usage time.

Conclusion
Almost all of the visual impaired kids showed a better compliance holding the upright position for a longer time and with better awareness.
Clinical Relevance: This kind of stimulation during the upright position can improve the sensory perception, besides enhancing their motor skills (head control and handling tasks).

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Conflict of Interest
No conflicts have been disclosed for Baiardi, Da Riva and Schoch

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IC28: Update on the Evidence: RESNA Ultra Lightweight Manual Wheelchair Position Paper Revision for 2021

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Learning objectives

1. Describe one of the intentions of the revision of the paper: "RESNA position on the application of ULW MWC"
2. List three major topics that will be included in the revision of the "RESNA position on the application of ULWMWC"
3. Identify two client case examples that will enhance the application of this position paper in clinical practice

Introduction

This revision to the RESNA position on the Application of Ultra Lightweight Manual Wheelchairs was initiated in April of 2020 following approval of the RESNA Board of Directors. This is intended to be an update on the evidence and build on the previous position paper that was finalized in 2012. This paper intends to contribute to the Evidence Based Practice that we all try to implement on an every-day basis. We are combining lived experiences through clinical examples, research evidence and professional expertise to synthesize the current body of evidence supporting the provision and recommendation of ultralight MWCs. We hope this document will serve to support clinical decision making in the field to provide optimal outcomes for your clients.

In line with definitions of evidence-based practice, Sacket and colleagues described EBP as the "conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients", but they also note that using the best evidence does not negate lower levels of evidence. Evidence based practice does not have to only include randomized controlled trials and meta-analysis but really seeing the best external evidence to support a clinical question. There are some instances when we cannot wait until a RCT can be established, but we must proceed ahead with our best judgment and "follow the trail".

This work group took a collective review of the previous work that has been presented at ISS, RESNA, and other international conferences as well as the PVA Clinical Practice Guidelines from 2005 and the original RESNA position paper and combined that with a Scoping Review of the evidence up to June 2021. A scoping review helps us to determine where the current research is, determine if a further systematic review is needed, will allow us to summarize and disseminate available research, and identify what gaps exist in the current literature (Askey & O'Malley, 2005).

Currently, the final position statements are being reviewed and evaluated and the draft of the document will soon be posted to the RESNA website for the open review period. The themes that you will see include: muscle recruitment, kinematics and wheelchair skills, repetitive strain injuries, equipment selection & configuration, alternative propulsion styles, rolling resistance, durability & maintenance, physical environment and participation impact and a highlight of the pediatric and older adult segment of wheeled mobility clients.

The paper will also enhance the previous clinical application section of the existing paper with examples related to: older adults, pediatrics, foot propulsion, a person with paraplegia, and a young adult with Cerebral Palsy.

Conclusion

The RESNA position paper work group still has a few milestones ahead of us but we are getting closer to the finish line. We accept suggestions and comments once posted on the RESNA website to ensure that this paper reflects our industry as a whole. We will also have two experts who are RESNA members review the entire document as well as continued presentations at ACRM, ASCIP, and APTA Combined Sections Meeting. Then we will have the final position paper posted on the RESNA website and will plan to submit to the Assistive Technology Journal for publication.

Ultimately, we hope that this update to the literature supports the previous paper and expands on new topics and populations. We hope this document will continue to support evidence based clinical practice along with your evaluation skills and practical experience. It allows us an opportunity to remember to always be an advocate for the right equipment for each individual and to include them in the decision making process

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Full list of references will be available in the final position paper.

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members that contributed to this project in alphabetical order: Theresa Berner, Jennith Bernstein, Jaqueline Black, Mary Cabarle, Tina Roesler, Joseph Ott, Lynn Worobey, Kendra Betz, Sage Scarborough.

Conflict of Interest

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IC29: Back Support Configuration for Optimal Scapular and Pulmonary Function

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Learning objectives

1. Describe the anatomy and kinesiology of the scapulae in relation to propulsion and reach for MRADL performance.
2. List 2-3 body function systems affected by optimal use of a wheelchair back support.
3. Identify 4 features of back supports and summarize how proper application can positively affect respiration and propusion.

Introduction

Determining an overall seating system starts with the full client assessment including the mat evaluation. The back support is an essential component of the overall seating system. Its height, contour, weight, adjustability, materials, and overall design all affect how the client is supported, how they move, and how they use their body. Back supports are generally prescribed for postural support exclusively. However, supporting the posterior aspect of the thorax also impacts body function systems including respiration and integumentary function. Support of the upper thoracic region also affects scapular mobility related to upper extremity use for MRADL performance and manual wheelchair propulsion.1, 2, 3 An unstable trunk requires the use of the upper limbs for stability and the need to 'hold themselves' in place will limit a wheelchair rider's ability to complete functional daily tasks.

Back supports should be utilized to ensure comfort and optimize function. The following are goals of an appropriate back support system.

- Optimize postural alignment as a static activity.
- Optimize postural control during dynamic activity by providing proximal stability to create a stable base to allow for distal mobility11 and functional tasks.
- Minimize energy expenditure needed to sit upright
- Maximize upper extremity function.
- Optimize scapulo-thoracic orientation and facilitate shoulder extension.
- Maintain integrity of the spinal curvatures.

Back contours:
The back contours can be utilized to provide the necessary support while also allowing for dynamic movement and function. The shape of the back support shell must be compatible with the other seating components and the wheelchair frame for best set up and adjustability. Whether planar, contoured symmetrically or contoured in a customized manner, the shape of the back shell will assist in providing lateral trunk support, balance, alignment, and stability.

Back length and height: The length of the back support is the measurement of how 'tall' the shell is. The height of the back support is related to where the back is mounted on the wheelchair frame and how 'high' it sits related to the seat pan and the client's trunk. There is sometimes a compromise between support and function and priorities must be determined during the client evaluation.

Adjustability:
Back supports can adjust in depth, height, and angle- all adjustments that add to the support of the client's body and allow for both positions of rest and of function. Height is related to the overall support needed by the client for upright sitting, propulsion, upper body function and pressure management. Depth adjustment will ensure that there is no interference from back canes and that the seat depth is maintained for optimal pelvic support and stability. The seat to back angle is paramount to allow a client the ability to sit and function in the most stable and balanced manner.

Medium/Material of Insert:
Within the back shell, there is a surface that will be the primary contact with the client's body. There are various mediums used including air, gel, foam, and combinations of the materials. The choice of material is not only dependent on posture and stability, but also risk of pressure injury, pain/comfort/tolerance, type of support required and what positions the client sits in. All these things needs to be considered.

"The higher discomfort rating among rigid backrest users may be due to sub-optimal shape, fit, adjustment or user preferences due to length of disability." 6 Whatever the reason, the adjustment and fit of the back support and other seating components is essential to optimal functional ability of the client throughout their day.

In current practice wheelchair back supports generally address postural needs. However, back supports have benefits beyond postural alignment by promoting shoulder range of motion for reach and optimizing pulmonary function. Understanding scapular kinematics and its relation to the upper quadrant and pelvis, plus chest expansion requirements for pulmonary function are key considerations when selecting a wheelchair back support.

The winglike scapulae can enhance or impede posture and function through their positioning. Scapulae lay tilted 5 degree anteriorly over the thoracic spine between T2 and T7.11 The thoracic spine's natural concave curve is between 20 and 40 degrees. The scapula has three joints: the glenohumeral joint, the acromioclavicular joint, and the scapulothoracic joint. Proximal upper extremity movement originates from articulation with the axial skeleton through scapulothoracic joint.8 This means thoracic posture and support should be considered not only for erect spinal alignment but also to promote joint mobility in the upper quadrant.7

A thoracic hyperkyphosis posture pulls scapulae into an increasingly anteriorly tilted position. With scapulae protracted beyond 5 degrees over the thoracic spine, the glenohumeral joint becomes misaligned decreasing shoulder range of motion, especially anterior and lateral reach.5 Three-region postural correction can be achieved by positioning the inferior aspect of a rigid back support at the posterior superior iliac crests. This supports the pelvis into neutral keeping it from collapsing backward into the posteriorly tilted pelvic posture. Ultimately the back support not only rectifies posterior pelvic and spinal alignment

issues, but in turn can also maximize shoulder reach by restoring the thoracic spine platform off which the scapulae function.

For people with compromised respiratory systems the back support medium and construct is very important. A study by Crytzer et al. published in 20184 examined back support material in relation to respiratory functioning for a group of participants with spina bifida. Findings showed that back supports comprised of inflatable air cells inside the rigid shell allowed for increased trunk expansion than did back supports with firmer inserts like exclusively foam. These findings suggest that when considering a rigid back support for positioning for a client with compromised respiratory functioning, the quality of inner air cells over foam may maximize their ability to breath using accessory muscles in the trunk.

Conclusion

In summary, back supports are an integral part of the seating system. Beyond offering postural support, they also can promote respiration and maximize reach. It is imperative that the back support fit the client's shape rather than the client being expected to conform to an off-the-shelf back support contour. The thoughtful selection of back support materials, contour, adjustments coupled with optimal mounting position allows the client to maximize their posture and function. We encourage practitioners to explore the wide array of available back support considerations.

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Conflict of Interest

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IC30: Demystifying Cushion Claims: How to use Wheelchair Cushion Performance Standards to understand manufacturer's marketing

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Patricia Karg, MSc
Katherine Dash

Learning objectives

1. Participants will be able to better interpret 6 key cushion marketing claims.
2. Participants will be able to understand 6 corresponding standardized performance tests.
3. Participants will list 3 different information sources for international/national cushion performance testing standards.

Introduction

Wheelchair Cushion marketing materials are the communication between wheelchair cushion manufacturers and consumers. These materials house claims about the cushion's construction, usability, and comfort that are all too often taken at face value. It is time for consumers and manufacturers alike to be educated on how to question and dig deeper into the meaning of key marketing phrases such as "pressure distribution", "improved stability", "optimal immersion", "shape matching", "breathability" and "slip prevention" as they relate to cushion performance. Wheelchair cushion performance metrics are the key to understanding the claims and how they relate to user needs [1-11].

Marketing tactics used for consumer mattresses are similar to those used for wheelchair cushions but perhaps more familiar to the general public. Mattress marketing is notorious for inundating consumers with an abundance of information about product performance. However, a closer examination of the claims about product performance likely reveals they are difficult to relate to personal experience. Think about that mattress commercial where a raw egg gets dropped onto the surface of the mattress and the raw egg doesn't shatter. While memorable, we challenge you, the prospective consumer or manufacturer, to question how the protection of a raw egg informs the benefits of that mattress' performance for the human body. An educated consumer would ask for more information about the underlying data supporting the mattress' performance and a conscientious manufacturer would have these data backing up these claims at the ready.

As a part of the University of Pittsburgh's Rehabilitation Engineering Research Center (RERC) on wheelchair and cushion performance standards [1, 12], we have tested over 50 wheelchair cushions with varying construction, material and coding using standardized wheelchair cushion performance tests [1-11] outlined by National (ANSI/RESNA) and International (ISO) standards organizations [13, 14]. In addition, we surveyed over 30 cushions' marketing materials, searching for patterns in marketing claims and the associated jargon. A series of clinicians, wheelchair users, and manufacturers were also interviewed to better understand the needs of each stakeholder group surrounding cushion selection and production. We discovered links between many of the most commonly used marketing concepts, customer perspectives, and standardized performance data.

For example, several of the interviews conducted described the importance of pressure distribution as a key cushion characteristic. Consequentially, over 60% of all marketing materials surveyed made some reference to the cushions' pressure relief, reduction or distribution properties. But what data supports these claims and how does it apply to performance for an individual user? Deriving meaning from adjectives such as "optimal" or "effective" when describing pressure can be difficult. Understanding how the cushion distributes pressure and the anatomical locations where the pressure distribution occurs are key for consideration by the consumer and the marketing by the manufacturer. The use of phrases referring to the cushion's ability to re-distribute or eliminate pressures away from locations such as the coccyx, sacrum, ischial tuberosities, or bony prominences can be legitimately supported by standardized performance data.

Conclusion

Pressure distribution as well as other commonly seen marketing themes can be demystified with the use of performance standards. Knowledge of standardized cushion performance data empowers manufacturers, clinicians and consumers. Manufacturers can utilize standard wheelchair cushion performance tests published by national (ANSI-RESNA) [13] and international (ISO) [14] standards organizations to produce reliable cushion performance data that will back their marketing claims. Simultaneously, clinicians and consumers can be aware of what types of performance data they should be asking for when they read various marketing claims, and how best to use and interpret these data when selecting a cushion.

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Additional Learning Resources

For more information about the initiatives and mission of the University of Pittsburgh Wheelchair and Cushion Standards Group created by our NIDILLR funded Rehabilitation Engineering Research Center on Wheelchair and Cushion Standards please visit our website: www.wheelchairstandards.pitt.edu.

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Conflict of Interest

Our laboratory performs testing and evaluation for various cushion manufacturers. We receive grant funding from the National Institute on Disability, Independent Living, and Rehabilitation Research to develop, evaluate and promote wheelchair cushion standards.

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IC31: Putting It into Practice: Applying What We Know about the Importance of Mobility in the School Setting

Nancy McNamara, PT

Learning objectives

1. Describe 3 benefits of self directed mobility for learning and development
2. Identify 3 examples of adapted equipment to support self directed mobility
3. Identify 3 assessment tools for planning, assessing and progressing a student's mobility skills

Introduction

Research demonstrates the benefits of early, self directed mobility on development and learning, including visual, cognitive, language and social development. Self directed and efficient mobility facilitates increased social participation and independence. School provides a familiar, safe environment to encourage self directed mobility. Practice opportunities can be built into daily routines. TrueNorth804 is an educational cooperative in the northern suburbs of Chicago. TrueNorth804 physical therapists work with 196 students in 46 schools across 18 member districts. Therapists work with students. educational teams and families to provide self directed mobility experiences for students. Partnerships with families, school districts, community organizations, manufacturers and suppliers help to obtain and maintain trial equipment for student use at school. This instructional course will share tools and techniques used to facilitate student mobility, learning and independence.

Importance of Movement:
Children learn by moving. Active movement (rolling, scooting, crawling, climbing, walking, propelling a wheelchair) allows a child to explore and interact with their environment. Active movement and exploration of the environment support visual, cognitive, language and social development. Self directed and efficient mobility facilitates increased social participation and independence (Rosen et al., 2017). Starting early is important as learned helplessness is established as early as 4 years old (Butler, 1991). Efficient mobility allows a student to conserve energy for instructional and social activities.

Considerations to Guide Movement Opportunities:
Durkin describes three stages of learning powered mobility: "learning the concept of movement, learning how to operate the machine, learning how to use powered mobility as part of everyday life style" (Durkin, 2009). The Assessment of Learning Powered mobility use (ALP) and Driving to Learn Program consider eight stages of learning with a child progressing from novice to expert. The ALP tool and facilitation strategies provide characteristics of each stage and suggestions for strategies to support learning at each stage (Nilson & Durkin, 2014). Field and Livingstone refer to these groups of learners as exploratory learners, operational learners, and functional learners (Field & Livingstone, 2018).

At all stages of learning it is important to be a responsive partner who "listens and times their interaction, adds information to help the child learn and, most importantly, allows the child to take the lead" (Durkin, 2009). Practice opportunities should be student led with limited adult prompts.

Dynamic systems theory and a perception action view of development suggest that learning a motor skill is influenced by a child's ability to act on their environment to achieve an outcome and requires active exploration. Through repeated practice opportunities with the correct tools, environment and support to allow success, movement patterns with a desirable outcome, as perceived by the student, will be reinforced (Rahlin et al.,2019). Motor learning research suggests using non generic feedback over generic feedback (Chiviacowsky & Drews, 2014), distributed practice over massed practice, random practice over blocked practice and whole practice over parts practice (Zwicker & Harris, 2009). Incorporating practice into daily activities maximizes practice opportunities to encourage transfer of skills (Levac et al., 2009). Using guided discovery when appropriate (ie. have student reflect on activity, review video of activity with student) encourages learning, motivation, self reflection and problem solving (Schoemaker & Smits-Engelsman, 2015).

Tools to Support Mobility:
Equipment used to support mobility includes: gait trainers, mobile standers, ultra light wheelchairs, Go Baby Go cars, power wheelchairs with joysticks or head array control, a variety of seating and positioning accessories, remote stops (wired and wireless), and low and high tech choice boards to work on directional and movement concepts.

Mobility devices for student trial have been purchased or donated. Items that students have outgrown or that are no longer needed are refurbished and used with other students. Manufacturers and suppliers provide demo devices and assist with maintenance of trial items. Area researchers, rehabilitation engineers and school community members (electrical engineers) have assisted with Go Baby Go car modifications. The Kids Equipment Network (TKEN) has been an invaluable resource in helping to obtain and maintain mobility devices for students. Funds have also been obtained through educational foundation grants.

Goals and Assessment:
Goals of a school mobility program range from providing an initial means of independent mobility for beginning exploration of cause and effect and tool use to providing a means of efficient and independent mobility in a large, busy school environment and in the community.

Tools used for planning and progress monitoring include subjective reporting from teachers and other school personnel, Assessment of Learning Powered mobility use (ALP) instrument and facilitating strategies, Power Mobility Indoor Driving Assessment (PIDA), Power Mobility Community Driving Assessment (PCDA), and the Wheelchair Skills Program and Wheelchair Skills Tests (WSTs). The School Functional Assessment (SFA), the Assessment of Functional Living Skills (AFLS), and the Functional Assessment and Curriculum for Teaching Everyday Routines (FACTER) are used to help define functionally relevant student goals to increase participation, i.e. "student will move in line with peers," "student will obtain

lunch from cafeteria service area and transport lunch to lunch table."

Interventions and Motivators:
Interventions and motivators are individualized based on the student's stage of learning and personal interests. Practice opportunities typically take place in familiar, safe spaces, as perceived by the student. Practice may occur indoors or outdoors, in wide open and uncluttered spaces or in busy and crowded spaces, depending on the student's needs. Whenever possible, practice occurs in the environment in which the skill will be used in daily activities. Motivators used include: scavenger hunts, hitting or following a ball, activating a switch operated door, traveling to preferred peers, achieving predetermined wheelchair skills to move spaces on a mobility skills game board, traveling to a urinal, driving to class without an adult, getting lunch.

During this instructional course, case studies will be shared to demonstrate how research in mobility and learning is put into action in the school setting using a variety of adapted mobility equipment and motivators with students at all stages of learning.

Conclusion

Students spend a large percentage of their time at school. School provides a familiar, safe controlled environment to encourage self directed mobility. Providing varied and differentiated mobility options for students supports student learning, participation and independence. TrueNorth804 therapists use a variety of mobility devices, motivators and assessment tools to support student mobility; considering stage of learning, importance of being a responsive partner, developmental theory and motor learning principles when planning mobility experiences. Relationships with families, educators, member districts, educational foundations, community organizations, manufacturers and suppliers have been instrumental in providing mobility experiences for students.

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Conflict of Interest

No conflicts have been disclosed.

IC32: Integrated Assistive Technology Features on Power Wheelchairs

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Learning objectives

1. List 3 assistive technology features available on power wheelchairs.
2. Identify at least 1 assistive technology feature that is unique to each manufacturer's power wheelchairs.
3. Identify each professional's role in education and application of power wheelchair electronics.

Introduction

Power wheelchair manufacturers readily incorporate technology that allows users to control their phones, computers, and environments via the wheelchair drive system. Although forms of this technology have been available for years (Cook & Polgar, 2015), these features are rarely employed. This underutilization is often due to a lack of education, awareness and/or comfort by clinicians and Assistive Technology Practitioners (ATP). Complex Rehab Technology (CRT) practitioners will benefit from learning how manufacturers have made this technology user friendly, gaining confidence in available features, and knowing when and how to introduce these features to users. This course will outline the assistive technologies integrated into power wheelchair electronics and highlight the unique features of four wheelchair manufacturers: Invacare, Permobil, Quantum, and Sunrise Medical. We will explore how these technologies interact with mobile devices, computers and environments.

The most common assistive technology (AT), features on power wheelchairs include infrared, Bluetooth and USB charging ports. Infrared technology provides the capability to wirelessly use the drive control of the chair as an Electronic Aid to Daily Living (Layton, J. 2005). Devices typically controlled with infrared include TV, lights and fans. Infrared requires both a transmitter and a receiver. The wheelchair generally serves as the transmitter, and the media, a TV for example, is the receiver. Infrared features such as menus, code storage, customizability and access to programming differ among manufacturers. Bluetooth is wireless technology that allows devices to communicate with one another. It works for short distances and does not require line of sight. Just as laptops can connect wirelessly to printers or mice, the wheelchair can connect wirelessly to phones, tablets, and computers.

Bluetooth technology is used for mouse emulation which allows a wheelchair user to simulate mouse control on their mobile device. Bluetooth is also used with iOS's "Switch Control", a scanning method that allows an individual to navigate their iPad and iPhone.

Mouse Emulation:
Mouse emulation is active in the Bluetooth mode and controlled through the wheelchair driving method. Joysticks (used at the hand or chin) are proportional in motion (providing a full 360 degrees of control), while non-proportional driving methods will move the cursor through four axes: up, down, left and right. While the driving method acts as the mouse and moves the cursor, there are several different methods to perform mouse clicks and these vary depending on the wheelchair manufacturer.

Switch Control:
Bluetooth is also used for Switch Control, a scanning option that allows someone who cannot tap a touch screen to access their iOS device via the wheelchair drive control. "Scanning is a method of access where items in the selection set are highlighted in turn" (Colven and Judge, 2006). The methods used to activate the Bluetooth switch through the wheelchair include nudges, external switches, tapping and dwell. These options are dependent upon the wheelchair manufacturer.

The USB charging port allows the user to charge a phone, tablet, or even some tablet-based speech generating devices. This can be considered a safety feature, ensuring that a user has the means to power their phone for emergency calls. There are two different styles of USB charging ports, affixed and portable. The affixed style is mounted on the wheelchair and connected directly to the wheelchair battery. The portable model plugs into the wheelchair charging port. The portable models are more reasonably priced than the affixed style. However, these need to be removed to charge the wheelchair. Please refer to the Wheelchair Manufacturer Comparison table (see Figure 1) to explore the integrated AT features from four major manufacturers.

Figure 1.

Wheelchair Manufacturer Comparison Chart

	Integrated vs External device required	Available on which models?	How many devices does it control?	Mouse - how to click	How to switch between devices	How to switch between modes
Permobil R-Net+	***Dependent on the input device selected:*** **Integrated:** PJSM/CJSM joystick OMNI2 Enhanced Display **External Module required:** LCD, LED, VR2 joysticks, Omni	**Model availability dependent on input device (see previous column):** F3, F5, F5 VS M3, M5 M300 Corpus HD M300 PS JR K300 PS JR Koala K450 M1	**Integrated:** BT Mouse Emulation: 2 Switch control: 2 IR: 30+ **External Module:** 1 device per module, separate modules for Mouse Emulation or Switch Control (iDevice)	**Integrated:** ▪ Input Nudge* (time/function is programmable) ▪ Assignable buttons (PJSM/CJSM only) ▪ iDevice and BT Mouse have programmable shortcut keys on PJSM/CJSM **External:** ▪ Nudge (programmable) ▪ Dedicated external switch	**Integrated:** ▪ BT Menu (Mode 3 for CJSM/PJSM, Mode 5 for OMNI2) **External:** ▪ Mode button ▪ Toggle with paddle ▪ External switch	**OMNI:** ▪ User menu: (Timeout to menu, sequence, standby select) ▪ External mode switch ▪ Soft key mode button **PJSM/CJSM:** ▪ Toggle with paddle ▪ External switch ▪ Assignable buttons/softkeys
Sunrise R-Net	***Dependent on the input device selected:*** **Integrated:** CJSM 2 JS (IR &BT) OMNI 1(IR Only) OMNI 2 (IR & BT) **External Module required:** CJSM1 LED OMNI 1	**Model availability dependent on input device** Q700M, Q500M, Q400M, QM-710, QM-715, QM-720, Pulse 5, Pulse 6 ZM310, S-636 , S-646SE P-222SE	**Integrated:** BT Mouse Emulation: 2 Android/PC Switch control: 2 IOS IR: 30+ **External Module:** 1 device per module Android/PC or IOS	**Integrated:** ▪ Input Nudge* (time is programmable) ▪ Assignable buttons available ▪ Specialty Inputs **External:** ▪ Input Nudge* (time is programmable) ▪ assignable buttons available ▪ Specialty Inputs ▪ Ctrl+S 1 and 2: 10 assignable buttons for each module for a total of 20.	**Integrated:** ▪ BT Menu (Mode 4) **External:** ▪ Mode button ▪ Toggle with paddle ▪ Timeout to standby ▪ Assignable buttons ▪ Specialty inputs	**CJSM 1-2 and LED:** ▪ Toggle (CJSM2) ▪ Mode Button ▪ Timeout to standby ▪ Assignable buttons **OMNI 1 & 2:** ▪ Mode switch ▪ User Menu (timeout to menu, sequence, standby select) ▪ External mode switch ▪ Assignable buttons ▪ Timeout to standby ▪ Specialty inputs **Ctrl+S 1 & 2:** 10x2 = 20 assignable buttons
Quantum Q-logic 3 Q-logic 2	BT included with enhanced display and expandable joystick (Both) Separate module for IR on joystick (may be upcharge) (Q-Logic 3 only)	Q-Logic 3 expandable joystick and enhanced display- Edge 3, Stretto, 4Front2, 4Front, Edge 2.0, Edge 2.0X, Edge Z, 1450, Edge HD J4 and J4 HD special order	(Q-Logic 3) Up to 16 devices (Q-Logic 3) Mouse Emulation: 8 devices (Q-Logic 3) Switch control: 8 devices	▪ Multiple options to toggle between screens (mouse mover and mouse clicks) Q3 ▪ Dwell Q3 ▪ Mechanical Switches Plugged into mode jack with Custom function setup	Q3 Only: 1. Mode switch to auxiliary mode or R command from home screen to aux. mode or custom programmable switch directly to BT screen q3	▪ Mode Switches (both) ▪ Standby select, then give desired command to select mode (both) ▪ Customized key buttons on joystick (both) ▪ Custom programmable switch (Q3)
		Bluetooth programming only available on the QLogic 3e Joystick QL@- Rival	(Q-Logic 2&3) IR: built in with enhanced display. Separate module if joystick only (Q-Logic 3)	▪ Customized key buttons on joystick both ▪ iAccess Module q3	2. Scroll to mouse/switch control, then R command to select 3. Scroll to desired device, then R command to select	
Invacare LINX Mk6i	Included in REM 400 and REM 500 Also available: ASL mouse emulator (additional cost)	SP2	BT: 10 total Switch control: 4 IR: not currently available BT and switch control require use of Tecla-e" Has IR	▪ Touch display screen ▪ Toggle keys ▪ Button press ▪ Mechanical switch	▪ Screen swipes ▪ Screen taps ▪ Switches ▪ Long press ▪ Short press ▪ "Force to function"	▪ Screen swipes ▪ Screen taps ▪ Switches ▪ Long press ▪ Short press ▪ "Force to function"

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Figure 1. Anterior

Switches:
Switches are a core component of accessing assistive technology. When selected and placed properly, switches can open worlds of access to speech generating devices, EADLs, computers and mobile devices (Ablenet, www.ablenet-inc.com). External switches can be used for a variety of functions on a wheelchair. Some examples include powering the wheelchair, changing modes, completing mouse clicks, and quick options for answering a phone. There are a variety of switches available. Switch categories include:

- Mechanical — requiring an application of force (ex. Ablenet Buddy Button).
- Fiber optic — interrupting a light beam that is emitted (ex. ASL Fiber Optic).
- Proximity — detection of movement through an electromagnetic field (ex. Ablenet Candy Corn Proximity Sensor Switch).
- Pneumatic —detection of airflow or air pressure (ex. Enabling Devices "sip and puff"). Exploring switch access points should be performed by a skilled therapist and/or an ATP, as there are a variety of factors to consider.

It is important to understand the Wheelchair Service Provision Process as outlined by RESNA. The wheelchair service delivery model includes multiple steps (Arledge et al, 2011). While all areas of the Wheelchair Service Provision Process are important, the most significant when considering AT control include:

ASSESSMENT–The information obtained in the assessment should be used to identify appropriate equipment goals and selection. It is important to take into consideration safety, use of technology, and how activities of daily living are performed.

EQUIPMENT RECOMMENDATION AND SELECTION–It is important to educate the user in all the Assistive Technology features, regardless of the available insurance coverage. When appropriate, it is helpful to have the user try the Assistive Technology incorporated on the chair.

FITTING, TRAINING AND DELIVERY-Once the wheelchair arrives, it should be fitted and programmed to meet the user's needs. This includes setting up and programming

Figure 2.

Figure 3.

the AT control. Proper setup and education will optimize functional benefits and improve the user's safety and independence.

Remember that this process requires a team approach. There are numerous professionals involved in the wheelchair evaluation, ordering, fitting, and training processes. Specifics are dependent upon the care setting and how roles are delineated within the organization. Key players include therapists, suppliers, manufacturers, clinical educators and end users.

There may be facilities without a dedicated seating clinic, where ATPs are not available, or which are located in a rural area with limited staffing. In these situations, it is even more important for clinicians to be informed and to act as an advocate for the patient. Use available resources, such as building relationships with the wheelchair representatives and clinical educators. Ask questions and pursue new knowledge to ensure the users are educated on the wheelchair AT features.

Conclusion

With technology constantly evolving, it is imperative that clinicians stay abreast of changes and innovations in the AT features available on the power wheelchairs. Promoting education and awareness of the assistive technology features for wheelchair users provides the opportunity to increase independence and improve quality of life. As stated by one of the pioneering advocates of technology for people with disabilities: "For most people, technology makes things easier. For people with disabilities, however, technology makes things possible" (Mary Pat Radabaugh).

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Additional Learning Resources

1. INVACARE: Invacare Technical Support 800-333-6900 Adaptive Switch Labs: 800-626-8698 www.ASL-inc.com
2. PERMOBIL: Phone: 800-736-0925 Email: tech.support@Permobil.com
3. QUANTUM: Phone: 1-833-745-3835 (Ask for "Quantum Tech Support"; then option #1)

SUNRISE: Phone: 800-456-8168 (Sunrise Medical Technical Support)
MISCELLANEOUS: https://craighospital.org/services/assistive-technology/assistive-tech-lab-resources www.atilange.com https://support.apple.com/en-us/HT201370

Conflict of Interest

Leah Barid and Jill Baldessari have no conflict of interest. Representatives from 4 wheelchair manufacturers represent the products and interests of their respective brands

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IC33: Introducing CVT+: Using Images to Improve Complex Rehab Technology Outcomes When Using Clinical Video Telehealth

Steven J. Mitchell, OTR/L, ATP

Learning objectives

1. List 3 areas of specialized expertise that must be available to effectively prescribe & provide "SCI/D CRT".
2. Give 2 reasons why it can be difficult to assess positioning or view details of a configuration over streaming video.
3. List 3 reasons why adding the capability to share images dramatically improves the effectiveness of telehealth.

Introduction

Successful outcomes for Complex Rehab Technology (CRT) require an accurate understanding of the user, their problems, products, and effective configurations. For people living with Spinal Cord Injuries & Disorders (SCI/D), how we configure a CRT product can be just as important as the product itself. If clinicians are going to use telehealth to effectively provide "SCI/D CRT", they will need to discern a level of detail that streaming video will seldom provide. Finding a way to upload images, so that clinicians can view them in real-time, is not just a best practice, it is a "must practice" for those hoping to use telehealth effectively to provide SCI/D CRT. This article introduces the concept of "CVT+" and demonstrates how adding the capability to simultaneously share images during a session can dramatically improve the effectiveness of telehealth during complex rehab service provision.

I am an occupational therapist who works at one of the VA's 25 Spinal Cord Injuries & Disorders Centers. I oversee the prescription, configuration, and provision of any Complex Rehab Technology (CRT) prescribed by our SCI/D service. The veterans I follow come from Ohio and surrounding states and have a diagnosis of SCI, ALS, or advanced MS. Because most will be full-time users with complex needs, we tend to prescribe mostly high-end products. In this paper, I will refer to these products as "SCI/D CRT". Clinicians who prescribe SCI/D CRT in the VA have a unique job that has no private sector equivalent. While we may not have the same reimbursement constraints as other settings, most VA's do use CRT suppliers for the technology-related component of service delivery. As a result, many of us acquire any additional product expertise or technical skill sets we may need to provide a configuration that will achieve our outcome.

Because the configuration is so inextricably linked to the outcome, I firmly believe that clinicians need to "own" the configuration of any SCI/D CRT that they prescribe. To do this, their service delivery model should reflect a clinician-driven process where it is the therapist's responsibility to ensure that the clinical, product, and technical skill sets needed to achieve their outcome are in place. This holds true regardless of whether a service is to be provided virtually or in-person.

As the largest provider of telehealth in the country, VA considers these services to be mission-critical to their future direction of care. As such, I have spent years trying to find a way that I could use telehealth and still get the outcomes that I achieve in the clinic. Unfortunately, pixelation of the video stream usually kept me from discerning the level of detail I needed to make an accurate assessment of the user's positioning or view key aspects of their configuration. While I suspected that sharing images could solve this problem, none of our approved applications allowed me to do this. As a result, over 95% of our veterans returned to the clinic for their fitting and training. While this increased the time, expense, and inconvenience associated with providing our equipment, I really saw no other way to ensure that the SCI/D CRT we prescribed actually provided the expected outcome for the user.

In March of 2020, however, COVID-19 brought our ability to perform in-person fittings to an abrupt halt. Because telehealth had become our only viable option, I had serious doubts that we could effectively provide some of the more complex powerchairs that were now sitting in my clinic. That all changed when I received an email informing us that leadership had temporarily authorized the use of "mainstream" videoconferencing applications for telehealth. This gave me the opportunity to finally try something I had wanted to do for years--combine the ability to share images with conventional clinical video telehealth. I refer to this concept as "CVT+".

I approached Health Aid of Ohio (our DME suppler) about the prospect of implementing a program that used CVT+ to perform complex fittings in veteran's homes. They enthusiastically agreed and submitted a proposal to our Prosthetics and Sensory Aids Service for approval. They designated specific staff for me to work with, agreed to follow an enhanced infection control protocol, and provided a couple of 4G iPads for us to use. It may have taken a pandemic, but the concept of CVT+ had gone from theory into practice in a matter of days.

CVT+ combines synchronous video telehealth with a separate capability to share images during the session. Here's how it works. Instead of relying on a single pixelated video stream as the only source of information, CVT+ provides two separate "feeds" that that the clinician can view simultaneously on different devices. Initially, Zoom was used to provide the video component and a shared private directory was created in Dropbox for uploading images.

An iPad placed on a tripod inside the home serves as a "big picture" feed that provides a stationary view of events and facilitates face-to-face interaction.

One of Health Aid's iPhones provides the second, more portable, "detail feed". This feed allows the clinician to view something specific, in limited detail, on the clinical iPad. During the fitting, the clinician uses the detail feed to perform a basic assessment of the user's positioning and gauge the effectiveness of any adjustments. Once all the fitting tasks are completed, this feed is used to assess the client's ability to use their chair in different environments and activities.

When the clinician needs to see something in a greater level of detail, they simply ask for an image. In less than a minute,

they will be able to view a high-resolution image on their cell phone that provides a remarkable amount of detail. Using the "pinch & zoom" functionality of their touch screen, it may be possible to see an even greater level of detail than they would see in-person. Not only are images far less pixelated than streaming video, they are less affected by the types of suboptimal lighting conditions that frequently exist in many homes.

The Four Key Views: A Protocol to Establish a Baseline and Develop a Game Plan

As soon as the user has been transferred into their new chair, images are obtained from four "key views" and uploaded to the image directory for the clinician to examine. These images are taken directly from the front, rear, and joystick side of the chair. The fourth image is also taken from the side, but with the seat fully tilted, to assess the influence of gravity on the user's posture, positioning, and function.

An experienced clinician who has the opportunity to view these images will know many of the issues they will need to address before they've viewed a single frame of video. The ability to identify the issues in advance and develop a game plan to address them is an enormous benefit of using CVT+. Obtaining a second set of key views at the end of the session provides an objective measure of the effectiveness of any adjustments.

Unlike streaming video, images in the directory can be accessed in the future. For example, the four key views may be useful to the clinician who is attempting to monitor the rate of disease progression, destructive postural tendencies, or age-associated changes. Any images that show specific details of a configuration can be extremely useful if having to restore a complex configuration following a repair or when troubleshooting issues in the field.

While CVT+ provides a high level of visual detail, problems caused by force, pressure, or shear may go undetected if the clinician relies solely on visual information to make their assessment. For this reason, any seating/wheeled mobility intervention provided over telehealth should include protocols that specifically check for these issues.

Conclusion

It's been said that "desperate times call for drastic measures". During the first few months of this pandemic, drastic measures were in order. At the same time, it must be recognized that a drastic measure will seldom yield the same result as the "best practice" that it replaced. For me, the ability to share images using CVT+ has transformed telehealth from something that I couldn't use reliably into an effective alternative for some clinical CRT services. While it took a pandemic to be able to implement it, I hope to expand its use long after the pandemic has ended. CVT+ will not replace every type of in-person clinical CRT intervention, but I firmly believe that in some circumstances it's use could result in superior SCI/D CRT outcomes at a significantly less cost than is currently the case.

This will only take place if clinicians are willing to own their outcomes, direct the process, coordinate skill sets, and realize that the key to big picture success lies in their ability to effectively execute the details. While CVT+ can ensure that the clinician is able to see the details when they use clinical video telehealth, the rest will be up to them.

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Conflict of Interest

Steven J. Mitchell, OTR/L, ATP has no financial or non-financial interests to disclose. The discussion of specific products in this presentation does not imply they are in any way endorsed by the presenter, the Cleveland VA SCI/D Service, or the Department of Veterans Affairs.

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IC34: The Development of a Competency-Based Framework for Wheeled Mobility & Postural Management Assessors in New Zealand

Liz Turnbull, OT

Learning objectives

1. Describe the background to the competency based framework used by the ministry of health in new zealand for wheeled mobility and postural management assessors.
2. Explain how clinical reasoning can be incorporated into assessment forms used by wheelchair services for the purposes of providing mentoring for less experienced therapists.
3. Describe the use of a case study submission for therapists applying for the level 2 (complex) credential.

In August 2010, the New Zealand Ministry of Health, Disability Support Services, introduced a competency based credentialing framework for therapists assessing and prescribing equipment for people with wheeled mobility and postural management needs. This came from recommendations made in the Disability Resource Centre (DRC) report commissioned by the Ministry of Health (2005) Environmental Support Services Review and Framework Plan. Summary Report: August 2005 which identified a number of opportunities to improve the way in which services are delivered. Specific findings which are relevant to this presentation included:

- The (then) current Accredited Assessors Scheme lacked competency based standards
- Competence of assessors was variable
- Assessor training was inconsistent and lacked structure
- The professional standards monitoring role was not well implemented This session will outline the background and pathway from the DRC report to the implementation, in 2010, of the Competency Framework for Wheeled Mobility and Postural Management assessors, the rationale for refinements of the case study requirements for therapists applying for the Level 2 (Complex) credential, and key learnings along the way from the presenter's perspective.

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IC35: A Delphi Study to Develop Evidence-Based Guidelines for the Introduction of the Permobil Explorer Mini

Heather A. Feldner, PhD, PT, PCS
Teresa Plummer, PhD, OTR/L, ATP, CEAS, CAPS
Alyson Hendry, CCC-SLP

Learning objectives

1. Discuss two reasons that more rigorous approaches to powered mobility introduction for infants are beneficial to clin
2. Compare and contrast the Delphi study consensus outcomes for prioritizing content in an evidence-based guideline.
3. Identify one way in which an evidence-based guideline for the introduction of powered mobility for infants can support.

Introduction

Supporting the emerging mobility and exploration of infants and toddlers with motor impairments is critical. Both theory and evidence continue to grow in defining powered mobility learner profiles and learning stages, developing training tools that facilitate driving skills, and ultimately bolstering the application of pediatric powered mobility devices in this population. However, there remains little standardization of how to introduce powered mobility to infants in an exploratory stage of learning in a safe and structured manner. With the recent introduction and FDA approval of the Permobil Explorer Mini powered mobility device for children ages 12-36 months, a unique opportunity arose to contribute to this burgeoning field.

Background:
5.1% of children ages 0-14 globally, have mobility delays and it is estimated that only 0.2% of these children have access to a powered mobility device. Self-directed mobility allows children to independently explore their environment influencing all aspects of development. Power mobility for children with mobility impairments has been shown to have positive impacts on the child's cognition, language development, visual skills, socioemotional development, use of hands and arms, as well as overall increased independence and participation in daily life. Researchers continue to develop novel approaches to overcome the challenges of producing high quality evidence related to powered mobility, but more research is needed to justify and promote access to devices and services to a greater extent. The development of a systematic, evidence-based guideline for introducing powered mobility to infants may:

- Improve access to mobility as part of multi-modal early intervention
- Help ensure continued development of best practice and evidence to support shared decision making
- Provide reproducible, repetitive, and reliable training guidelines to facilitate learning across contexts
- Be used in conjunction with existing and emerging powered mobility outcomes measures to determine intervention effectiveness
- Allow for future grant funded research and multi-site studies to maximize self-initiated mobility and exploration outcomes for young children with disabilities.

Purpose:
The purpose of the project described in this session was to develop a comprehensive, user-centered guideline for the introduction of the Permobil Explorer Mini that combines the evidence within powered mobility and early development literature with the expertise of pediatric rehabilitation professionals (PT, OT, SLP) and caregivers of infants and toddlers with motor impairments. We focus here on a consensus study involving these stakeholders to define and prioritize critical elements necessary to introduce powered mobility to children 12-36 months of age.

Methods:
We conducted a Delphi study consisting of three rounds. The first round provided open-ended questions about critical elements and learning strategies to include in the introduction of powered mobility to infants and toddlers across cognitive, communication, motor skill, and adaptive behavior domains. After consolidating these elements and refining them into a series of statements regarding the importance of the particular strategy, element, or behavior, categorical listings were presented to participants in the second round to determine the level of agreement for the importance of (and thus the inclusion of) each item in the guide, with a consensus level set at 75%. Participants noted their agreement or disagreement for each statement, and were also provided an open-ended opportunity to address other categories or strategies that they felt were not represented within each listing. Following analysis of levels of agreement for each statement, and a critical evidence appraisal to determine evidence in the literature to support essential statements, they were incorporated into a draft guide. The draft guide and a list of statements that achieved greater than or equal to 75% consensus were presented for review to the participants for the third round of the Delphi Study. Participants were asked to verify that all statements that achieved consensus were included in the draft guide, and also provided open-ended feedback about the overall structure and content of the guide, which was used for further refinement by the research team.

Results:
We recruited 40 stakeholders to participate in the study across the US (n=26), Australia (n=5), New Zealand (n=4), Israel (n=2), Ireland (n=2,) and Sweden (n=1). Of these, 18 were occupational therapists, 12 were physical therapists, seven were Speech-Language Pathologists, and three were caregivers. There were 56 Essential Features of Powered Mobility Training for Infants 12-36 months that achieved consensus. The research team incorporated over 140 peer-reviewed articles across disciplines as evidence to support the identified statements. Some example Essential Features included categories such as: Ensuring Family Centered Practice, De-Emphasizing 'Readiness' in favor of Exploration, Supporting Co-Emergence of Mobility and Language/Communication, and Tailoring Training Activities Based on Learning Stage, Phase, or Type.

Discussion:
Both evidence in the literature and expert consensus support the application of powered mobility for infants with disabilities. It is important to consider environmental exploration, agency, and socialization as well as mobility as critical outcomes when considering the application of powered mobility in infants 12-36 months old. The results of this study suggest that a family centered approach to introducing powered mobility to infants is essential. Careful consideration and intention should also be considered with language expression and comprehension when giving instruction to infants. Developmentally appropriate, play-based intervention is a necessary component for powered mobility interventions for infants. Further, clinicians and caregivers agreed that there is a critical period of time for developmental milestones to provide for a strong foundation for future participation.

Importantly, consensus statements included both what was important for successful introduction of power, as well as what was not essential for success. Further, not all statements that achieved consensus were found to have empirical evidence that supported it. In these cases, it is noted in the guide that there is a lack of conclusive evidence currently in the literature despite reaching consensus by clinicians and caregivers. It is clear that further research is needed to ensure continued access to meaningful mobility technologies for infants and toddlers.

Conclusion
Improving the rigor by which powered mobility interventions are introduced is an important step to enhance measurable clinical and research outcomes and maximize access to mobility opportunities at critical developmental periods. The forthcoming, evidence-based guideline document may be used by stakeholders to systematically approach the introduction of the Explorer Mini in particular, as well as other pediatric powered mobility devices.

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Conflict of Interest

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IC36: Functional Mobility Assessment Registry Data Updates

Mark Schmeler, ATP, OTR/L
Greg Packer, MBA
Richard Schein, PhD, MPH
Tyler Mahncke

Learning objectives

1. Identify two reasons why the field needs a mobility registry
2. Discuss the 10 items and scoring of the Functional Mobility Assessment (FMA) and elements of the associated database
3. List three elements of the associated FMA Database/ UDS Registry

Standardized outcome measures and associated datasets are necessary to improve evidence and accountability in the field of mobility assistive equipment. This session will present updated developments in the Functional Mobility Assessment (FMA) / Uniform Data Set (UDS) registry. Challenges and strategies associated with the implementation of standardized measures in clinical routine and associated data collection, aggregation, and analyses will be discussed.

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PS04.1: Development of a custom, flexible force sensor to detect patient position and movement in a wheelchair

Robert Podoloff

Learning objectives

1. Participants will learn the process for developing a custom sensor including the design and configuration process.
2. Participants will understand pressure distribution patterns in a wheelchair during common patient movements.
3. Participants will understand essential insights to consider when using a pressure measurement system for evaluating p

Introduction

In an attempt to alleviate the formation of pressure ulcers in wheelchair-bound patients, researchers at a major university conceptualized a product based on tactile sensors and a mobile phone application that could warn the user of potentially dangerous pressure concentration situations. This paper outlines the steps taken to develop the sensors required for this application.

This presentation will review the process used by a major research university to develop a custom tactile sensor for use in detecting the position and relative motion of a person in a wheelchair. Starting with an off-the-shelf seating analysis system, the project began by examining the pressure distribution patterns experienced by several subjects during several common patient movements. Once the areas of most interest were identified, mockups of a custom sensor configuration were constructed using a series of standard single cell force sensors. This configuration was then used to refine the system electronics and validate the intended sensing cell locations. With the size, sensitivity and final locations determined from the mockups, the custom sensor configuration was then designed and printed. The presentation will include a live demonstration of both the analysis system used to inform the design process as well as the final custom sensor.

Conclusion

Off the shelf tactile measurement systems can be easily used to investigate the complex interactions between a human body and a supporting surface. The ability of the software to create “virtual sensors” allows the researcher to examine an unlimited variety of potential configurations, resulting in the simplest and most cost effective solution for a potential mass market product.

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Conflict of Interest

The presenter is the CTO of Tekscan, Inc. the maker of one type of tactile measurement system.

Contact Information

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PS04.2: The Effects of Aging on Wheelchair Seat Cushions of Various Material Constructs

Patricia Karg
David Brienza
Alexandra Delazio
Amanda Manko

Learning objectives

1. Describe 3 categories of seat cushion material constructs
2. Describe the 4 components of the minimal method for simulated aging
3. Describe 6 cushion performance characterization tests

Introduction

n/a - requested a poster presentation

Over time, wheelchair cushions experience degradation of mechanical properties which inhibits their ability to properly support the buttocks and distribute pressure, thus leading to increased risk of pressure injuries. The RESNA WC-3 seating standards specify performance tests used to characterize changes in cushion properties pre and post simulated aging. These tests include loaded contour depth (immersion), impact damping, hysteresis, 10% force deflection, horizontal stiffness, and sliding resistance. The minimum method for simulated aging involves laundering and disinfection, cyclic loading, and accelerated heat aging. The combined procedures are estimated to simulate approximately 18-24 months of use.

This study evaluated 3 common cushions (foam, air, and foam-fluid) before and after simulated aging to determine how aging affected each construct. The foam cushion saw consistent decreases in performance across the metrics post aging. The air cushion had decreased performance in all metrics except sliding resistance. The foam-fluid cushion had decreased performance in all metrics except hysteresis, which could be due to gel displacement, and loaded contour depth, which could be due to bottoming out.

The minimum simulated aging protocol in the RESNA standard had a clear effect on cushion performance characteristics within different material constructs. Continued testing is underway to assess the lifespan of a cushion with continued aging.

Conclusion

n/a - please note that this paper was requested to be changed to a poster presentation and the presenter changed to Patricia Karg

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Additional Learning Resources

For more information about the initiatives and mission of the University of Pittsburgh Wheelchair and Cushion Standards Group created by our NIDILLR funded Rehabilitation Engineering Research Center on Wheelchair and Cushion Standards please visit the website, www.wheelchairstandards.pitt.edu, and follow the Wheelchair & Cushion Standards Group on LinkedIn.

Acknowledgments

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Conflict of Interest

No conflicts have been disclosed.

Contact Information

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PS04.3: Development of the high-performance low-cost personalized modular SquishINS cushion for value-driven pressure relief

Kath M Bogie, D.Phil
Joseph Lerchbacker, BS
Steven J Mitchell, OTR/L, ATP
Mary Ann Richmond, MD

Learning objectives

1. Describe the use of value-driven engineering principles in a high performance low cost wheelchair cushion
2. Discuss the advantages of an effective personalized high-performance pressure relief cushion
3. Discuss the advantages of a modular cushion, for which parts can be replaced.

Introduction

The wheelchair cushion plays an essential role in maintaining quality of life for wheelchair users, providing sitting stability while decreasing skin breakdown risk and increasing overall sitting tolerance. The World Health Organization Global Cooperation on Assistive Technology mission states that access to high quality affordable assistive products enables the individual with disability to lead a healthy, productive and dignified life. High-performance seating technologies are usually expensive, placing them beyond the budget of many who need effective pressure relief. Due to high direct cost, many individuals considered to be at mild to moderate risk for tissue breakdown don't get advanced pressure relief cushions until they develop pressure injuries. Value driven engineering (VdE) seeks to provide effective high performance at greatly reduced cost.

Literature review:
A wide range of pressure relief cushions are available and are generally classified as foam, viscoelastic foam, gel or air ('flotation') based. Cushions may contain combinations of materials, such as gel under high pressure regions of the ischial tuberosities and foam elsewhere. 'High performance' pressure relief cushions used by individuals at high risk of pressure injury development often employ specialized foams and gels. The materials used in these commercial cushions designed for high-risk individuals were developed 15-35 years ago, specifically for specialized application in seating cushions. These materials were, and remain, expensive due to relatively low volume production. Costs are passed on in the high overall cost of a high-performance pressure relief cushion; which is typically $300 or more. The critical pressure-relieving components of the two leading systems are either interconnected or single component. These cushions have provided effective pressure relief for many users. However, the high cost limits their universal provision for all wheelchair users.

We previously identified a range of novel dynamically responsive materials developed for the non-medical market and suitable for use in seating assistive technology. Polymeric spheres filled with gel or air have become widely available, principally as toys with no specific function. These materials are produced in very high volume making them available at a correspondingly low cost. The high viscoelastic deformability and low thermal coefficient of these polymeric balls indicated that they are also ideally suited for use in a modular seating support system. The exterior of these polymeric balls is both waterproof and washable. These materials characteristics meet several of the basic design criteria for a high-performance wheelchair cushion.

Our preliminary work found that these materials can provide the same, or superior, pressure relief characteristics in an advanced seating support device at a significantly reduced cost [Freeto, 2015, Freeto et al, 2018]. However, there remains a need to further investigate the concept that dynamically responsive materials can be incorporated into a VdE modular cushion designed to provide both pressure relief and postural stability.

Purpose:
The overall purpose of the study was to develop a modular wheelchair cushion using value-driven engineering principles to provide effective personalized high-performance pressure relief at low cost. Manufacturing principles include using techniques that are readily translatable for the home user.

Methods:
SquishINS inserts are additively manufactured using modified low cost desktop Lulzbot printers. Each class of SquishINS has varying inner structures which alter stiffness by up to 40%. Mechanical properties are evaluated using ISO 16840-2 benchmarking test protocols;

1. Load/displacement compression testing of individual SquishINS over a force range relevant to seating.
2. Creep testing to determine how SquishINS respond to loading applied continuously for an hour
3. Hysteresis testing determines the role of adding and removing seating loads
4. Overload recovery testing determines the cushion's response to excessive localized pressure.
5. Temperature and humidity under load over time have been tested using a standardized Sitting Microenvironment simulator.

Results:
SquishINS inserts were additively manufactured with varying inner structures that combine lightness and variable stiffness. The dynamically responsive SquishINS are light, ensuring the SquishINS cushion is suitable for manual wheelchair users as well as power wheelchair users.

1. Load/displacement testing showed that there was a maximum 7mm compression at the highest load tested for the softest SquishINS.
2. Creep testing showed that after initial compression there was less than 1mm change in SquishINS under sustained loading.

3. Hysteresis testing showed that displacement under maximum load was less for the denser SquishINS, which showed no hysteresis under cyclic loading. The lighter SquishINS displaced more under load, which implies better spread under loads due to seating. However, there was also some sustained displacement following cyclic loading.
4. Overload recovery testing showed that SquishINS cushions recovered at least 99% of the original height after 20 minutes of overloading to 500N. Similar results were obtained with all classes of SquishINS.
5. Microenvironmental testing indicates that the SquishINS cushion has low moisture and temperature levels at the user/cushion interface

Discussion:
Modularity allows customization of the SquishINS cushion for each user using a patented cushion fitting algorithm [Bogie and Freeto, 2020] which optimizes pressure distribution over the cushion surface; the SquishINS inserts are adjusted for the user's unique anatomy and their seating system configuration. Replacing individual SquishINS as needed enables increased overall cushion durability. ISO 16480-2 standards testing indicates that the modular cushion performs better than, or equivalent to, the most widely prescribed high-performance cushions. The thermal conductivity characteristics of the cushion support a microenvironment with low moisture and temperature levels [Freeto et al, 2016, Freeto et al, 2018].

Conclusion

The unique modular design of the *Squish*INS cushion enables low-cost customization and high performance to provide effective personalized distribution over the cushion surface by adjusting to the user's unique anatomy. The *Squish*INS cushion uses an array of highly deformable, dynamically responsive and lightweight additively manufactured inserts. The *Squish*INS high-quality affordable cushion breaks the link between performance and cost for advanced personalized seating systems. *Squish*INS cushions are suitable for all wheelchair users.

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Conflict of Interest

Dr. Bogie is co-inventor (with Tyler Freeto) on U.S. Patent: US10653573B2 *Fitting System & Method for Modular Pressure Relief Cushion.* Issued May 19th 2020.

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Tuesday
February 1, 2022

IC37: Dominican Republic Wheelchair Sector Policies and Practice: Successes, Challenges and Opportunities

Alba Polanco, MS
Maria Luisa Toro Hernandez, PhD
Mary Goldberg, PhD

Learning objectives

1. Describe 3 major recent positive policy changes in the Dominican Republic's wheelchair sector
2. Relate the DR wheelchair sector current opportunities with those in your context
3. Identify one area for potential rapid and sustainable wheelchair sector development in the DR

Introduction

The Dominican Republic (D.R.) has a population of 10.7 million, of which 12% of the people live with a disability, and more than 400,000 people have a mobility impairment.

The D.R has ratified The Convention on the Rights of Persons with Disabilities (2009) and Inter-American Convention for the Elimination of All Forms of Discrimination Against Persons with Disabilities (2001). National legislation (Law 5-13) ensures access to assistive technology and makes the government responsible for this provision.

The National Disability Council (CONADIS) leads and oversees that public policies are inclusive of persons with disabilities. By law, CONADIS is responsible for final approval of AT needs. The Ministry of Health is responsible for rehabilitation services and while it has nationwide coverage, public rehabilitation services are scarce. However, the D.R. has implemented recent policies related to wheelchair service provision which provides a growth opportunity in the sector.

Wheelchair Service Provision Background

The provision of wheelchairs in the Dominican Republic has historically relied on imported wheelchairs that are either donated by international organizations or bought from local vendors to donate to the user. The most common wheelchairs provided are standard, active and All Terrain models by the Church of Jesus Christ of Latter-day Saints (LDS). International organizations such as Walkabout, Propel, Joni and Friends are the major providers of special wheelchairs. These organizations come to D.R. for one week per year, and in some cases provide training with and to local professionals. However, proper follow up is not always guaranteed. There is only one locally manufactured wheelchair—an all terrain—that costs approximately US$430 (figure 1) This type of wheelchair is frequently donated through donor partnerships.

Figure 1. Example of D.R. locally manufactured wheelchair

Note. Source: adr.org.do

Wheelchairs are exempt from importation taxes for NGOs, people with disabilities, and companies led by people with disabilities (Organic Law for the Rights of Persons with Disability, 2013).

Personnel

Some professionals involved in service provision have received basic training, and to a lesser extent, intermediate (as defined by the World Health Organization) training. However, wheelchair provision personnel guidelines are lacking and most of the people trained are located in the capital city. Since 2016, peer-led independent living workshops have been implemented by CONADIS to promote independence and train on wheelchair skills. Although these workshops are not directly related to the wheelchair provision process, participants may be able to obtain a new wheelchair through this mechanism. In 2019, two versions of this workshop were held for rehabilitation professionals, including physicians, occupational therapists, and physical therapists. Only 2 universities have a rehabilitation school and wheelchair training is only included as part of one course. Donations imply that wheelchair availability depends on donor stock and is perceived as a charity issue instead of a human right. This also suggests that provision often occurs outside of or with little involvement from the health system. Other implementation challenges include little awareness of wheelchair service and product standards within professionals and users, limited options regarding maintenance and follow up, and lack of quality product standards. Recent Policies In October 2019, the National Social Security Council approved the inclusion of manual wheelchairs, pressure relief cushions, and special strollers for people with permanent disability, as certified by CONADIS, in all health insurance schemes. The funding cap for these products is approximately US $430 (CNSS, 2019). This cap might be insufficient to cover the cost of a broad variety of manual wheelchairs and strollers. Special Strollers are only approved for children with a cerebral palsy diagnosis. Wheelchairs may be changed every 5 years or before if authorized by CONADIS. The approval of this resolution provided an opportunity to tackle the system challenges and to implement new policies while defining this new process. Three initial steps were implemented towards the operationalization of the resolution including creation of product type definitions, awareness raising stakeholder workshops, and development and publication of standard operating procedures (see Figure 2). It was also determined that CONADIS would develop a mandatory certification process for vendors personnel, to

guarantee a proper fit to user. However, this step is yet to be developed.

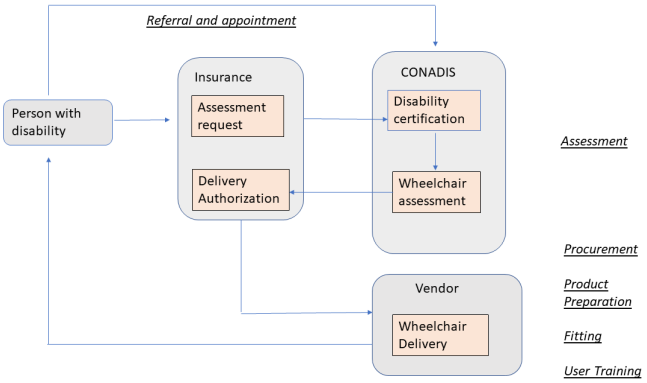

Figure 2. D.R. Insurance Wheelchair Provision Process

Users were informed about this new process through newspaper press releases and stakeholder webpages such as CONADIS and DIDA (insurance affiliates rights advocates). At the same time, three capacity building initiatives were initiated including 1) training and 2) certification of local personnel by the International Society of Wheelchair Professionals and financially supported by the Pan-American Health Organization (PAHO), and 3) training of trainer trainings. Participants were selected by CONADIS considering territoriality, wheelchair service provision involvement, including community leaders, stakeholder representatives, rehabilitation professionals and academia. Last, but not least, ISO 7176 (part 8) related to "Requirements and test methods for static, impact and fatigue strengths", was reviewed by an intersectoral committee led by INDOCAL (the local ISO member) and is now waiting for public survey (INDOCAL, 2021). COVID-19 pandemic and the election process in the country followed by a government change has limited implementation and follow up of these initiatives. As July 2021, only one (1) wheelchair has been delivered following this process (as informed by public information office). The Assistive Technology Capacity Assessment (ATA-C) was conducted by the Ministry of Public Health with technical assistance from PAHO. This assessment provides a high-level picture of the capacity that the country has to regulate, finance, procure, and provide assistive technology. At the time of the submission of this paper, the ATA-C report was not public yet.

Future work required to develop the DR national capacity for appropriate wheelchair provision might include:

- Technical support to develop and implement product and service standards.
- Partnerships that facilitate access to users who cannot afford the copayment or need more expensive wheelchairs.
- Design of a system that ensures proper procurement, follow up and maintenance of products.
- Strengthen university wheelchair curricula and intermediate training of professionals currently delivering wheelchairs.
- Development of an information system.

Conclusion

The D.R. has historically relied on a limited variety of donated wheelchairs with some personnel trained at a basic level. Quality wheelchair provision, as aligned with the WHO service provision steps, is limited and not formally integrated within the health system, creating difficulties for follow up, proper fit and assessment of complex cases. The inclusion of wheelchairs and special strollers in the insurance scheme in October 2019 motivated a series of actions to strengthen the system. This included developing the process, increasing awareness of stakeholders, improving capacity, and discussing ISO 7176 part 8. COVID- 19 and political changes limited progress, however, the upcoming ATA-C report may provide an opportunity to develop a subsequent action plan for wheelchair policies and practices. Additional international providers and manufacturers may also support the strengthening of the D.R. Wheelchair sector.

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Conflict of Interest

Authors report no conflict of interest.

Contact Information

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IC38: Exploring Alternative Drive Controls for Clients with Advanced Neuromuscular Diseases

David Miller, OTR/L, ATP/SMS
Peter Rubino, COTA/ATP

Learning objectives

1. Identify at least three vital components needed when assessing end user needs with advanced access controls.
2. Identify at least two ways using eye gaze and blue tooth technology control to operate power wheelchair.
3. Describe at least three strategies to optimize patient success when assessing eye gaze and blue tooth driver controls.

Introduction

We are faced with increased pressure in clinics on productivity and shortened face to face time with our patients. This is especially challenging in determining alternative drive controls with end users with limited, inconsistent fine or gross motor movements. This session introduces unique alternative driver controls to clients with advanced stage neuromuscular diseases, such as ALS with minimal access sites to operate eye gaze and blue tooth driver control technologies that have allowed this client population to maintain independent mobility when other solutions have no longer worked. Will review considerations when assessing these types of controls based on patient's goals, physical and cognitive limitations, power wheelchair electronic integration, programming strategies, funding, and critical caregiver/supplier support which are crucial to having a successful outcome.

Evaluation Process:
Many elements are addressed when deciding on a power mobility base, seating, and deciding an appropriate driver control method. Evaluating end users with progressive diseases can be challenging to determining how to plan ahead and how your equipment will adapt to them as we look "beyond the standard joystick." Having an integrated team of clinicians and resourceful ATP can assist in the intake interview process with the patient/end user to gather as much critical information on hand for best clinical practice. Getting as much information ahead of time makes for a more productive intervention and better preparation for demo equipment for the appointment. Sensitive topics might be uncomfortable to discuss patient and caregiver, but it is important to acknowledge patient's goals to lengthen function.

Considerations:
During an intervention, various primary and secondary support surfaces should be evaluated in order to determine what achieves optimal postural alignment and stability while conserving the client's function. In addition to postural components, the need for power seat functions (both for pressure relief and function) is also commonly considered with when looking at power seat functions, the way in which a change in position effects access to and use of the drive control needs to be examined. During the evaluation process, we also cannot forget about other factors contributing to success including a drive wheel configuration that works for the patient's environment and functional use, tracking technology, programming of the power wheelchair to support alternative controls, and overall footprint considerations of ventilator support, upper extremity supports, and hardware for communication/AAC devices.

Clinical intervention with newer proportional drive and non-proportional Switch input Devices:
Been there, done that! Will review alternative proportional/ switch input devices and focus on newer advances in alternative drives to add to the clinical arsenal for this patient population with a progressive neuromuscular condition. Will discuss these input devices in greater detail when considering on how they integrate to wheelchair driver control, power seating, communication, and bluetooth access. "Position dependent" driver controls do require more extensive set up. No matter all the clinical, ATP/supplier tech training provided, the patient/caregiver relationship is mission critical for set up, calibration, and basic troubleshooting for a successful outcome.

Funding Considerations:
Will discuss funding options, hcpcs coding, and objective findings to write a strong letter of medical necessity.

Conclusion

A clinical team with a background in seating mobility, computer access, and augmentative communication specialist with a skilled assistive technology professional can be an excellent formula to have an have a positive outcome for the end user in input selection, power mobility product choice, client/caregiver training especially working with end users with advanced muscular disease where timing is critical.

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Conflict of Interest

David Miller, OTR/L, ATP/SMS was previously a staff member at Helen Hayes Hospital and became an employee of Permobil in Summer, 2021

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IC39: Playing to Learn: Importance of Self-Directed Mobility in Children

Lauren Rosen, PT, ATP/SMS
Jennith Bernstein, PT, DPT, ATP/SMS

Learning objectives

1. Recognize three areas of development that are affected by independent mobility.
2. List three “do’s” and three “don’ts” when assessing children for powered mobility.
3. Discuss two obstacles to obtaining powered mobility for children.

For infants and children, the importance of self-directed mobility starting as early as possible is more than physically moving from one location to another. The depth if the effect of learning to move has a long-term impact on multiple body functions and structures. This can include vision, motor planning, motor control, postural development, cognition, speech production, social interaction and play participation. When a child learns to initiate mobility it influences depth perception, object permanence, and prevents the development of learned helplessness. The ability of a child to determine when and where they would like to move can be limited when a child is unable to sit, stand, or ambulate. When our youngest clients cannot stabilize or mobilize through traditional methods, a wheeled mobility solution may be recommended for part or all of their time. This presentation will include resources for current research, clinical guidelines, and detail the solutions available for our pediatric population when wheeled mobility is part of the solution. The positive effects of mobility and how this applies to all children with mobility limitations will also be discussed.

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IC40: Seating and Mobility: What's Annoying and What's Fixable

Gerry Dickerson, CRTS, ATP
Jay Doherty, OTR, ATP/SMS
David Algood, MSc, MBA
Angela Regier, OTD, OTR/L, ATP/SMS

Learning objectives

1. List 3 brands of power wheelchairs that can be connected using Blue Tooth.
2. Identify 2 features of the connected chair that consumers want set up which are not supported by funding.
3. List 3 issues with seating and mobility technologies that affect consumer mobility and independence

Introduction

This highly interactive, one-hour session will feature a panel of presenters from the sales and R&D departments of the major seating and mobility companies. Moderated by Gerry Dickerson, CRTS, ATP, the goal of the session is to open a dialogue between clinicians, providers, and the mobility companies to discuss features that are troublesome and suggest new technology that would be helpful. Participants will be divided into groups and meet with each company in a "round robin" style session. Come prepared with your list of questions and issues, such as annoyances; things that should be fixed; what users demand with the "connected" chair that you are not able to fulfill; what tech works the way it should and what doesn't; and new ideas for more mobility and independence.

N/A - copying and pasting the abstract again since it has to be 500 characters: This highly interactive, one-hour session will feature a panel of presenters from the sales and R&D departments of the major seating and mobility companies. Moderated by Gerry Dickerson, CRTS, ATP, the goal of the session is to open a dialogue between clinicians, providers, and the mobility companies to discuss features that are troublesome and suggest new technology that would be helpful. Participants will be divided into groups and meet with each company in a "round robin" style session. Come prepared with your list of questions and issues, such as annoyances; things that should be fixed; what users demand with the "connected" chair that you are not able to fulfill; what tech works the way it should and what doesn't; and new ideas for more mobility and independence.

Conclusion

By working together and developing good relationships with manufacturers and advocates, seating and wheelchair suppliers and ATPs can provide valuable feedback that can impact future design and features, as well as funding and coverage.

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6. Quantum Power Mobility. Product Marketing Brochure #0001658-062420 Interactive Assist

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Conflict of Interest

Gerry Dickerson, moderator, is an employee of National Seating and Mobility, a seating and mobility supplier. He is also President of the Board of Directors for NRRTS, and a RESNA Fellow.

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IC41: Using and ICF based, clinically guided, and evidenced backed tool to help clients choose a mobility device

Mandy McDonald, MS, OTL, ATP
Chris Maurer, PT, MPT, ATP

Learning objectives

1. Identify the purpose of the Functional Impact Tool (FIT) for Mobility Devices
2. Demonstrate understanding of the concept of the mobility device as an environmental factor per the WHO's ICF
3. Identify specific ICF categories impacted by mobility device choice

Introduction

The impact of the mobility device set-up on balance (Janssen-Potten, et al. 2000), seated pressures (Maurer, Sprigle 2004), shoulder dysfunction (Boninger, 2005) and function (Hastings, et al., 2003; Sprigle et al., 2003), among others, have been addressed in literature. Reliable evaluations of consumer satisfaction with their mobility device once obtained are also available, including the Functional Mobility Assessment, the Wheelchair Satisfaction Questionnaire, and the Quebec User Evaluation of Satisfaction with Assistive Technology (Quest 2.0). Evidence-based literature, however, is not available to guide the determination of the most appropriate mobility device to best meet an individual's overall needs on the front end. A need for a tool to assist end-users and the treatment team in determining which type of device may provide the best fit overall for the person's particular lifestyle was identified.

To begin the process, journal articles, RESNA position papers, APTA special interest group positions, Posture and Mobility Group articles were reviewed. Information from these sources were synthesized with clinical experience and framed with the World Health Organization's ICF to develop the Functional Impact Tool (FIT) for Mobility devices. Viewing mobility devices as environmental factors, the FIT for Mobility devices uses the WHO's ICF model to help clinicians and clients explore the potential impact of different mobility devices on client-specific body structures and functions, activity, and participation in a structured, consistent, and methodical way. The ICF qualifier rating scale is used to help quantify the extent of participation restriction that may be experienced using one device in comparison to using another device or devices.

Literature was found addressing the general importance of most the categories:
The first category, KEEPING PAIN LOW, is based on ICF code b280 under Body Functions and Structures: "Sensation of Pain". Jain, et al (2010) found a high prevalence of shoulder pain among all people with spinal cord injury, whether using manual wheelchairs, power mobility devices, or ambulation devices such as canes and walkers. Walford, et al. (2019) found that the configuration of the wheelchair Upper extremity pain has been shown to impact wheelchair users throughout their lives. For people with spinal cord injury, pain is associated with lower reported quality of life and physical activity (Gutierrez, et al, 2007; Lundqvist et al., 1991). Wang, et al. found people with upper extremity pain demonstrate worse perceived health and greater depressive symptoms (2015). Samuelsson et al. found people with SCI and UE pain reported difficulty with wheelchair use, including propelling up inclines, loading the wheelchair into a vehicle, and transferring (2004), and higher unemployment status and lower full-time employment was demonstrated by Dalyan et al. in 1999. Scoring criteria for Keeping Pain Low was based on clinical experience and supported by these articles.

SAVING ENERGY FOR IMPORTANT ACTIVITISE is based on ICF code b1300: "Energy level" under Body Functions and Structures, Mental Functions, Energy and drive functions. Energy conservation has been shown to help individuals with spinal cord injury "do the things they value, enhancing their sense of control over their lives, reducing pain and helplessness, increasing motivation and enhancing relationships strained by fatigue" (Hammel et al 2009).

The category FEELING GOOD ABOUT YOURSELF is based on the ICF code b1266, "Confidence", which is under Mental Functions under the Body Functions and Structures Component. Geyh, et al. (2012) found both self-efficacy and self-esteem to correlate strongly with participation among individuals with spinal cord injury. In fact, these factors were found to be more related to participation than anxiety, depression, pain, health conditions, social support, coping styles, or sense of coherence. This highlights the importance of taking the individual's self-efficacy and self-esteem while using a mobility device into consideration while discussing mobility device options. The category PROTECTING YOUR ARMS is based on the ICF code b729: "Functions of the joints and bones". The scoring criteria was heavily based on the Clinical Practice Guidelines for the Preservation of Upper Limb Function following Spinal Cord Injury. It is clear that scapular dyskinesis is associated with shoulder injury and pain (Kibler, et al 2012). As such, a video- recorded scapular evaluation during mobility device use is included in the pain category client education and scoring, along with a client evaluation of upper limb function after a full day of mobility device use. This category has proven to be very eye-opening for inpatients who are considering different devices.

HAVING GOOD BODY POSITIONING is based on the ICF code d410-d429: "Changing and maintaining body position" under Body Functions and Structures. Posture during manual wheelchair propulsion as a predictor of shoulder pain for people with spinal cord injury has been demonstrated by Walford, et al. (2019). Clinical experts have confirmed the importance of a client's ability to maintain their posture throughout the day, as seated posture for people with mobility impairments has been found to impact progression of postural deviation, pain, visual field, digestion/bowel function, respiratory function, and skin integrity. The category BEING AWAY FROM CAREGIVERS WHEN WANTED is based on the ICF code d599, "Self-care, unspecified". The score is calculated based on how long an individual can be safe without a caregiver present and get all basic needs met.

MOVING AROUND USING YOUR WHEELCHAIR is based on d4700: "Using human-powered vehicles" and d498: "Mobility, other specified", and the scoring criteria is based on clinical input and multiple mobility scoring scales. Community access is crucial to "restoring independence and enhancing quality of life" for people with spinal cord injury (Jean L. Minkle, 2000). At the same time, transportation issues for people with disabilities are complicated and varied (Rosenbloom, 2007). MOVING AROUND USING TRANSPORTATION is a based on dd4701-d4759: "Using transportation" and "driving", as well as on e540: Transportation services, systems and policies. The GETTING THE WHEELCHAIR PAID FOR category is based on ICF code e565, "Economic services, systems and policies", and Using the Parts of the Wheelchair or Telling Others How to Use Them is based on e310-e399: "Support and relationships". The criteria for scoring of all categories were modified extensively with clinical use of the tool, and further modified based on content validation exercises, including clinical expert critiques and feedback.

Conclusion

The outcomes of the tool are not meant to be a definitive answer to the question of which device will be best for the client. Ultimately, after all categories have been assigned a performance qualifier (only possible after each mobility device has been fully trialed with the primary treatment team) and the totals have been considered, the client is able to see a quantitative approximation of the functional impact of each device on the ICF's continuum from functioning to disability. The hope is that use of the tool will make exploration of the different devices and components available more objective, help the clinician document the devices considered and the education provided, and help the client take ownership of the final decision of which mobility device to pursue.

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Conflict of Interest

There are no conflicts of interest to report for either presenter.

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IC42: Improve Your Outcomes: Implementing a Wheelchair Clinic Follow Up Clinic

Andrea Stump, PT, DPT, NCS, ATP

Learning objectives

1. Identify two barriers and facilitators of developing a wheelchair follow up program.
2. Discuss at least 3 positive effects of wheelchair follow up training related to equipment abandonment and client QOL.
3. Describe 3 reasons why a follow-up clinic enhances client experience with wheelchairs and promotes increased revenue.

Introduction

Determining that your client needs a wheelchair, selecting the components and configuring it to maximize their abilities is the easy part. Ensuring your patient is comfortable in the seating and knows how to use their wheeled mobility device is the challenge. Equipment abandonment and failure to utilize appropriate wheeled mobility leads to frustration from the client, vendor and therapist.

After working for multiple years in neurological rehabilitation in multiple levels of care, it became clear that lack of patient education following a client's wheelchair delivery leads to increased equipment abandonment, mistrust of professionals and poor outcomes related to seating and functional mobility and independence. Our clinic has developed criteria for follow up, a process flow with multiple vendors and follow up appointments with client training and positioning assessments. This has led to reduced abandonment of equipment, increased independence and mobility for patients, reduced need for vendors to attempt to correct without input of a therapist and increased revenue for our clinic. This program was limited by COVID, but does continue to demonstrate consistent growth and anticipated growth in the future. Additional barriers which will be discussed further include vendor buy in, logistics related to plan of care and scheduling as well as staffing and support from leadership.

Conclusion

Through implementation of this clinic, we have seen improved independence and mobility outcomes as well as reduced secondary complications. There have been positive outcomes related to posture and comfort related to seating. This clinic has seen improved outcomes related to reduced equipment abandonment, improved patient safety, increased patient independence and enhanced relationships with clients and the community.

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Conflict of Interest

N/A

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IC43: The Effect of Whole Human Vibrations on Tissue Loads

Dr. Alexander Siefert

Learning objectives

1. Explain the standardized procedure to evaluate whole body vibrations
2. Understand the influence of vibrations on the level of tissue loads
3. List at least 2 possibilities to reduce the level of tissue loads due to whole body vibrations

Introduction

In this session the general influence of whole-body vibrations on tissue loads is presented using the finite element analysis (FEA) approach. The presentation gives first a general overview about the industrial standard for the evaluation whole body vibrations. Then the procedures for the measurement are presented and some examples in the field of wheelchair designs are shown. In the next step the FEA approach is introduced and the requirements for its application for the analysis of tissue loads due to whole body vibrations is covered. Finally, a pilot study for the analysis of a manual wheelchair moving over different pathways is presented and summarized.

Whole Body Vibrations:

Nowadays, various types of wheelchairs enable users to participate in everyday life and leisure activities. Due to further developments, such as lightweight construction or electrification, the range of applications and speed has steadily increased, see Cooper [1] and Tolerico [2]. A related disadvantage of this trend of higher mobility level is induced whole-body vibrations. In the development of wheelchairs, the dominating decisive factors are usability, comfort and prevention of tissue damage. The topic of whole-body vibrations is usually not in the focus. However, these occur constantly in everyday life and represents a relevant load factor causing additional discomfort, which can reduce the daily radius of action. Further, it is important to understand that induced vibrations can cause health issues like low back pain, see Bovenzi [3]. Due to this the EU passed 2002 the directive 2002/44/EC, see [4], defining daily vibration levels at working environments to prevent health issues. The evaluaitn procedure is shown in figure 1. In the study of Wolf [5] it was shown for a manual and a power wheelchair, that they exceed the action value of 0.5 m/s² while moving over typical pathways. The measurements were carried out at the seat frame, an evaluation of the tissue loads below the IT was not carried out. FEA Approach for the Assessment of Tissue Loads The usage of numerical simulations is a common and helpful tool in many fields of applications. In the automotive sector countless finite element (FE) models are used starting from strength prediction of a bolt up to simulations of the behaviour of a complete vehicle with occupants in a frontal crash. The human body is analysed e.g. to assess the comfort or the tissue loads, see Siefert [6] and [7]. In the study the virtual human Jo is applied. It is a detailed model of the human body and is validated for the static loading via pressure maps and for the dynamic loading via the apparent mass. The apparent mass describes the human behaviour due to induced vibrations. The FEA approach enables the computation of measurable quantities like the pressure map but also non-measurable quantities like the internal tissue stress and strains. In the pilot study a model of manual wheelchair based on technical drawings is used. A simplified foam cushion block is applied in the setup. The nonlinear material behavior is implemented via uniaxial compression test data of foam specimen. Pilot Study The first step in the study is the validation of the model setup in comparison to the data published by Wolf [5] evaluating the vibrational level. Therefore a model of the pathway similar to the test setup is generated, see figure 2. In the second step the influence of the vibration on the pressure map and the internal tissue loads is evaluated using the VSD approach. It is observed that there is a significant increase of the tissue loads, although the vibrational level measured at the wheelchair frame is not above the specified limit value. A visulization of the result is presented in figure 3. Accordingly, an evaluation of whole-body vibrations and their risk on pressure injuries via the accelerations at the frame is only a first indicator. Nevertheless, the risk can be underestimated. A numerical simulation with a validated human body model enables a more detailed assessment of a potential risk for pressure injuries.

Conclusion

Numerical models of the human body are used in several application fields and Moermann [8] emphasizes the importance of geometrically detailed, three-dimensional models when studying tissue loads. For the analysis of whole-body vibrations these models must be validated via static and dynamic measurements. Using these models enables a more precise evaluation of daily vibration levels and their influence on tissue loads. Further, variations of wheelchair (frame, suspension, tires) and cushion designs can be analysed and optimised virtually to improve the product performance. This goes along with reduced development time and cost as the number of hardware iteration cycles can significantly be reduced.

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Conflict of Interest

There are no conflicts of interest.

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IC44: Wheels and Casters: It's How We Roll...

Joseph Ott, PhD

Learning objectives

1. Participants will understand newly developed testing methods and their impact.
2. Participants will understand the impact of tire and caster selection and configuration for manual wheelchair users.
3. Participants will have a link to a resource hub providing further insight into the discussed topics.

Introduction

Rolling resistance is an incredibly important factor to consider when prescribing and maintaining manual wheelchairs. When propelling, the upper extremity forces must overcome rolling resistance as they move the device forward. Therefore, rolling resistance should be mitigated to reduce the risk of upper extremity injuries from prolonged propulsion and higher resistive forces during propulsion.

While there have been numerous studies on rolling resistance for the mobility industry, many were not able to draw specific implications and clinical relevance. Furthermore, testing a complete wheelchair does not provide insight into which factors are more influential or interrelated at a component level to rolling resistance and ultimately, propulsion. This research is the most comprehensive of its style by testing wheels and casters individually through a battery of conditions that include camber, load, toe, speed, tire pressure, and surfaces. Over 1000 trials were completed on six wheels and six casters to identify the most influential factors of rolling resistance and their interaction effects.

In addition to the laboratory testing, a 200-person community-based study was conducted to see the prevalence of influential factors on user's devices. A specialized testing apparatus was developed and implemented at adapting sporting events. Camber, toe, and tire pressure were able to be easily measured on user's everyday devices to show insight on what is actually happening in the community.

Conclusion

Laboratory testing shows significant influence from tire and caster selection. Additional factors, such as toe, need to be mitigated and tire pressure should be maintained in pneumatic wheels and casters. The weight of the user, device, and accessories needs to be considered along with its front to rear distribution. The community results show the lack of maintenance and significant misalignment is occurring and is leading to increased rolling resistance and ultimately increased risk of upper extremity injuries.

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Additional Learning Resources

Rolling Resistance Fact Sheet fount at https://kad179.files.wordpress.com/2021/06/wheel-rolling-resistance-overview.pdf

Conflict of Interest

Joseph Ott is currently a Research Engineer for LUCI, LLC.

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IC45: Mainstream Smart Home Technologies for People with Physical Disabilities

Dan Ding
Lindsey Morris
Alex Houriet
Cheng-Shiu Chung

Learning objectives

1. Participants will identify two customizations that can be made to a mainstream smart home technology device to improv
2. Participants will identify two resources that can be utilized to determine the compatibility of mainstream smart home
3. Participants will be able to identify three environmental factors to consider when selecting mainstream smart home te

Introduction

Mainstream smart home technologies (MSHT) are rapidly evolving, resulting in dynamic and affordable tools, which are frequently utilized to support participation in our daily activities. Use of MSHT as assistive technology (AT) is a potential, cost-effective intervention to increase independence and quality of life for persons with disabilities, especially when introduced by qualified service providers who can ensure that the devices meet the diverse abilities, needs, and goals (Waite, 2015). However, there is a lack of empirical evidence regarding the service delivery models and effectiveness of using MSHT as AT (Larsson Ranada & Lidström, 2019). Furthermore, the rapid growth and evolution of MSHT has resulted in a wide array of devices and platforms without a standard communication protocol; making it difficult to determine the compatibility of MSHTs and maintain an understanding of their functionality and accessibility, in order to select devices that best meet user needs (Balakrish

This presentation discusses findings from research and benchmark testing of MSHT completed during the development of a technology guide for the ASSIST (Autonomy, Safety, and Social Integration via Smart Technologies) project, which aims to develop and evaluate an evidence-based model for delivering MSHT as AT to support independent living and community integration of persons with disabilities who are at risk of institutionalization. The technology guide provides an overview of a MSHT system as well as details of each component (i.e., input methods, processors, and output devices). The section on input methods covers digital assistants, smart home apps via touch, voice, and assistive devices, and augmentative & alternative communication (AAC). The section on processors covers fundamentals of communication protocols and popular MSHT ecosystems. The section on output devices covers different types of MSHT for lighting control, climate control, home entry, TV control, and other activities, and introduces the environment considerations, technology considerations, and functional considerations for selecting the devices. Finally, we summarize the factors to consider when assessing MSHT compatibility, functionality, accessibility, and personalization capabilities to support the use of MSHT as AT for person with disabilities.

Conclusion

This presentation provides the fundamentals on how to set up a MHST system as AT for people with disabilities, and introduces a variety of factors to consider during this process.

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Additional Learning Resources

https://assistdrrp.pitt.edu/smart-home-resources/

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Conflict of Interest

None

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PS05.1: A Novel Fall Detection System Using Machine Learning and Computer Vision Techniques

Nadim Barakat, BA
Margaret Bujor
Kathryn Reid, PhD, RN, FNP-C, CNL

Learning objectives

1. Explain how accidental falls are a threat to the wellbeing of patients with cognitive or physical disabilities.
2. State the two major categories of commercially available fall detection technologies that exist on the market today.
3. Summarize two potential pros and cons of a system that applies machine learning and computer vision to predict falls.

Introduction

Falls pose a serious and pervasive threat to the health and wellbeing of adults with movement impairments and mental disabilities. In addition to being a major cause of injury and mortality for patients over 65, falls are an incredibly expensive cost for patients and the medical system as a whole. Current solutions to falls mainly include fall detection systems such as wearables and context aware systems that utilize sensors to monitor a physical space. Video monitoring systems are also being implemented into many patient care settings; they involve a human observer remotely monitoring a patient's movements in a room with cameras. The main difficulty with these systems is the lack of privacy and the constant human monitoring. An emerging alternative is the use of an automated artificial intelligence video-capture system that monitors a patient's movements and sends alerts when a fall event has been detected or predicted, while not storing any of the patient's data to preserve privacy.

Falls in the elderly are a major public health problem in the United States. Approximately 25% of adults aged 65 years and older fall every year, making falls among the leading causes of morbidity and mortality in this age demographic. Falls are also extremely expensive, costing the U.S. healthcare system approximately $50 billion in preventable medical expenses every year.

On average, one-third of falls in the elderly population result in bone fracture or traumatic brain injury. To compound this issue, hospitalization after a fall exposes elderly patients to many deadly, downstream risks such as pressure ulcers, hospital acquired infections, and dangerous polypharmacy. These falls occur in a variety of locations such as the hospital, nursing home, and private residences. Each year in the United States, 700,000 to 1 million falls occur in hospitals, while 50% of the 1.6 million nursing home residents in the U.S. experience falls as well. Furthermore, a third of the nursing home residents who fall will fall two or more times in the same year, placing those in nursing homes at high-risk even with the protection of healthcare professionals nearby in the facility.

Preventing falls is a universally-recognized patient safety priority for inpatient facilities serving older individuals. However, there are few to none commercially available monitoring systems capable of both detecting and predicting falls. This is likely because fall etiologies are complex and multifactorial, consisting of numerous, dynamic intrinsic and extrinsic variables. The combination of factors such as a patient's personal characteristics (age, functional status, medication list, etc.) in addition to extrinsic factors (high risk walking environment, trip hazards, stairs, etc.) have made it difficult for current systems to accurately predict falls. As a result, most current systems focus solely on reactive fall detection. Additionally, current wearable technologies suffer from poor long-term compliance due to discomfort or forgetting to activate the alert. An emerging alternative to many fall detection methods such as wearables or pressure sensors is the use of a video monitoring system to detect when a fall has occurred or when an at-risk patient is performing a risky action such as standing up and walking around without any assistance. While some healthcare systems currently use a human observer to monitor the video feed, this is a major privacy concern for many patients and calls for the development of a standalone alternative.

Thus, this study focuses on testing a novel implementation of a convolutional neural network for object detection combined with a pose detection algorithm to detect and alert patient falls and high fall risk positions that predict falls. This automated video monitoring system uses computer vision and machine learning to scan the video feed for falls and high fall risk positions and sends an alert when an event is detected, while not storing any video to preserve patient privacy.

In order to assess the accuracy of this technology in detecting falls and high fall-risk positions, 27 healthy adult subjects were recruited to act as simulated patients in a hospital room setting. They each performed eight different movement pattern scenarios: (1) falling off a bed onto the floor, (2) falling off the bed onto the floor with a research associate (RA) in the room, (3) standing up from the bed and falling onto the floor, (4) sitting up in bed, (5) sitting up in bed with an RA in the room, (6) standing up from the bed, (7) standing up from a bed and walking out of the room, and finally, (8) getting off the bed and sitting down on the floor. Each of these scenarios were repeated 5 times for a total of 40 scenarios per participant. All falls were performed onto a padded mat in order to ensure the safety of the participants, and participants were video recorded from three different camera angles (center, left, and right) during their participation in the study.

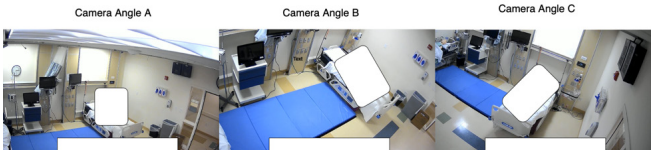
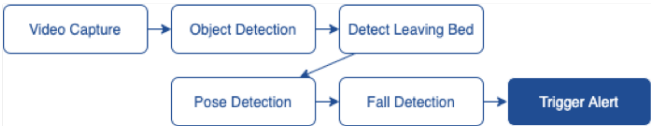


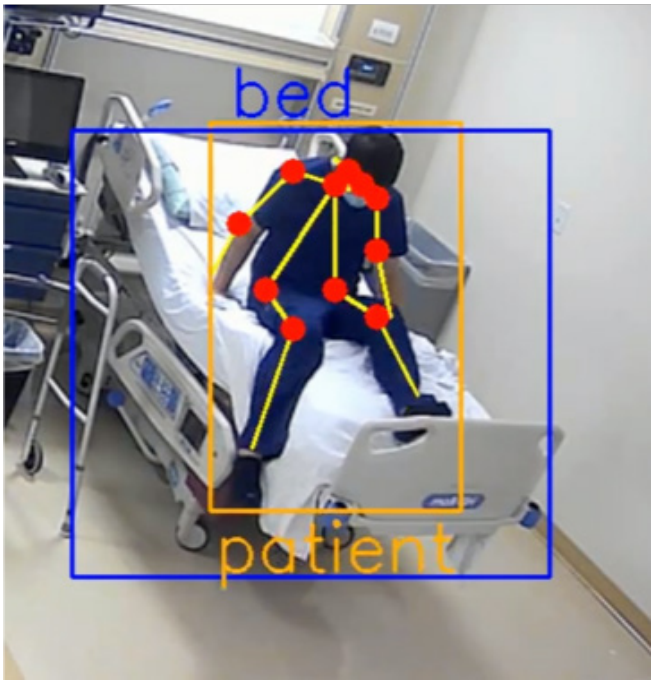
Figure 1.

The scenarios were analyzed by the technology for a variety of metrics: fall detection, sitting detection, standing detection, and multiple people detection. All scenarios were analyzed for a fall with scenarios 1, 2, and 3 actually

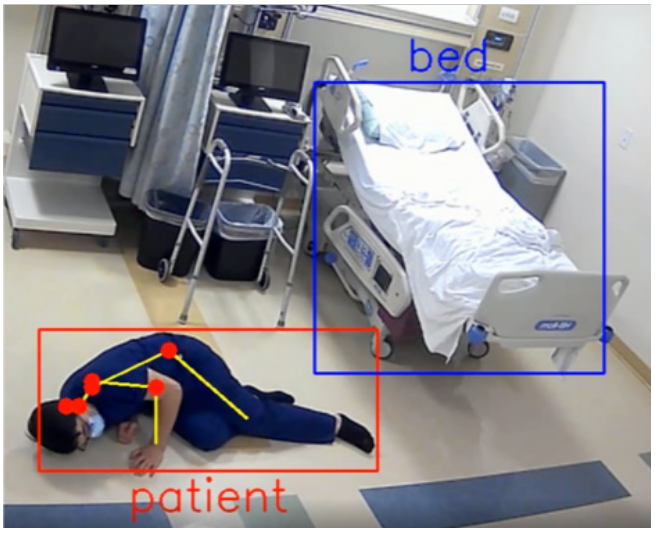
including falls. However, scenarios that included multiple people were only scanned for multiple people detection because the technology is designed to not send alerts when multiple people are detected. In addition, each scenario was specifically analyzed for one principal event that had to be detected during the scenario. Thus, scenarios 1 and 3 contained detectable falls, when adjusting for this consideration. Scenarios 4 and 8 were analyzed for sitting because these scenarios always included the sitting position. Scenarios 6 and 7 were analyzed for standing because each of these scenarios always included the standing position, and scenarios 2 and 5 were analyzed for multiple people.



Poster Figure 1.



Poster Picture 1.



Poster Picture 2.

Data from all three camera angles was processed by the machine-learning technology, and subsequent program output was recorded to determine the accuracy of the technology in scenario detection. Preliminary data analysis found the sensitivity for fall detection to be 81.3% and specificity to be 94.7%. Full data analysis is still currently ongoing, but the technology is capable of detecting with promise both fall and stand scenarios, as well as multiple people present in the room. The technology was unable to detect the sitting position consistently; however, this shortcoming will be addressed in future development. Sources of possible errors include differences in participant sitting, standing, and falling patterns, perhaps leading to inconsistencies in the technology's detection of predetermined scenarios. In the future, work to train the machine-learning program on a wider variety of video angles, patient images, and movement patterns could help address these issues.

Conclusion

Preliminary results show promise in the ability of this technology to detect several different positions and scenarios that would be important for detecting and predicting an oncoming fall. It necessitates further development to refine the scenario detection and integrate into a front-end system to be used in patient rooms to allow intervention for fall prevention. Further testing in long-term care facilities or hospitals would be helpful to identify capabilities in real-life situations and evaluate immersion in healthcare workflow with the goal to improve patient care and reduce healthcare spending.

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Conflict of Interest

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PS05.2: Low-cost CAD/CAM system for complex seating adaptations

Carlos Gonçalves, MEng
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Aline Correa, OT

Learning objectives

1. List at least two of the available options for CAD/CAM seating solutions;
2. Describe the process for creating a CAD/CAM workflow with low-cost 3d sensors, free software, and regular CNC router
3. List the guidelines for delivering CAD/CAM solution for patients with severe deformities

Introduction

Sculpting foam for cushions and backrests by hand for adaptations to individuals with severe deformities is a great challenge. Mainly, it is impossible to acquire the anatomical contours with precision, which compromises the pressure distribution. This scenario implies pain and hinders the patient from remaining seated in the wheelchair. In 2015, SARAH started to use a CAD/CAM process for seating solutions to facilitate manual work and provide better adaptations for patients with severe deformities. This research presents a study case with 30 subjects that received a seating adaptation designed with a CAD/CAM system at SARAH Network of Rehabilitation Hospitals. There was a considerable reduction in time spent with the patients for adjustments, an increase in comfort, and increased time on the wheelchair for all adaptations. The CAD/CAM system captures and reproduces the body contours of patients, which permit good pressure distribution, increases the comfort and the time seated.

Introduction

Custom-fitted seats have made a substantial contribution toward treating nonambulatory individuals. An accurate and reliable definition of the contour of the surface of a seat insert is essential for the successful fitting of patients with severe spinal deformity. Since 1990, Computer-Aided Design/Computer-Aided Manufacture (CAD/CAM) solutions have been used as a clinical tool for the design and fabrication of custom wheelchair seats. The body contour of a patient is obtained with specialized equipment; this information is digitalized, edited in computer software; and further sculpt foam with a CNC machine (Brienza, Brubaker, McLaurin, & Chung, 1992; Lemaire, Upton, Paialunga, Martel, & Boucher, 1996).

There are new possibilities of 3D scanning for the manufacture of the customized seat and backrests cushions (da Silva, Beretta, Prestes, & Kindlein, 2011), but there are few studies that compare the results of the CAD/CAM system with the manual process (Tasker, Shapcott, Watkins, & Holland, 2014). There are few commercial options that provide complete CAD/CAM solutions for wheelchair adaptations. Most companies rely on OEM (original equipment manufacturer) hardware and software to create their manufacturing workflow. Scanners, 3D editing software, CNC milling cutters, and robots are used to create solutions that range from anatomical shapes to the final solution.

Since 2015, a CAD/CAM project has been developed at the SARAH Network of Rehabilitation Hospitals, called “3D Seating”, to improve the process of wheelchair adaptation for patients with severe deformities.

Materials and Methods

The CAD/CAM process for “3D Seating” is divided into four steps (figure 1).

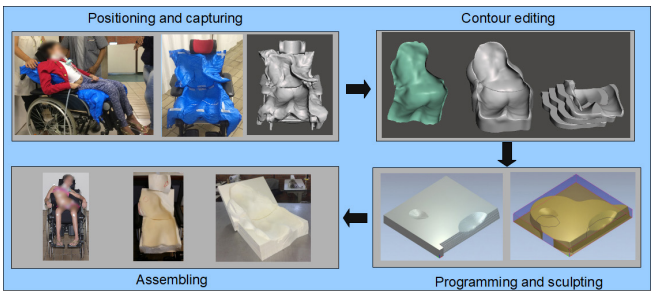

Figure 1. “3D Seating” workflow

- Positioning and capturing: the clinical team position the patient over bean bag cushions (one for the seat and one for the backrest), in his/her wheelchair. A Microsoft XBOX 360 Kinect (Zeng & Zhang, 2012) connected to a computer that runs the Skanect software (“Skanect,” n.d.) digitalizes the contours made in the bean bags of the seat and backrest.
- Contour editing: the cushion/backrest is designed digitally with the software Meshmixer (Autodesk MeshMixer, 2012).
- Programming and sculpting: each layer that assembles the final equipment is the input of the software ArtCam (“Autodesk ArtCam,” n.d.) for creating the toolpath required to accomplish the final shape. A CNC router loads the gcode file for each layer and sculpts the respective foam.
- Assembling: the seating technician glues the sculpted layers to assemble a rigid structure that receives a final 30mm soft foam layer for comfort and immersion.

The positioning and capturing stage is critical because the final product should simulate the patient’s position over the bean bag. In most cases where the cushion or backrest does not fit the subject well, the bean bag was poorly positioned around the patient. Notably, the clinical and technical team should visualize how the patient will get in and out of the wheelchair. On many occasions, the patient should remain seated in the bean bag for some period of time to evaluate his/her position. This research presents a case studies report on the evaluation of medical records and answers from a pre-defined questionnaire to evaluate the performance of the adaptations. The main variables used are the maximum time the users could be in the wheelchair and the overall perception of the equipment. This research is approved by the ethical committee of the SARAH Network of Rehabilitation Hospitals, registered with the CAAE number 03709118.5.0000.0022

Results

The study’s age group dispersion and the range of diagnostics are presented in figure 4. Fifty-three patients had already benefited from the “3D Seating” workflow.

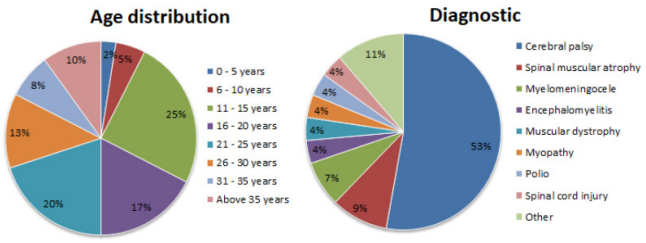

Figure 2. sample description of 53 subjects.

The clinical teams observe a trend in decreasing the time to deliver an adaptation, fewer test appointments before delivering the adaptation, and more significant time using the customized cushion/backrest. Thirteen subjects were interviewed following a standard questionnaire. The average time spent in the wheelchair increased with "3D Seating" compared to the conventional adaptation, both in absolute and percentage (Figure 3).

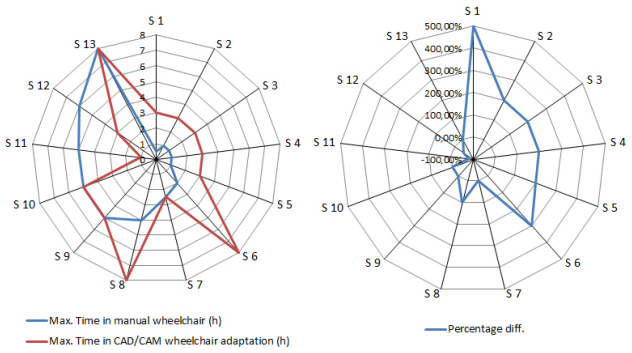

Figure 3. Absolute and percentage differences from maximum sitting time.

Some user or family reports about "3D Seating" are presented below.

- "Better posture, more body fit …"
- "Very good, helped not to atrophy …"
- "Was 100%, avoided pressure sore, does not mark the skin, dresses the hip."
- "Very good, 100% comfort, perfect fit of scoliosis, relieved."
- "Very comfortable, much better positioning and comfort than before, no pain in the ribs"
- "Looks good without the belt, firmer, more supported."
- "It was great; it does not hurt the coccyx anymore, it does not complain, it used to cry, supports better the ribs"

Conclusion

The "3D Seating" method for wheelchair adaptations of patients with severe deformities could provide greater immersion of deformities and consequently increase the time of sitting, prevent comorbidities, and promote greater autonomy for the user to perform their activities of daily living.

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Conflict of Interest

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PS05.3: Content and Face Validation of a Novel Physical Seating Assessment Technique.

Bart Van der Heyden, RPT

Learning objectives

1. Describe how you can be part of the content and face validation process of newly proposed Mechanical Assessment Tool
2. List at least tree measurable outcomes of this novel MAT assessment
3. Describe at least 3 benefits of this novel MAT eval compared to the classic MAT eval

Introduction

The hands-on physical assessment, which is often referred to as the Mechanical Assessment Tool (MAT) is an important part of the seating assessment process and is intended to inform about the selection of an appropriate seating system (function, shape and size) with respect to the client's functional capacity, posture and pressure injury management.

The MAT assessment is used to:

- Examine and quantify the mobility of the client's body and body segments and assess if deformities are fixed, partway flexible to neutral or flexible.
- Examine the influence of tone and spasm on posture
- Provide clinical reasoning and documentation for the proposed seating intervention
- Assess practical interventions for improving posture and pressure management through simulation in the seated position. Typically the MAT assessment is done in :
- The client's existing seating system
- In a supine position on the plinth
- In seating on the plinth to simulate Postural Support Devices with the hands

In the supine position of the MAT assessment the Range of Motion (ROM), the type of deformity and outcomes like the amount of ROM in degrees and the position of the pelvis, trunk, hips, head, neck & knees and feet are produced. However, the data from this process is often :

- Recorded by body segment, not taking into account the impact on ROM segment of proximal and distal segments. (f.i. ROM of Pelvis vs. ROM of the pelvis with lower extremities in a fixed position)
- Recorded in degrees, not in distance measures, which makes it hard to use the data for the prescription of a seating system
- Not specific enough and difficult to use finding for building a seating system. ((f.i. failing to quantify a partway flexible to neutral ROM)
- Time consuming, taking up resources and poor efficiency.

Conclusion

The newly proposed techniques focus on the supine part of the MAT assessment and aim to provide data from the supine position on the plinth that can be used 1:1 in the build of a seating system. The outcomes produced are distance measurements, ROM including multiple segments interactions with improved efficiency & outcomes. As part of the face and content validation process, and overview of this novel assessment will be presented and an outline on how you can be involved in the validation process with be given.

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Conflict of Interest

Bart Van der Heyden is the owner of private physical therapy practice 'de Kine' and SuperSeating, a company providing clinical services and T&E services for health care professionals.

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IC46: Dynamic Seating- Diverse Applications: A Series of Case Studies

Michelle Lange OTR/L, ABDA, ATP/SMS
Karen "Missy" Ball MT, PT, ATP
Mary Shea MA, OTR, ATP

Learning objectives

1. The participant will be able to list 3 goals of Dynamic Seating.
2. The participant will be able to describe 3 clinical applications for Dynamic Seating.
3. The participant will be able to list 2 limitations of Dynamic Seating.

Introduction

"Dynamic seating is defined as movement which occurs within the seating system and/or wheelchair frame in response to intentional or unintentional force generated by the client. Dynamic components absorb force. When client force ceases, the stored energy is returned through the dynamic component, which in turn assists the client back to a starting position" (Lange, et al., 2020). Dynamic seating can refer to the entire frame or modular componentsthat can be added individually or in combination with one another."Common modular options allow movement at the pelvis, knees, and head"(Eason, 2011;Freney& Schwartz, 2015;Lange, 2013;Presperin-Pedersen & Eason, 2015).In this presentation, we will explore through case studies the diversity of applications for dynamic seating.

Most wheelchair seating systems are static, meaning that the surfaces do not move or yield to client forces. For people with increased muscle tone, extension against a static seating system often results in loss of position and alignment with the support surfaces as these unrelieved forces then result in joint extension (Hahn, 2009; Cimolin, et al., 2009; Chen, et al., 2018; Crane, et al., 2007). As the client relaxes and active extension is reduced, the client may return to a less than optimal seated position, having lost alignment during this extension cycle.

In the early 1990s, dynamic seating options became available, either as an integrated wheelchair system or as separate components which could be added to an existing wheelchair frame. Dynamic seating is defined as components designed to move in response to client forces, dissipating this force and, as a result, reducing active extension. The energy is absorbed by a dynamic component (elastomers, springs, or hydraulics) which assists the client back to a neutral starting position without loss of alignment with the support surfaces (Lange, et al., 2020). Dynamic seating components are available at the hips (dynamic backs), the lower extremities (dynamic footrests), and the cervical area (dynamic head support hardware). Dynamic seating refers to this intervention in general, rather than a specific component.

Dynamic seating has been shown to absorb and dissipate forces (Avellis, et al., 2010; Crane, et al., 2007; Ferrari, 2003), protecting the client from injury caused by sustained and/or repeated forces (Hong, 2006; Avellis, et al., 2010; Cimolin, et al., 2009) and reducing damage to the seating system and wheelchair (Hong, 2006; Hahn, 2009; Crane, et al., 2007; Incoronato, 2007). Movement also provides sensory input which can increase alertness and decrease agitation (Pfeiffer, et al., 2008; Pfeiffer, et al., 2011; Rollo, et al., 2017; Watson, et al., 1998). Finally, dynamic seating can improve postural control and stability (McBurney, et al., 2003; Fowler, et al., 2001; Adlam, et al., 2014; Incoronato, 2007; Crane, et al., 2007; McNamara & Casey, 2007; Brown, et al., 2018), as well as function (Adlam, 2015; Adlam, 2014; Crane, et al., 2007; Incoronato, 2006; Dalton, 2014; Cimolin, et al., 2009). This instructional course will present a definition and goals of dynamic seating. A series of case studies will be presented to illustrate specific applications of this intervention to meet individual client needs.

Conclusion

Dynamic seating can be an effective intervention for clients who exhibit increased muscle tone resulting in high forces against a wheelchair seating system. Dynamic seating interventions can also be helpful for clients using wheelchair seating who seek out movement. Research supports a variety of clinical benefits of movement within a wheelchair seating system.

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Conflict of Interest

Missy Ball: No conflicts have been disclosed.
Michelle Lange: provides consultation and education for Stealth Products and Seating Dynamics, a manufacturer of dynamic seating components.
Mary Shea: No conflicts have been disclosed.

IC47: Motivate to Move: Promoting Parental/ Caregiver Adherence to Early Power Mobility

Lisa K. Kenyon, PT, DPT, PhD, PCS
Victoria Krajenka, PT, DPT
Katie Lach, PT, DPT
Hayley VanBeek, PT, DPT, Betsy Williams, MSLIS

Learning objectives

1. Define motivational interviewing to a professional colleague.
2. Discuss 3 general motivational interviewing principles pertinent to early power mobility programs.
3. Describe the implementation of motivational interviewing scripts to address 3 different parent/ caregiver-identified barriers to successful implementation of home-based early power mobility programs.

Introduction

Parental/caregiver adherence to home-based intervention programs is an essential aspect of implementing assistive technology and developmental/rehabilitation programs for infants and young children. Early power mobility programs typically involve use of alternative power mobility devices, such as ride-on toy cars or our Play & Mobility Device, to allow infants and young children with mobility delays or restrictions to independently move and explore in their environment. Despite the recognized benefits of self-directed mobility, parental/caregiver adherence has been identified as a frequent barrier to the successful implementation of early power mobility programs.

Motivational interviewing is a person-centered approach to promoting behavioral change that is used to improve patient/client adherence to various health and rehabilitation programs. In parent-based motivational interviewing, parental/caregiver collaboration, autonomy, and empowerment are emphasized to facilitate changes in parent/caregiver behaviors that in turn may positively influence children's participation in prescribed programs. This conference presentation will present a parent-based motivational interviewing intervention developed to improve parental/caregiver adherence to home-based early power mobility programs. Details pertaining to the two evidence-based scoping reviews conducted in collaboration with a psychologist to develop our parent-based motivational interviewing intervention will be presented. General motivational interviewing principles and techniques pertinent to early power mobility programs will be reviewed and illustrated through the use of video cases. Following an overview of the parent-based motivational interviewing intervention, small group active learning strategies will be employed to allow attendees to practice and experience the motivational interviewing intervention. Discussion of the real-world application of the motivational interviewing intervention in our program will be used to exemplify implementation and use of motivational interviewing in early power mobility programs. To assist both clinicians and researchers in this area, specific motivational interviewing scripts addressing various parent/caregiver-identified barriers to successful implementation of home-based early power mobility programs will be provided to attendees.

Conclusion

This study highlights both the similarities and differences in power mobility interventions for each of the 3 power mobility learner groups. Further research is needed to evaluate the clinical application of the key aspects of intervention identified this study. Since being submitted for presentation at the International Seating Symposium, originally scheduled for March 2021, this study has been published in Developmental Medicine and Neurology (Kenyon et al, 2020).

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Conflict of Interest

No conflicts have been disclosed for any of the authors.

IC48: Virtual Reality as a Power Wheelchair Assessment and Training Tool

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Learning objectives

1. Identify three barriers involved in the current power wheelchair skills training and prescription process.
2. Identify three potential benefits to the use of virtual reality for power wheelchair skills training and prescription.
3. Verbalize understanding of utilizing outcome measures to determine success of power wheelchair skills training.

Introduction

Currently, there is no industry standard for power wheelchair skills training at the initial assessment or at delivery of the prescribed equipment. Literature to support training recommendations is lacking. Processes for training vary greatly by clinic and are constrained by time, financial resources, treatment space, and absence of the necessary demo equipment. Add to that the gap between equipment trials and equipment delivery, where patients may forget strategies and directives, and current training for power mobility skills is inadequate. Lack of adequate training can lead to injury, abandonment of equipment, and caregiver burden. Virtual reality (VR) has long been used for gaming and simulated medical or job training. It is a valuable tool for enhancing learning of new skills with decreased risk to the trainee and other involved parties.

Currently, there is no industry standard for power wheelchair skills training at the initial assessment or at delivery of the prescribed equipment. Literature to support training recommendations is lacking. Processes for training vary greatly by clinic and are constrained by time, financial resources, treatment space, and absence of the necessary demo equipment. Add to that the gap between equipment trials and equipment delivery, where patients may forget strategies and directives, and current training for power mobility skills is inadequate. Lack of adequate training can lead to injury, abandonment of equipment, and caregiver burden. Virtual reality (VR) has long been used for gaming and simulated medical or job training. It is a valuable tool for enhancing learning of new skills with decreased risk to the trainee and other involved parties. Use of virtual reality in seating clinic may reduce noted barriers of time, space and access to demo equipment and serve as valuable tool to enhance skills training/acquisition. In a 2019 scoping review, w/c based simulator training was shown to improve driving ability. This presentation will show how to put this into practice and review current limitations regarding current power wheelchair skills outcomes and standard training. We will explore a novel virtual reality power wheelchair training simulator and its utility in bridging the skill gap by reviewing preliminary data and case studies.

Virtual Reality

Virtual reality is a computer-generated, artificial environment. The technology immerses the user into the simulated environment by engaging visual, audio and haptic senses. It is a continuum, ranging from completely virtual to completely real. When blending virtuality with reality we create a mixed reality (MR), where virtual and real world elements come together in a single user interface. It is within this MR that job training programs have been developed to improve accessibility, safety and repeatability of the training. The success of such programs has resulted in a recent explosion in the development of VR programs and continued progression in its use and applicability to various fields. Within the wheeled seating and mobility industry, for instance, we have begun researching the potential impact of VR on power wheelchair skills training and carry over.

Potential Benefits of VR

Virtual reality systems have the potential to address some of the barriers that currently impact power wheelchair skills training. The systems are compact, easy to use and deemed safe. Storage space, or lack thereof, is a commonly reported limitation among clinics. It negatively impacts the ability to stockpile demo equipment, which can effect clinic efficiencies. Virtual reality systems do not take up much space, can be designed to include chairs of multiple drive types and can be controlled with various input devices. Power wheelchair training may also be limited by lack of training space or perceived threats to end user safety. In VR, space is essentially limitless and there is no fear of injury to the participant and trainers or damage to the training spaces. Driving potential can be assessed with minimal risk. Demo equipment is limited in supply and cannot stay with a single user for a prolonged time. Consequently, another barrier, especially for newer power chair users or those changing drive controls, is time between equipment trials and equipment delivery. Skills may deteriorate in this time gap. Training or skills practice in the MR environment can be repetitive and consistent, without a chair being physically present. Lastly, the use of VR is noted by participants to be enjoyable and engaging by participants. Thus, this could improve motivation and participation in skills training.

Potential Drawbacks of VR

Virtual reality does come with its downsides, though. Most notable is the risk of "simulator sickness." This can come with various symptoms, including, but not limited to, nausea, headache, eye strain, fatigue and difficulty concentrating. There are ways to reduce the risk of simulator sickness or to mitigate the symptoms, but, for some, it can make the use of VR intolerable. There is also evidence suggesting that depth perception is underestimated in the VR environment, which could reduce translation of skills to the real-world. Additionally, VR is a form of technology, relying on computers, software and hardware specifications. This comes with the potential for equipment malfunction and session interruption. The program utilized by this group is new and still in its development stages, limiting the depth and breadth of its functionality and capacity for skills training at this time.

Conclusion

The application of VR across multiple disciplines is growing rapidly. Evidence supports its effectiveness for job training, due to the capacity for consistency, accessibility and improved safety. There are barriers in current power

wheelchair skills training, which this group feels can be addressed by VR. However, further developments in the technology and additional research are needed to assess its true applicability.

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Conflict of Interest

We have nothing to disclose.

IC49: My Wheelchair Guide: Manual Wheelchairs (a Smartphone application)

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Mary Shea-Stifel, MA, OTR, ATP

Learning objectives

1. Participants will describe 3 areas of critical input that should be part of a quality assessment for a wheelchair.
2. Participants will list the 6 users' steps in the process to obtain a manual wheelchair and the role of each team member.
3. Participants will be able to articulate 2 wheelchair skills that can be learned through use of the app.

Introduction

The new smartphone app called "My Wheelchair Guide: Manual Wheelchairs" is designed to assist wheelchair users with navigating their way through the wheelchair selection and acquisition process. The My Wheelchair Guide app helps empower users to be more prepared for their evaluation and to participate in the team decision to obtain a wheelchair. The "team" being the user, therapist, supplier, physician and/or caregiver. This app includes text and videos to assist the user in developing manual wheelchair skills and learning basic wheelchair maintenance.

Prior to reading further, please search in Google Play Store and Apple app stores for 'MWG Manual' and download the app to your smart phone.

The wheelchair is the single most enabling technology that allows people with mobility limitations to be independent. Shorter rehab stays and limited access to trained wheelchair seating and mobility professionals, especially in rural areas, reduces time spent on education and training. The degree to which wheelchairs and other assistive technology contribute to quality of life depends on the appropriateness of the selection, how well the technology matches the user's needs, the final fit and the provision of education/training in its use. With increased pressures on cost and limited time spent on wheelchair training, consumer educational materials are needed to help the user with decision making. Thus, this app was developed to meet these needs.

Trained professionals play an important role in the prevention of secondary conditions and, in promotion of safe and effective use of wheelchairs. However, day-to-day management of health and function rests in the users' hands. Research indicates that supporting consumer education and self-management can positively affect health outcomes.

Consumers who are at the center of the acquisition process feel a sense of ownership in the selection and use of their wheelchair.

The aim of this app:

1. Empower wheelchair users to take ownership in acquiring the ideal wheelchair.
2. Learn how to use and maintain the wheelchair in a safe and effective manner.

This new app has been designed to support patient education, decision making, as well as self-management skills for wheelchair use and performance.

Background

Staff from the Department of Rehabilitation Sciences and Technology, University of Pittsburgh contacted United Spinal Association to discuss updating the Mobility Map originally developed by Users First. United Spinal and a team of Clinician Task Force members updated the Mobility Map. University of Pittsburgh then utilized the Map to assist in developing the My Wheelchair Guide App. They also completed clinical studies using the app with wheelchair users and therapists and published the results. CTF provided expert review of the MWG App and recently the Power app. Other primary references for development of the app included the Wheelchair Skills Program, Dr. Lee Kirby at Dalhousie University and the University of Pittsburgh Wheelchair Maintenance Training Program.

The App includes 5 main areas

1. Get a Wheelchair 6 steps with a Q & A at the end
   a. Self-Assessment "My Wheelchair Checklist"
   b. Physician Referral
   c. Wheelchair Evaluation including Functional Assessment and Mat Evaluation video
   d. Wheelchair Selection
   e. Funding Process
   f. Receive Wheelchair
   g. Q&A h. Glossary

2. **Use a Wheelchair**
   a. Wheelchair Elements – components and features to compare and contrast to client needs with a Self-Assessment for the user to complete regarding their current wheelchair. A summary of their assessment can be emailed to their Seating Team.
   b. Fit and Set Up – how different features impact exertion, comfort, stability, propulsion efficiency, and pressure distribution. Self-assessment tool/checklist, summary and ability to email to the Seating Team.
   c. Wheelchair Skills – basic skills with videos and text descriptions, Intermediate and advanced skills – to raise awareness but recommend training with skilled therapist. Self-assessment tool/ checklist adapted from Wheelchair Skills Test questionnaire. Summary and Recommendations provided based on answers.
   d. Q&A

3. **Maintain a Wheelchair – 'What to do and who to call for what' is interspersed throughout the app**
   a. Weekly - Tire pressure, cushion cover & insert
   b. Monthly - Frame, wheels, seat, wheel hardware, cleaning actions
   c. Quarterly - Lubricate moving parts
   d. Yearly - Professionally service

4. **Health Issues - Common issues that need attention, Explanations about the injury, Consequences, Treatment options and cost, Common causes, Signs of injury and how to prevent**
   a. Pressure issues
   b. Shoulder
   c. Elbow
   d. Wrist
   e. Hand
   f. Lower limb
   g. Neck pain and Back pain
   5. Resources
   a. Publications
   b. RESNA position papers
   c. Rehab Programs
   d. Independent Living
   e. How to find a professional
   f. Wheelchair Transportation
   g. CTF, CARF, NCART, NRRTS, United Spinal Association

All information throughout the app includes pictures, illustrations, videos with captions and narrations. Checklists are also included.

Conclusion

The My Wheelchair Guide: Manual Wheelchairs app continues to be updated and a Power Wheelchair version is in the process of being developed. We encourage all therapists and suppliers to become familiar with the app and utilize this in your practice. Begin by implementing the use of the app with your wheelchair users during their inpatient rehab stay or when scheduling the person for an evaluation as an outpatient. Have the user download the app and go through the steps. Provide the user with your contact information to enter into the app to send you emails directly from the app as they transition through the process.

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4. Users First
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6. Thank you to all those who developed and continue to update the Manual app and those who are developing the Power Wheelchair version of this app.

Conflict of Interest

No conflicts have been disclosed

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IC50: Smart Home Makeover Disability Edition

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Learning objectives

1. Participants will be able to name two smart home protocols being used in comercially available smart home technology.
2. Participants will be able to name the most important information to gather during an evaluation.
3. Participiants will be able to name one way that the elderly can take advantage of smart home technology.

Introduction

This presentation will discuss how commercially available smart home technology can be used by people with disabilities to make them more independent in the home. The low cost and modular nature of current smart home technology makes environmental control much more achievable than in years past. The days of having to purchase an $8000 box just to get started are long gone. This presentation will provide an overview of the currently available technology, where to start, and ways to provide access to this equipment for people with disabilities. How this equipment can assist the elderly to be safe in their home will also be discussed.

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Conclusion

We now live in a world where smart home technology is affordable, accessible, and useful to people with distillates.

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Additional Learning Resources

www.staceyoniot.com

Conflict of Interest

Antoinette is the owner of ImproveAbility, a for-profit AT consulting and sales firm. ImproveAbility supplies and setups up home automation systems.

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IC51: Showing our Values – Clinical Practice in Aotearoa New Zealand

Liz Turnbull, OT
Jasmine Fox, OT

Learning objectives

1. Gain knowledge of wheelchair and seating practice in Aotearoa, New Zealand and develop an appreciation of the Māor.
2. Be able to implement a theoretical model into their everyday practice.
3. Be able to recite their own identity using the concept of a Māori pepeha to introduce themselves.

Introduction

Mobility Solutions is a government service within Auckland District Health Board (ADHB), providing individualised wheelchair and seating solutions for clients with complex postural and mobility needs of all ages and abilities within the Auckland region. People with disabilities in Aotearoa (New Zealand) mainly receive assistive equipment through government funded providers.

The New Zealand government is currently implementing a renewed commitment to improving health outcomes for Māori (indigenous people) in accordance with the principles of the Treaty of Waitangi (1840). The Treaty is the founding document of Aotearoa signed by the British Crown and Māori chiefs in 1840. It's purpose is to protect the rights of Māori and to provide them with equal status as non-Māori. Aotearoa health and disability providers believe that understanding and implementing the Māori world view into their practice is essential to successful health outcomes for all New Zealanders (Ministry of Health, 2020).

When working with clients who have complex postural management and mobility needs, wheelchair and seating practitioners are required to draw on all aspects of a person in order to provide the best and most suitable solution for them.

History & Context

Māori society was founded on collaboration and interdependence. It is made up of multiple large iwis (tribes). Each iwi is made up of various hapū (clans or decent groups) which can be made up by several hundred members. Each hapū is made up of whānau (extended family). The bond that holds them together is one of kinship – whanaungatanga. Members of hapū and iwi helped each other, working for the group. They undertook all the major tasks necessary for the group's survival (Orange, 2004). After Aotearoa became a British colony, the way in which iwi and hapū functioned began to change. When the government purchased or confiscated Māori land in the 19th century, tribes were dispersed (Orange, 2004). Māori population in 1769 was estimated to be around 100,000, by 1840 the population had declined by up to 30%. This was due to introduced diseases, lifestyle changes and the introduction of muskets which lead to warfare (Durie 1994).

In 1840 a formal agreement, The Treaty of Waitangi was made between Māori and the British Crown (Ramsden, 2015). There are two versions of the Treaty – one in English and one in Māori. Due to errors in translation, each party understood the Treaty differently. Māori considered the Treaty to be a guarantee of their rights as tangata whenua (people of the land) whereas the British at that time saw the Treaty as a surrender of Māori sovereignty to the Crown. Subsequently, the impact of colonisation contributed to the decline of Māori mauri ora (health and well-being) as Māori became disconnected from their taonga (treasures) which included their land and tikanga (customs) (Orange, 2004).

In 1975, the Waitangi Tribunal was established to investigate claims by some Māori that the New Zealand government had not upheld the promises of the Treaty (Orange, 2004). Claims were predominantly about land, fishing rights and language but Māori health was also identified. Since then the Ministry of Health has identified that a Māori health model such as Te Whare Tapa Whā is applicable for ensuring positive health outcomes for Māori (Ministry of Health, 2017).

Health, Equity and Values

"In Aotearoa New Zealand, people have differences in health that are not only avoidable but unfair and unjust. Equity recognises different people with different levels of advantage require different approaches and resources to get equitable health outcomes." (Ministry of Health, 2019 p. 7). This concept acknowledges that not only are differences in health status unfair and unjust, but they are also the result of differential access to the resources necessary for people to lead healthy lives.

Māori have undisputed poor health outcomes when compared to non-Māori. They experience reduced life expectancy, longer hospital stays, and higher rates of disability and chronic disease (Robson & Harris, 2007). Health practitioners are guided by legislation and ethics to practice in a culturally safe manner and contribute in any way they can to bettering health outcomes. Mobility Solutions and ADHB are on a continuous journey to consider how we deliver services and what we can do at an organisational, service and individual level to improve outcomes. Our focus is on equity as opposed to equality (Ministry of Health, 2018). Models to guide and support effective and culturally safe clinical practice

Various models have been developed to support health care providers to understand and consider the holistic needs of Māori. The model Te Whare Tapa Whā developed by Professor Sir Mason Durie identifies that the Māori world view has four key elements that require attention to achieve an optimal health outcome. Taha Whānau (family), Taha Wairua (spiritual), Taha Tinana (physical), Taha Hinengaro (mental and emotional) are the corner stones of wellbeing and offer a unified holistic theory of health. These four corner stones are represented by the four pillars of a house. If one cornerstone does not have structural integrity, the house will collapse (Durie, 1985; Durie, 1994)

Using Te Whare Tapa Whā as a foundation, wheelchair and seating practitioners can be guided through their journey and experience with clients as they work towards a wheelchair and seating solution. The therapist brings their experiences, values, beliefs and biases to the clinical relationship. They walk the path to the client's whare (home). Relationship and the establishment of connection and a common understanding is important at this stage. Whakawhanaungatanga as a concept can be broken down

into ‘whaka’ cause something to happen, ‘whānau’ family, ‘whanaunga’ relative, ‘whanaungatanga’ relationships and shared experience. Pepeha is an acknowledged way of establishing whakawhanaungatanga. It is a way of introducing yourself by sharing the connections you have to people and places that are important to you (Mead,2016). Once connection is established, the therapist can look to developing an understanding of the person. The whole person is represented by the whare which is supported by the four corner stones of wellbeing - family, spiritual, physical, mental and emotional. The clients lived experience overarches these cornerstones. Having developed an understanding of the whole person, the therapist can work with the client to explore their function and needs, their goals and aspirations and work with the client to identify a solution that fits within system and process parameters. This expansion of Te Whare Tapa Whā can be utilised within wheelchairs and seating and will enhance culturally safe practice.

Conclusion

Conscious consideration of the needs of our client’s and our connection are pivotal to holistic client centred care. The values that underpin us as clinicians and how we work - therapeutic use of self, influences our practice (Hagedorn, 2000). Efforts made to improve Māori health outcomes and engage Māori in the design and delivery of health care in Aotearoa have international relevance. Understanding and practicing with sound cultural safety as opposed to simple competence will drive change. Critical consciousness is key (Curtis et al 2019). To achieve this, clinicians and organisations should engage in self- reflection and strive for self-awareness to reduce bias and increase connection. Effective leadership, sound knowledge and strong commitment to practicing in a transparent values- based way will support clinicians to address the needs of all clients in their care. The expansion of the Te Whare Tapa Whā model therefore warrants deeper application to wheelchairs and seating.

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IC52: Best practices in online seating and mobility education

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Learning objectives

1. Describe at least two opportunities and two barriers to online education
2. Give 2 examples for translating in-person learning outcomes into online learning outcomes
3. Apply online education principles to seating and mobility education in the student's own context

Introduction

With the push to online education, there is a need to initiate a discussion about online education in seating and mobility. Online education is often referred to as distance education, e-learning, online learning, web-based learning, and virtual learning. (Anna Sun & Xiufang Chen, 2016) For the purposes of this paper, we will use the term online education. Online education, which is defined as classes that are delivered completely on the Internet, is a sub-set of Web-based education. In comparison, hybrid or blended courses combine online components with traditional, face-to-face components. (Mary K. Tallent-Runnels et al., 2006). Online education is divided into asynchronous and synchronous learning. Given the breadth of web-based education modalities, the information and communication technologies available to both teachers and students, and the principle of online curriculum design, online education is more than just recording a face-to-face lecture. The development of online education requires the same instructional design as in-person education, including clear goals, objectives and assessments. The learning activities are then developed based on the goals and objectives. The learning activities can include asynchronous and synchronous lectures, discussion posts and formative and summative quizzes. Therefore, we will discuss online education principles and strategies for education in the field of seating and mobility, and provide examples of online learning activities for use in post-secondary and post-professional education.

Online Education

Online education is not as simple as turning traditional in-person lectures into asynchronous video recordings. In an online environment, an instructor cannot sense the level of engagement in the same way that they can in a traditional lecture-based environment. For many instructors, the level of engagement is the hallmark of active learning activities, for example in-class discussions and think-pair-share activities. Therefore, we will examine asynchronous and synchronous online learning activities, and provide examples of the online learning activities in seating and mobility. We will leverage our own experiences as instructors in both single-class workshops for post-professional education, and multi-class courses for pre-professional education. We will describe the development of individual classes or entire courses based on a forward-looking instructional design model.

Backward Course Design

Best practices in education use a backward course design process and are driven by the course learning goals and objectives, as opposed to subject matter topics. One example of a backward model for integrated course design includes 4 components: situational factors; learning goals; teaching/learning activities; and feedback and assessment. (Fink, 2005). However, many novice instructors take a forward design approach and first identify topics, which provides barriers to effective instruction. Therefore, the course design process should start with creating learning goals and learning outcomes, and then generate assignments and topics. Tying together the goals, outcomes, assignments and topics allows the student to appreciate the learning process and understand how the various topics connect together. The course design process is critical for an effective and inclusive online learning environment.

The online environment provides an opportunity for learning and engagement that is not readily available through traditional lecture and lab-based education. Furthermore, the online environment promotes metacognition through a variety of learning activities. (McGuire et al., 2015) Examples include student engagement via interview with consumer-experts and professional-experts, multi-media activities, gallery walks, gamification, role play, and discussion board. If the course is designed properly, online education can provide an environment where the student can truly synthesize the core concepts of seating and mobility.

Case Example

The Ohio State University developed an online asynchronous certificate program designed to educate pre-professional and post-professional students on the principles of assistive technology. The curriculum for the Assistive and Rehabilitative Technology Certificate Program (https://go.osu.edu/artc) was designed in collaboration with the School of Health and Rehabilitation Sciences, the Occupational Therapy Division, the Office of Distance Education and E-Learning, and the Assistive Technology Center at The Ohio State University Wexner Medical Center. The course goals and learning objectives drove the development of learning activities and assessments. Learning activities were chunked into small components, scaffolded, and varied in order to support student synthesis and application. Furthermore, both low stakes and high stakes assessment were used to facilitate the learning process. The courses within the ARTC program leverage metacognition principles throughout in order to provide an engaging and purposeful learning environment.

Course Objective	Module Objective	Learning Activity	Topic	Assignments
Students will understand the service delivery process for seating and mobility across multiple settings.	Comprehension: Describe the seating and mobility service delivery process Application: Illustrate the seating and mobility service delivery process	1. Readings 2. Short lecture video 3. Consumer interview video	Seating and mobility service delivery process	Video Case Study Discussion [UG] and Moderation [Grad]

Note: A module typically includes 1 week of course activities in a traditional semester

Conclusion

Student stakeholders have different objectives based on their current educational goals, experiences, academic background and the needs of future employers. Online education can meet the student objectives through a backward design process that include engaging learning activities. Through active learning activities, the student will learn about the principles of the seating and mobility devices, strategies, services and practices that are not feasible in a traditional in-person educational environment. The online environment provides a unique opportunity to reach a geographically and professionally diverse group of students, and prepare the next generation of assistive technology professionals (ATP), engineers, technologists, technicians and clinicians. Student stakeholders have different objectives based on their current educational goals, experiences, academic background and the needs of future employers. Online education can meet the student objectives through a backward design process that include engaging learning activities. Through active learning activities, the student will learn about the principles of the seating and mobility devices, strategies, services and practices that are not feasible in a traditional in-person educational environment. The online environment provides a unique opportunity to reach a geographically and professionally diverse group of students, and prepare the next generation of assistive technology professionals (ATP), engineers, technologists, technicians and clinicians.

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Additional Learning Resources

1. https://keeplearning.osu.edu/ https://odee.osu.edu/students https://keeplearning.osu.edu/tools https://online.osu.edu/tech-support
2. Dennis Learning Center at Ohio State – Channel - https://www.youtube.com/channel/UCDg8eWnepNZ-lo-6Yr4IRqg
3. Dennis Learning Center – Study Smarter – Tips for Online Learning https://dennislearningcenter.osu.edu/student-resources/tips-for-online-learning/
4. OSU Course Goals and Learning Outcomes https://drakeinstitute.osu.edu/instructor-support/assessment-plan-development/articulate-course-goals-and-learning-objectives

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Conflict of Interest

Carmen DiGiovine is employed by The Ohio State University and The Ohio State University Wexner Medical Center. He is the Director of the Assistive and Rehabilitative Technology Certificate Program.

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IC53: A Telehealth Model for Assistive Technology Assessments

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Learning objectives

5. Understand the benefits of using telehealth for assistive technology assessments.
6. State three advantages for utilizing telehealth for a service delivery model.
7. Differentiate the areas of assistive technology that can be assessed remotely in the home.

Introduction

The international pandemic brought an abrupt need to change the traditional healthcare delivery model. Access to specialty services such as assistive technology for in person assessments needed to be halted. Clinicians at the Denver VA were faced with an opportunity to think creatively to be able to deliver services in an alternative method. By utilizing telehealth technology, assistive technology assessments and training were initiated. The service delivery model was constantly revamped by lessons learned in the field to streamline the process. Functional considerations for optimizing telehealth AT assessments were developed and expanded to provide necessary services to Veterans with diagnoses of spinal cord injury (SCI), amyotrophic lateral sclerosis (ALS), and multiple sclerosis (MS).

In the beginning of 2020, healthcare facilities were forced to limit most in-person appointments, including many specialty services due to the potential risk of COVID-19 transmission. The dilemma arose on how to provide necessary assistive technology services without in-person assessments to a fragile population of Veterans with the diagnoses of SCI, ALS, and MS, some of which were time sensitive cases. Clinicians at the Denver VA embraced the massive conversion of utilizing telehealth to deliver valuable assistive technology services to Veterans in their homes (Bashshur et al, 2020; Wosik et al., 2020).

Telehealth services help to improve access and continuity of care by providing an effective and convenient modality for patients and providers to use (Gladden, Beck, & Chandler, 2015). With the state of the pandemic, by offering specialty services remotely, the risk of disease transmission could be minimized for vulnerable populations, as well. Using a government-based telehealth software, VA Video Connect, Veterans in their home could have access to skilled clinicians to successfully evaluate, assess, prescribe, and train individuals and their caregivers on various assistive technology solutions for communication, environmental access, and computer and phone accessibility. Furthermore, with the use of telehealth services, Veterans' follow-up and troubleshooting needs and were being met in real time and in a much more time efficient manner by eliminating the need for travel. Clinicians are able to support the Veteran's use of the intervention more effectively with telehealth, while in the comfort of their own home.

In the home, virtually, a clinician can visualize functional deficits in communication, dexterity, coordination, and functional accessibility while the Veteran is interacting with their home environment. Telehealth allows the clinician to truly visualize a Veteran's functional capabilities rather than relying on the verbal reports given by Veterans and/or caregivers during an in-person appointment (McCue, Fairman, & Pramuka, 2009). By identifying these deficits early, appropriate interventions can be selected through visual examination, identification of personal goals, education, and simulated trials.

Many of today's commercially available smart home technologies can be beneficial in increasing independence for individuals with disabilities. Beneficially, because these technologies are so commercially available, many Veterans already have some of these technologies in their home. In-person encounters make it difficult to work with these home environment solutions, whereas telehealth allows the clinician to be involved in that setup and training in the home. In addition, utilizing technology and having training in real life scenarios allows for troubleshooting on the spot. Particularly for Veteran's with progressive conditions, telehealth proves to be a very successful method to conduct routine follow-ups without requiring the Veteran to come in for an appointment. This method allows for recording outcome measures, re-assessing goals, and re-intervention as indicated. Clinicians were able to implement the following 90-day follow-up tool with outcome measure to continue tracking Veterans' assistive technology needs:

90-Day Follow-up Tool:

What equipment/technology did you receive?

1.

Review of goals upon d/c:

1.

Rate your independence and efficiency on a scale of 1 to 5, with 1 being Unable to accomplish and 5 being completely independent. In which areas have the adaptations increased your independence and efficiency?

Access/use of the phone
[ ]1 [ ]2 [ ]3 [ ]4 [ ]5 [ ]NA

Access/use of your computer or tablet
[ ]1 [ ]2 [ ]3 [ ]4 [ ]5 [ ]NA

Position of your devices (desk, wheelchair, reach)
[ ]1 [ ]2 [ ]3 [ ]4 [ ]5 [ ]NA

Control over your environment (lights, bed, entertainment)
[ ]1 [ ]2 [ ]3 [ ]4 [ ]5 [ ]NA

Access to emergency services
[ ]1 [ ]2 [ ]3 [ ]4 [ ]5 [ ]NA

Access in/out of your home-door
[ ]1 [ ]2 [ ]3 [ ]4 [ ]5 [ ]NA

Access in/out of home using ramps/VPL
[ ]1 [ ]2 [ ]3 [ ]4 [ ]5 [ ]NA

Ability to communicate
[ ]1 [ ]2 [ ]3 [ ]4 [ ]5 [ ]NA

Access/use of gaming platform
[ ]1 [ ]2 [ ]3 [ ]4 [ ]5 [ ]NA

Are you satisfied with the adaptations provided?
[ ]Y [ ]N

Are you using the adaptations provided?

[ ]Y [ ]N

If not, what are the barriers to use? Were the adaptations user friendly and easy to learn? (unable to use =1, no barriers to use= 5)
[ ]1 [ ]2 [ ]3 [ ]4 [ ]5

How long did it take to complete training to learn to use the device(s)?

Did the training provide on your issued equipment enable you to meet your goals?
[ ]Y [ ]N

Has your quality of life improved as a result of the equipment and training provided?
[ ]Y [ ]N

For Veteran's whose condition no longer allows for travel to and from a clinic location, this method allows clinicians to continue following and addressing assistive technology needs in the home. For example, clinicians at the Denver VA were able to assist with communication device mounting and positioning for a Veteran fully dependent on a ventilator using eye gaze while in bed. Not only could this Veteran no longer travel, but the feasibility of evaluating eye gaze in bed is much more difficult in a clinic location rather than the Veteran's home environment. While telehealth can be a very useful service delivery model, the functional components must be considered. The client needs to have access to the internet and a computer, tablet, or phone with video and sound capabilities. Caregiver assistance is critical to address any technological barriers as well as assist with being the clinicians' "movement" to move the screen around as necessary throughout the telehealth session.

Conclusion

Throughout the course of the pandemic, the clinicians at the Denver VA have learned how to adapt and find solutions to continuing providing care to a very vulnerable population through the use of telehealth. Not only did it allow for these Veteran's to continue to be seen, but telehealth helped remove many barriers involved in providing assistive technology services, designed for in the home use, in a typical in-person clinic setting. The method of assistive technology service delivery allowed for improved appointment response time, real-time treatment and troubleshooting, improved continuity of care for Veterans with complex medical needs, and the ability to more easily apply incremented outcome measures to assistive technology practice. While telehealth is not without its own difficulties in setup, training, and technical limitations, the benefits of this platform were successfully applied to practice for the delivery of assistive technology services within the Denver VA.

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Conflict of Interest

These authors are employed by the VA Eastern Colorado Health Care System, Rocky Mountain Regional VA Medical Center.

IC54: Impact of the Assistive Technology Professional in the Provision of Mobility Assistive Equipment

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Gede Pramana, PhD

Learning objectives

1. List two guidelines an ATP provides when assessing wheelchair provision
2. List two client-level factors to be related to the variability in satisfaction with functional mobility
3. List one advancement of having an ATP certification

In today's complex rehab technology world, healthcare professionals are challenged to provide a quality service to our patients in a manner that establishes professionalism and credibility to not only our patients but to our payer systems as well. The central goal of seating device prescription is to minimize disability by maximizing functional independence and interaction. Patient-centered evaluation of functional outcomes for individuals who use wheeled mobility is critical to assure proper fit and minimize risks/limitation due to inappropriate or no longer adequately fitting equipment. One mechanism for professional recognition is the attainment of a professional certification such as the RESNA Assistive Technology Professional (ATP). The ATP certification allows one to provide proper evaluation, knowledge to ensure proper assignment of assistive technology, and administrator training for the appropriate usage of rehabilitation devices. This session will demonstrate the benefits of an ATP involvement in the prescription of a wheeled mobility seating devices. In addition, the presentation will discuss additional client-level factors related to the variability in satisfaction with functional mobility. In today's complex rehab technology world, healthcare professionals are challenged to provide a quality service to our patients in a manner that establishes professionalism and credibility to not only our patients but to our payer systems as well. The central goal of seating device prescription is to minimize disability by maximizing functional independence and interaction. Patient-centered evaluation of functional outcomes for individuals who use wheeled mobility is critical to assure proper fit and minimize risks/limitation due to inappropriate or no longer adequately fitting equipment. One mechanism for professional recognition is the attainment of a professional certification such as the RESNA Assistive Technology Professional (ATP). The ATP certification allows one to provide proper evaluation, knowledge to ensure proper assignment of assistive technology, and administrator training for the appropriate usage of rehabilitation devices. This session will demonstrate the benefits of an ATP involvement in the prescription of a wheeled mobility seating devices. In addition, the presentation will discuss additional client-level factors related to the variability in satisfaction with functional mobility.

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PS06.1: Person-Centered Care in the Provision of Wheelchair Seating and Mobility Technologies: A Review of the Literature

Becky Breaux, MS, OTR/L, ATP

Learning objectives

5. Participants will define person-centered care (PCC) and list its key conceptual underpinnings.
6. Participants will identify three outcomes of a PCC approach in the provision of CRT.
7. Participants will list three barriers and one facilitator to this approach.

Introduction

The purpose of this presentation it to summarize a review of the literature on person-centered care (PCC) in the rehabilitation sciences, assistive technology, and complex rehabilitation technology fields. Specifically, this review will describe the history of PCC and how it is defined and conceptualized, the outcomes of using a PCC approach, and the barriers and facilitators to its application and use.

Introduction:

To improve outcomes for wheelchair users and reduce risks for a poor fit with their technologies, experts in the WSM field recommend a person-centered care (PCC) approach as the industry gold standard for service provision (Arledge et al., 2011; Cohen et al., 2013). A person-centered approach encourages collaboration and effective communication among the healthcare team, honors patient autonomy and individuality, recognizes the holistic, biopsychosocial needs of the individual, and facilitates informed and shared decision-making. While research supports the importance of a PCC approach to reduce rates of technology abandonment, improve patient satisfaction, and reduce the risks of technology mismatch, PCC practices are not consistently implemented in the field (Federici et al., 2015; Holloway & Dawes, 2016; Johnston et al., 2014). Researchers note that "a provider-centered/controlled approach continues to occur" (Johnston et al., 2014, p. 422) and that individuals with disabilities are frequently denied informed decision-making opportunities, such as trying out devices before purchase.

History/Conceptual Underpinnings of PCC:

Historically, some believe the conceptual basis for PCC dates back to the work of Florence Nightingale who emphasized the importance of the person over the disease (Morgan & Yoder, 2012). However, Carl Rogers, an American psychologist and clinical psychotherapist, is most widely acknowledged for coining the terms client-centered and person-centered as he argued for the importance of care that is non-directive in nature and gives autonomy to the client (Rogers, 1980). Today, healthcare providers across settings interpret or define PCC differently, adding perhaps to inconsistency in understanding and use of the practice. In 2001, the Institute of Medicine promoted PCC as one of six pillars of quality health care, defining it as care that is "respectful of and responsive to individual patient preferences, needs, and values, and ensuring that patient values guide all clinical decisions" (Epstein et al, 2010, p. 1490). Some experts argue that PCC practice can be more easily defined by what it is NOT, "namely, disease-centered, technology-centered, physician-centered, or hospital-centered care" (p. 1490). On the other hand, neither is PCC "simply capitulating to patients' requests" or "throwing information at people and leaving them to sort it out on their own" (p. 1490).

Outcomes of a PCC Approach

A consistent finding among various studies on the outcome of using a PCC approach was an association between PCC and an increase in patient satisfaction with health care services (Constand et al., 2014; Kyler, 2008; Mckinnon, 2000; Morgan & Yoder, 2012). Similarly, studies found that person-centered practices, or aspects of PCC such as shared decision-making, collaborative partnerships, and goal-setting, resulted in an increase in perceived client self-efficacy, improved functional or medical outcomes, improved quality of life, and better adherence to health programs (Constand et al., 2014; Epstein et al., 2010).

Experts also argue that taking time to learn about a client in the early stages of care, as part of a PCC approach, can lead to overall improvements in how care is delivered, with a net result being greater efficiency of care (Federici et al., 2015; Verza et al., 2006). Additionally, they argue that higher rates of client satisfaction and improvements in client health and functional outcomes can further reduce their need for more interventions or additional costly procedures (Epstein et al., 2010). The upfront costs of PCC, therefore, are likely to be offset by its long-term benefits.

Barriers to PCC

Scientists identified several political and financial barriers to PCC such as an organizations failure to support the practice with vital resources and ensure that service providers understand the key components of the practice and how to implement it successfully. The value an organization places on cost-efficiency and cost-effectiveness may also hinder PCC practices, which typically take time to implement effectively (Federici et al., 2016). If an organization focuses primarily on short-term financial outcomes and fails to consider the long-term benefits of a PCC approach, the policies and resource allocation may not be conducive for PCC implementation. Cultural and institutional structures that place value on the biomedical model, evidence-based medicine, or hierarchical positions within professions can also serve as barriers to PCC. For example, researchers found that clinicians were hesitant to implement PCC because sharing power with the patient threatened their position as an expert or diminished their credibility.

Conclusion

This presentation will summarize the literature on PCC practices and offer suggestions about methods to improve its implementation as well as areas to consider for future research specific to the field of wheelchair seating and mobility service provision.

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Conflict of Interest

There are no conflicts of interest.

PS06.2: The Adaptive Driving Program at UPMC-CAT: An Inside Look at Clientele & Factors Influencing Their Fitness to Drive

Gloria "Gene" Gomez, MS

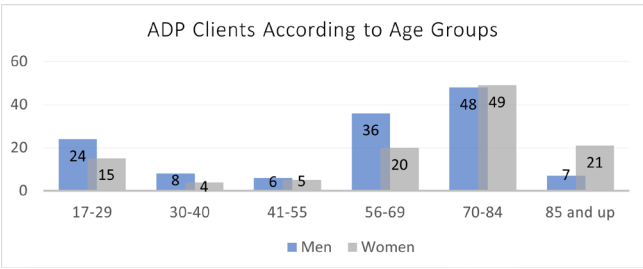
Learning objectives

1. Describe the demographics and range of services provided by the Adaptive Driving Program
2. Understand the role and impact of visual acuity when it comes to driving
3. Discuss how using technological features could benefit clients in driver rehabilitation programs

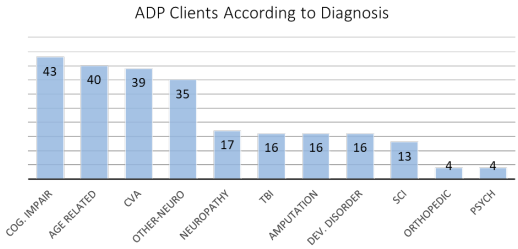
Introduction

This presentation is based on a project that analyzed data from clients of the Adaptive Driving Program at the Center for Assistive Technology in 2019. Currently, a controversial topic in driver safety are the standards in visual acuity and how it impacts the driving performance of people with low vision and/or vision impairments. Given the extensive variation in jurisdictions across the United States when it comes to vision requirements, the effectiveness of vision screening parameters is questionable (5, 12). However, research is limited, outdated, and/or before the emergence of advanced safety features found in vehicles today. Recent studies show that visual acuity does not play as a significant role as cognition (2, 10). Yet none have focused on providing evidence from recognized driver rehabilitation programs that ensure the safety of these drivers. This work is the first step towards conveying the effect that these two components had in assessing clients' fitness to drive.

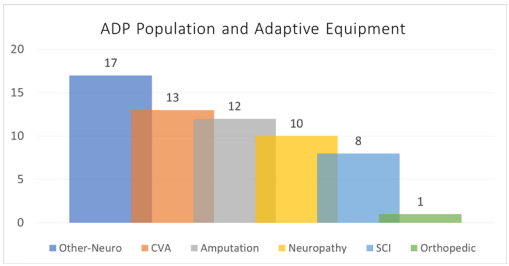
The clients belonging to this project were evaluated by the Adaptive Driving Program (ADP) in 2019. Categories were developed on primary diagnosis and reason for referral. Based on the presentation, clinical tests, and/or level of impairment, some clients were recommended additional training (n=82). Additional training was considered and recommended on a case-by-case basis to restore a skill and/or learn to drive with adaptive equipment (AE). Descriptive statistics can be found in Graphs 1-3.



Graph 1.



Graph 2.



Graph 3.

The variables collected were primary diagnosis, visual acuity, license restriction (glasses or corrective lenses), outcome of evaluation, type of vehicle and the adaptive equipment. A total of 243 (Men: 129; Women: 114) clients were assessed by ADP. Four of these clients were provided with vehicle modifications while the remaining 239 received a pre-driver evaluation (PDE) that consisted of a clinical assessment and a behind-the-wheel assessment.

Per the practice guidelines from The Association for Driver Rehabilitation Specialists (ADED), the clinical assessment was performed via a compendium of tests that measured physical functioning, vision, visual perception, and cognition (1). The behind-the-wheel assessment was completed with an ADP vehicle equipped with a dual brake pedal system, in a real-time driving environment. Assessment route was typically 60-minutes in duration with a variety of traffic environments (residential, city, highway). Main outcomes from the PDE were training, cleared to drive, and cessation.

In this paper, the terms pass/safe/fit are used interchangeably to mean the client was cleared to drive. While, fail/unsafe/unfit indicate that the client was recommended driving cessation by the certified driver rehabilitation specialist (CDRS).

The 239 clients were divided into three visual acuity (VA) groups: 20/20, 20/30, and 20/40

Visual Acuity	N=235
20/20	109
20/30	109
20/40	17

Table 1.

Each group was then subdivided by license restriction, outcome of evaluation, and primary diagnosis. Four clients were excluded because VA was not recorded on file or was outside the range of the VA groups (two were 20/50 and one was 20/70).

As seen in Table 2, license restriction was represented by 'Yes' or 'No,' to indicate if the client had a license restriction or 'N/A' if such variable was missing.

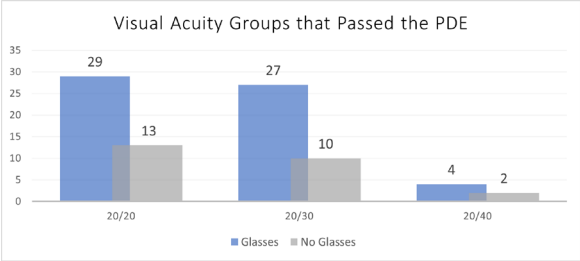
License Restriction	N=242
Yes	147
No	91
N/A	4

Table 2.

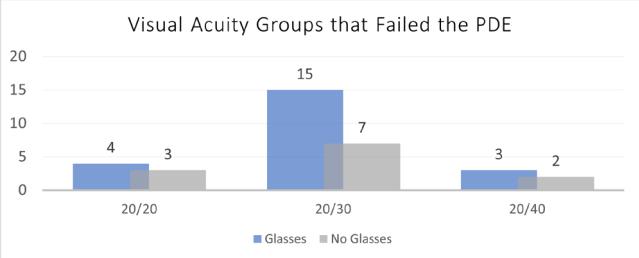
PDE outcomes were labeled 'Pass' or 'Fail.' Pass suggesting the client was cleared to drive while 'Fail' meant driving cessation. Cessation means the client demonstrated areas of concern associated with short-term memory skills, visual-spatial organization, divided attention, road sign recognition or other visual, cognitive, or motor skills that are reflective of driving. Driving behaviors that were commonly flagged and contributed to failing were problems with lane position, steering stability, inadequate scanning, and in extreme cases steering/braking interventions by the CDRS.

Clients that did not complete the behind-the-wheel assessment due to licensure issues (n=27; medical recall, suspended, expired) or those whose PDE outcome was to receive training in AE/remediation (n=82) were also excluded.

Graphs 4 and 5 show the VA groups based on Pass/Fail outcome.



Graph 4.



Graph 5.

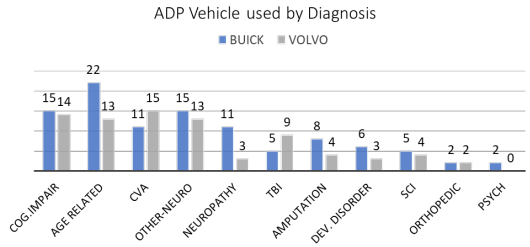
Data on AE and vehicle used (Buick Lucerne or Volvo S90) was also collected to learn about the current in-vehicle technologies and how it can best serve the forthcoming ADP population. Table 3 shows the number of times each vehicle was driven.

Vehicle, n (%)	N=192
2011 Buick Lucerne	102 (53.13)
Volvo S90	80 (41.67)
Both	10 (5.2)

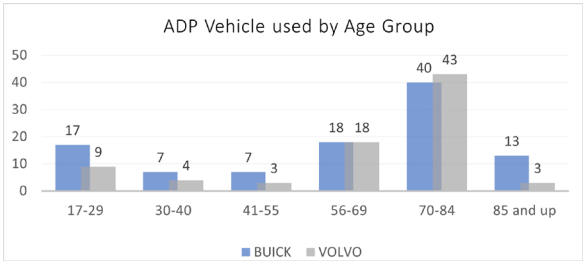
Table 3.

Occasionally, due to client preference and/or vehicle maintenance, a different car was used resulting in equal exposure of advanced driver-assistance systems (ADAS). ADAS are features designed to increase driver safety that when properly executed can enhance the ability to maintain good vehicular control and improve reaction times (7, 8).

Some available features in the ADP cars are blind spot warning (BSW), head up display (HUD), forward collision warning (FCW), and lane departure warning (LDW). Considering that 125 (51.44%) clients were 70 years and older, incorporating ADAS into driving habits could not only improve driver safety but alleviate some health limitations thereby enhancing quality of life. For example, BSW has shown to be beneficial to the aging population and those with limited range of motion (7). Graphs 6 and 7 show the vehicles used by clients according to diagnosis and age group



Graph 6.



Graph 7.

Thirty-four (14.29%) clients had a 'Fail' outcome. Twenty-one (61.76%) of them were referred to ADP for cognitive impairment and seven (20.59%) were referred for age-related impairments. All clients that failed the evaluation can be seen in Table 4 grouped by diagnosis.

Diagnosis, n (%)	N=34
Cognitive Impairment	21(61.76)
Age Related	7 (20.59)
Other-Neurological	3 (8.83)
Cerebrovascular (CVA)	2 (5.88)
Orthopedic	1 (2.94)

Table 4.

No significant relationship could be established with VA and PDE outcome due to the variety in visual acuity, license

restriction, and PDE outcome. In other words, some clients had no license restriction and/or belonged to more than one VA group and/or had different PDE results.

More than half of the clients (64.70%) that failed the PDE belonged to the 20/30 VA group. However, they were deemed unfit to drive due to concerns unrelated to visual acuity. It was noticed that when cognition was intact, clients from different visual acuities performed well on the PDE. Furthermore, a small group (n=6) referred for cognitive impairment passed the PDE but were recommended to return for a re-evaluation in a year or when notable cognitive decline was observed. At that time, the degree to which their cognition was affected had not yet translated into their driving skills.

It should be noted that when a client presented with cognitive deficit and VA ≥ 20/40, there was a higher probability of driving cessation. For instance, the client with 20/70 VA was referred for cognitive impairment and failed the PDE not only because of low visual acuity but also due to poor visual-spatial organization and attention skills.

Conclusion

Cognition and VA were imperative in determining fitness to drive; however, cognitive deficit was the most consequential factor. Findings from this project concur with existing results in the topic of driver safety, that is, driver safety might not be jeopardized by those in the low vision range, assuming cognition is intact (2, 10). In fact, it has been proven that visual acuity is not found to be associated with vehicle accidents nor was it a factor in precluding them (4, 11, 13). Therefore, it is important to look beyond visual acuity requirements when evaluating driving capacity (3, 6, 9, 10). Moreover, with the training from a CDRS and knowledge on how to best utilize ADAS, clients with a variety of visual acuities or vision impairments can become safe drivers and attain/maintain licensure (3, 7). Future studies should take driver rehabilitation programs into consideration when appraising driver safety and performance of individuals with low vision and/or vision impairments.

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Conflict of Interest

Gene Gomez is a former student of the Master of Rehabilitation Technology program at the University of Pittsburgh during which she completed her fieldwork with the Adaptive Driving Program in summer 2021.

PS06.3: AT for Sports and the HAAT Model: A Case Study in Adaptive Skiing

Madelyn Betz MRT, BA

Learning objectives

1. Identify three aspects of the HAAT model that can be directly applied to adaptive sports.
2. Describe five components of the athlete evaluation that influence technology selection.
3. List three stakeholders who can assist the adaptive athlete with choosing the best combination of sports technologies.

Introduction

Choosing the best piece of adaptive sports equipment is an involved process that requires athlete evaluation, extensive investigation about options available, equipment trials, and consultation with experts in the sport specific technology, seating interventions, and skills training. In this case study the HAAT model is used to determine optimal adaptive ski technologies through evaluating the athlete, his current assistive technology, and the activity within the physical, social, and institutional context.

CLIENT BACKGROUND

The individual this case study is based on, who will be referred to as the "athlete", is exploring various options for replacing his current monoski. The athlete spent a day on the Colorado slopes with a group of seasoned adaptive skiing instructors and a seating specialist collaborated to identify the best monoski model to fit the athlete. Using the HAAT model, the athlete's functional needs and personal preferences regarding various pieces of adaptive skiing equipment are evaluated [1].

Human

The athlete sustained a T11-12 ASIA Impairment Scale B spinal cord injury [2]. He has full range of motion and strength in his upper extremities, estimated 1 to 2 muscle function grading for hip flexion, and some sensation below his level of injury. He is about six feet tall and 190 pounds and has no previous history of pressure injuries. There are no significant abnormalities in his sitting posture: he has a level pelvis, even leg length, and normal sitting balance for his level of spinal cord injury.

Activity

The activity specific to this case is adaptive mono-skiing, which the athlete has been an active participant for nearly 30 years. He is involved in a variety of other adaptive sports and recreational activities, which are very important to his quality of life. He is completely independent, works full-time, and travels frequently. Family time is very important for the athlete, and is a significant factor related to his recreational skiing pursuits.

Assistive Technology

The athlete has used a Praschberger monoski for the last 20 years that has reached the end of its useful lifetime. The suspension system of the rig has become compressed over the years, lowering the overall seat to floor height, and impacting the athlete's ability to load on to the chairlift safely and independently. The Praschberger's seating configuration is set up to the athlete's preferences, with approximately 100 degrees of hip flexion, 90 degrees of knee flexion, and minimal seat slope (minimized further by athlete with a wedge).

Context

There are various contexts that shape the athlete's decision-making process when pursuing new adaptive sports equipment. When evaluating the physical environment of the ski mountain, it's important to consider accessibility, transportability, independence, and safety when choosing a new piece of equipment. The athlete needs to transport the monoski from the car to the chairlift and transfer from his wheelchair to the ski safely and efficiently. The social context most relevant to the athlete is his family approach to skiing. He is not in a competitive environment and will be skiing primarily in beginner to intermediate terrain with his children, which may affect the caliber of the equipment he chooses. For the institutional context, policy and funding support for adaptive sports equipment is much different than for conventional assistive technologies like wheelchairs. Adaptive sports technology is not funded by insurance and only the Veteran's Administration pays for this equipment, which he does not qualify for. The athlete can pay out of pocket for his new monoski or pursue external funding through grants dispersed by adaptive sports focused non-profit organizations.

Action Taken

The athlete trialed two different monoskis, the DynAccess Hydra and the HOC Nissin, out of roughly a dozen different models that are currently on the market [3, 4]. He spent three hours in each rig that also had different buckets, bindings, and skis between each set-up. He identified benefits and drawbacks to each piece of equipment, including the differences in suspension systems, seat to floor heights, and overall cost to purchase. The athlete consulted with two adaptive ski instructors, who collectively offered decades worth of experience working with monoski models and athletes. A physical therapist with expertise in adaptive sports seating was also present to offer support during these conversations.

Maintaining skin integrity and creating a seating system that properly secures the skier to the rig is paramount to skiing performance, regardless of the experience of the skier. This athlete has relatively straightforward seating needs, so a highly customized seating system was ruled out based on his needs. The athlete preferred a lumbar height bucket that fit him snugly, as compared to a mid-to-lower thoracic level bucket. He also used a Ride Designs Fit Kit – Low profile to offload weight from the ischial tuberosities to the proximal thigh [5]. He chose not to use the hip guides that come with the Fit Kit; however, these would be optimally incorporated to offload pressure from the trochanters.

After trialing the two rigs the athlete is pursuing the more expensive Hydra rig, due to the superior suspension system, lower overall weight, higher center of gravity, and self-reported improvement in skiing technique. He will be pursuing a combination of grant funding and paying out of pocket to fund this device.

Follow up

Completely dialing in the new rig and seating system will be an iterative process that requires several on-mountain trials and collaboration with seating specialists and

adaptive skiing instructors. The athlete's skin integrity will be repeatedly monitored throughout this process so that additional seating interventions can be implemented if necessary.

The Hydra, although significantly more expensive, was chosen because of its superior engineering and overall experience. The athlete was initially deterred by the expensive price tag of the rig (about $9,000) but was so excited about the rig that pursuing a purchasing plan was deemed appropriate. Although it's a large up-front investment, this new monoski will likely last for the remainder of the athlete's recreational skiing career. An individual's excitement towards a certain piece of equipment should be an important consideration when making decisions as more value is added to the device the client prefers.

Conclusion

The process for acquiring a new piece of adaptive sports equipment is different than pursing wheeled mobility devices, as detailed in the RESNA Wheelchair Service Provision Guide [7]. However, there are some similarities, including referral to qualified professionals, assessing current technology, trialing equipment, funding and procurement, and fitting, training, and delivery. The HAAT model is directly applicable to all aspects of the service delivery process for adaptive sports equipment [1]. There does not appear to be any literature about monoski evaluation and selection. However, evidence that supports the importance of off-loading bony prominences to protect skin integrity [8] and supporting optimal configuration in adaptive sports equipment to prevent upper limb injury [9]. These considerations are important for all athletes with disabilities but is especially important for the aging athlete who would be significantly negatively impacted by a pressure injury or upper limb injury.

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Conflict of Interest

The author has no conflicts of interest to disclose.

IC55: Lessons learned from the development of the International Society of Wheelchair Professionals

Mary Goldberg, PhD
Krithika Kandavel, PhD
Jon Pearlman, PhD
Nancy Augustine, PhD

Learning objectives

1. Describe at least three tools available at ISWP.
2. Identify at least one opportunity for engagement with ISWP.
3. Contrast ISWP's value proposition with the professional association(s) in which you are a member.

Introduction

Access to quality and affordable wheelchair products and services is a human right. In the global south, the gap in access is immense with more than 80 million people in the world not accessing the products and services that they require. This gap is the result of a systemic problem that can be described using the WHO's "5Ps" framework: the requirements for wheelchairs in a context are unknown (People); the workforce is insufficient (Personnel); the services fragmented (Provision); the wheelchairs are unavailable or inappropriate to the context (Products); and a lack of coordination and investment in the field (Policy). The International Society of Wheelchair Professionals (ISWP) was established in 2015 to coordinate wheelchair sector activities and has become a collaborative and multi-disciplinary platform of end-users, clinicians, designers, researchers, and activists. It grows daily with 5,200+ members from 106 countries and a social media reach of 111,000 in 108 countries.

ISWP has developed several tools, resources, and forums to assist in coordination and execution of wheelchair sector capacity building initiatives. They can be categorized according to the WHO's 5Ps of people, personnel, provision, products, and policy. Last, we describe how ISWP will transition to a self-sustaining non-profit entity.

People:
ISWP developed two versions of a Minimum Uniform Dataset dataset questionnaire which service providers can use during wheelchair service and provision with clients. The data can be gathered for a client who is being evaluated to receive a wheelchair for the first time or for a replacement wheelchair. The short version includes 26 questions. The long version has 36 questions, with additional questions including wheelchair and cushion manufacturer, make, model; training received; assistance using a wheelchair indoors and outside; distance traveled in the wheelchair; and whether the client takes public transportation. It is available in English, French, and Spanish.

Personnel:
Online courses: As a part of training, ISWP recently developed online courses based on the WHO Wheelchair Service Training Packages (WSTP) and other evidence-based resources. These courses can support the training of wheelchair providers in basic (for users who can sit upright without support) and intermediate level (for users who need additional support), the training of trainers of both basic and intermediate level, and training managers of wheelchair services and other stakeholders.

The ISWP Wheelchair Service Provision Basic Test, based on the WHO Wheelchair Service Training Package - Basic Level (WSTP-b) [Frost et al 2012] and other evidence-based resources, is an assessment that measures the knowledge of wheelchair service providers at the basic level. The test consists of 75 multiple choice questions, with a pass score of 70% [Gartz, 2016]. The test is available in 15 languages.

Basic Skills Assessment: ISWP validated and conducted a feasibility study of three remote basic skills assessment modalities for wheelchair service providers, including an online case study quiz, an in-person skills assessment and a video conference skills assessment. Results are published in the WIN along with a downloadable rubric [Ardianuari, 2020].

ISWP Trainer Recognition Process: ISWP helps to keep track of certified wheelchair trainers around the world. These individuals completed training through the WHO Wheelchair Service Training Package-Training of Trainers [World Health Organization 2017].

The ISWP Wheelchair Service Provision Intermediate Test, based on the WHO Wheelchair Service Training Package – Intermediate Level (WSTP-i)[Frost et al 2012] and other evidence-based resources, is designed to test the knowledge of personnel who provide complex wheelchair and cushion for children and adults who need additional postural support to sit upright. The test is available in English and Spanish. This exam has two parts. Part 1 is an online exam that consists of 91 questions with 70% as the pass score. Part 2 is the skills portion of the test (submission of two case studies).

ISWP's Wheelchair Service Provider certification acknowledges that providers have received appropriate wheelchair service provision training and have the knowledge at the basic level and have received appropriate training, which are valuable to both employers and wheelchair users. The process is currently available in English, French and Spanish.

The Seating and Mobility Academic Resource Toolkit (SMART) was created to support the provision of wheelchair education into academic rehabilitation programs (e.g., occupational therapy, physical therapy and prosthetics and orthotics) in various contexts (e.g., high-resourced, low-resourced).

Provision: The ISPO standards will serve as the basis for the new WHO Wheelchair Service Standards document. Four working groups are involved: Standards Development, External Review, WHO Steering Group and Coordination Group. The project will be completed over the next two year.

Products:
The ISWP Product Testing Wiki is a collaborative resource to support wheelchair and wheelchair component product evaluation. The WiKi includes best practice

recommendations, test methods, test equipment designs, information about wheelchair testing centers, among other information. The content and its resources are based on publicly available material, research literature, and recommendations from experienced wheelchair testers around the world. It also houses wheelchair testing centers from around the world. A wheelchair testing center is a facility where standardized tests are performed on wheelchairs or wheelchair parts to evaluate performance and safety. These tests might follow ISO (International Standards Organization) and/or local testing procedures.

Policy:
Policy Advocacy Kit (PAK) supports stakeholders with a framework and tools to address unmet obligations of the UNCRPD, focusing specifically on Article 20, placing the wheelchair users as the central focus within the wheelchair provision process. The PAK is rooted in the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD), the World Health Organization (WHO) Guidelines including the associated Wheelchair Service Training Packages (WHO-WSTPs), and the International Standards for wheelchair and seating technology.

A Forming Committee of 10 leaders from 4 countries supported the transition of ISWP from incubation at the University of Pittsburgh to the recruitment of a Founding Board. The subsequent Founding Board was named to establish ISWP as a separate organization outside of the university. 11 members represent a cross-section of the international wheelchair sector were elected by the Forming Committee and the ISWP Advisory Board members. The Founding Board will hire an executive director who will transition the organization to a fully independent international association.

Conclusion
ISWP has developed several tools and forums for communication among stakeholders. The future of ISWP as a separate entity involves opportunities for sustainability and to support its members through its tools, resources, and community to advocate and advance their local/national wheelchair sector with a systemic view. Challenges ahead include reaching critical mass at the local levels and development and implementation of a revenue structure for sustainability.

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Conflict of Interest
None

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IC56: Introducing: Digital Validation of Design of Seating Interventions

Bart Van der Heyden, PT
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Learning objectives

1. List at least two benefits of using fea for wheelchair intervention evaluation
2. List at least tree measurable variables when varying the back support angles, seat cushion angles and back support heights
3. List at least 2 consequences when changing the angles of secondary positioning devices supporting the pelvis from 45 degrees to 70 degrees to 90 degrees

The large amounts of wheelchairs and wheelchair seating variations as well as the large amount of wheelchair and wheelchair seating adjustments provides the client with more options, but it has also made the selection process more difficult for prescribers and clients and more expensive for funding agencies. As the prescription process becomes more complicated and funding agencies increasingly demand evidence to support the need for equipment, outcome measurement is becoming increasingly necessary (1) The choice of frequently used seating interventions like the amount of back support recline, cushion angle and foot support height are often based on clinical experience in combination with user feedback about experienced comfort when trying the wheelchair seating intervention for a limited amount of time. In the presented study the influences of the following parameters are examined: -Recline back support angles -Seat cushion angle (slope) -Height of the back support -Angles of secondary positioning devices supporting the pelvis The study is carried out using the numerical Finite Element Analysis (FEA) approach, using the Virtual Patient Model (VPM) Jo. The following parameters will be evaluated for each parameter: -Pressure Imaging -Friction at the cushion – client interface -Internal tissue strains: Strain Energy Density (SED) and Volumetric Strain Distribution (VSD) -Postural stability parameter (PSP) Based on these findings, we can improve our understanding of the mechanical interaction between the human body and the wheelchair for these set ups.

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IC57: A Different Approach to Documentation

Gerry Dickerson
Charles Sargeant

Learning objectives

1. Identify at least 4 reasons for negative determinations regarding seating and mobility requests
2. Identify and compare the major components of an LMN/LOJ that are needed for reviewers to understand the request
3. Understand at least 5 of the emerging elements regarding documentation for S&M interventions

Documentation, documentation, documentation. Words that, at times, bring fear and anxiety to the clinical and supplier ATP community.

What is needed? What is really required? Are multiple page LMN's really useful in the authorization process for CRT? What is the process/requirement for each payer source? Are they all different? Can we develop a simpler, more accurate documentation process that satisfies the need of the payer, the clinician, the supplier ATP, the consumer and results in the timely provision of the needed intervention? Can we develop a process that will reduce the documentation burden of all involved?

Some payers have low complexity in their documentation requirements, while others seemingly require endless reams of documentation. Much of that documentation can have little or no relevance to the actual intervention being requested.

Much of documentation is "shadow work", work that is done without acknowledgement from others involved i.e., management personnel, consumers and payers. It is also a burden that is not recognized when regarding reimbursement. Clinicians especially, spend countless hours of their own time working on documentation and the additional task of denial challenges.

We will be reviewing current similarities in documentation requirements for CRT as well as best practices from Payers that have the highest speed of approval for their recipients / members. With these learnings we can create a future that makes industry standard documentation simpler and more efficient while maintaining responsible utilization for our Payers. With documentation process improvement, we can make three-month deliveries for complex chairs an issue of the past.

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Additional Learning Resources

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3. Department of Health and Human Services
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5. Government Accountability Office (GAO-19-277) March 2019
6. Medicare and Medicaid; CMS Should Assess Documentation Necessary to Identify Improper Payments https://www.gao.gov/products/gao-19-277

IC58: Considering Power Dynamic Positioning as an Essential Part of the Seating System

Kathy Fisher, OT
Stephanie Tanguay, OT/L, ATP

Learning objectives

1. Identify 3 seating assessment principles
2. Identify 5 power positioning options
3. List 3-5 clinical benefits of dynamic position change

Cushions and backs are key components of a seating system to both offer clients a stable base to allow mobility and to promote optimal positioning for function and skin protection. Is seating effective when in a static position? Often seating components in a static position cannot relieve pain, reduce negative effects of gravity or effectively redistribute pressure. Bodies are designed to move therefore we must consider seating and mobility systems that will allow for position change. This presentation will address power dynamic positioning features and how they work in harmony with seating to further offer clients optimal positioning and support. Using case examples, we will discuss clinical justification to illustrate positive positioning outcomes.

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IC59: AAC for the ATP (RESNA Track)

Elizabeth A. Speaker-Christensen, MA/ CCC-SLP/L, ATP

Learning objectives

1. Name 3 types of images used for communication
2. Describe 4 access methods for AAC.
3. Discuss the Fitzgerald Key and how it can help with teaching and implementation.

Introduction

Augmentative and Alternate Communication systems are often recommended by speech/language pathologists, yet team members (OTs, PTs, Teachers, IT) do not always understand the feature matching process. This presentation is meant to clarify the process for the entire team and provide ideas for participation in the decision making process, use of devices during OT, PT or classroom activities, and multidisciplinary problem solving.

Augmentative/Alternate Communication (AAC) assessment, feature matching and implementation requires a team approach for language growth, development, and access. The process begins with a referral and moves through the assessment, equipment and device trials, data collection and procurement of an appropriate system. The assessment should always begin with access. With so many differing access methods, language programs, platforms and manufacturers, the decision process can be complex, but by gathering good data and allowing sufficient time for learning and practice, a successful match can be made. Speech therapists are trained to consider language development, use, disorders and therapeutic interventions, but assistive technology practitioners can be just as confident in their roles when incorporating AAC into their professional services.

Conclusion

By understanding the AAC feature matching process and how decisions regarding AAC are made, all AT practitioners can be confident in implementing AAC during their interactions. In addition, by knowing how and why decisions are made, each individual practitioner can contribute to the process and act as a valuable team member. By having a large team, community, and "village" we can increase success and decrease device abandonment.

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Conflict of Interest

Beth Speaker-Christensen is the owner/SLP for AAC Helper, LLC and has no financial disclosure or affiliation with ISS or any of the AAC manufacturers. Beth Speaker-Christensen is a member of ASHA Sig 12, member of USSAAC (and serves as Chair of the Membership Committee), and member and ATP of RESNA

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IC61: Working with wheeled mobility device users to develop active mobility strategies to improve community participation

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W. Ben Mortenson, PhD, MSc, BScOT, OT

Learning objectives

1. XLearn barriers, hazards, and sources of burden in the pedestrian environment affecting route choice.
2. Use maps to plan routes to destinations in the community that are important to the individual.
3. Create mobility strategies that promote physical and social engagement in the community Introduction

Introduction

People who use wheeled mobility devices (PWMDs) often struggle finding pedestrian routes to destinations because of environmental, personal, temporal, and information factors (Atoyebi et al., 2019; Prescott, Labbé, Borisoff, Feick, & Mortenson, 2019; Prescott & Mortenson, 2021). These factors are particularly challenging in unfamiliar, unexpected (a familiar environment with a temporary barrier), or complex environments (e.g., cities without a grid pattern street infrastructure). Navigating the community using a manual wheelchair, power wheelchair, or scooter requires a balance between the cognitive elements of wayfinding and the physical aspects of wayfaring (Lanng & Jensen, 2016; Montello & Sas, 2006). Because current maps do not incorporate accessibility factors, developing the skills to plan trips and follow these plans could benefit from a personalized intervention takes into consideration the spatial context that PWMDs experience (Karimi & Kasemsuppakorn, 2013).

Purpose

The purpose of this presentation will be to provide rehabilitation professionals with the tools to work with clients to develop strategies that help them better navigate their community. To begin, participants will be introduced to simple mapping technologies and mobility planning strategies. These will be applied in three case studies to identify routes to destinations in the community that are important to the individual, avoid barriers and hazards, and minimize burden. Participants will identify routes to each destination, recognize challenges along the route, and develop approaches to overcome those challenges, including assistive device options, and mobility training (e.g., exercise, wayfinding training, wheelchair skills training).

Methods

Developing effective active mobility strategies for PWMDs requires identifying the strengths and weaknesses of the individual, capacities of their mobility device(s), and environmental challenges that impact what they do (and want to do) and when they want to it. Described below is a 5-step process that involves an environmental audit and personal reflection.

Step 1 Brainstorming activities
To begin, it is important to know what a person will be doing in their community. This includes what they currently do and what they would like to do if it were accessible. All aspects of life should be considered including work, school, leisure and recreation, shopping, social interactions, health care, etc. Temporal variable such time of day, week or year are additional variables that may affect participation. Copy these activities onto individual pieces of paper and prioritize each activity by placing them into low, medium, and high importance. This will help with focusing on what is most important for the next steps.

Step 2 Inventory strengths and weaknesses
Working with a clinician, a PWMD should reflect on the personal abilities they have and the capacities of any assistive devices they may use to get around. This would include physical abilities such as strength, endurance, and balance, health status, toleration for pain, and other abilities deemed necessary for community mobility. For example, activities in very hot conditions can be more dangerous for a person with a high spinal cord injury and this should be taken into consideration in certain climates. Rate strengths and weaknesses on a scale of (1) very poor to (5) very good. This will help with evaluating challenges and identifying strategies moving forward.

Step 3 Mapping routes
To evaluate routes to preferred destinations identified in Step 1 requires mapping. While this step could be done with a paper map, it is better served by using simple Geographical Information software. In this exercise, we describe how to use Google Earth to map the shortest route from an origin (e.g., home or work) to a destination (e.g., doctor's office, supermarket, park).

1. Open Google Earth
2. Zoom to home and pin home on map (Add Placemark)
3. Pin a destination identified in the brainstorming
4. Right click on the home placemark and choose Directions from here
5. Right click on the destination placemark and choose Directions to here
6. Right click the route created and choose Show Elevation Profile as shown in Figure 1
7. Review the route to determine if it is a good candidate (most direct)

Step 4 Assessing routes
To assess the accessibility of routes to preferred destinations, the map is used again to identify barriers, hazards, and burden along routes. using Google Street View, which is part of Google Earth. This can be accomplished by:

8. Reviewing the route by dragging the person icon to the home placemark and releasing the mouse button to enter Street View
9. Follow the route created and identify any challenging factors (add a placemark at the location of the challenge and add a description)
10. Take note of any of these nine key barriers and hazards:
    a. No sidewalks or curb ramps
    b. Steep hills and cross slopes
    c. Obstacles that make the path too narrow to use

d. Temporary barriers (e.g., parked cars, construction, snow)

e. Changes in elevation that are too large to overcome (e.g., steps)

f. Poor visibility (e.g., lighting, blocked sightlines)

g. Access to accessible washrooms

h. Firm and even paths

i. Social issues (e.g., personal safety, health related)

11. Estimate the burden of the route (easy, moderate, hard, not possible) based on these six factors:

a. Distance: Shown on Elevation Profile

b. Slope: Follow along on the Elevation Profile by hovering over the profile (it will show you on the map that corresponds with that slope).

c. Cross slope (this may require visiting the site)

d. Width

e. Surfacing: firmness (asphalt, concrete, dirt, grass, etc.)

f. Obstacles: stairs, changes in elevation (steps, stairs)

g. Hazards: overhead, protruding, tripping

Figure 1. Elevation Profile

Step 5 In the final step, strategies for enabling access for individual routes or for overall community access should be explored. This might include speaking with city planners and engineers to create curb ramps, purchasing add-ons such as power assist to deal with long distances or steep inclines, training programs to improve endurance, or orientation exercises to improve wayfinding.

The approach described above can be done at any time in the life of a PWMD though it might be most important when when returning home from rehabilitation, moving to a new neighbourhood, living in a constantly changing community, or experiencing life changes that may affect their personal abilities. By engaging in the process PWMD may also gain better wayfinding skills and better self-awareness of how their abilities match environmental demands. It is also hoped that the skills and knowledge learned by rehabilitation clinicians can be added to their professional toolkit.

Conclusion

There are many factors that affect the ability of people who use wheeled mobility devices PWMDs to get around their community. Working with rehabilitation clinicians and simple mapping technologies, PWMDs can develop pedestrian navigation strategies that take into consideration environmental, physical, temporal, and information challenges that promote greater participation. This paper provides guidelines for identifying the factors that contribute to navigational barriers and approaches for addressing these challenges.

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Conflict of Interest

No conflicts of interest

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IC62: Outcome Measures to Assist in Decision Making and Demonstration of Product Success

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Mary Shea MA, OTR, ATP
Cindy Smith PT, DPT, ATP

Learning objectives

1. Identify 4 outcome measures that can be used in the wheelchair service provision process
2. Demonstrate how to assess a bilateral forward upward reach.
3. Determine how spinal alignment, such as kyphosis, can be assessed when sitting in a manual wheelchair

Introduction

What is a Measure? The size, amount, or degree of (something) by using an instrument or device marked in standard units or by comparing it with an object of known size (Google Dictionary) What is an Outcome in Health Care? "A state, behavior, or perception of an individual, family, or community that is measured along a continuum and is responsive to clinical intervention" (Jette, Halbert, Iverson, Micelei, Shah, 2009) What is an Outcome Measure? "A set of items that are used to create scores that are intended to quantify a person's performance or health status based on standardized evaluation protocols or closed ended questions." (Heinemann, 2009)

What is Reliability?

- Consistency
- Test-Retest Reliability: "The degree to which an instrument is stable, based on repeated administrations of the test to the same individuals over a specified time interval" (Portney & Watkins 2009)
- Intra-rater Reliability: "The degree one rater obtains the same rating on multiple occasions of measuring the same variable" (Portney & Watkins 2009)
- Inter-rater Reliability: "The degree at which two or more raters cn obtain the same ratings for given variable" (Portney & Watkins 2009)

What is Validity?

- How much a measure assesses what it is intended to measure?

Face Validity

- How Meaningful and Trustworthy is The Interpretation of a GIVEN SCORE from a GIVEN MEASURE for a GIVEN PERSON under a GIVEN CONTEXT

What are facilitators and barriers to using outcome measures in clinical practice? (Heinemann, 2009)

Facilitator:

- Guidance and time in selection of measure, administration, scoring, and interpretation
- Access to resources (space, equipment, etc)
- Practicality
- Scorer Understands Benefit of Outcomes Measure
- Consistency
- Support from organization
- Ease of performance
- Reasonable amount of time

Barriers:

- Tool takes too long to administer, interpret, analyze
- Lack of knowledge about outcome measure
- Lack of competence
- Lack of resources/equipment
- Cynicism regarding benefits or overwhelmed
- Lack of consensus for use

Wheelchair Seating and Mobility - Typical Measures

- Pain via Visual Analog Scale
- Range of Motion
- Manual Muscle Testing
- Tone/Reflexes
- Interface Pressure Mapping
- Wheelchair Skills Test (therapist reported and person reported)
- Wheelchair Forward Propulsion
- NPIAP Pressure Injury Stages (npiap.com)
- Posture and Posture Ability Scale
- Wheelchair Outcome Measure (WhOM)
- Wheelchair Users Shoulder Pain Index
- Modified Functional Reach Test
- Timed Up and Go Test
- Functional Mobility Assessment
- Vertical Forward Reach
- Time Forward Wheeling
- Ramp Ascent and Descent
- Pictures with and without measurements

Discussion

Section on Measures and Outcome Measures in Rehab-Participatory

Outcome

Measures That Can Be Used To Determine Seating System Intervention and Assess Its Effectiveness

Postural measurements of the pelvis and spine: Linear measure from floor to acromion

- Not Standardized
- Inter and Intra reliability
- Valid for measuring sitting changes when using a back support on a wheelchair

Vertical Forward Reach: Maximal bilateral reach upward and forward

- Reliable
- Valid for assessing effectiveness of back support when reaching upward

One Stroke Push: How far the wheelchair moves forward with one stroke on carpet, 14' x 40" x _ pile (May et al.)

- Reliable
- Valid when assessing effectiveness of back support during propulsion

Timed Forward Wheeling: Time to cross a distance of 23 meters - crossing at a 4 lane intersection (May et al,)

- Reliable
- Valid

Ramp Ascent and Descent: Timed test on a 10.3 meter ramp with a 1:12 grade slope. (May et al,)
- Reliable
- Validity questionable during descent- not using back support

Breathing Status
- Standardized
- Reliable
- Valid to assess effectiveness of back support when used after tsk exertion
- Portable spirometer is valid- expensive high calibrated spirometer machine was not valid for context

Pain via Visual Analog Scale Rating
- Standardized
- Validity

Skin Interface Pressure Mapping
- Objective, non-standardized Protocol
- Face validity
- Skin Pictures with or without measurement tool
- National Pressure Injury Advisory Panel Stages (npiap.org)

Wheelchair Skills Test (WST)"

Conclusion

The outcome measures discussed in this one hour sessions are not inclusive, but just an example of measures that can be used to track progress and demonstrate efficacy of a product.

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Acknowledgments

We would like to thank wheelchair and seating professionals throughout the world who continue to contribute to the plethora of knowledge that has grown our industry from its infancy. We appreciate the days of Joan Bergman, Adrienne Bergen, Elaine Trefler, and Doug Hobson. We, Jessica and Mary, want to thank you, Cindy Smith as you retires, for her passion, expertise, and friendship. You will be missed greatly and we are honored to be presenting with you at this ISS.

Conflict of Interest

Jessica Presperin Pedersen OTD, MBA, ATP/SMS, FAOTA
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Disclosure: We have no financial or other disclosures pertaining to this presentation.

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I63: Standardized Seating: Can a Wheelchair Cushion Selection Algorithm Work?

Sarah Lusto PT, MSPT, ATC, ATP

Learning objectives

1. Identify the clinical basis for a wheelchair cushion selection algorithm (wcsa)
2. Describe the limitations of the braden scale and explain how the utilization of subscales may assist in identifying risk
3. Discuss how different wheelchair cushion evaluation and selection methods/processes are impacted by setting and service

Introduction

The correlation between cushion selection and pressure injury prevention has been a hallmark of research for decades now, and new research is constantly being supported to look at the efficacy of new cushion materials and designs. However, for all that progress, we must also acknowledge that there exist barriers limiting access to knowledge and resources, which too often prevent the actualization of those evidence-based recommendations from ever becoming a part of the plan of care. Therefore, following a review of literature and clinician task force, a Wheelchair Cushion Selection Algorithm (WCSA) was proposed and developed to be used not only as a clinical and educational guide but also to assist clinicians in advocating for access to services, equipment, and resources while at the same time helping enhance interdisciplinary communication and cooperation.

Course Roadmap

Introduction of Clinical Reasoning for Development a Wheelchair Cushion Selection Algorithm (WCSA)

1. Detrimental Impact of diagnosis-specific coverage criteria for wheelchair cushions
2. Differences in access to knowledge and resources across clinical settings
3. Clinical and non-clinical influences on wheelchair cushion selection
4. Importance of interdisciplinary care
5. Knowledge translation and resource allocation within different models of wheelchair service delivery models

Creation of a Clinical Task Force

Members of the PT, OT, Nursing, and Leadership teams across the inpatient rehabilitation and critical care hospital divisions met to initially discuss the current support surface recommendations and selection procedures being implemented in an effort to align interdisciplinary procedures and improve patient outcomes. Out of that initial meeting, an inpatient rehabilitation division clinician task force which included therapy team members with dedicated wound care and wheelchair seating and mobility experience, was created to establish more specific education training modules and updated clinical best practice guidelines in order to standardize care and equipment access across the division. As a component of this work, a Wheelchair Cushion Selection Algorithm (WCSA) was proposed.

Literature Review – Discussion of summary of findings

A comprehensive literature search was conducted to identify the clinical basis for the wheelchair cushion selection algorithm. A broad search was performed using PubMed/Medline identifying publications from 2005 onwards. Search terms determined by the PICO framework and Boolean functions were incorporated to help capture relevant literature related to wheelchair cushion selection and pressure injury risk assessment. Because the purpose of this literature review was for finding evidence-based support for the development of a clinical tool, and not a systematic review itself, three high-quality systematic reviews with meta-analysis (Moore & Patton, 2019; Huang et al., 2021; Chou et al., 2013) were used as primary resources for the identification of existing evidence concerning pressure injury risk assessment and prevention alongside research in support of wheelchair cushion design principles.

Evidence-Based Support for Algorithm Development

1. "Due to the low and very low certainty of evidence from the included studies, there is no reliable evidence to suggest that the use of structured and systematic pressure ulcer risk assessment tools reduce the incidence, or severity of pressure ulcers when compared to risk assessment using clinical judgement." (Moore & Patton, 2019)
2. "Maximal preventive efforts should be extended to include individuals with intermediate Braden Scale subscale scores." (Alderden et al., 2017)
3. "The use of subscale scores can enhance prevention programs and resource utilization by focusing care on the risk factors specific to the individual patient." (Tescher et al., 2012)
4. "Pressure ulcers are a complex and vexing multi-faceted problem which will require the consideration of patient, provider and system-level strategies to address them." (Guihan & Richardson, 2018)

Clinical considerations in Development of WCSA

1. Risk assessment scale validity
2. Risk assessment scale inter-rate reliability
3. Attribution of Braden Subscale Scores to clinical risk indicators
4. Determination of wheelchair cushion categorization
5. Target audience of the use of the WCSA
6. Translation of usability across the interdisciplinary team
7. Alignment of WCSA with current Wheelchair Cushion justification criteria
8. Potential to utilize WCSA as potential evidentiary support for medical necessity as part of wheelchair seating and mobility evaluation
9. Development as WCSA as an adjunct to skilled intervention, not a replacement

Discussion of Structure and Use of WCSA
As outlined in figure 1,

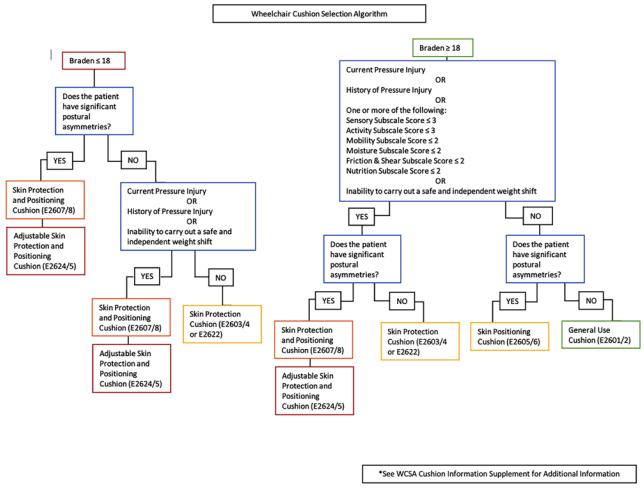

Figure 1. WCSA

the WCSA utilizes language consistent with Medicare coding and LCD coverage criteria to help standardize terminology and allow for its potential utilization as part of letters of justification. Clinicians utilize the algorithm starting at initial evaluation, or the point of first pressure injury risk assessment. It is based initially off the overall risk for pressure injury development as defined by a Braden score cut-off of 18. If less than 18, it then guides clinical decision-making to whether there is the need for positioning features in addition to skin protection as indicated based on the presence of significant postural asymmetry, pressure injury history, or pressure relief independence. If there is an initial score of greater than 18, further input of additional information on subscale scores and the presence of postural asymmetries is required to guide clinical decision-making. This incorporation of posture and Braden subscales is designed to capture a broader subset of the potential at-risk population and help identify those factors that most contribute to that individual's specific increased risk. This increased specificity is also designed to assist with clinical decision-making during the final equipment selection process, which occurs after the broader categorization of the cushion is determined by the algorithm.

Equipment Reference Guide
As a supplement to the WCSA, an Equipment Reference Guide was also proposed and intended to be kept updated and relevant to each individual hospital's wheelchair cushion inventory. This reference guide would include a breakdown of available wheelchair cushions for trial and use. They would be identified using the same categories as the WCSA, but additionally outline clinical features relevant to the Braden subscales, including material construction, shape (liner, contoured, pelvic well), shear reduction properties (fluid inserts, dry flotation, gel overlay, etc.), pressure redistribution properties (immersion, envelopment, off-loading), micro-climate properties (cover-materials, inner and outer cover construction). It would also contain general clinical comments made by the wheelchair team. The development of this guide also assisted in bringing to the forefront discussion of improving the allocation of resources and equipment across all hospitals within the inpatient division and not just those seeing higher percentages of spinal cord injury and brain injury populations.

Proposed Plan for Implementation
The implementation plan included educational models targeting wound care injury prevention modules for therapy staff and nursing timed with yearly clinical competency training. This was to be followed by the development of electronic medical record documentation standards and the designation of individuals at each site to serve as leads for their respective therapy teams. At those sites with dedicated ATP and wheelchair teams, they would head the education and planning, while at sites without a dedicated wheelchair lead or ATP, we would complete a "train the trainer" program and offer clinical support from another site as needed.

Limitations
At the time of this submission, due to the onset of the COVID-19 pandemic, as well as staffing changes, the implementation of this algorithm was unable to be initiated as planned. However, the task force successfully completed and implemented the education modules with success and set a solid foundation for the future.

Future Considerations
1. Objective measures pre and post-implementation looking at changes in pressure injury prevalence.
2. Flexibility of standardized models to adapt to changes in equipment and across clinical settings.
3. Additional risk assessment tools to be considered either as an adjunct to or in replacement of the Braden subscales.

Conclusion
The use of a WCSA is not meant to limit or replace individualized wheelchair cushion selection and evaluation. However, in those settings where access to knowledge and physical resources is limited, it can help serve as a clinical and educational guide. It may also have other secondary benefits, such as assisting clinicians is advocating for access to services, equipment, and resources, as well as helping enhance interdisciplinary communication and cooperation, especially with nursing and wound care services.

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Conflict of Interest

Since the time of submission of this initial abstract, I am no longer an employee of the Kessler Institute of Rehabilitation and have since transitioned into a role as a clinical educator for Permobil whose product lines include Roho, Comfort Company, and Vicair.

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IC64: The Complete Solution Approach: Seating for All that Matters in the LTC and Community

Anna Sokol, RN, MN, BScN, BScKin

Learning objectives

1. List three major quality metrics in the community and LTC industry
2. Name at least 3 features of seating design that may help prevent wheelchair-related falls and PIs
3. Describe infection control requirements related to seating and mobility product design

Introduction

Patient safety and prevention of incidents is an important priority of the healthcare systems around the globe. Falls, pressure injuries, and infections have been identified as the costliest safety issues that drive organizational expenses and hospitalizations rates up. Yet these same three safety events are usually preventable. When the wheelchair is prescribed, the selected system should meet the individual's mobility and seating needs. If clinicians add another angle to their assessment and select cushions, backs, and headrests with infection control, fall and pressure injury prevention in mind, the wheelchair system will help to curb the adverse events.

Fall prevention – what to look for in the wheelchair cushion Falls incidence and costs continue to climb up in the community. As an example, falls in the Ontario long-term care settings grew from 13.9% in 2010/2011 to 16.4% in 2017/2018 (HQO, 2018). Latest developments in video technologies allows researchers and administrators to look deeper into the causes of falls. Yang et al. (2017) analyzed 1800 videos of falls of 529 residents in two LTCs (private and publicly funded). Reviewing events that occurred seconds prior to the falls revealed information about the possible causes of falls. Throughout the study period (18 months), 46% of observed individuals suffered one fall, 20% had two falls, 10% had three falls, 6% had 4 falls, and 18% had five or more falls. Half of the falls occurred when a person was seated, was wheeling, or was changing position such as getting up or sitting down. The incorrect shift of the body weight and excessive sway of the trunk were the dominating themes of the Yang et al. (2017) study. Ability to establish stable posture is a complex neuro-motor skill that is closely linked to proprioception – position and gravity sense.To maximize postural stability and minimize risk of falling during position change, the intermittently ambulating wheelchair user should engage all the components of proprioception. Using wheelchair armrests as a base of support, removing obstacles such as footrests, ensuring midline and wide-base leg positioning, as well as keeping in touch with the wheelchair (with locked wheels) in the upper calf and popliteal area – all of these strategies are helpful during seat-to-stand transfer. This is where the leg troughs formed by abductor and adductor contour provide additional benefit. Getting as close as possible to the chair (with locked wheels), using the back of the legs and both hands (if possible) may reduce risk of falling during the stand-to-seat transfer. A waterfall front edge of the wheelchair cushion can help to maximize the contact surface in the popliteal area, thus adding the sensory input from the skin. Using a contoured wheelchair cushion with a lower profile improves wheelchair stability by keeping the users' center of gravity low. Lower profile of the seat cushion is also associated with reduced risks of falls and improved leg-propelling function due to lower seat-to-floor height (Okunribido, 2013). Additional features such as pre-ischial bar for prevention of forward sliding of the pelvis and raiser rear contour for prevention of posterior pelvic tilt add additional value to contoured cushions; every bit of assistance is important for a wheelchair user with high risk of falls. For the person using only one leg for wheelchair propelling (as a result of the stroke or amputation), the ability to customize or modify the cushion with unilateral elevation can improve balance and reduce pelvic rotation and address obliquity.

Pressure injury prevention – what to look for in the wheelchair seating). While multiple etiological and pathophysiological factors may contribute to the development of PI, preventable wheelchair-specific factors such as ill-fitted cushions, wheelchairs, poor trunk support, pelvic obliquities, inadequate pressure-relief surfaces, and insufficient offloading should be of greatest concern to seating professionals (Wall & Colley, 2003). A wheelchair cushion should provide sufficient immersion, offloading, and envelopment to address pressure and shear issues at rest and in motion. A well-fitted foam or hybrid wheelchair cushion should help with postural support which will reduce compression of cardiovascular, gastrointestinal, and respiratory organs caused by poor posture. A contoured cushion fitted to a person's size, with features such as pelvic seat well for immersion of bony prominences and trochanteric shelves to allow sufficient off-loading and transfer of forces onto lateral femurs may provide an effective solution. Fluid pads with silicone of very thin viscosity will minimize shear forces during movement, and – if constructed in a way to keep fluid in place – will offer a compliant medium to minimize soft tissue deformations. . It is important to consider the cushion cover material and the role it plays in creating or reducing friction (slippery effect) as well as temperature and moisture affecting surface tissues. Some manufacturers offer a variety of cushion covers that reduce shear, add breathability, or allow effective disinfection.

Infection control and wheelchairs

Different settings required different approaches to infection control, cleaning, and disinfection. In the home setting, an individual would want to be able to put the cushion covers through a laundry cycle. However, when a wheelchair user is scheduled to see a specialist at the hospital or clinic, the cover that allows wiping with a disinfectant would be appreciated. In the long-term care setting, the wheelchairs should be individually assigned, yet we often see these mobility devices being used by multiple residents. If materials of the wheelchair frame and seating are not compatible with facility-approved disinfectants, either wheelchairs don't get disinfected posing infection control risks, or they get disinfected by means or products that may destroy wheelchair components or materials. Public health recommendations note that equipment surfaces should be cleaned in between multiple patient use. Products should be made of materials that can endure repetitive use of disinfectants. Hermetically welded seams are recommended

to prevent entrapment of particles or bacteria. It is also required that equipment surfaces stay intact, without damages, tears, or holes – to ensure that cleaning and disinfection is effective (HICPAC, 2019). Hospitals and seating clinics often have similar policies. Therefore, it is important to select seating products and wheelchair systems that address local infection control requirements.

Conclusion

Multidisciplinary attention to the wheelchair cushion, back, and headrest may be a missing piece in the patient safety puzzle. Prompt identification of risks related to wheelchair cushions, backs, and headrests will lead to timely wheelchair seating assessments conducted by trained OTs and PTs. Multidisciplinary education about links between the wheelchair seating and patient safety may prevent pressure injuries, falls, and infections. Manufacturers are constantly innovating and offering new products and materials that reflect market needs. Inquiries about the seating designs will inform clinicians about new options. And collaboration between the manufacturers, healthcare organizations, clinicians, and wheelchair providers may potentially address all the matters important in the community and long-term care.

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Conflict of Interest

Author holds the position of the clinical education specialist at Motion Concepts, manufacturer of Invacare® Matrx® Seating and Positioning product line.

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IC65: The Seat Cushion Micro Climate: Cushion Surface Temperature, Moisture and Humidity - What is the effect on Skin Integrity? Current Research Findings

Amy Bjornson, PT, ATP/SMS, Physiotherapist

Learning objectives

1. Identify the primary mechanisms by which heat, moisture and humidity can negatively affect the skin's health and integrity
2. List 4 mechanisms of reducing the risk of tissue injury due to heat and moisture.
3. Identify 2 strategies to assess a cushion's ability to protect skin from damage due to moisture, heat or humidity

Introduction

Historically, the term Microclimate has been used in a weather or topographical context, but as of late it has made its way into CRT industry to describe the mini-atmosphere of increased skin temperature and moisture at the seating interface.

Because of their limited mobility and sensation, wheelchair users are at risk for tissue injuries. We've known for decades that pressure and shear are clear culprits in these injuries, but continued research is determining that higher skin surface temperature and moisture are also contributing factors and management of this climate is also critical in healthy skin promotion.

This session will investigate the existing research on the contribution of temperature and moisture in pressure injuries, the body's response to heat stress in common mobility disorders and the overall effect on skin integrity. We will also discuss the research currently underway at Southern Cross University in Australia. This study, investigating clients using several common wheelchair cushions, will investigate cushion surface temperature, cushion humidity and client body temperature.

Conclusion

This workshop will assist in identify the primary mechanisms by which heat, moisture and humidity can negatively affect the skin's health and integrity and what to consider during wheelchair cushion selection.

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Conflict of Interest

Amy Bjornson is employed by Sunrise Medical Australia, manufacturer of seating and mobility products

IC66: Closing the Gap for People Needing CRT Through Inpatient Rehab and Outpatient Collaboration

Cathy Carver PT, ATP/SMS
Katie Fitzgerald, PT, NCS

Learning objectives

1. Participants will identify 2 potential barriers to bridging the gap between patients receiving appropriate CRT in the fi
2. Participants will identify 2 ways to start a collaboration between inpatient rehab and outpatient therapists in the prov
3. Participants will identify 2 ways to improve follow up care for CRT after discharge from inpatient rehab and how to trac

Introduction

Spain Rehabilitation Center is a comprehensive rehabilitation hospital housing one of the Model Systems for Spinal Cord Injury and Traumatic Brain Injury. It is part of one of the largest academic hospital systems in the US with 1100 total beds and is a level 1 trauma center. The services offered extend the continuum of care from the Emergency Dept to outpatient services. The focus of this instructional course will be the transition from inpatient rehab to outpatient services related to ensuring patients get appropriate mobility equipment.

A pattern of repeating trends began to emerge in the last two years that were problematic for patients who had long-term Complex Rehab Technology (CRT) needs. An increase in referrals to the outpatient wheelchair clinic for patients with secondary issues of pain, pressure injuries, postural issues, and/or contractures limiting mobility was found to be correlated with patients having received a basic wheelchair that transitioned from rental equipment to purchase before long term needs could be assessed. Since the wheelchair had been purchased, the patient now presents with little options for changing equipment under insurance benefits. A multidisciplinary discussion between outpatient and inpatient therapists revealed multiple procedural barriers and a knowledge gap related to timing of making recommendations for long term/purchased CRT. Other issues were discovered such as, a lack of available trial equipment, limited use of various suppliers of CRT, and a lack of understanding of responsible use of a patient's insurance benefits by inpatient therapists.

Key staff from inpatient PT and outpatient PTs in Wheelchair Clinic were identified and regular meetings began. We addressed the decision making process of who needs a CRT eval in inpatient vs. who should wait and refer to OP for an evaluation. The workflow processes for inpatient and outpatient were discussed and better appreciated. Communication between therapists in these departments improved for consultations. Discharge planning and referral processes were created, streamlined and now being utilized. Various educational resources have been provided. Inservices by local CRT suppliers have been set up and relationships begun. Inpatient is working on addressing inventory of equipment and educating staff/ teams on discharge planning/referral process. Ways to track improvements in the collaboration will be provided in this presentation. This collaboration has improved outcomes for patients and improved the team approach across this part of the continuum of care. It remains a work in progress and we will share lessons learned and ongoing work including educational needs, tracking outcomes, use of suppliers, staff needs and process improvements. The main goal is to be focused on outcomes for patients and the continuum of care.

Conclusion

This collaboration between inpatient and outpatient therapists who work to recommend appropriate seating and wheeled mobility equipment has improved outcomes for patients. It has also improved the team approach across this part of the continuum of care. It remains a work in progress and we will share lessons learned and ongoing work including educational needs, tracking outcomes, use of suppliers, staff needs and process improvements. The main goal is to be focused on outcomes for patients and the continuum of care.

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Conflict of Interest

no conflicts of interest to disclose

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IC67: The Wheel Story: The Impact of Wheels and Tires on Manual Wheelchair Performance and Propulsion Efficiency

Curt Prewitt, MS, PT, ATP
Deborah Pucci, PT, MPT

Learning objectives

1. List three features of caster wheels and explain how they influence manual wheelchair propulsion efficiency
2. List three features of drive wheels and explain how they influence manual wheelchair propulsion efficiency
3. Explain three characteristics of drive surfaces and explain how they impact manual wheelchair drive wheel and caster sel

Introduction

The word 'wheel' in wheelchair may often be overlooked, or quickly dismissed by checking a standard, or no-charge box on an order form without giving it a second thought. Have those of us involved in the wheelchair prescription process taken the time to really understand one of the greatest and most widely used inventions in human history: the wheel? What does it really do, and what is important to know when selecting wheels and tires for manual wheelchairs?

Imagine a meticulously configured ultralightweight rigid manual wheelchair, set up for the user's anatomic measurements, postural support needs, and skill level. The wheelchair has an aggressive axle position and is stripped down of secondary components, such as anti-tippers, armrests, or even wheel locks. The end-user is expecting a highly efficient, high-performance wheelchair. Now, imagine the chair being issued equipped with mag wheels and pneumatic tires with flat-free inserts. Was that the best choice for wheels and tires for this individual and this wheelchair?

There is ample evidence that suggests that weight distribution may be the most critical factor that affects propulsion effort or efficiency (Sprigle & Huang, 2015; Sprigle et al, 2019) and much of the research indicates that wheel and tire selection is the next most influential factor affecting propulsion efficiency. Despite this evidence, wheel and tire selection on manual wheelchairs is often determined by cost or maintenance factors rather than based on performance characteristics. This may result in users receiving wheels and tires that may be less than optimal for their abilities and needs.

Understanding what role a wheel actually serves for a wheeled mobility device is important. A wheel is a means of reducing friction and providing leverage. It is a force multiplier. Similar to a mechanic using a long wrench to provide increased leverage to loosen a tight bolt, a wheel takes the force a user applies and increases it. Two physical principles involved in the function of wheels and tires are rolling resistance and rotational inertia. These factors can significantly influence the performance and energy cost of the wheel, and thus the wheelchair.

What affects the performance of a wheel?
Rolling Resistance is defined as any force that slows down a rolling wheel. Simplistically, it can be described as a loss of energy due to friction. Many things may contribute to rolling resistance, but a primary contributor to it is non-elastic effects. Non-elastic effects are influences in which not all the energy needed for movement of the wheel is recovered in the process of movement. Among these non-elastic effects is rebound. Rebound is the main cause of energy loss associated with rolling resistance and is attributed to the viscoelastic characteristics of the tire material (e.g., rubber or polyurethane). In the literature the technical term for this rebound is hysteresis. We can think about rebound by considering a bouncing ball. When dropped, some balls will bounce back to near the height from which they were dropped, while others will not bounce back, or rebound, near as much. For example, SuperBalls are claimed to have a resilience, or rebound of about 90 percent, meaning it will bounce back up 90% of the height from which it was dropped. Other non-elastic effects include permanent deformation (of a rolling surface such as soil or gravel, for example) and slippage on the rolling surface.

Related contributing factors to rolling resistance can include tire type, tire material, shape and tread pattern; system weight distribution (noted above as the most critical factor affecting propulsion efficiency); wheel diameter and tire width; and inflation pressure (or durometer for non-air-filled tires). Pneumatic, or air-filled tires, for example, have been demonstrated to have less rolling resistance than tires that are non-air-filled. These non-air-filled tires include solid tires as well as pneumatic tires that contain a solid insert in place of air. Sawatsky et al stated: "The solid tyres performed worse than all three pneumatic tyres even when tyres were under-inflated to 25% of tyre pressure. . ." (Sawatsky, et al, 2004). In another study, Kwarciak et al stated that pneumatic tires exhibited lower rolling resistance than solid tires, and also noted that solid tires showed larger increases in rolling resistance with increases in load when compared to pneumatic tires (Kwarciak, et al, 2009).

Inertia is defined as a property of matter by which it continues in its existing state of rest or uniform motion, unless that state is changed by an external force. Think about overcoming inertia to initiate movement on a very heavy shopping cart – it may take quite a bit of 'push' to get it moving. We also need to recognize that inertia is involved with the rotating mass of a wheel. Getting a heavy wheel spinning can require an appreciable effort, and likewise, getting that wheel to come to a stop can also require considerable effort. When considering the inertia of a rotating mass, the distance of the mass from the axis of rotation significantly increases the effort required to accelerate or decelerate it, so understanding the impact of choosing heavier wheels, or heavy tires is an important consideration in the prescription process, and in discussions with end-users regarding environment of use, abilities, goals, etc.

Conclusion

When you think about it, wheels are remarkable components that can make mobility easier for an individual who uses a wheeled mobility device. It is called a wheelchair, after all. There is no perfect drive wheel, nor is there a perfect caster wheel for all surfaces (Sprigle et al,

2019). There are many wheel and tire choices out there, and a good understanding of wheel and tire technology and performance characteristics can inform and improve decision-making for an individual's circumstances. If the professionals involved in prescribing and recommending are aware of the benefits and limitations of any particular wheel or tire, and they involve the end-user by informing them of the options based on their individual needs and capabilities then this will contribute to the better outcomes and greater user satisfaction.

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Conflict of Interest

The primary author is employed by a manufacturer of manual wheelchairs

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IC68: Supporting the Client: Extending the impact of the ATP through client and caregiver training and support

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Learning objectives

1. Describe three ways that client and caregiver context impacts long-term AT implementation
2. List three resources the clinician or professional may provide to clients and/or caregivers to address common challenges
3. Describe two ways to build capacity of the client and/or caregiver within specific contexts

Introduction

Professionals working with wheelchairs and other types of assistive technology often have limited time to address all of their client's needs. Technology challenges inevitably arise when the clinician or ATP is not available. This can impact whether or not the client can continue to use the technology effectively and may even lead to abandonment if issues are not able to be addressed in a timely fashion, particularly for individuals with complex needs who use a variety of technologies. This instructional course focuses on practical ways ATPs and clinicians can support AT implementation with clients and their caregivers in ways that go beyond direct support. We consider multiple client and caregiver contexts because the strategies and resources used in capacity-building depend on the context.

Many ATPs have experienced the situation where the implementation of an assistive technology solution seemingly went well, only to find out several months (or years) later that the AT was no longer being used. What went wrong? In hindsight, you realize your implementation training focused on the operational skills your client needed to use their AT (that's what they were focused on too) but didn't include enough resources to keep them going in their everyday world. Not only that, you (rightly) focused your training on the AT user but forgot about their network of support - the supports and relationships that, with enough training and resources, can be a significant facilitator in any person's environment.

The implementation section of RESNA's ATP exam outline, which is based on a job analysis by expert AT practitioners, points to the need for capacity-building strategies and resources that go beyond the direct services that an ATP or clinician provides. Yes, implementation means to "train the client and team members in device operation, adjustment, [and] care" but implementation also includes training on the "maintenance, and the troubleshooting process across all impacted environments in which the client interacts" (RESNA, 2021) Two other implementation steps point to the need for capacity-building: 1) "Provide or make recommendations regarding ongoing training or services to achieve goals," and 2) "Educate client and team members about changes which may necessitate follow-up to make adjustments or modifications" (RESNA, 2021). The role of the ATP is to prepare the AT user for long-term implementation. But identifying the practical strategies and resources that will extend the impact of the ATP depends on the context. Three variations are addressed. First, assistive technology enables adults with disabilities to live independently in the community with minimal support. But when their AT fails or cannot be adjusted independently, as would be the case for someone who needs to adjust their wheelchair while they are positioned in it, the AT user needs to be prepared. A supportive friend or caregiver may need training too. Capacity-building approaches to training in this context include having the client practice resolving common challenges, inviting a friend or family member to be part of the training, providing comprehensive documentation for troubleshooting and making sure that all equipment includes emergency contact information. Second, assistive technology also enables adults with complex disabilities to live interdependently in the community with additional support, including personal assistants. This context has some specific challenges like frequent caregiver turnover, more frequent residential setting changes, and switches in suppliers due to changes in insurance plans. Direct involvement with the fitting and set-up process can increase client and caregiver awareness, ownership and investment, all factors that increase the success of ongoing implementation. The capacity-building approach to implementation in this context involves identifying other key individuals who are willing to share responsibility for knowledge of equipment operation and repair. In this context, easily accessible troubleshooting resources are very important. The resources need to be provided in multiple formats (oral, written text, graphics) to address the access needs of clients and their multiple caregivers. Quick resources like laminated tags with device serial number, date of purchase, manufacturer name and phone number, and the supplier's contact information are crucial when caregiver turnover is high.

Finally, assistive technology enables children of all ages to participate in activities at home and at school. In terms of the child's support network, this context is less challenging because a significant number of caregivers (parents and teachers) are naturally part of the child's environment. Young children may not be ready to troubleshoot their own technology, so they rely on parents, guardians and school personnel for support. While the presence of so many supportive relationships is a major facilitator at home and school, the challenge to implementation is that there are so many people to train! A capacity-building approach may take the form of group training coordinated by the school or by the parents. There is a great need for collaboration between school, home and AT providers and suppliers because educational goals evolve as the child develops and matures. Wheelchairs literally have to grow with the child but so does the rest of the AT they use. Another challenge of the large support network is determining roles and responsibilities so that no one drops the ball because they assumed someone else was going to catch it. A common strategy to address this challenge in the school setting is an implementation plan that details these responsibilities. Additionally, on-demand training resources (websites, YouTube videos, Google Docs) may be appropriate for this larger group of people, who may be spread out

geographically and may not have had access to the original group training.

Conclusion

Extending ATP impact through client and caregiver training goes beyond the initial operational training. It means considering how context impacts the challenges the AT user will face during everyday implementation and considering how the AT user's network of supports and relationships can be included in capacity-building training approaches and resources.

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Conflict of Interest

Daniel Cochrane is an employee of the Assistive Technology Unit at the University of Illinois Chicago and a member of RESNA's Board of Directors. He received no compensation for this presentation.

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IC69: Smart Wheelchairs: What's Available for Power Chair Safety?

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Learning objectives

1. The participant will be able to define smart technologies in the context of power wheelchairs.
2. The participant will be able to list 3 goals of power wheelchair smart technologies
3. The participant will be able to describe 3 clinical applications of power wheelchair smart technologies.

Introduction

We live in an age where smart cars are emerging in an effort to increase vehicle driving safety and reduce accidents. But what about power wheelchairs? Technologies to ease the driving task, decrease collisions and increase overall safety for the power wheelchair driver have been available in the research lab for a number of years. Some of these technologies are just becoming commercially available. Smart power wheelchair technologies are available along a continuum, from systems that provide a warning of pending obstacles, to systems that 'assist' the driver in navigation and speed to avoid collisions and drop offs, to systems that automatically drive from one location to another with little input from the driver.

Complex Rehab Power Wheelchairs (PWCs) have evolved since the earliest power chairs that just added motors, batteries and a joystick to a manual chair frame. In addition to driving from Point A to Point B, the driver can control power seating functions (such as a power tilt), use the driving method to emulate a mouse or send a switch signal to another assistive technology device or even charge their smartphone.

Definition

So, what is a Smart Wheelchair? A Smart Wheelchair provides features above and beyond what current power wheelchairs offer. Here is a formal definition:

"A Smart Wheelchair is integrated or retrofitted technology for a power wheelchair that provides enhanced, independent mobility to a wheelchair user, user health and wellness data collection capabilities, and/or connectivity to integrate with the connected world."

How Does This Technology Work?

Smart technologies include sensors which are designed to 'sense' some aspect of mobility or seating and positioning. A sensor or an array of sensors may warn the driver of potential collisions or other hazards, such as a tipping risk on a steep incline. Other sensors are integrated into the power wheelchair electronics and prevent collisions, assisting with steering and speed, dependent on the environment. An example of steering assistance is being able to drive through a doorway without the possibility of contacting the doorframe. An example of speed assistance is driving in a crowd of people while the sensors and electronics automatically match pace of the crowd, regardless of the position of the joystick or other driving method, preventing the wheelchair from bumping into anyone. Sensors can also stop a power wheelchair from driving over a drop-off, such as a curb outside. Some Smart technologies offer autonomous driving; so that the driver has little to no interaction with the driving method; rather the system "drives" the base safely from one location to another.

A key part of the proposed definition of Smart Wheelchairs, includes connectivity, the ability to connect with the external environment. One example of a 'connected' chair is the feature that allows a caregiver to receive notifications on their smartphone if the chair tips over as well as the location of the chair and driver.

Finally, Smart Wheelchairs need to be able to offer private and secure monitoring, recording, and reporting of data related to machine performance, driver experience, and health-related data including by not limited to frequency of off-loading or heart rate which in the chair.

Need

Is there a need for Smart Wheelchairs? Despite changes in power wheelchair design, including drive wheel position, seat height options, and wide variety of anterior and posterior tilt options; safety continue to be a concern. Not too long ago, the wheelchair industry embraced safety in transportation and now transit 'options' are hardly an option - it is a standard requirement for any chair being transported. We look for RESNA WC-19 compliance on a chair, to ensure the safety of the occupant of the chair when being transported.

When power chairs consisted of motors, batteries, and a joystick being added to a manual chair, there were essentially no real 'braking systems'. Early adopters of power chairs, in the early 1960s, quickly learned to put the joystick in reverse to slow the chair, especially when driving downhill. Even today, power chairs do not have 'active' braking systems like automobiles. Wheelchair standards test data discloses that for today's power chair, when traveling at top speed, the minimum braking distance is up to 9.2 feet! The chair will continue to travel up to 9.2 feet before coming to a complete stop!

Current power wheelchair design is unable to prevent collisions with obstacles (including people, walls, and doorways), going over a drop off (including curbs and the edge of a ramp), or tipping if the user has driven to an unsafe angle. The driver must note potential hazards and respond quickly enough to avoid the hazards of everyday driving.

Forces of impact from tip and roll accidents resulted in significant risk for mild to severe head injury, depending on chair position and restraint at the time of incident (Erickson, et al., 2016). Finally, over half of the accidents reported in a 10-year period result from drivers impacting a stationary object or encountering environmental hazards like uneven terrain (Carlsson, et al., 2019). Clearly, there is a need to increase safety to limit or prevent collisions, drop-offs, and tipping, as well as limit or prevent driver injuries.

Clinical Applications

Smart Wheelchair technologies is applicable in the following clinical scenarios:

- Accessibility. Maneuvering around tight spaces is very difficult. For example, driving in a crowded classroom or

driving up a lift to get into an accessible vehicle and lining up the base with tie downs.
- Obstacles. To avoid obstacles, the driver must see them. The driver must also be able to gauge distance and respond in a timely manner.
- Distractions. Everyone can be distracted. If the driver is distracted while driving, collision or a drop-off is more likely.
- The driver's motor control limitations can impact driving precision and reaction time.
- Vision limitations, specifically a lack of acuity and visual spatial limitations, can make driving more difficult and less safe.
- Cognitive limitations may reduce understanding of the implications of driving off a curb or a collision with an obstacle.
- Alternative driving methods. People who use alternative driving methods have impairments which impacts driving precision, gauging distances, changes in height (i.e. curb vs. sidewalk, ramps), and visual field (especially behind the driver and down low). Smart wheelchair technologies can compensate for these issues, limiting collisions, drop-offs, and tipping while increasing functional mobility, independence.

Conclusion

Complex Rehab Power Wheelchairs provide a means of mobility and much more, however, limitations in safety remain. Smart Wheelchair technology, specifically for power chairs, is addressing these issues along a continuum of need and offering even more capability including connectivity and health and wellness features. Smart wheelchairs can provide increased driving efficiency and safety, protecting the driver, others around them, and the environment. Smart wheelchairs can open up independent driving to more people and improving driving for many current drivers.

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Additional Learning Resources

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2. LUCI Safety Report 2021

Conflict of Interest

Jean Minkel provides consultation to LUCI, a manufacturer of smart wheelchair technology.
Michelle Lange provides consultation to LUCI, a manufacturer of smart wheelchair technology.

IC70: Using pressure mapping in mobile shower commode chair assessments

Emma Friesen, PhD, CPEng (Biomed)
Jessica Presperin Pedersen, OTD, OTR/L, MBA

Learning objectives

1. Discuss at least two factors aside from interface pressures that should form part of a comprehensive seating assessment
2. List three key bony landmarks to assess in Mobile Shower Commode Chair (MSCC) seating
3. Describe two limitations and two examples of erroneous readings from IPM

Introduction

Interface pressure mapping (IPM) technology is often used as a component in comprehensive clinical assessments for pressure injury management (Teleten et al., 2019). IPM systems consist of a thin mat containing an array of sensors, and a computer or tablet with software to display data gathered by the sensors. IPM systems allow users to measure and display a range of information including the load on each sensor cell, the known location of the load, total area of contact, and centre of force using numerical and graphical displays.

A majority of seating studies and clinical practice guidelines using IPM focus on chairs and cushion selection (Stephens & Bartley, 2018; Sprigle & Sonenblum, 2011). Few focus on using IPM to assess "alternate" sitting surfaces such as those used for toileting (Lustig et al., 2018) (p. 23). The purpose of this workshop is to explore the use of IPM for assessing and configuring seating surfaces of Mobile Shower Commode Chairs (MSCCs). The workshop will cover the following topics: use of IPM in context of comprehensive MSCC assessments, limitations of IPM and artefacts commonly seen in seating-specific IPM images, and unique aspects of surfaces used for toilet sitting when compared with other seating surfaces.

IPM as a component of comprehensive MSCC assessments

Experts note that while IPM can provide crucial information relating to seating and the performance of sitting surfaces, it is best used as a component of broader comprehensive assessments of skin integrity and pressure management (BC Interprofessional Skin & Wound Committee, 2021; Lustig et al., 2018; Teleten et al., 2019). These assessments should ideally be individualised and team-based, consider the risks for pressure injuries across a 24 hour period (BC Interprofessional Skin & Wound Committee, 2021; Lustig et al., 2018) and across devices used (Gefen et al., 2020). For assessments specifically focused on MSCCs, broader comprehensive assessment could include reviewing factors contributing to toileting and bathing disabilities (Gill et al., 2006; Talley et al., 2014), as well as the specific skin integrity and pressure management risks associated with the user's health condition (e.g. spinal cord injury).

Conducting the MSCC assessments

In terms of IPM assessment processes, various jurisdictions and expert groups have published protocols on conducting pressure mapping assessments (BC Interprofessional Skin & Wound Committee, 2021; ter Haar et al., 2014). Generally, these protocols include information on the equipment and supplies needed, and procedures for undertaking and documenting the results of a pressure mapping assessment. As such, healthcare and Assistive Technology practitioners should consult resources available or required for use in their organisations and use these as the basis for IPM assessments. For most assessments however, IPM can be used to: locate anatomical landmarks, show areas of unusually high load, comparing load distribution with different MSCC configurations and surfaces, and for education.

In MSCC seating, the key bony landmarks are the Ischial Tuberosities (ITs), greater trochanters (GTs), and coccyx or sacrum. MSCC seats are generally designed so that the ITs are minimally loaded or are floating inside the seat aperture (Friesen et al., 2013). The sub-greater trochanters pick up more loading to support the pelvis. In an optimised set up, the proximal and distal thighs will also be loaded. These areas of greater loading correspond to areas of higher pressure showing via IPM compared with loading on the surrounding tissue. The position of these landmarks should then be verified through manual palpation, if possible (Jan & Brienza, 2006). If the IPM shows loading in unexpected places on the seating surface, or areas of unusually high pressure, these should be further investigated, beginning with palpation.

IPM can help demonstrate and quantify the impact of changes or adjustments to an MSCC set up. In Figure 1, the user is seated in the same MSCC seat and frame. The pressure distribution patterns and peak pressures are notably different when adjustments are made to height of the arm supports (to ensure loading on the forearms) and foot supports (to ensure loading on the feet). These IPM images are useful for educating users, caregivers, and healthcare practitioners involved in seating (All Wales Tissue Viability Nurse Forum (WTVNF) & Pressure Ulcer Prevention and Intervention Services (PUPIS), 2019; Teleten et al., 2019; Vos-Draper & Morrow, 2016).

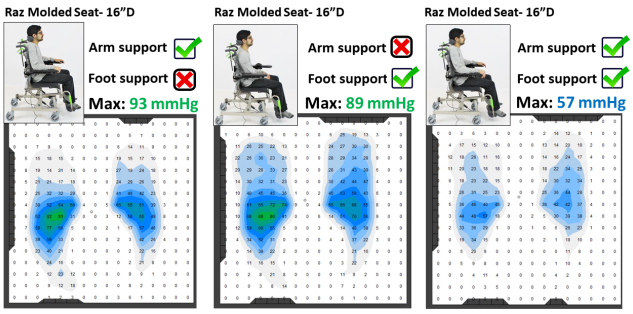

Figure 1. Impact of three Mobile Shower Commode Chair (MSCC) adjustments on pressure distribution across the MSCC seat.

IPM limitations and artefacts

IPM systems have limitations and it is crucial that numerical values and images are interpreted appropriately . One important limitation of IPM is that it only measures pressure between the person and a seated surface. IPM doesn't measure other so-called mechanical boundary conditions such as the time duration of the mechanical load, other types of loading (shear and friction), nor the mechanical properties of the person's tissue. Further, the cause of pressure injuries is multifactorial and can include extrinsic factors (environmental temperature and humidity, i.e. microclimate) and intrinsic factors (e.g. age, mobility status, cognitive status, nutrition, etc.).

Another limitation is uncertainty, generated when using the IPM system. Measurement can be impacted by calibration, creep, hysteresis, and sensor saturation. The presence of the mat itself, lying between the person and the support surface, can also lead to readings that don't accurately reflect the forces exerted. For example, the sensor mat can develop creases as it conforms to the shape and curves of the aperture, as shown in Figure 2. The presence of an aperture in MSCC seats creates potential for hammocking (bridging) of the sensor mat as it stretches over the ITs and across the aperture. This can lead to pressure readings being generated even where the body surfaces are not in fact loaded, as shown in Figure 3.

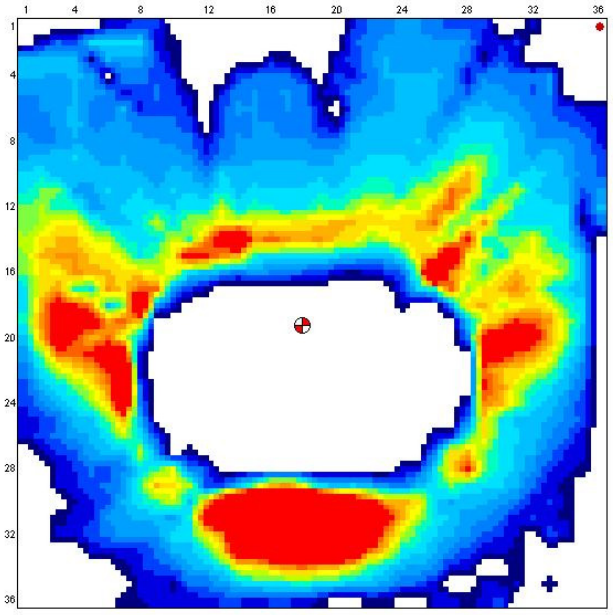

Figure 2. Interface Pressure Mapping image showing creases caused by the mat conforming to curves of an aperture. Image © 2017-2021 P. Slattery. Used with permission.

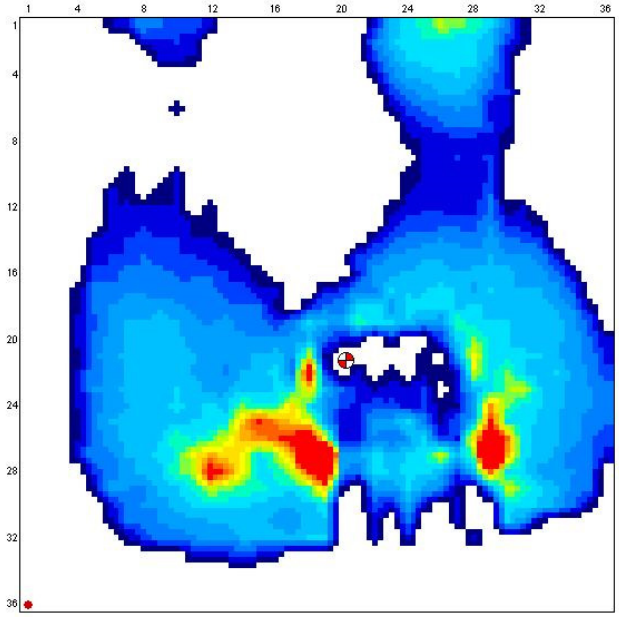

Figure 3. Interface Pressure Mapping image showing pressure readings between the Ischial Tuberosities, caused by the mat hammocking between these bony prominences. Image © 2017-2021 P. Slattery

Conclusion

IPM can be used as part of a comprehensive seating assessment for MSCCs. IPM can provide quantifiable and visual evidence for assessing MSCC sitting surfaces and set up. When using IPM systems, awareness of limitations and uncertainties is needed to ensure numerical values and images are interpreted appropriately.

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Conflict of Interest

Both authors are employees of Raz Design Inc.

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IC71: Virtual Visits for Seating and Mobility Assessments

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Learning objectives

1. Compare 2 different approaches to conducting virtual visits
2. Identify at least 3 components of the seating and mobility assessment that could be conducted virtually
3. Recognize 2 benefits of implementing virtual visits to their seating and mobility practice

Introduction

The global pandemic has raised questions about the best practices for seating and mobility assessments. Some care has shifted to being provided virtually, and in some areas, health directives have mandated that health care providers limit the number of in person visits (Chief Medical Officer of Health, 2020; College of Occupational Therapists of Ontario, 2020). Discussion about virtual visits for seating and mobility assessments has become polarized, with some professionals taking the stand that seating and mobility assessments can not be conducted virtually. The issue of using virtual visits for seating and mobility assessments is more than a simple "Yes" or "No" question; there is an opportunity to consider a more nuanced approach, grounded in evidence.

Despite the strong reaction to whether virtual visits are appropriate in the context of seating and mobility assessments, there is a responsibility to examine the literature and ask different questions.

Under what circumstances can virtual visits be as effective as in person visits?

There is a perception that the expert clinician can not complete a thorough assessment unless they are present with the client. However, the inter-rater reliability of the Functioning Everyday with a Wheelchair-Capacity instrument (Schmeler, 2005) was studied comparing the ratings of a novice clinician present with the client, and the remote expert practitioner, and found excellent inter-rater reliability, and that the remote practitioner was able to accurately assess the client's functional mobility needs. (Schein et al., 2011).

Sitting balance has also been evaluated for the feasibility to assess remotely using the Function In Seating Test (FIST) (Frechette et al., 2020), Trunk Control Test (TCT) and tee-Shirt-Test. (Abou et al., 2021) These tests, when performed remotely or in person have good to excellent agreement and the authors concluded that remote assessment is feasible, viable and valuable. (Abou et al., 2021)

There is a history of assessing pressure injuries remotely through tools such as the Photographic Wound Assessment Tool (Thompson et al., 2013). A recent case report published (Engels et al., 2020) demonstrated that virtual wound consultations were feasible and facilitated by well established collaborative relationships with the care providers and previous use of telemedicine technology. (Thompson et al., 2013)

This isn't meant to suggest that all components of all assessments can be completed virtually but demonstrates that there is a role for virtual visits, and not all components of a seating assessment need to be preformed in-person for all clients.

When deciding what components of an assessment can occur virtually for a client, it's important to consider what components of that assessment could be completed virtually. For example, medical history, surgical plans, medication history may already be completed virtually. Other components such as gait pattern, skin integrity and devices used may be able to be assessed visually and through discussion in a virtual platform.

For those components that must be completed hands-on, a useful question is whose hands, needs to be with the client – or what skillset/expertise needs to be hands-on. For example, if the visit involves a complex assessment of tone, the hands that need to be with the client may be those of the therapist, and the rehab technology supplier could be remote. If the visit is related to an equipment adjustment, perhaps it is the RTS who needs to be present with the client, and the clinician attend remotely. In this way the clinician and RTS function as an interdisciplinary team and determine who needs to be present with the client on a visit by visit basis.

What are the potential benefits of virtual visits for the client, the health care provider/complex rehab technology supplier and system?

There are benefits to adopting virtual visits including reducing the travel involved in assessments for the client (Ott et al., 2021) and cost savings (Ott et al., 2021) stemming from the clinician being able to see a full roster of patients, rather than spending time travelling between clients.

Clients who have a limited sitting tolerance, challenges with broken equipment or who live in remote areas may have better access to an assessment conducted virtually than attending an in-person appointment.

How can virtual visits be leveraged to promote an improved customer experience and potentially improved outcomes?

The barriers and facilitators to implementing telerehabilitation in a variety of health care settings is being studied and can be applied to seating and mobility assessments. Of note in one study "the most frequently cited barrier for provider's adoption of [telerehabilitation] was traditional rehabilitation cultural practice, which has typically relied on manual manipulation and face to face evaluations". The key is not to let this traditional rehabilitation cultural practice limit the exploration of new service delivery models, including hybrid models (Camden & Silva, 2021) that may have tangible benefits for the client, provider and system. A simple method of challenging the service delivery model is to keep a running tally of the number of people and times someone has seen the client in person in the provision of that mobility device. Given that the public health advice has been to limit the number of people with whom a person interacts (Chief Medical Officer of Health, 2020; College of Occupational Therapists of Ontario, 2020), decreasing

the number of in person visits means decreasing the total number of in person visits as well as decreasing the number of individuals interacting in person with the client. For example, if a client attends a seating assessment in person and is seen by a therapist, an assistant, and a CRT, that counts as 3 visits or contacts.

Clinicians who are experts in seating and mobility, may be novices in the use of technology, and require the development of skills and tools in this domain. As an example, a hospice agency is developing an intentional viewing guide to help health care providers pick up on cues in the person's environment as the camera may limit their view of the environment (Shea et al., 2021). There is also an opportunity to explore, new, blended service delivery models. One such protocol uses a telehealth clinical technician (TCT) to connect the client to the expert clinician for the wheelchair assessment (Ott et al., 2021). The TCT was responsible for setting up the equipment in the home to facilitate the virtual visit, with the clinicians seeing the client remotely.

Conclusion

The global pandemic has forced a shift to more virtual health care across settings and disciplines. There is an opportunity to move beyond our same traditional rehabilitation cultural practices of in person visits, to explore other models of service delivery including virtual seating and mobility assessments.

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Conflict of Interest

The presenter works for a medical equipment provider, however no products or services are promoted in this workshop

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IC72: Scoping Review Investigation of Complex Rehabilitation Technology and Next Steps

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Madelyn Betz, MRT, BA
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Learning objectives

1. Identify two steps of the CRT scoping review process
2. List two themes extracted from the CRT scoping review process
3. List two stakeholder groups involved in CRT service delivery

Introduction

Complex Rehabilitation Technology (CRT) is defined as products and services, including medically necessary individually configured highly customized manual and power wheelchair systems, adaptive seating systems, alternative positioning systems, and other mobility devices that require evaluation, fitting, design, adjustment, and programming. Wheeled mobility service delivery is not a new concept or technology; however, dramatic changes have occurred in the last few decades, including changes to funding, provider qualifications, consumer needs and desires, and advances in technology. In addition, third-party policies that currently regulate CRT service delivery, specifically Medicare, have undergone significant changes to coverage and payment. This session will present preliminary results and common themes from a scoping review process and stakeholder engagement of CRT service delivery along with the creation of an online survey for further data collection.

Introduction

Mobility devices offer increased independence for individuals with disabilities in the home and community by reducing reliance on others and facilitating mobility for function, employment, education, and independent living. Mobility devices, or complex rehabilitation technologies (CRT), are products and services that include medically necessary highly customized manual and power wheelchair systems, adaptive seating systems, alternative positioning systems, and other mobility devices that require evaluation, fitting, design, adjustment, and programming (Complex Rehab Technology Definition, 2014). As of 2014, roughly 1.4% of Americans ages 15 and older use a wheelchair or similar device due to a mobility limitation (Taylor, 2018). In 2007, international estimates indicated that 65 million individuals use a wheelchair (Sheldon & Jacobs, 2007). With a rise in overall population and increased life expectancy, the need for CRT and support services are continually growing in the years to come (Cooper et al., 2008). Given the number of individuals using CRT and the variability in the provision of CRT services, there is a need to describe the current seating and mobility service delivery process, with a focus on CRT, through a scoping review and survey of stakeholders. Therefore, the purpose of the scoping review and survey are to describe past and current CRT service delivery processes for individuals with disabilities who have a mobility impairment. Furthermore, we will identify best practices, barriers, facilitators and unique features of service delivery policies and practices in diverse clinical and funding environments.

Methods

The scoping discovery review included three phases: scoping review; survey development and survey implementation. The scoping review described the CRT service delivery process and identified areas for inclusion in the scoping survey. The survey development process leveraged the scoping review results and stakeholder feedback. Upon completion of the survey development, the survey implementation included a broad group of stakeholders across multiple consumer groups, geographical locations, professional backgrounds, and CRT experience. The three phases provided an overview of the current state of CRT service delivery, which will be used to inform the remaining CRT Coverage Policy sub-projects.

Compared to a systematic review that answers a more specific question, a scoping review allows researchers to examine the available literature with a broader lens (Arksey & O'Malley, 2005). The team utilized Colquhoun, et al. as a framework for conducting the review, a six-step process that includes: 1) identifying the question, 2) identifying relevant studies, 3) selecting studies 4) charting the data, 5) collating, summarizing, and reporting results, and 6) consultation (Colquhoun et al., 2014). The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA-SCR) guidelines were used as a framework for reporting information gathered from the scoping review (Tricco et al., 2018). The scoping review provided a summary of current CRT service delivery.

The survey development was based on the results from the scoping review, and addressed each of the primary themes from the scoping review. The survey was developed in 3 stages: 1) primary review by five subject matter experts (SME) on the scoping discovery review team; 2) secondary review by 20 additional SMEs on the project team; 3) tertiary review by SMEs external to the project. The survey development was an iterative process where the SMEs rated the survey questions based on the clarity and relevance. Finally, the SMEs identified the survey questions that applied to each stakeholder group. We are currently in the middle of the survey development phase.

Survey implementation will start in autumn 2021. The survey implementation will include stakeholders from diverse consumer and professional groups. The analysis of the survey will describe the current state of the CRT service delivery process, and identify any emerging practices that were not identified in the scoping review.

Results

Based on the scoping review process, we screened over 2900 abstracts, reviewed over 300 full-text articles, and extracted data from over 50 peer-reviewed journal articles. We identified four primary themes and 18 sub-themes. The primary themes included wheeled mobility devices, policy, service delivery, and consumers. The themes provided the foundation for the survey questions. The survey included 18 questions, and was sent out to the five SMEs on the scoping review sub-project team. Based on their feedback, the survey was revised and sent out to over 20 SMEs on the DRRP team, and then to external SME experts in summer

2021. Once the results, which address clarity, relevance, and stakeholder significance, are analyzed, the survey will be revised and deployed in autumn 2021.

Discussion

The purpose of the scoping review and survey are to describe past and current CRT service delivery processes for individuals with disabilities who have a mobility impairment. The four primary themes are wheeled mobility devices, policy, service delivery, and consumers. The themes align with assistive technology service delivery models described in the literature, which is not surprising given that CRT is a sub-set of assistive technology service delivery process (Andrich et al., 2013; Cook et al., 2020) . The themes provided the foundation for the scoping discovery survey, which includes multiple question from each theme. The scoping discovery survey development process addressed the clarity, relevance and stakeholder significance for each question, and includes both internal and external project stakeholders. The three phases of the scoping discovery review process will lead to a description of best practices in CRT service delivery, and provide a foundation for future research and development activities.

Conclusion

The purpose of the scoping review and survey are to describe past and current CRT service delivery processes for individuals with disabilities who have a mobility impairment. The scoping review identified four primary themes and 18 sub-themes. The four primary themes are wheeled mobility devices, policy, service delivery, and consumers. The themes align with the broader assistive technology service delivery models described in the literature. The themes provided the foundation for the scoping discovery survey, which includes multiple question from each theme. The scoping discovery survey development process addressed the clarity, relevance and stakeholder significance for each question. The three phases of the scoping discovery review process will lead to a description of best practices in CRT service delivery, and provide a foundation for future research and development activities.

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Additional Learning Resources

1. Assessment and Investigation of New Coverage Policies for Complex Rehabilitation Technology (CRT) within a Contemporary Accountable Care Environment - https://www.crtpolicy.pitt.edu/
2. Disability and Rehabilitation Research Projects (DRRP) Program: Research on Healthcare Policy and Disability - https://acl.gov/programs/research-and-development/disability-and-rehabilitation-research
3. Knowledge syntheses: Systematic & Scoping Reviews, and other review types - https://guides.library.utoronto.ca/c.php?g=713309&p=5083888

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Conflict of Interest

Carmen DiGiovine is employed by The Ohio State University and The Ohio State University Wexner Medical Center. He is the Director of the Assistive and Rehabilitative Technology Certificate Program.

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IC73: Fit for Future

Simon Hall

Learning objectives

1. How to develop a modular service that is flexible and adaptable to meeting our clients' needs
2. How to ensure our services are in line with best practice
3. How to set goals, keeping quality and standards at the centre of service provision

This presentation will focus on Specialised Seating Services moving into the future. It will take into account learnings from the Covid-19 Pandemic, and share alternative pathways with regard to assessing on a virtual basis. It will also highlight the application of technology throughout the various pathways of the specialised seating assessment process. This presentation will outline all aspects of service provision, with the client at the centre, as well as the clinician and the suppliers of aids and

IC74: Least Costly Alternative: The True Economic Value Provided When Appropriate CRT is Prescribed

Catherine Sweeney, PT, ATP/SMS

Learning objectives

1. Identify 2 barriers to obtaining medically appropriate medical equipment in the current US model of equipment provision
2. List 3 healthcare cost saving benefits achieved when proactive prescription of CRT is performed
3. Specify 3 frequent medical complications related to inadequate equipment prescription or delayed procurement.

Introduction

In the US, medical insurance policies use coverage criteria guidelines for complex rehab technology (CRT) based on history of medical complications already experienced, such as pressure injuries, UE repetitive strain injuries and falls. This reactive approach places consumers who use wheeled mobility full-time at a significantly higher risk for such complications caused when inadequate devices are prescribed. These injuries create significant functional and economic impact for the individual as well as drive up costs for our healthcare system. This 1-hr course will discuss and challenge the current reactive model of equipment prescription and explore the true economic costs overall. Clinical studies & case presentations will demonstrate the economic and medical/functional benefits which can occur using a proactive approach. Attendees will be able to more clearly advocate for wheeled mobility devices that provide the true least costly and medically CRT for meeting their clients' needs.

This course will review the current reactive approach that US insurance guidelines use for approval of complex rehabilitation technology (CRT). The course will then explore, using updated economic healthcare data, the billed cost to our healthcare system that is spent treating pressure injuries, upper extremity repetitive stress injuries, and falls. These costs will be then compared to what the allowable costs for CRT features are currently, such as power seating, ultralight manual wheelchairs, and power assist devices, to demonstrate CRT as the actual least costly alternative. Also, the SCAI (Siva Cost Analysis Instrument) will be briefly highlighted as a unique approach to measuring true "costs " to a healthcare system. Updates regarding national efforts to expand coverage of CRT will be discussed with resources given to encourage participation. These concepts will support the role of proactive equipment provision in a Value-Based healthcare model.

Conclusion

This course emphasizes the importance of a proactive approach to equipment prescription as relates to Value-Based Healthcare. It will compare and contrast the current reactive model costs to our healthcare system to the significantly lower purchase price of the equipment itself. Using the SCAI tool as an example of a broader calculation of cost, this course will challenge attendees to push for policy change as well as more confidently advocate for the most medically and functionally appropriate equipment for their clients.

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Conflict of Interest

Catherine Sweeney is a full-time employee of Permobil, a manufacturer of complex wheeled mobility devices and seating and positioning components.

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IC75: Custom Molded Seating: Options, Innovations and Covid-19

Jill Sparacio, OTR/L, ATP/SMS, ABDA

Learning objectives

1. List 4 different manufacturers of custom molded seating.
2. escribe the 4 steps of the custom molded seating process
3. Identify the necessary steps to sanitize/clean a shape capture system to insure cleanliness.

Introduction

The term “custom molded seating” continues to intimidate seating teams, as it has for many years. Most see a time consuming process that is often a last resort. What should be seen is a method to provide custom contact and support to facilitate a consumer’s functional posture leading to optimal function. In order to get past the intimidation of custom molded seating, the seating team needs to have an understanding of the concepts and details of custom molded seating. There needs to be familiarity of the product options. While one cannot be expected to fully understand the intricacies of each manufacturer, general concepts are needed. Additional information is easily available from each manufacturer through contacting their customer service departments, reviewing websites and on-line order forms as well as support from sales representatives.

Custom Molded Seating

At this point in time, there are more custom molded seating options available than ever before. This offers consumers many choices. There are 4 basic steps that lead to ideal custom molded seating. These steps include a thorough evaluation to determine the specific features that are needed to match the consumer’s needs, the shape capture, the manufacturing process and finally the delivery process. Although this session is not going to discuss how to mold, the team needs to be qualified to complete the process. Part of that qualification includes knowing the benefits and drawbacks of each manufacturer’s system. There are some basic similarities as well as some basic differences. This knowledge is vital in the decision making process during the evaluation making sure product features are matched to the consumer’s needs. Through the use of a variety of molding frames and bags, shapes can be simulated in a free-standing simulator or while seated in one’s definitive wheelchair. Once captured, the shape can be captured easily through the use of 3-D camera or app systems. This is a change from many years ago when plaster casts needed to be provided to the manufacturer. Through digital technology, all information can be immediately emailed or downloaded to the manufacturer, saving time to get the shape directly into production.

In addition to having preferred methods of obtaining the data, each manufacturer offers different approaches in the manufacturing. For instance, some cushions are manufactured with poured foam while others are carved from premade blocks. Manufacturers have preferred or proprietary foam options but also offers other types to further customize the fit and support. Modifications to the digital file through comments on the order form or to the actual cushion prior to the finishing process can be completed by most of the manufacturers. As with foam, each manufacturer has specific methods to cover and protect cushions through the use of a variety of materials. These materials range from vinyl to a variety of drapable fabrics to multiple layers of spacer mesh fabric. To insure proper fit, whether it is due to a poor shape capture or a misguided manufacturing process, each manufacturer has a system to assess and revise or re-do the cushion. That might result in a new cushion or modifications to the cushion in question. Bottom line, the manufacturers understand the importance of a good fit and will assist until that happens, within reason. Because custom molded seating is so unique to that individual, time frames are very important. Manufacturers strive for a quick turn around from the receipt of the digital file along with the order form until shipping the finished cushion. However, if insufficient information is provided, the time frame extends. Manufacturing and shipping times can vary depending on how busy the manufacturer is, i.e. orders placed during busy periods.

The process for custom molded seating requires intimate interaction and contact with the consumer. A hands-on approach is needed during the evaluation process to identify the location and type of support needed. The shape capture requires more than one team member in close proximity to the consumer. Since March 2020, the Covid-19 pandemic has limited this type of close contact with consumers, making the shape capture process difficult. In addition, anxiety related to the spread of the virus has made some consumers and seating team members hesitant to pursue this type of seating. Through the use of personal protective equipment (PPE) and proper sanitization techniques, fears can be calmed allowing for a successful shape capture. The use of PPE will minimize contact and exposure. A consumer’s seating needs should not be compromised due to the pandemic. In reviewing different manufacturers’ instructions to properly clean and sanitize the shape capture system, simple cleaning with disinfectant wipes is needed. Spraying the bags with a sanitizing spray and allowing them to air dry is an effective last step. Doing this for an additional time in front of the consumer and their family/caregivers offers additional reassurance. This procedure should be done after every use regardless of the status of the current pandemic. In terms of PPE, care should always be taken to protective oneself through the use of a proper mask, gloves and a face shield, if indicated. If able, the consumer should also use a mask, face shield, as warranted.

Conclusion

Custom molded seating has been a successful option to help provide intimate contact and support for many years. Currently, there are more options than ever before. Each manufacturer offers unique benefits and drawbacks. In order for the seating team to make informed recommendations, an understanding of these features is needed. These features cover all aspects of a custom molded cushion including how to create and capture the shape to types of foam, coverings and possible modifications. In order to compare and contrast features of four commonly used manufacturers, a comparison chart has been created. This is based on the manufacturers’ responses to a questionnaire related to specific details of custom molded seating. As previously discussed, there are so many commonalities yet so many subtle differences. After all is said and done, the only

decision is how to best meet each consumer's unique needs.

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Conflict of Interest

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IC76: A Fall Prevention and Management Program for Full-time Wheelchair & Scooter Users Living with Multiple Sclerosis: Preliminary Findings

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JongHun Sung, PhD, ATC, Rebecca Yarnot, MS, Jacob Sosnoff, PhD

Learning objectives

1. Describe circumstances associated with falls among full time wheelchair users.
2. Describe the current research related to fall management among full time wheelchair users.
3. Describe specific strategies to educate full-time wheelchair users living with multiple sclerosis about fall management strategies.

Introduction

Approximately 25% of individuals living with multiple sclerosis (MS) are unable to ambulate functional distances in their home and use wheelchairs or scooters to support mobility. Among individuals living with MS who use a wheelchair or scooter full-time, 75% 1 of the population report falling at least one time in a period of six months. Falls experienced by individuals who use a wheelchair or scooter full-time frequently result in physical injuries as well as psychological consequences. 1, 2 The impact that falls and concerns about falling can have on quality of life and community participation among individuals with MS is substantial 3. Community participation is important to the health and well-being of individuals who use a wheelchair or scooter full-time 4 and is strongly associated with quality of life 5. Self-imposed activity restrictions associated with fall experiences and fear of falling can result in significant psychosocial consequences 6 for individuals with MS who use a wheelchair or scooter full-time beyond any physical injury incurred 7, 8. To date, limited evidenced-based fall management education specifically designed for individuals who use wheelchairs and scooters exists. A pilot intervention to reduce fall incidence among individuals living with MS who use a wheelchair or scooter full-time was published in 2018. The intervention focused on improving the quality of transfer skills and seated postural control. Twelve weeks after exposure to the intervention, a significant decrease in fall incidence was reported, along with significant improvements in transfer skills and seated postural control. No significant differences were found among concerns about falling, quality of life and community participation 9, 10. In light of these findings and results from previous research among ambulatory individuals living with MS in which multifactorial fall prevention programs were found to be effective11, the authors expanded the intervention to comprehensively addresses a variety of fall risk factors12. The purpose of this study is to examine the efficacy of a multifactorial, community-based intervention to reduce fall incidence among individuals living with MS who use a wheelchair or scooter full-time. Secondary aims were to examine the influence of the intervention on functional mobility skills associated with fall risk (e.g., transfer and wheelchair/scooter skills, balance), knowledge of fall risk factors, fear of falling, and perceived quality of life and community participation.

Methods:

A mixed method, longitudinal research design was implemented to evaluate the impact of a 6-week community-based fall management intervention. All study-related procedures were approved by the Institutional Review Boards at the University of Illinois at Urbana-Champaign (UIUC), University of Illinois at Chicago (UIC) and Shepherd Center (SC). All interested participants were invited to participate if they met the following inclusion criteria: (1) a diagnosis of MS; (2) 18 years old or older; (3) patient-determined disease steps level of 7 (i.e., main form of mobility is via a wheelchair or scooter); (4) self-reported ability to transfer independently or with moderate/minimal assistance, and (5) at least 1 self-reported fall in the past 12 months. Participants were excluded if (1) they had an MS exacerbation in the past 30 days, (2) receive a score of 10 or above on the short blessed test 13, or (3) were unable to remain in an upright position for at least an hour. After signing an informed consent document, all participants travelled to a research laboratory and underwent a baseline assessment (Visit 1) with a trained member of the research team. Information on the participant's history with MS, along with basic demographic information was collected. Next, participants were asked to complete surveys to assess fear of falling, fall prevention strategies, community participation, and quality of life. After completion of the surveys, physical assessments were performed to assess transfer and wheelchair quality and seated postural control. After completion of visit 1, participants prospectively tracked fall incidence using a paper calendar for 12 weeks before engagement in the intervention. Fall monitoring continued throughout the duration of the study (44 weeks total). After prospectively monitoring falls for approximately 12 weeks, participants engaged in a multifactorial community-based intervention. The intervention was delivered by trained physical or occupational therapist to groups of 2-5 participants which met for six, two-hour weekly sessions. Full details of the intervention are described in Rice, et al (2019)14. Briefly, using the health belief model and social cognitive theory as a theoretical foundation, the intervention covered topics found to be associated with falls among individuals who use wheelchairs and scooters1, 15-17 including: wheelchair/scooter skills, transfer skills, exercises to improve sitting balance and core strength, management of environmental hazards and MS symptoms, post-fall recovery, and the use and maintenance of assistive technologies. After completion of the intervention (approximately 20 weeks post Visit 1), participants returned to the research laboratory to complete Visit 2. All measurements taken at baseline (Visit 1) were repeated, with the exception of the demographic information. A 30-minute qualitative interview was also performed. Participants returned for a final study visit (Visit 3) approximately 32 weeks after Visit 1. During Visit 3, the assessments completed during Visit 1 were repeated with the exception of the demographic survey.

Results:
Participants who completed the intervention were an average of 57.57 ± 10.96 years old, 76.19% female (n=16), 66.67% use a power wheelchair as their main form of mobility (n=14). Participants lived with MS for an average of 20.67 ± 9.18 years and used their mobility device an average of 64.65 ± 33.86 hours per week.

Fall Incidence: No significant differences found in the number of falls reported over time, $F(2, 60)= 0.54$, $p =0.59$, $\eta2 = 0.04$. Participants reported an average of 1.48 ±2.11 falls per week pre-intervention, which increased to 1.71 ± 1.95 in the 12 weeks post-intervention, and decreased to 1.29 ± 1.98 (12.84% reduction) in the final 12 weeks of fall tracking ($d= 0.09$). Subjectively, many participants reported a perceived decrease in the number of falls they experienced, often attributing this perceived changed to a heightened attention to themselves and their surroundings: "I think they markedly decreased. …I think you can see this in my calendars. I think because I stop and think more. Set up more, plan more." Male, 72, PWC

Fear of Falling:
No statistically significant changes in fear of falling as reported by the SCI-FCS ($F (2, 58) = 1.37$, $p = 0.26$, $\eta2 = 0.05$), nor the single item fear of falling question ($F (2, 58) = 0.34$, $p = 0.72$, $\eta2 = 0.01$). Fall concern decreased from 34.1 ± 7.72 pre-intervention to 30.62 ± 7.72 immediately post-intervention (-10.21%), but slightly increased to 31.21 ± 6.10 at 12-weeks follow up (-8.48%, $d = 0.42$). Many participants reported a perceived decrease in their fear of falling immediately after the intervention, citing improved confidence in their transfer skills: "I am less afraid of falling because I know better how to maneuver myself for a transfer or when I am in the middle of a transfer and feel like I am going to fall." Male, 39, PWC

Fall Prevention Strategies:
A significant improvement in participants' self-reported fall prevention strategies and management skills occurred after exposure to the intervention. Participants reported a significant increase in their regularity of using fall prevention strategies (FPSS: $p= 0.02$, $\eta2 = 0.13$, $d = 0.78$), significantly greater confidence in their ability to manage falls (Fall Management: $p = 0.04$; $\eta2 = 0.11$, $d = 0.58$), and significantly greater knowledge and skills to manage fall risk (FPMQ: $p = 0.01$; $\eta2 = 0.17$, $d = 0.96$). Post hoc analysis with a Bonferroni adjustment revealed that FPSS significantly increased from pre-intervention scores of 11.57 ± 3.8 to 12-weeks follow-up (Visit 3) scores of 14.47 ±3.67 (+25.06%). FPMQ also significantly increased compared to pre-intervention scores of 31.75 ± 6.70 at both post-intervention (37.24 ± 5.76; +17.29%) and 12-weeks follow-up (37.63 ± 5.55; +18.52%). Post hoc analysis did not indicate any significant differences between assessments for Fall Management, however a 19.83% change did occur immediately after the intervention. In post-intervention interviews, many participants discussed having a heightened awareness of their surroundings and their body's needs, which enabled them to make safer choices to prevent falls:
"This program has helped me to focus more, to think about where my feet are, to make sure my wheelchair is off. All of those things you kind of knew, but this formally taught me, no you have to do this because it's safer." Female, 61, PWC Community Participation and Quality of Life: No significant differences were found for either the community participation indicator importance (CPI-Importance), $F(2, 58)= 0.88$, $p =0.42$, $d = 0.41$, nor control (CPI-Control), $F(2, 58)= 0.52$, $p =0.60$, $d =0.32$. There was also no significant changes to overall quality of life ($F(2, 58)= 0.14$, $p =0.87$, $d = 0.12$), physical health related quality of life ($F(2, 58)= 0.30$, $p =0.74$, $d = 0.07$), or mental health related quality of life over time ($F(2, 58)= 0.26$, $p =0.77$, $d = 0.20$).Though no significant improvements were seen overtime in community participation and quality of life survey measures, subjectively many participants reported an increase in participation and comfort in community-based activities when interviewed after the intervention:
"I feel more confident to go out to social places, not being so fearful of that part of falling or not falling…I think it gave me more room to do some of the things I would normally leave a question mark in or not attempt." Female, 46, PWC
"I'm less afraid to go out and about now… my one daughter is on the swim team, and before I would be too nervous to go to any swim meet that were held a further distance from where she swims with her team, but now I'm not worried." MALE, 39, PWC

Functional Mobility:
After exposure to the intervention, transfer quality significant improved over time, $F (2, 56) = 5.34$, $p = 0.01$, $\eta2 = 0.16$). Transfer quality increased from 7.35 ± 1.52 pre-intervention to 8.31 ± 1.32 immediately post-intervention, and further increased to 8.63 ± 0.92 at 12-weeks follow up. A Bonferroni post-hoc analysis revealed that while there was not a significant change in transfer skills from pre-intervention to immediately post-intervention, there was a significant improvement from pre-intervention to follow-up ($p = 0.01$, $d = 1.02$).Participants also discussed the perceived refinement of their transfer skills as a result of the intervention and increased confidence in performing them: "I was not familiar with transfer much at all, but the different practices and strategies to use for transfer is one of the other things that has helped drastically reduce my falls…and especially bed transfer, from the wheelchair to my bed, were very, very helpful." Male, 39, PWC
No significant changes were noted in wheelchair skills (WST) over time, $F (2, 53) = 1.16$, $p = 0.32$, $\eta2 = 0.04$). Wheelchair skill increased from 81.35 ± 15.56 pre-intervention to 87.12 ± 12.35 immediately post-intervention but decreased to 86.74 ± 10.85 at 12-weeks follow up ($d = 0.40$). Despite this insignificant change in wheelchair skills at the study visits, participants noted the value of the wheelchair skills practice provided in the intervention:
"I'm more conscious of what I'm doing. So instead of saying "oh yeah I can do this", it's like "alright, how are you gonna do this and do it that way and you won't end up on the floor." Female, 68, MWC
No statistically significant changes in postural control (FIST) were noted over time, $F (2, 56) = 0.23$, $p = 0.80$, $\eta2 = 0.01$). Subjectively, study participants indicated that the exercises included in the intervention influence seated postural control: "Because the exercises that I have learned from the program… I have learned better ways to keep my balance to prevent from a near fall turning into an actual fall." Male, 39, PWC

Conclusion
This study evaluated the impact of a six week fall management intervention on fall frequency, fear of falling, fall prevention strategies, community participation, and functional mobility. Quantitative results indicated that after exposure to the intervention, transfer quality and fall management strategies significantly improved. Moderate effect sizes were also noted among concerns about falling, activity curtailment due to FOF, community participation,

and wheelchair skills. Qualitative results indicate that participants found benefit in the program and saw an impact on their day to day lives. This study is noteworthy because it is the first to describe the impact of a multifactorial fall management study and collect long-term follow-up data with continuous fall tracking in this population. Further research is needed to examine the generalizability of this intervention to a larger and more diverse population and further test its impact on fall frequency.

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Conflict of Interest

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IC77: Healthcare Quality Improvement Focused on Efficiency of Complex Wheelchair Procurement: An Administrative Case Report

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Grace Hoo
David Brewington

Learning objectives

1. Illustrate 3 ways quality improvement projects impact departmental workflows and wheelchair delivery timeframes
2. Compose a list of 3 key stakeholders involved in ordering a complex wheelchair and describe their role in the process.
3. Compile 3 ways that operations management teams can optimize resources in the complex wheelchair ordering process.

Introduction

Specialty wheelchair (WC) clinics prescribe power or manual WCs for patients to promote mobility to increase independence. The operations of a clinic can influence the timeframe from completing an evaluation for a complex WC to its delivery. The purpose of this case report is to evaluate changes in timeframe for delivery of a definitive complex WC post implementation of quality improvement (QI) departmental and system wide changes involving new process and workflows.

A retrospective chart audit gathered baseline data on the timeframe between evaluation and delivery of a complex WC for 50 individuals prior to QI changes. Northwestern IRB approval #STU00211367. Standard departmental workflow collected 745 individuals post QI changes. Interventions included defining roles for all key players involved in the process and providing education. An information systems project revised the electronic medical record including physician and clinician documentation, scheduling templates, tracking of referrals, WC parts order details, plan of care and physician certification, and daily reports tracking completed documentation. Establishing regular supplier meetings promoted a common goal of collaboration and increasing accountability. The QI project outlined staff and supplier goals for timeframes for paperwork completion. Finally, processing centralization occurred for all paperwork regarding complex WCs along with logging and tracking of documents by support staff.

Conclusion

On average the mean delivery timeframe prior to the QI changes was 162.2 days with N=50. Post mean was 127.4 days with an N=745. Overall reduction in timeframe for delivery of evaluation to fitting and delivery of definitive complex WC was reduced by 21.5% or 34.8 days. QI changes resulted in a reduction in wait time for patients to receive their definitive complex WCs in a specialty WC clinic.

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Conflict of Interest

No conflicts have been disclosed.

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IC78: Start with the Client: Increasing Your Value Through Client-Centred Practice (RESNA Track)

Emma Smith, PhD, OT, ATP
Susan Johnson Taylor, OTR/L
Jean Minkel, PT
Weesie Walker, ATP/SMS

Learning objectives

1. List three benefits of a goal-directed, client-centred approach to assistive technology provision
2. Describe two ways to maintain a client-centred approach when resources, including time, are limited
3. Describe the importance of integration of assistive technologies in meeting client needs

Our clients are complex, with varied needs. In many cases, the wheelchair user is also a user of a range of other assistive technologies, many of which require integration with their wheelchair, and all of which require integration with their life. Assistive technology professionals and clinicians often work in silos for assistive technology provision and may not consider the range of technologies used by a person when prescribing and providing. This leads to poor integration and often to abandonment of one or more of the technologies. Using a goal-driven approach, we can ensure that clients receive the right technology, at the right time, with integration meeting their daily needs. In this one-hour instructional session, we will discuss the importance of goal setting with your client, and using those goals to drive your assessment and integration of the range of technologies used on a day to day basis. We will discuss strategies to achieve client-centred practice in the limited time available to ATPs and clinicians. Finally, we will share stories and experiences to highlight the potential benefits of using this client-centred approach. This session will be conducted in a moderated talk-show style with experienced clinicians and suppliers in the field, who will draw from their wealth of experience providing assistive technologies to clients.

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IC79: Heads UP! Supporting Head Control and Access to AT: Using Bluetooth Connectivity and Seating for Task Engagement

Michele Bishop, ATP
Lisa Rotelli, PT

Learning objectives

1. Identify 2 parameters which need to be configured for the ipad recipes to work.
2. Identify 3 characteristics of seating and positioning which must be supported to use the head easily for access.
3. Identify 3 characteristics of the atom and the tecla e which will allow the student to access their ipad or aac device initially.

For children with complex bodies it is critical that those of us in assistive technology become knowledgeable in the integration, configuration and navigation of systems our children are using. We need to become more "inclusive" in the use of AT throughout the day in multiple activities as we continue to provide children with increased opportunities to learn. We've always wanted to support the use of independence with the iPad for children with complex bodies but have had little or minimal success. We must also become more knowledgeable about how to support functional seating positions and increase a child's postural control experiences which support task engagement, which then, can support increased competent head access. Using Tecla e and the ATOM head array allows access to the iPad that has never existed for our children as students with the most challenged access. We do not have to lean on only switch driven apps, this is so exciting, it has to be seen to be believed. However, this is not simply a product demonstration, this session will focus on how to configure access to the iPad, including the iPad own accessibility menus and recipes, but will also support how to create and configure navigational strategies that will work for your child/student and her/his interests. This is not a session on how to use the iPad as an AAC device, but rather how to use the iPad in all ways, and for all interests, and for students who also have a dedicated AAC device, and/or a powered chair, and/or use a computer. We will share the "how to" parts of supporting individuals who depend on AT and AAC devices in varied environments. We will share how to set up software configurations to assist in navigating throughout them, including iPad use. First we will demonstrate and share the physical configurations of the devices and how they work together, how they are literally "hooked up," how they are compatible, and how they work. Then, secondly, we will share strategies of teaching and implementing the use of these systems, truly needed for more independent control. This session will be demonstrating some new technology and newer ideas of configuration and navigation, and integration. Knowledge of systems is necessary.

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IC80: 10 Things I Hate About You: Exploring Relationships, Roles, and Responsibilities of Seating and Mobility Team Members

Lisa Cordero, PT, ATP
Linda Bollinger, PT, DPT, ATP

Learning objectives

1. Identify 3 major responsibilities of the Rehab Technology Supplier and Licensed Clinical Medical Professional in the
2. Identify and remove 3 barriers in the CRT process
3. Create a process for providing seating and mobility services

Introduction

After 15+ years working together, the presenters of this class describe their working relationship like a marriage. They knew each other well including how the other thought and behaved during the CRT wheelchair ordering process. However, like most marriages, that didn't mean it was perfect. By establishing a consistent processes and clear roles and responsibilities, they were able to run a successful seating and mobility clinic while maintaining a supportive friendship. This course will describe the trials and tribulations of that love-hate relationship in an effort to identify roles and responsibilities and methods to improve the wheelchair delivery process in a clinic setting.

This session will take the participant through various stages of developing and working in a seating clinic. The presenters use their experience working together to describe the challenges and successes of using the "team approach". The use of movies titles highlights the topics discussed:

1. The Devil Wears Prada-Navigating a challenging work environment
2. 10 Things I Hate About You- Challenges working with other professionals
3. When Harry Met Sally- Creating a friendship and working relationship which can create a more cohesive experience for the consumer
4. Jerry McGuire-Team approach, roles and responsibilities of all the members of the team- both clinical and supplier teams

This course will describe the trials and tribulations of that love-hate relationship in an effort to identify roles and responsibilities and methods to improve the process. It will look at the challenges of the therapist and supplier working with clients with developmental disabilities, including funding equipment. The role of the therapist will be discussed including how much responsibility is required when recommending equipment. The supplier role will be discussed including the challenges of being a clinician in a non-clinical role, and respecting the boundaries in that position. The presentation will also discuss the other members of the team and support staff and how they contribute to the client's final product. Finally, barriers to service and benefits of creating a working process will be presented.

Conclusion

There are many different service evaluation and delivery models in existence in the provision of seating and mobility to consumers. The experience shared in this course on the traditional seating clinic environment will provide participants with the ability to identify barriers to optimal clinical outcomes and how to overcome them in the process of evaluation to delivery. The presenters will discuss the support team members, how to best utilize them to improve the process and experience for the consumer, and how to set up a clinical environment to provide the consumer with the best final outcome that can be achieved.

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Conflict of Interest

Conflict of Interest: Lisa Cordero is an ATP working with National Seating and Mobility. Linda Bollinger is a Pediatric Sales Specialist working for Leckey/Sunrise Medical.

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IC81: A Clinical Introduction to R & D: The How and Why Behind the Specs

Dawn Hameline, OTR/L, ATP

Learning objectives

1. List three primary influencers on product development
2. Briefly describe the process and intent of standards testing
3. Understand the use and limitations of marketing materials

The technologies behind power mobility have evolved since Everest & Jennings introduced the manufacturing of electric wheelchairs in 1956. Wheelchairs are considered a medical device and are therefore regulated by the FDA's regulatory process, to include power seating systems, standing chairs, all terrain and even stair climbing chairs, all of which are trying to fill a mobility need. In this session we will provide an overview of the R&D processes for bringing advances in power wheeled mobility to market and the hurdles experienced along the way. The complexities of FDA, ISO and ANSI RESNA standards paired with the collaboration of engineer, users and clinicians will be discussed. An overview of the intent of wheelchair testing and the types of tests will be provided. Consideration must be given to the critical limitations to research and development. With all product introduction or advancement, R&D has to meet the requirements for safety and effectiveness as well as justify the design by being cost effective, meet a need and be marketable. We will review methods for both clients and clinicians to provide valuable feedback to companies regarding product design improvements to effectively impact product development. Discussion will include the impact of fielded device adverse events. With product launch comes the release of marketing materials. Understanding the testing results can facilitate equipment selection. We will contribute to the understanding and application of these marketing materials to real world functional use, highlighting the information that is not prominently displayed and help to interpret that that is.

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2. ANSI RESNA WC Suite Code of Federal Regulations CFR 820 (Medical Device Quality System Regulation) https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfCFR/CFRSearch.cfm?fr=820
3. U.S. Food and Drug Administration Guidance on Medical Device Regulation https://www.fda.gov/medical-devices/device-advice-comprehensive-regulatory-assistance/overview-device-regulation Accessed 2020

IC82: Using big data to improve quality and value for multiple stakeholders in complex rehab technology (CRT)

Ginger Walls, PT, MS, NCS, ATP/SMS
Karin Leire, MSc
Carla Nooijen, PhD
William Emfinger, PhD

Learning objectives

1. Describe 2 examples about how data from connected chair technology can be used to improve wheelchair performance.
2. Discuss 2 examples how data from connected chair technology can be used to better understand wheelchair users' behavior.
3. Explain 2 ways data from connected chair technology could inform your practice - recommendations, service or follow-up.

Introduction

Big data is being used more and more to make informed decisions. Accelerometer data from smartphone users worldwide is currently informing health policy.(1) However, our knowledge about wheelchair users is generally derived from smaller heterogeneous samples.(2) Big data can open new opportunities for CRT as the number of consumers using connected wheelchair technology grow.

This course will discuss how data from connected wheelchair technology can be used to improve wheelchair performance; to increase our understanding of actual wheelchair use; to inform clinical practice and wheelchair service delivery; and to influence funding policy. This course will also include brainstorming to challenge participants to identify knowledge gaps and to discuss other uses of big data to improve practice or fuel research.

Connected wheelchair data

In looking at connected wheelchair data, two types of data insights can be distinguished - performance insights about how technology is functioning and behavior insights about how technology is being used. Many power wheelchair variables and functions can be analyzed. For example, the cumulative distance driven can be compared among power wheelchair users driving various types of power wheelchairs. This driving data can also be linked to battery health and increases our understanding of needs and performance.

For manual wheelchair users who utilize power-assist and a wrist-mounted wearable, we can analyze how many pushes are performed, as well as differentiate propulsion activity with and without power-assist use. Different user profiles have been identified; ranging from those who are less active and use their power assist less than 30 minutes/day on average to more active riders who average over 150 minutes of active power assist use per day, peaking at 570 minutes of activity/day. Similarly, we see a broad range of distance travelled with power-assist riders. Some travel on average less than 0.8 km/day and never more than 1.6 km/day; whereas others average over 3.2 km/day and even up to over 14.5 km/day.

On power wheelchairs, to gain insight into the use of the tilt function, analysis was completed on the proportion of how frequently users move into the maximum possible tilt angle, relative to the days that their wheelchair is turned on. The analysis showed that about 60% of users move into this tilt angle occasionally or frequently. A comparison between continents showed that maximum posterior tilt was used least frequently by European users and most frequently by Canadian and American users. Further analyses showed that the frequency of maximum posterior tilt usage is comparable between users of different wheelchair models.

Interestingly, looking at data collected, we can see that users who use certain types or configurations of power wheelchairs drive up to twice as much in a week, compared to users who use other types or configurations of power wheelchairs. To gain insight into these different patterns of driving behavior, the average distance driven was analyzed, including only those days on which wheelchairs had been actually used, resulting in average ranging from 1.2 km/day (0.7 miles) to 2.1 km/day (1.3 miles).

Data from connected wheelchair technology benefit many stakeholders and ultimately lead to improved health, participation, and quality of life.(3) Power wheelchair users and caregivers benefit from having more information about how they are using their chair via apps showing how long they can drive with the current battery status or when there is an error and may need service. Their confidence and ability to participate in quality-of-life enhancing activities is increased.

Clinicians can follow-up with clients using manual wheelchairs on how they are using their power-assist technology to mitigate their risk of upper extremity injury or with clients who have power wheelchairs on their power seat function utilization.

Service technicians can utilize a proactive, conditions-based service delivery model with insights that decrease the risk of wheelchair breakdown/downtime and show the need for wheelchair maintenance.

Wheelchair manufacturers can use data to inform the design of new products. For example, by analyzing the most common combination of actuator angles used in standing, manufacturers can set the optimal ranges for new wheelchairs. Also, feedback from wheelchair users can be captured in an app and analyzed towards innovation of products better designed to meet their needs.

Researchers using connected data from power wheelchairs in collaborative projects can link the data to results from other assessments, i.e. the Functional Mobility Assessment, or to document compliance in intervention studies.

Data showing evidence of increased participation and outcomes of consumers using optimal CRT can also be used to inform insurance policy coverage decisions.

Conclusion

Big data from actual users has the ability to inform clinical practice; improve manufacturer wheelchair design; transform the provider repair model from reactive to proactive; fuel research; help transform insurance coverage, especially when considering a value-based model. Most of all, big data from connected technology has the ability to improve wheelchair users' experience, health, participation, and quality of life. How will you become an early adopter of connected CRT to promote these outcomes in your practice?

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Conflict of Interest

Ginger Walls, Karin Leire, Carla Nooijen, and William Emfinger are all employed by Permobil.

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IC83: Seating & Mobility Index as an Assessment & Classification Protocol for CRT

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Rachel M. Hibbs, DPT, ATP
Julie Mannlein, PT, ATP
#Melissa Wright PT, ATP

Learning objectives

1. Explain 3 challenges with the current Medicare policy for CRT
2. Describe 3 potential benefits of using the Seating and Mobility Index (SMI)
3. List at least 4 stakeholder groups that would benefit from the use of the SMI

Introduction

Medical documentation for the provision of CRT is complex. One main issue is getting the funding and reimbursement. Documentation is not standardized and can be difficult to numerically measure the client's needs for different devices. CMS policies for CRT are also based more on diagnostic criteria and use within the home. In many instances, despite compliance with Medicare's coverage guidelines and having all supporting documentation, the insurance approvers often lack expertise resulting in denials and delays in provision of CRT. Although the evaluations provide measures of function, there are no standardized measures to facilitate objective review, approval, and payer coverage for provision of CRT. The objective of this project is to develop the Seating and Mobility Index for clinicians to assess and quantify a person's need for different types and levels of CRT based on function, participation, and environmental factors rather than diagnosis

CRT is the provision of medically necessary devices that require evaluation, configuration, fitting, and programming for a unique individual (NCART, 2019). Given that clinicians already use various standardized tools as part of their clinical examination and assessment for CRT, this project is now proposing to further develop the concept into a formalized tool called the Seating & Mobility Index (SMI). A systematic review of existing classification systems used in healthcare and related areas to comprehensively describe a person's functional status has been completed. These systems include Strength/ROM, Balance, Sensory Function, Coordination, Posture, Tone/Reflexes, Cognition, Pulmonary Function, Cardiovascular Function, Skin, Function, UE Function, Mobility-Ambulation, Mobility-Wheelchair propulsion, Pain, Quality of Life, Environment and Satisfaction. Any classification system that appeared to have relevance per consensus of the investigators, was reviewed to determine scope and design as a potential model for the SMI. This was followed by gathering and reviewing to assess existing standardized and validated tools used to assess body structures and function, activity and participation, and personal and environmental contexts that can be considered for inclusion of a new CRT functional classification index. Assessment of the tools required that they were peer-reviewed and address one or more ICF domains. They were then assessed for their clinometric properties including practicality for clinical implementation.

The investigators are now in the process of developing a survey which will be disseminated to clinicians involved in CRT provision to capture a larger sample. In this survey, each tool will be rated as essential, useful, or not necessary across the domains of relevance, meaningfulness, and burden. The ratings will determine which tools may be considered for inclusion in the SMI index as it indicates more than 50% of the respondents rated the item as essential.

Upon selection of the tools for the SMI, they will be constructed into an index format. Specifically, their scoring system will be further evaluated to determine how it could be calculated alongside other tools to be factored into a SMI composite score. The goal is not to change the validated score of the tool but rather factor it into a meaningful component of the SMI score. It is likely the SMI will be a compilation of existing tools; therefore, reassessment of these individual tools for clinometric properties will not be necessary. It is further anticipated that not all tools considered for the SMI will be appropriate for all people and their condition but rather be part of a battery of tools (toolbox) a clinician can select from. For example, a Timed Up & Go Test would not be administered to a non-ambulator but rather a 10m Wheelchair Push Test would suffice as a reasonable alternative.

Online training materials to administer and score the SMI will be created that will include a manual and videos. The initial SMI (Beta Version 1) and associated training materials will then be shared with the Advisory Group that contains all stakeholders for internal feedback related to content and clarity before it undergoes broader investigation of content validity.

Once Beta-Version 1 of the SMI and scoring scheme is completed, it will be shared along with the training materials electronically with outside clinicians such as the CTF to review for content validity. Respondents will review the tool and complete an online survey as to the tool's clarity, meaningfulness, and practicality. It is expected that at least 25 people will respond. Results of the survey will be tabulated and analyzed using Content Validity Ratios in a similar fashion to how specific tools were validated in Aim 2. Feedback will be used to update the SMI and training materials as needed and create SMI Beta-Version 2.

SMI Beta-version 2 will then undergo testing for inter-rater reliability. This will be performed by having one expert clinician from each of one of the three collaborating institutions who were involved in the development of the SMI administer the components of the SMI to 5 different cases as part of their routine practice for a CRT assessment. This will yield 15 cases, with 3 raters per case. The 15 cases will be de-identified, will not include a calculated SMI index, and will not include a CRT recommendation. These reports will then be shared with 3 blinded clinician experts who were not involved in the development of the SMI but will have received the SMI training materials. This will include 3 raters (one from each of the three collaborating institutions) who are involved in the provision of CRT. Each rater will review all 15 cases for a total of 45 ratings. Upon review of the case report findings, the raters will assess and calculate a SMI score. Therefore, each case will have 3 raters. This sample

size should suffice for the purposes of analysis. Inter-rater reliability will be calculated using intraclass correlation coefficient (ICC, 2k) with the goal of achieving an ICC >0.80.

The same cases and clinicians, therapists and wheelchair providers will be used to assess agreement of SMI Scores with type of recommended equipment. This will occur simultaneously during the inter-rater reliability study. The therapists serving as raters will review the report and independently recommend a category of CRT. Consistency between the clinicians, therapists and wheelchair providers will be calculated similarly to inter-rater reliability using ICCs.

Once SMI Beta Version 2 is tested, the team will work to incorporate the tool into a new CRT policy model. The specific details are premature at this time however it is likely the SMI score will become an attribute within the policy to document and justify levels of CRT intervention.

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Additional Learning Resources

National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR) grant number 90DPGE0014-01-00. NIDILRR is a Center within the Administration for Community Living (ACL), Department of Health and Human Services (HHS).

Conflict of Interest

No conflicts have been disclosed

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Wednesday
February 2, 2022

IC84: The ATP as The Case Manager – Communication & Collaboration your key to successful outcomes in AT

Michael P. Seidel ATP, CRTS
Sue Redepenning OTR/L, ATP, MN-AS, ECHM

Learning objectives

1. Participants will be able to define case management: (Case management is a collaborative process that assesses, plans, i
2. Participants will be able to define 3 different types of external case managers and their roles: (Work Comp Nurse case m
3. Participants will be able to identify 3 different responsibilities of the ATP when working with case managers: (Establis

Introduction

Numerous referrals for AT services come from Case Managers and there are numerous types of Case Managers we work with on a daily basis. Understanding the roles and responsibilities of the case manager and the ATP along with other individuals is key to a successful AT delivery model. Utilizing a client centered approach, focusing on communication and collaboration, we will explore the various participants involved and their roles and responsibilities the referral, procurement and funding for AT services and products. We will specifically review the role of the ATP acting as an “internal” case manager facilitating and participating in the assessment process, documentation requirements and ensuring funding is in place and delivery is completed for AT. The understanding of roles and collaboration of all involved participates is key in ensuring the best outcomes are achieved for the client with AT needs.

The presentation will define case managers roles and expectations when working with an ATP. We will review the role of the ATP when interacting with clients and how an ATP can most effectively manage the process in meeting the clients and case managers needs when recommending and providing assistive technology.

We will explore and review setting expectations and boundaries in this process. We will also explore best communication practices to achieve the desired outcomes for all involved parties.

Conclusion

Upon conclusion of this presentation you should be able to define and understand the role of the case manager and how the ATP can identify needs of the case manager and client as well as manage their expectations throughout the process. The ATP can effectively serve as an internal case manager within their role to achieve the goals outlined for assistive technology. By implementing the tools outlined in the presentation the ATP can avoid misunderstandings, delays and poor outcomes in meeting the clients assistive technology needs.

References

1. CMSA Website

Conflict of Interest

No conflicts have been disclosed

IC85: Valuing Consumers' Choice and Control Within a Functional Based Insurance Funding System

Tracee-Lee Maginnity, OT
Rachel Maher, PT
Rachel Fabiniak, PT

Learning objectives

1. Participants will be able to compare and contrast 3 differences between a function based and medically necessary fund
2. Participants will be able to identify 2 advantages and disadvantages of a function-based funding system
3. Participants will list 3 functional outcome measures that can assist in evaluating functional benefits with power and

Introduction

It is well documented that well matched wheelchair features can increase a user's functional capacity and lead to increased quality of life. There are various funding systems around the world with most providing some level of contribution towards a wheelchair. And whilst some do take into account certain functional requirements, the majority of these systems are based on medical necessity and/or matched to specific lists, the primary outcome being movement from point A to B or postural management. Specific features that may assist someone to do something they choose to do are not the focus and sometimes overlooked part of the big picture.

The National Disability Insurance Scheme (NDIS) is the main funding system throughout Australia. The scheme was developed as a client centred approach where justification for funding assistive technology (AT) is based on how it can enable the schemes participant to meet their functional goals. The scheme encourages community participation opportunities as well as equipment that is individualised and meaningful. The NDIS supports choice and control for procurement of a wheelchair as long as that wheelchair is determined reasonable and necessary. When the client is able to clearly articulate their goals and have a clinician who is competent in articulating these goals to the funder, an individual is able to obtain equipment that is able to maximise their function and participate in life to the best of their ability.

As with all funding systems globally, clinicians often face challenges in Australia with showing the value of the wheelchair and its features and relating the features of a wheelchair to a functional benefit.

If a person or their surrounding family or team have difficulty with goal setting, this can result in either the under (or over) prescription of equipment that may not maximise their function or carries the risk of abandonment. The under (or over) prescription of equipment may also occur if a person's therapist has difficulty articulating the person's functional loss and how the required equipment will best meet their needs. This session will look into the data collected through the NDIS for power and manual wheelchairs that currently exists. Understanding the data can provide insight into the changes that clinicians should consider in their current practice. Along with the data, we will use some unique case examples to highlight some of the functional goals and advantages to end users this system.

Conclusion

This session will conclude with a look into the use of current outcome measures to assist with assessment for, and evaluation of power and manual wheelchair prescription and how this can relate the data driven outcomes seen in the case examples. Whether the funding is medically necessary, or function based, the clinician must utilise outcome measures to justify the value of a clinician involved prescription process.

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Conflict of Interest

All three presenters are employed by Permobil Australia.

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IC86: On Time Mobility; a 23-year Perspective

Scott Jerome, MPT, CPSI
Matt Lowell, MPT
Ken Kozole, BSME, OTR/L

Learning objectives

1. Participants will list three benefits of early mobility and strategies for ways to implement it in their own practice
2. Participants will create a template for identifying needs in their community and creating unique programs to address
3. Participants will list three reasons to implement mobility throughout a lifespan that is accessible to children

Introduction

Ken, Matt, Scott, Claire and Jen bring a breadth of experience to Shriners Hospitals for Children. Our team collectively has over 90 years of wheelchair and pediatric experience. Our team also has worked in the burn trauma, school and homecare settings, teaching pediatric physical therapy at the University level and in mechanical Engineering. This has allowed us to bring a unique perspective to pediatric care and wheelchair seating and mobility innovation. We also staff a special needs car seat clinic, run the Un-Limb-ited amputee camps, and our annual Halloween Wheelchair Costume Clinic. What we love most about our jobs is working with the kids and their families. We highly value the support provided by Shriners Hospitals to develop programs as they are identified for patient needs, and to allow us to provide high-level care and treatment according to best practice.

Twenty-three years ago Shriners Hospitals for Children – Salt Lake City introduced a dedicated wheelchair seating and mobility department. What started as a single therapist working out of a small storage closet has grown to four full time therapists, two technicians, a coordinator and an aide. A dedicated office, a two thousand square foot off site storage unit, a box truck, on site storage and workspace for building and fitting equipment, supplement the closet remains. The true growth of this program has been driven by the needs of our patients and families, practicing in a family centered approach to care. Everything from the length of our appointments, how we schedule, and who attends has evolved. We would like to share our experiences and practices that have evolved from having dedicated staff that have worked exclusively with children and their wheelchair mobility and seating needs. Shriners Hospitals for Children's mission of delivering top quality care to children regardless of their ability to pay has allowed us to treat according to best evidence based practice regardless of whether families or insurance could support it. Early mobility has long been a serious pursuit for our staff and we would like to discuss the many ways we have successfully supported it by utilizing standard equipment, as well as creative modifications. The concept of family centered care is a core value for our institution and has inspired many different projects, programs, and even the way that we set up our wheelchairs. We have made the "HP tune" (high performance) a standard here and along with many seating professionals have long embraced the need to maximize mobility while minimizing effort for our young clients. Our loaning library program for our custom beach strollers and freewheels allow our kids and their families to explore and enjoy with greater freedom, and our annual Halloween wheelchair costume design clinics have been a huge success. After discovering, a significant need in our community to increase access to adaptive car seats we initiated a special needs car seat program with amazing results for improving safety, positioning, and comfort for our patients. This presentation will expand on what is involved in implementing and running these programs, as well as share what we have learned after twenty-three years of providing mobility in our community.

Conclusion

Through the experiences of Shriners Hospitals for Children, Salt Lake City, Seating and Mobility Department over the past 23 years, we have been able to develop a system of practice that benefits the patient and family in a cost effective means regardless of their abilities to pay. This is achieved by listening to the needs of the families we serve and develop programming to meet those identified needs. It is a systematic, evidence-based approach meeting the child and families developmental needs, patient participation, and addressing needs identified that are not readily available within the community. We highly value the support provided by Shriners Hospitals to develop these programs and allowing us to explore those processes in a best practice. We hope that sharing our experiences with a greater audience that they too may be able to bring this knowledge to their communities and practices to make a positive change within their community.

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We would like to thank all of our gracious donors over the past 23 years who have made it possible for this type of program dedicated strictly to meet the needs of children with mobility impairments. Without them, these programs would not exists. We look forward to our future, serving our community for many more years to come and sharing what is learned in the hopes of these programs touching a greater population and along with them the benefits that they provide.

Conflict of Interest

No conflicts have been disclosed.

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IC87: Wheeled Mobility Assessment & Delivery: Has the Pandemic Changed this for the Better?

Alfred Lee, ATP, MA
Maureen Mclain, PT, DPT

Learning objectives

1. List 3 available technology platforms that can be used for remote wheelchair appointments
2. Identify at least 1 clinical and 1 logistical benefit for remote wheelchair appointments
3. Identify 2 potential challenges when using remote wheelchair visits

Introduction

The assessment and delivery of wheeled mobility devices and related home access equipment has traditionally been a hands-on, in-person multi-step process to ensure optimal outcomes. Initial assessments and follow-up appointments are often time intensive situations for all stakeholders. Additionally, there can be extensive travel time for both the patient and practitioner. Remote visits and telehealth can be an effective solution, but although there are local and regional champions, widespread use has not been implemented historically. Preliminary research results have tentatively shown that remote visits can be as effective as in-person visits by wheelchair users and general clinicians, but experts in the field have some hesitations.

Materials and Methods:
The Veterans Affairs Administration (VA) has had a strategic initiative to improve the delivery of care closer to where the individual Veteran lives. It has a telehealth platform that is accessible to any VA staff and patient regardless of location. In addition to in-house clinicians the VA also has an integrated patient procurement and logistics service through the Prosthetics and Sensory Aid Service. While much of the telehealth emphasis has focused on the clinical component of wheeled mobility services, the VA has started to expand the use of telehealth into the areas of remote follow up assessments, repairs, and coordinated deliveries with contractors. In addition, we are also working to expand into vehicle and home access and home safety assessments. Results: To date there is not a universal model of wheeled mobility assessment and delivery within the VA Healthcare System. There are a few program models with local champions being utilized at the facility level. Other facilities primarily use wheeled mobility telehealth in an ad hoc manner. The VA as an organization recognizes the value and various local champions and VA work groups are collaborating to create recognized best practices, foster closer communication with all stake holders and leverage wheeled mobility experts as consultants for lesser experienced clinicians.

Conclusion

The Covid-19 Pandemic has forced all stakeholders in the wheeled mobility community to adapt to changing norms for safety and access to services. The VA as the only National Healthcare System with its own in-house clinicians, procurement staff and IT infrastructure is uniquely capable to collaborate and create solutions for better patient access on a large scale. As we eventually move into a post-pandemic world, the technology tools and program models used today can improve wheeled mobility services access by making it more convenient for end users and providers by leveraging technology to decrease commute times, assessments, and response times.

Background:
The assessment and delivery of wheeled mobility devices and related home access equipment has traditionally been a hands-on, in-person multi-step process to ensure optimal outcomes. Initial assessments and follow-up appointments are often time intensive situations for all stakeholders. Additionally, there can be extensive travel time for both the patient and practitioner. Remote visits and telehealth can be an effective solution, but although there are local and regional champions, widespread use has not been implemented historically. Preliminary research results have tentatively shown that remote visits can be as effective as in-person visits by wheelchair users and general clinicians, but experts in the field have some hesitations.

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IC88: Wheeled Mobility with Empathy during Pandemic, Strategies for a Calm Approach

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Amy Grace, OTR/L, ATP

Learning objectives

1. Identify 1 or more strategy to active listening.
2. Demonstrate 2 or more techniques for setting boundaries.
3. Name 2 methods to keep the team focused.

Introduction

As individuals are trying to navigate the impact COVID-19 is having on their lives, the seating and positioning industry has managed to persevere through the crisis to be there for the consumers. Seating and Mobility industry never loss focus but it has not been easy.

Excerpts and Quotes from Wendy Leebov, EdD and Carla Rotering, MD. (2014) The Language of Caring. Guide for Physicians: Communication Essentials for Patient-Centered Care. 167 Pgs.

Empathy and Compassion

A. Communicate with Empathy (Pg. 94-102)

1. Expressing empathy helps you come across as the caring person you are; patients, families, and physicians all benefit.
2. Empathy can be expressed by recognizing how patient's feel about their concerns/experience and acknowledging those feelings to patients and families with words and nonverbal behavior.
3. Empathy is often confused with sympathy. A sympathetic caregiver shares feelings with the patient, their feelings are congruent (sometime termed 'affective empathy'). While sympathy can positively contribute to the relationship, it can be exhausting.
4. You can effectively use empathy by acknowledging what you imagine patients and families are feeling without having the same emotions at the same time (sometime labeled 'cognitive empathy').
5. Acknowledge the Person's Feelings
   a. Read the patient's (or their family member's) words and nonverbal cues and reflect back the feelings you think you are seeing or hearing.
   b. Sound tentative and curious, so the person can correct you if your read of their emotions is not exactly right.
      1) "You sound..."
      2) "You seem..."
   c. Respond to the feelings you are hearing. Four out of five people ignore patient's cues and expressions of emotions.
      1) Sadness: "That sounds really painful and you sound very sad about it."
      2) Distrust: "You seem concerned about whether you can rely on me since you had so much trouble reaching me."
      3) Mixed feelings: "You sound pulled between wanting to lose weight and feeling hopeless about it."
   d. Be accepting and nonjudgmental:
      1) "I realize it's scary" e. Ask for and accept corrections. "I want to understand. Did I miss anything?"
   f. Pursue, follow-up on the feeling.
      1) Restate the feeling, checking with the patient or family to see that you've understood.
      2) Ask the patient or family member a related question, "What in particular is wearing on you?" or "Tell me what's confusing, so I can help."
   g. Validate, legitimize the feeling (when appropriate).
      1) "You certainly have reason to feel exhausted."
      2) "This is a very hard decision to make."
      3) "I can certainly understand that this is disturbing news."
   h. Suggest that others have had a similar experience.
      1) "Others facing this feel a lot like you do," or "You're not alone in feeling this way."
   i. Make a congratulatory or appreciative remark.
      1) "This must be so difficult and you're very brave."
      2) "I realize your father's care requires a lot from you, and I think you're doing a great job."
6. Show Empathy Nonverbally
   a. Adjust your eyes, posture, face, and pace to mirror the other person.
   b. Meet anger with a look of concern, urgency with urgency, and calm with calm.

B. Heart-Head-Heart Empathy Technique

1. Heart = emotion, caring, empathy. Heart message are personal and subjective about emotions and concerns. Heart messages help patients and families feel your kindness, caring and support; it helps them feel important, decrease their anxiety and more easily absorb information.
2. Head = tests, information, analysis, questions, solutions. Head messages are more rational and information oriented, including inquiring, analyzing, and problem solving. Patients learn valuable information and they appreciate answers and solutions.
3. Applying Heart-Head-Heart Empathy.
   a. Heart - address the person's feelings and anxieties with empathy;
   b. Head - convey factual information;
   c. Heart - close on a personal or feeling note.

Listen Carefully and Explain in a Way Others Understand

C. Be Present and Demonstrate Listening (Pg.29)

1. Pay undivided attention, consciously stay on purpose, and don't judge. By doing so:
   a. You'll notice more cues coming from the patient and gain valuable information that helps to provide appropriate care.
   b. You'll ease patient anxiety, and help them FEEL your caring.
   c. You'll encourage patients to open up, to trust, and to partner with you in their care.
2. When you really listen, taking in whatever is arising, instead of trying to fix it, push it away, rush out of the room, or ruminate about the next pressing thing you have to do, this is profoundly healing for the patient.

D. Manage technology effectively when you're with the patient: Studies at Kaiser Permanente advise against trying

to pay attention to both the patient and the device at the same time. Multitasking is inefficient and patients experience you as disconnected and inattentive.

E. Personalize Explanations. (Pgs. 111-18)

1. A large gap exists between what physicians explain to patients and what they retain.
   a. Anxiety, fear, preconceived notions, and filters block patient retention and understanding.
   b. The cost of misunderstood medical information is estimated to be 73 billion dollars annually (Kemp at all., 2008).
   c. Failing to verify understanding increases the risk of negative outcomes and malpractice claims.
   d. Differences in cultural background, education level, language, hearing, health literacy, family health history, and how much each person wants to know, affects people's comprehension; making it critical to tailor explanations to the individual.
2. Ask-Tell-Ask is an established evidence based approach to explaining effectively.
   a. Ask: Find out what the person knows and wants to know.
      1) Start with questions instead of information. Listen carefully. This will help you tailor your explanation to the individual's knowledge, questions, and concerns.
   a) "Please tell me your questions and concerns that would really help me."
   b) "I want to do a good job explaining this, so please tell me if anything I say isn't clear."
      2) Determine what they already know to correct misinformation and build on their knowledge.
   a) Check comprehension with open-ended, instead of short answer questions.
   b. Tell: Provide your explanation in a manner that meets the person's information needs.
      1) State your positive intent. Make it personal and for the patient's benefit.
   a) "I'm ordering this bloodwork to see if we can find a reason for your tiredness."
   b) "Mrs. Smith? This is Dr. Jones. I'm calling to ease your mind about your test results."
      2) Make it easy to understand, avoid jargon and acronyms.
      3) Use metaphors and analogies to help make the strange sound familiar:
   a) "The therapy is more like a marathon than a sprint."
   c. Ask: Verify understanding and address information gaps, questions, and concerns.
      1) Listen; address gaps and misunderstandings; then check again.
      2) Misunderstood medical information leads to patient anxiety, lack of adherence, medication errors, missed appointments, adverse medical outcomes, and lawsuits.

F. Engage Patients and Families as Partners

1. Empowerment, patient engagement, partnership, shared decision-making, and activation - whatever you choose to call it, when patients are actively involved in their health care, they engage in healthier behaviors, more effective self-monitoring, and greater adherence to their care plan.
2. Encourage the patient to speak up, listen respectfully, and reply in a nonjudgmental, positive tone.
   a. "How might you and I work together to solve this?"
   b. "I see you've been downloading information from the Internet. Tell me what you've come up with so far, and I'll share my thoughts with you if you would like."
3. Focus on the potential value of what the person is saying and find something to validate. Give patients choices when choices are reasonable, help people make educated choices by giving them the facts in understandable language and enough time to consider the options.

G. Effective Closing (Pg.62-4, 119)

   a. How you close encounters affect patients' (and families') feelings and leaves them with memories that last. It affects their grasp and adherence to the plan of care; comments and recommendations to others, and their survey responses.
   b. End the encounter so the patient and family members feel safe, cared for, confident, committed, clear about their next steps, and positive about you and their experience.
   c. Tell them the next steps; inform them how and when you will follow up with test results; or even better, ask how the patient would like to receive their results.*
   d. Check patient and family understanding and comfort with next steps.
      1) "So let's review our discussion to make sure we are on the same page."
      2) "So I want to make sure I was clear, what do you understand to be the most important things to do when you get home?"
   e. Ensure closure. Make it very clear that the visit is nearing an end and do all you can to help the patient feel finished.

Conclusion

It is no surprise that all these changes created a level of anxiety, short fuses and difficultly in maintaining focus. As everyone navigated each portion of the adjustments people found themselves low on patience and having to absorb others frustrations, anxiety and fear. Customer service skills have required a new level of care.

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Conflict of Interest

There are no conflicts to report.

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IC89: The value of community data in the design, testing, selection, and maintenance of casters

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Anand Mhatre, PhD

Learning objectives

1. Examine how evidence-based strategies inform four areas: design, testing, selection, and maintenance of casters.
2. Analyze community evidence gathered from four unique sources.
3. Utilize 6 resources developed from community data and testing protocol findings.

Introduction

Wheelchairs are crucial for people with spinal cord injury and similar diagnoses to increase access to education, employment, and healthcare. [1] Over 50% of wheelchairs fail every 6 months in urban settings and every 3 months in less-resourced settings due to adverse environments. [2-4] [5-7] Caster failures like fractured bearings, bent wheels and forks, and worn-out tires account for nearly a third of all failures. [8][9] These failures result in users being stranded or missing medical appointments and work, negatively impacting the user's quality of life. [3] Evidence-based testing is needed to ensure quality and prevent user consequences. [10] The University of Pittsburgh Rehabilitation Engineering Research Center and the International Society of Wheelchair Professionals are developing evidence-based testing protocols. This study analyzes the value of evidence-based strategies in developing protocols whose outcomes inform the design, testing, selection, and maintenance of casters.

Methods

Community evidence was gathered from multiple sources: 1) A community failure data repository created using tools including Labor Tracker, WCQ-c, and C-FIT; 2) Expert advice from ISWP Standards Working Group Members; 3) Wheelchair usage data collected with sensors and 4) Collection of failed caster samples.

1. Community Failure Data
Data recorded from January 2017 to September 2019 in Labor Tracker was collected for analysis. The data was separated by power and manual chairs, manufacturer, and then organized by HCPCS code for analysis. Four manufacturers were chosen for analysis as their models had more than 100 reported failures. Tilt-in-space (E1161) and ultralightweight (K005) wheelchairs were the two types of manual chairs analyzed in this study. For powerchairs, Group 2, Group 3, and Group 4 wheelchair models were chosen. The failure modes of wheel fractures and bent casters were coded as high-risk failures, while bearing fractures and worn-out tires were coded as low-risk failures. The Wheelchair Components Questionnaire for Condition (WCQ-C) was used to collect caster failures in Kenya. The Caster Failure Inspection Tool (C-FIT) was used to collect data in Indonesia, Scotland and Mexico. These validated tools provided insight into the effects of adverse environments seen in less-resourced settings and rural areas of resourced settings.

2. ISWP Standards Working Group
Advice on additional testing development was provided by members of the ISWP-SWG. The group is composed of expert wheelchair manufacturers, designers, providers, and researchers. Photos of failures that were not currently predicted in the testing method were discussed, and a testing matrix was created to detail different causes of failure not highlighted in current wheelchair standard testing. The group made recommendations for new test methods and accordingly, the SWG developed protocols for caster quality testing, rolling resistance testing, corrosion testing, and whole-chair testing.

3. Wheelchair Sensor Data
Real time field data was collected from three different wheelchair models to compare to testing results. Four users in total participated. The environment tested was hilly with uneven terrain. The accelerometer model X16-1D was chosen to gather acceleration data for one week. The sampling rate used to avoid aliasing was 400 Hz.

4. Collection of Failed Caster Samples
Samples of failed casters were collected from Scotland and Kenya to inform the exposures on the caster testing protocol. The failure modes and lifetime of the casters were used to compute the duration of abrasion exposure. Some samples can be seen in Table 1 below.

Results

Community Failure Data
2062 manual wheelchair and 4508 power wheelchair caster failures were reported through Labor Tracker and analyzed, as seen in Figure 1. Chi-squared analysis demonstrated the associations between failures and manufacturers and between failures and wheelchair models. A linear regression, pictured in Figure 2 was created to analyze preventative maintenance impact.

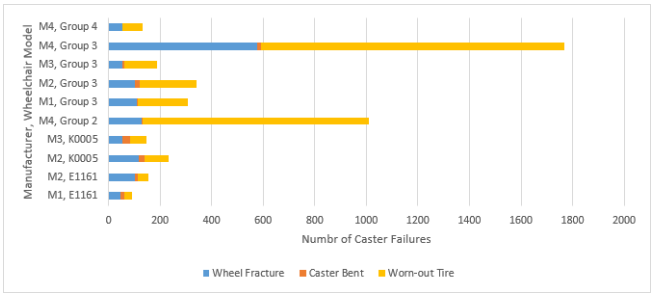

Figure 1.

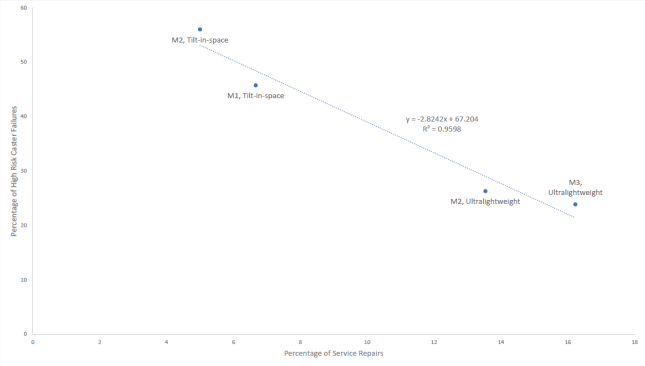

Figure 2.

Testing Protocol Design

The assessment of failure data from WCQ-C and C-FIT, as well as the failed caster samples, led the ISWP-SWG to recommend adding corrosion, shock, and abrasion testing to the protocol. The ISWP Caster Durability Testing Protocol, proposed as ISO/AWI 7176-32, includes 2oo hours of wet and dry corrosion testing in a salt fog chamber (as per ASTM B117) followed by shock and abrasion testing until failure on ISWP Chakra. The protocol requires a minimum of 2-years of equivalent cycle testing for a caster to pass. The testing protocol was applied to 8 different castor models tested under four conditions: shock, corrosion + shock, abrasion + shock and abrasion + corrosion + shock. For each model, a total of n = 8 samples was evaluated across the four conditions. Results demonstrate that corrosion and abrasion reduced castor durability between 13% to 100% depending on the model. Importantly, the inclusion of corrosion and abrasion resulted in changes in the failure modes for 75% of the tested models and two-thirds of the altered failure modes are associated with increased risk of injury for wheelchair users. Table 1 compares the caster failure modes experienced frequently in the community with the testing protocol results.

Table 2. Failure mode comparisons of community samples and protocol replications

Failure Mode	Community Sample	Test Sample
Wheel Fracture		
Tire Cracking		
Axle Failure		

Based on the community evidence and testing results, the following resources were developed:

1. Development of wheelchair design and selection guidelines
2. Design modifications
3. Wheelchair testing standards
4. Test improvement suggestions for ISO standards
5. Testing documentation
6. RERC Factsheet

Discussion

The tilt-in-space chairs experience twice the number of high-risk failures than ultralightweight wheelchairs. Among power wheelchair models, the proportion of high-risk failures increase with an increase in group number. This suggests improvements in quality and design of specific caster models is necessary and provides directions for data-based selection of caster models for testing. The testing studies to be conducted in the future shall focus on improving caster designs to reduce or even eliminate high-risk caster failures. Linear regression also suggests that preventative maintenance can reduce the amount of high-risk failures. The evidence-based approach to testing has reproduced community failures in laboratory settings. Caster testing results suggest that corrosion and abrasion present in the community reduce castor durability, thus supporting their inclusion in the castor testing protocol and potentially other wheelchair standards. Testing has also produced useful directions for potential design changes. With caster testing, thermoplastic bushings could outperform typical caster bearings in durability, rolling resistance and cost-effectiveness. This approach can be extended for developing additional testing protocols for wheelchair parts.

Conclusion

The goal of this study was to show the value of community data in developing testing protocol and resources on wheelchair design, testing, selection, and maintenance of wheelchair casters. Evidence-based caster testing has served as foundation for developing resources for informing design, selection and maintenance of caster products. The testing efforts and resources will improve the quality, safety and effectiveness of wheelchair products and reduce the frequency of wheelchair failures seen in the community. Information for safer use has been disseminated through the protocol, factsheets, and other resources. As more data is collected from the community over time, current findings may be further solidified, and new data trends and testing advances will be made. Overall, the data and testing show the need for designs selected based on testing evidence informed by the community, rather than relying solely on the judgement of the stakeholders.

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Additional Learning Resources

Wheelchair Standard Information and Caster Factsheet: https://wheelchairstandards.com/

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Conflict of Interest

The authors declare no conflicts of interest.

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IC90: The Pelvic-Spine Connection: The Key to Positioning and Function

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Learning objectives

1. Identify spinal and pelvic landmarks crucial to seated posture.
2. Understand changes to spinal and pelvic anatomy as it pertains to development.
3. Learn how external seating and positioning devices can influence posture and mobility.

Introduction

Over the years, the wheelchair and seating evaluation has become a very specialized process that focusses on matching the most appropriate equipment with the client's postural and functional requirements. It is an important part of the rehabilitation plan, but often has a strong focus on the equipment itself.
A properly fitting wheelchair can increase a user's function within the environment physically and socially and can improve overall quality of life. On the contrary, a poor fitting wheelchair and sitting posture can negatively affect the user's health. An important aspect to proper fitting is to understand the biomechanics of the pelvis and spine and how they integrate to promote stability and function in with the seated client. Getting back to basics.

During a seating and mobility evaluation, it is easy to focus on the equipment-client match, but it is equally important to remember the key anatomical, physiological, and biomechanical impact that application and configuration of primary and secondary supports will have on the body. It is also important to understand the limitations of our interventions on the anatomical structure.

In this presentation we will review pelvic and spinal anatomy as well as the development of spinal curves and how this impacts our posture during seating. We will look at how developmental disability can have a long-term impact on posture and stability. We will review how posture, including reducible and non-reducible deformities, can be enhanced through positioning devices. We will also discuss how the unique and complex anatomical structure of the spine may limit the impact of some seating interventions.

While most of us understand that the pelvis is our base of support for sitting and that the position of the pelvis dictates one's alignment and ability to function in the seated position, we often make the mistake of assessing the pelvis, trunk, and extremities separately. As the source of trunk mobility and the link between the upper and lower extremities, the spine is biomechanically linked to the pelvis and must also be considered when maximizing one's positioning. In the seated position, with the feet supported, the pelvis and spine function as a closed kinematic chain. (REF). This means that we cannot address one area of the chain without understanding or assessing the impact on the entire system.

For example, if we correct a reducible pelvic obliquity, but there is a non-reducible scoliosis, our correction could result in poor functional outcomes related to poor trunk positioning and less than optimal visual field. We must consider the entire anatomical chain. We need to consider the entirety of the seating and wheeled mobility system. The base, seat, back and secondary postural supports combine to create an integrated seating and wheeled mobility system and each choice of component, angle, or support will impact the others.

To understand this completely, it is necessary to review the unique structure of the spine and pelvis. After reviewing the critical landmarks of the pelvis, we then must examine the articulations of the spine and how they impact movement, stability, and development.

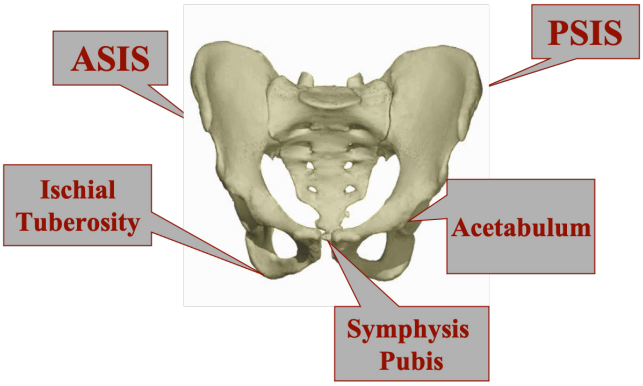

Figure 1. Pelvic Landmarks

When we look at the spine, there are many considerations that can impact proper alignment including tone, soft tissue length, capsular tightness, disk height, and joint orientation. It is critical to understand the complexity of spine to have successful outcomes.

First, the structure of the spine itself is very complex and varies from each region of the spine. If we start at the lower cervical spine (C3-C7) and traverse to the lumbar-sacral junction, we will see no fewer than six (6) articulations between each vertebra. The disk with the body of SPINE above and below (2) and the articulation of the superior and inferior facet joints (2 above and 2 lower). The motions we see, primarily flexion/extension, lateral flexion, and rotation, do not occur in isolation but are a series of coupling motions that include translation, compression and distraction to achieve a given range of motion. Why is this important? We are using comparatively simplified external supports to try and impact a very intricate system of joints. There will be limitations to the effectiveness of seating and postural supports simply due to the complexity of spinal articulations and our inability to address this at a more micro level.

Furthermore, we need to consider the developmental stage of our clients and how this relates to the normal development of spinal curves. The models of the spine we see, with ideal cervical extension and perfect lumbar curve are developed from norms of standing adults who have successfully progressed through the expected developmental phases of the spine.

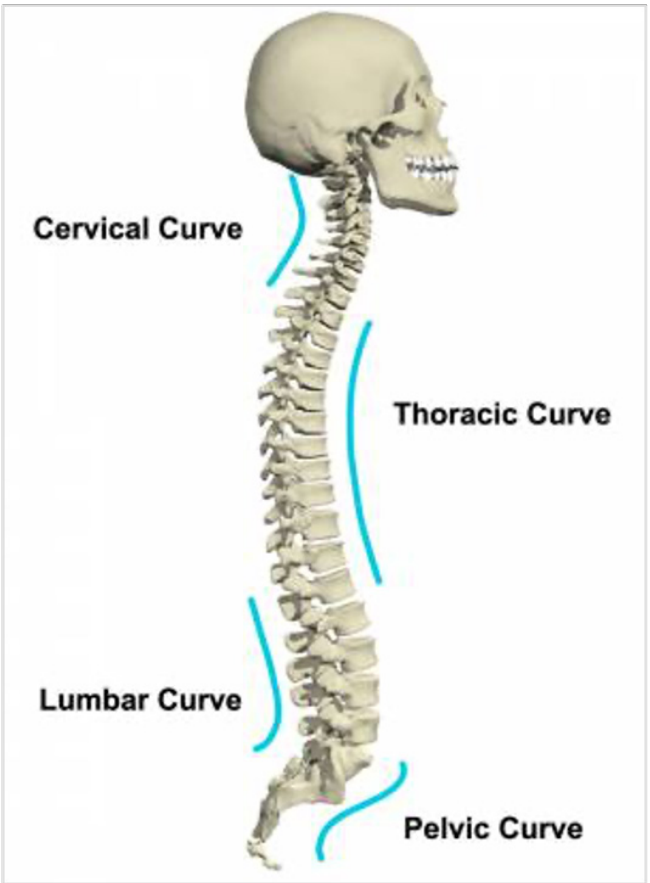

Figure 2. Normal Spinal Model

When in utero and after birth, the spine is essentially C-shaped. As a child grows and develops, we will see a normal formation of spinal articulations and the recognized spinal curves. These curves form during specific developmental periods. The cervical lordosis begins to develop at 6-8 months as independent prone lying and head lifting and turning is achieved. The lumbar lordosis develops at 10-12 months as a child weight bears through the lower extremities, and the lumbar spine tends to flatten out in the seated position. Keeping this in mind, providers need to consider the age of the client and the prognosis of disability to fully understand what interventions are needed to maximize functional potential. On the converse side, we should also consider the changes that happen to the spine as we age. These include disk compression, spinal fractures, shortening of soft tissues, and other changes that impact mobility. Not all seating and postural support devices will have the same impact based on spinal development, and this is before we consider growth and changes to soft tissue.

Overall, it is important to understand the biomechanics of the seated posture to successfully select and configure seating and mobility systems. We need to recall basic anatomy, development, and biomechanics to insure we select the most appropriate interventions and have the best outcomes.

Conclusion

Since the pelvis and spine provide the basis for seated stability and function, it is critical to understand the basic anatomy and biomechanics. We need to understand the limitations of our interventions based on the unique presentation of the client and realize that we are trying to impact only the gross spinal movements with our support devices. Understanding the biomechanics and utilizing devices with the correct shape are critical to seating and postural support success.

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Conflict of Interest

Allison Speight is a paid full-time employee of Motion Composites, a wheelchair manufacturer and is monetarily compensated for providing educational content related to such products.
Tina Roesler is a paid full-time employee of Bodypoint, a manufacturer of wheelchair postural supports and is mon

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IC91: Telehealth Reimbursement Considerations for Wheelchair Evaluation

Daniel Fedor

Learning objectives

1. Identify key clinical indications required for the wheelchair base and accessories
2. Describe how to accomplish payers' requirements using telehealth
3. Determine how to construct a successful telehealth wheelchair evaluation for qualifies patients

Introduction

Telehealth is not new and has been a limited acceptable option for many years under certain circumstances. When the public health emergency (PHE) hit in early 2020 requiring less contact, telehealth was significantly expanded. Will all or some of these expansions remain once the PHE ends? This session will dive deep into the past, present and FUTURE of telehealth.

Telehealth is a valuable option when appropriate as it enables the patient to receive care they need without the inconvenience and time constraints of an in-person evaluation. Due to the PHE telehealth has expanded significantly and many wonder which parts will remain after the PHE has ended. Some of the considerations for wheelchair evaluations that will be discussed in this session are: When is telehealth appropriate, how to document a comprehensive evaluation virtually and what are some of the concerns of having expanded telehealth. This session will provide attendees with implementable recommendations for proper compliant wheelchair evaluations via telehealth.

Conclusion

At the end of this session attendees will have a better knowledge of what is expected for the future of telehealth, appropriate use of telehealth, documenting a telehealth wheelchair evaluation for payers and compliance.

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Conflict of Interest

No conflicts have been disclosed

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IC92: Providing Consumer Value and Innovation Through Evidence-Based Product Development

Curtis Merring, OTR, MOT
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Jackie Klotz, CPMM

Learning objectives

1. Discuss 3 ways how crt product value is increased for the end-user by using informed decisions throughout different phas
2. Identify at least 1 key aspect of product management, product marketing, and clinical education in product development.
3. Identify 2 ways evidence-based practices are used for product innovation to improve clinical outcomes.

Introduction

What makes the CRT industry both very challenging and rewarding at the same time, is that no one product can fit everyone's mobility needs. When comparing the vast array of CRT products available, it can sometimes be difficult to choose which device is the best match for each individual.

The consumer, clinician, and equipment provider embark on a difficult, individualized journey striving to achieve the perfect solution. The product development team of any equipment manufacturer has the responsibility to provide innovative mobility solutions for their consumers as a primary objective and it is where the true value lies. But who is on the product development team, what are their roles, and how do they integrate the consumers' voice? How a manufacturer approaches product design can vary, but to provide high-value equipment that improves clinical outcomes, this needs to be driven by evidence-based practice and an interdisciplinary approach.

Conclusion

At all phases of the product development lifecycle, integrating evidence to influence product design, marketing, and education creates a high standard of responsible manufacturing. In addition, it is critical to make sure all stakeholders are included in the evidence gathering process, including consumers and their families, clinicians, and equipment providers.

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Conflict of Interest

Permobil (manufacturer) employee.

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IC94: Optimizing a Wheelchair: Taking Advantage of the Technology to Get the Best Outcomes, Now and in the Future

Deborah Pucci, PT, MPT
Curt Prewitt, MS, PT, ATP

Learning objectives

1. Attendees will be able to describe the influence of weight distribution on manual wheelchair rolling efficiency.
2. Attendees will be able to describe the relationship of UE position to force application during manual wc propulsion.
3. Attendees will be able to list 3 aspects of manual wheelchair set up to assess during follow-up visits.

Introduction

As professionals involved in manual wheelchair prescription and fitting, the value we bring to the process is directly related to our knowledge. This presentation will dive into the details of critical factors that must be considered to optimize postural stability and propulsion efficiency for end users, with consideration for the relationship between these factors. We will address how to make prescriptive decisions while providing for potential changes in clinical needs and the value of implementing follow-up to reoptimize the wheelchair over time.

Professionals involved in manual wheelchair prescription must work with end-users to create a configuration that achieves optimum results, not just for comfort, but for stability, for function, and for propulsion. As professionals involved in manual wheelchair prescription and fitting, the value we bring to the process is directly related to our knowledge. This knowledge should always be evolving with integration of ongoing research evidence. Without it, we are ill-equipped to contribute to the quality of life of manual wheelchair users. Historically, however, there is evidence that we as an industry have not done an adequate job of taking the user's needs and abilities into consideration in the prescription process, resulting in dissatisfaction and abandonment of adaptive equipment (Phillips & Zhao, 2010; Scherer & Galvin, 1996). Additionally, there is support that dissatisfaction and abandonment can be linked to lack of follow-up assessment to ensure that equipment continues to meet a user's needs over time (Scherer & Galvin, 1996).

This issue can be combatted through the use of evidence based practice. At its core, evidence based practice is the integration of sound clinical research, clinical expertise, and patient values (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996). This approach aids professionals in avoiding poor clinical decisions by considering the validity of clinical evidence within the context of both clinical knowledge and individual user need.

Understanding the multiple roles that a wheelchair serves for an end-user is also critical in the prescription process. Often, there can be a tendency to view a wheelchair primarily as a mobility device. Therefore, there is a focus on propulsion efficiency (particularly with ultralightweight wheelchairs) when considering factors impacting configuration.

The wheelchair, however, is not solely a mobility device. For many users, it is the position from which they perform all of their activities of daily living. One study monitoring users' activity in their natural environment discovered that users are physically propelling only about 10% of the time that they are up in their chairs (Sonenblum, Sprigle, & Lopez, 2012). This finding validates the need to focus on the wheelchair setup not just for propulsion, but for a user's static and dynamic support needs during activities of daily living.

Aspects of configuration such as axle position, seat to floor height, back angle, and back height, as well as others have all been shown to impact both mobility and function within the wheelchair. When considering these aspects, there is ample research regarding how to optimize configuration to enhance propulsion (Boninger, Baldwin, Cooper, Koontz, & Chan, 2000; Desroches, Aissaoui, Bourbonnais, 2006; Van der Woude, Veeger, Rozendal, , & Sargeant, 1989.) The fact that a wheelchair configuration impacts both propulsion and a user's function within the chair, however, makes it necessary that evidence supporting optimal wheelchair configuration is considered in all applicable contexts. Additionally, professionals need to anticipate potential changes in user function and/or need throughout the life of the equipment. This foresight ensures that the initial wheelchair configuration allows for setup changes while remaining within optimum parameters. Lastly, routine follow-up is imperative to reoptimize chair setup as needed.

Conclusion

Through the use of evidence based practice, professionals involved in wheelchair prescription can positively impact the lives of the individuals they work with. This approach promotes the use of clinical expertise to evaluate physical and functional needs, anticipates potential changes, and applies best research evidence to guide clinical decisions regarding wheelchair configuration within the context of an end-users' values, priorities, and expectations. When applied well, the result is wheelchair configuration that allows the setup of the wheelchair to be reoptimized over time.

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Conflict of Interest

The primary author is employed part-time as a contract educator for a manufacturer of manual wheelchairs. The secondary author is employed full-time by a manufacturer of manual wheelchairs.

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IC95: Electrical Stimulation and Improved Seating Outcomes: Literature Review and Clinical Application

Nathan Casey, PT, DPT, NCS

Learning objectives

1. Participants will identify 3 different types of electrical stimulation, and identify their therapeutic application.
2. Participants will be able to understand 6 physiologic benefits in which electrical stimulation has shown to improve s
3. Participants will demonstrate the ability to analyze 2 different case examples to maximize their capacity for clinica

Introduction

This course will review literature on electrical stimulation and the translation to better seating outcomes. Electrical stimulation has been a technology that has existed in physical rehabilitation for several decades, this course will help to translate use of electrical stimulation in physical rehabilitation to seating and positioning. The overall aim of this presentation is to provide seating clinicians more tools at their disposal to improve the lives of the patients they treat.

Electrical stimulation has been a technology that has existed in physical rehabilitation for several decades; however, there are few studies about the impact of electrical stimulation in seating and positioning. The evidence available shows good promise that electrical stimulation is a modality that could be of great use to clinicians that work in seating. Physiologically speaking, electrical stimulation increases regional blood flow, reduces muscle spasms, increases range of motion, decreases muscle atrophy, and can reduce pain. As seating clinicians, we have the ability to harness this technology to improve our seating outcomes and improve the long-term health of the patients/clients that we work with.

Conclusion

A review of the different types of electrical stimulation, common parameters, and therapeutic application will be provided to provide background content knowledge. In depth review of the physiologic benefits of electrical stimulation will be provided, as well as the current evidence that exists on translation to seating outcomes. Key articles will be discussed to establish clinical bottom lines on current recommendations for those working in the clinic. Additionally, case examples will be discussed to maximize the ability of clinicians to take this information into their clinic and apply it to relevant seating cases.

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Conflict of Interest

No conflicts have been disclosed.

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IC96: Seating and Positioning Across the Continuum: Improving Outcomes

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Learning objectives

1. Participants will be able to list 3 successful strategies for collaboration through the continuum
2. Participants will be able to list 3 barriers contributing to decreased follow through with equipment
3. Participants will be able to name 2 ways of tracking patient follow up and follow through

Introduction

In this presentation, we will talk about the successes and barriers of seating and positioning throughout the continuum. At The Ohio State University Medical Center, we see many of our patients from the acute care setting all the way through the outpatient setting.

At our hospital (The Ohio State University Medical Center) we have therapists in all settings from acute care, inpatient rehab and outpatient care. Therapists in all settings have been working towards developing and improving seating and positioning along the continuum. We have developed protocols and systems over the past few years to increase success for our patients. These protocols have helped increase buy in for our clients and accountability for our vendors. In the acute setting, the focus is on positioning in the bed, reducing skin breakdown and education on potential equipment needs. Many patients in the acute care setting do not go to inpatient rehabilitation. These patients need to be educated and set up with follow up at outpatient if able to get appropriate equipment. It is all too often that patients go home with inappropriate rental equipment or no equipment at all. In the in-patient setting, trialing varying equipment, meeting with vendors and ordering equipment. In the outpatient setting, following rehab progress, making adjustment to wheelchair orders, and final fittings and follow through. We have case studies that varying in their progression through our system.

Conclusion

This presentation highlights the strengths and weaknesses of our seating and positioning program across the continuum. We look at where we have succeeded and explore areas of growth. We also develop plans for the future to explore program improvements to increase our service delivery model.

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IC97: Adding ISO Standards to the Clinical Reasoning Process

Kara Kopplin, B.Sc. Eng.
Ana Endsjo, MOTR/L, CLT
Stacey Mullis, OTR/L, ATP

Learning objectives

1. Connect four or more recommendations from the International CPG for pressure injury prevention to ISO test standards
2. Analyze blinded test results to consider how the data may be applied to cushion selection
3. Evaluate the limitations and benefits of using ISO test data as part of the clinical reasoning process

Introduction

For decades, test standards have been developed by the International Organization for Standardization (ISO) to measure and characterize wheelchair seating. These standardized "bench tests" allow for an objective, scientific laboratory analysis of support surfaces. These tests measure the critical characteristics of wheelchair cushions, revealing properties that might be suitable for meeting the client's needs for tissue protection and positioning and to enhance the ability to perform MRADLs for a wheelchair user.

In 2019, the NPIAP/EPUAP/PPPIA clinical practice guideline (CPG) for pressure ulcer/injury prevention were published. How do the ISO standards relate to the CPG? How can your cushion selection process be simplified by using ISO technical data in combination with the latest clinical knowledge?

In this presentation, attendees will gain an understanding of how standards are created, from the national level up to the ISO global level. An overview of the current wheelchair seating standards will be presented in the context of the CPG, demonstrating why the test data can provide insight into cushion selection for the client. Various cushion technologies will be compared using blinded test data from numerous ISO standards to reveal important similarities and differences.

Conclusion

Both the benefits and limitations of the test data will be discussed, emphasizing the role of the ISO standards as another set of tools in the clinical reasoning process.

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Additional Learning Resources

1. https://guidelinesales.com/page/Guidelines
2. https://cdn.ymaws.com/npiap.com/resource/resmgr/events/NPIAP_Permobil_WC_Seating_Po.pdf
3. https://www.resna.org/AT-Standards/Wheelchair-and-Related-Seating-WRS
4. https://www.iso.org/committee/53792/x/catalogue/p/0/u/1/w/0/d/0
5. https://wheelchaircushionstandards.wpcomstaging.com/

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Conflict of Interest

Although both Kara Kopplin and Ana Endsjo are employees of Permobil, this status does not pose a conflict of interest.

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IC98: Driver Rehabilitation: Providing the Right Service at the Right Time

Amy Lane, OT, CDRS
Elizabeth Green, OT, CDRS, CAE

Learning objectives

1. Identity the differences in driver program models, provider credentials, the range of services and how it relates to specific areas of practice.
2. Cite examples of how to start the conversation to address driving and community mobility for each category of driver program.
3. List the three levels of driver rehabilitation programs and identity the distinction in program services.

Driving and transportation holds value for all individuals across the lifespan. The purpose of this session is to highlight the wide range of services related to driving and community mobility. Driver rehabilitation programs across North America and worldwide provide a range of services related to driving and transportation for persons with disabilities or those whose driving skills are significantly affected by medical or age-related changes. It is imperative that program terminology is clear and understandable to health care professionals, service providers, and consumers, especially when attempting to establish effective and efficient referral pathways. Attendees will be provided with available resources, strategies for initiating conversations about driving and information on when to refer to the appropriate level of program and services. During this session, a document that defines the spectrum of driver services ranging from basic driver education to high tech driver rehabilitation program will be shared. The document will provide all stakeholders invested in driver services with information on when to refer the right people to the right service at the right time.

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IC99: Using a Participatory Action Research (PAR) Approach to develop content for the ISWP Wheelchair Educators' Package

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Paula Rushton, PhD, OT
Teresa Plummer, PhD, OTR/L, ATP, CAPS, CEAS
Sara Múnera, MS, PT, ATP, WSP

Learning objectives

1. Participants will be able to describe how the PAR approach can be used to gain the perspective of diverse teams.
2. Participants will be able to describe how the Knowledge Management Logic Model can be used to address health problems.
3. Participants will be able to explain how the Wheelchair Educators' Package may be used within their contexts.

Introduction

Access to assistive products, such as wheelchairs, can reduce inequalities experienced by people with disabilities by enabling them to participate in society and enjoy fundamental freedoms (Tebbutt et al., 2016). However, access to an appropriate wheelchair and associated services remains a challenge worldwide. Although this issue is multifaceted, recent evidence highlights limited wheelchair service delivery education in professional rehabilitation programs worldwide. Educators from university rehabilitation programs have reported barriers in the integration of wheelchair content into curricula such as difficulties in the integration process (e.g., advocacy, planning, teaching or evaluating), limited human and physical resources (e.g., limited expertise, lack of teaching materials), limited funding and time constraints (Fung et al., 2017)This situation perpetuates a rehabilitation workforce that often lacks the competencies required for comprehensive wheelchair service delivery.

This workshop will describe our ongoing initiative in the development and refinement of a Wheelchair Educators' Package (WEP). The WEP is an online toolkit comprised of open-source and WEP-specific resources, organized into three primary sections (i.e., advocating, planning & teaching and evaluating) that can be used by educators of rehabilitation professionals globally to overcome the barriers that prevent the provision of adequate wheelchair service delivery education. Given the diversity of rehabilitation professionals who may engage in wheelchair service delivery, with varying scopes of practice across low-, middle- and high-income settings, the WEP provides a wide range of content and strategies from which educators may choose to provide an education that prepares clinicians to address local population needs, within both the local wheelchair supply chain and service delivery processes as well as governance. An overview of the Participatory Action Research (PAR) approach employed to engage in an iterative process of planning, action, and reflection (Stringer, 2008) among an international, interdisciplinary development team of 32 wheelchair service delivery experts from 21 countries will be provided. The benefits and challenges of the PAR approach encountered to date will be discussed and the strategies implemented to overcome the challenges shared. The use of the Knowledge Management Logic Model (KMLM) (Ohkubo, Sullivan, Harlan, Timmons, & Strachan, 2013) to guide the WEP development will be reviewed. The presenters will give a demonstration of the WEP itself ('under development' version), provide the opportunity for participants to engage in the use of the WEP and invite discussion about how the WEP may be used to add or enhance wheelchair content into the curricula of participants' settings. Suggestions for the refinement of the WEP will be encouraged and welcomed during the interactive discussion.

Conclusion

The PAR approach, combined with the use of the KMLM as a guiding model, has been effective in the WEP development process to date. The WEP has the potential to help educators to overcome context-specific barriers to providing adequate wheelchair service delivery education among rehabilitation professionals, thereby supporting competency development and capacity building of wheelchair service personnel. This work will bring us closer to our ultimate goal of the provision of an appropriate wheelchair for all those who require one for mobility and participation.

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Conflict of Interest

No conflicts have been disclosed.

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IC100: Telehealth for Mobility and Wheelchair Evaluation: An Observational, Evidenced-based Approach

Diane Carrillo, MPT, PT, ATP/SMS

Learning objectives

1. Participants will learn 5-7 evidence- based test observable test and measures for a telehealth mobility and wheelchair e
2. Participants will learn 4 policy and procedures for executing and completing a telehealth mobility and wheelchair evalua
3. Participants will learn 3 key patient populations that can be served by telehealth services.

Introduction

This course will address documenting with purpose using telehealth, present evidence-based test and measures, outline procedures and policy for safety and effective outcomes, and promote discussion. I believe that practice, time and evidence will show that telehealth is an effective and valuable way to meet the needs for wheelchair service delivery.

The industry of Complex Rehab Technology is ever changing. Most often these changes are brought about with in depth research and studies by professionals within our field. But what happens when our world is suddenly changed, brought to a stop and the way we are used to doing things has to change abruptly. That was exactly the effect of the Covid 19 pandemic that hit our world in 2020. As a private practice owner specializing in Mobility and Wheelchair Evaluation, I was faced with the questions: How would my practice survive? How could I continue to serve a population that was so desperately in need of help and services? I had to "Pivot or Perish", so I made the decision to pivot because the latter wasn't an option. But questions remained: Telehealth? Really? I just couldn't see it as an option. Many questions arose from my colleagues and many professionals in the field.

Documenting for wheeled mobility and seating has been an ongoing challenge. We will take a look at documentation requirements and how we can effectively document for medical necessity. We will learn how to document with purpose in order to produce an effective evaluation and justifications. It is time we "pivot" away from practices that are time consuming, unnecessary, and ineffective. Telehealth evaluations should look different then your traditional documentation. We need to use evidence based observable test and measures. Having the ability to observe a client within their home environment can be a very valuable option to assess, evaluate and document their functional abilities, functional strength and ROM, balance, posture and positioning, and perform wheelchair trials. We need to be able to tell their story well, what better way then to observe them in the exact environment that the prescribed wheelchair will be used. We must have procedures and policies in place to ensure safety and effective outcomes. Screening referrals for appropriate telehealth candidates is necessary. Not all clients are appropriate and we need to assess individual circumstances and use good clinical judgement prior to implementing a telehealth evaluation. We will review options and discuss policies that need to be in place to protect all parties involved.

Conclusion

As we move forward and return to our new normal way of practice we need to learn from our experiences. We need to pivot towards a new style of documentation and embrace options that will lead to optimal outcomes for our clients. We have come a long way with the utilization of telehealth but there is still work to be done. As Benjamin Franklin said "if better is possible then good is not enough". So, we must do better by using evidence-based observable test and measures along with implementing policies and procedures to advance to a better future.

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IC101: Impact of Cardiopulmonary Function on Wheelchair Seating and Mobility in Adults and Children

Theresa M. Crytzer, PT, DPT, ATP
Laura Dobrich, PT, DPT, ATP

Learning objectives

1. Examine the literature on people with neurological disabilities and the impact on cardiopulmonary function.
2. Review cardiopulmonary outcome measures and how they support clinical decision-making in wheelchair prescription.
3. Apply understanding of the 3-D nature of chest wall expansion and effects of gravity to decision making on seating.

Introduction

Cardiopulmonary function in people with neurological disabilities is compromised depending on physiological factors including neurological level and denervation of the muscles of respiration, hypotonia, spasticity, and presence of scoliosis and kyphosis. (Berlowitz, Wadsworth, & Ross, 2016). Customized wheelchair seating and supports can be applied to improve posture and chest wall expansion (Brunner, 2020; T. M. Crytzer et al., 2016; Holmes, Brock, & Morgan, 2019; Inskip et al., 2017; Patel, 2011). Spinal bracing and wheelchair seating may be paired to achieve these objectives (Bosshard et al., 2019; Richardson, 2021). Objective measures of cardiopulmonary function provide evidence of the medical need for customized seating and adaptive components (Arledge et al., 2011). Cardiopulmonary function can be improved by exercise and daily physical activity. Physical and occupational therapists can provide healthy lifestyle guidance to clients with neurological disabilities to meet recommend

Neurological conditions and respiratory complications
Pulmonary dysfunction is common source of morbidity and mortality in people with spina bifida, notably, pneumonia and respiratory failure were the 2nd and 3rd leading causes of mortality (Dicianno & Wilson, 2010). Scoliosis, obesity, denervation of the internal intercostal musculature impact pulmonary function. A high prevalence of pulmonary restriction was found in adults with spina bifida (69%, n=29). Restrictive pulmonary function was observed in 9/10 (90%) with thoracic neurological levels and higher neurological levels and greater degree of scoliosis were correlated with greater degree of pulmonary function impairment (T. M. Crytzer et al., 2018).

In individuals with cerebral palsy, respiratory impairment is also a source of morbidity and mortality due to impaired airway clearance, compromised swallowing and aspiration. (Boel et al., 2019). Complex neuromuscular impairments of the spine and chest wall and pelvis impact pulmonary function, often requiring accommodation through customized wheelchair seating and bracing (Holmes et al., 2019; Howard, Sees, & Shrader, 2019; Littleton, Heriza, Mullens, Moerchen, & Bjornson, 2011; Manzone, Arce, Avalos, Iñiguez, & Gemetro, 2019)

Cardiopulmonary dysfunction accounts for the largest portion of morbidity and mortality in people with spinal cord injury (Berlowitz et al., 2016; Galeiras Vazquez, Rascado Sedes, Mourelo Farina, Montoto Marques, & Ferreiro Velasco, 2013). People with spinal cord injury are especially vulnerable to respiratory illness in the year following the injury and face the potential for respiratory complications through life. Customized wheelchair seating can support the spine in extension and improve mechanics of intact respiratory muscles, promoting chest wall expansion.

In people with Duchenne Muscular Dystrophy, restrictive lung disease is inevitable and is mechanical due to impaired chest wall expansion and impaired diaphragmatic movement from muscle weakness, kyphosis and/or scoliosis, and obesity. Pulmonary function is often confounded by body morphology (e.g., abdominal girth), effect of gravity on the chest wall in various positions and contact of the torso with the wheelchair seat back (Katz, Arish, Rokach, Zaltzman, & Marcus, 2018) preventing posterior chest expansion. Power seat functions paired with customized seating/positioning can be considered to improve pulmonary function.

While further research is needed (Ryan, 2016) on these conditions previous research has shown that customized seating has improved pulmonary function (Lin et al., 2006; Nwaobi & Smith, 1986). Evaluating respiratory function, understanding the planes of ventilation and the effect of gravity and wheelchair seating position can promote therapists' provision of wheelchair seating and positioning that provides postural support while enhancing chest wall expansion.

Outcome Measures

Low cost clinical outcome measures to assess pulmonary function include Rating of Perceived Exertion scales, i.e., BORG Scale (Borg, 1998), and WHEEL Scale (T. Crytzer, Dicianno, Robertson, & Cheng, 2015) , Timed Up and Go (Christopher, Kraft, Olenick, Kiesling, & Doty, 2021), 10 Meter Wheelchair Propulsion Test (Andrews, Vallabhajosula, Ramsey, Smith, & Lane, 2019; Askari, Kirby, Parker, Thompson, & O'Neill, 2013), vital signs (e.g., oxygen Saturation, respiratory rate, heart rate, blood pressure), and chest wall excursion (Littleton et al., 2011). Costly laboratory testing includes arm ergometry exercise stress testing which is a steady state graded multi-stage test to assess the cardiovascular and pulmonary systems. Lung function in people with restrictive or obstructive lung disease can provide pre-post measures of responses to seating/positioning and wheelchair mobility (Berlowitz et al., 2016; Buu, 2017; Schilero, Spungen, Bauman, Radulovic, & Lesser, 2009).

Physical Activity

Numerous options exist to customize postural support and improve chest wall expansion are available. Once optimal wheelchair seating, positioning and mobility are achieved, therapists are in a key position to provide recommendations for physical activity and exercise so that wheelchair users can reduce sedentary time and improve their aerobic fitness in order to cut the risks of coronary artery disease, cardiometabolic syndrome, and obesity (Martin Ginis et al., 2018), (DiPietro et al., 2019), (Katzmarzyk, Ross, Blair, & Després, 2020). The benefits of cardiopulmonary exercise are numerous with risk reduction being a primary benefit.

Additionally, cardiovascular (central) adaptations and muscular (peripheral) adaptations to exercise occur that vary with the type of training (i.e., endurance versus high intensity).

Methods:
Demonstration/audience participation will enhance application of respiratory mechanics to case studies. Case studies will apply understanding of cardiopulmonary system function and respiratory mechanics to choices for customized wheelchair seating and components. Discussion will support learning objectives.

Discussion:
Because the postural muscles are also respiratory muscles (Mary Massery), to improve breathing mechanics, therapist evaluation should apply objective clinical measures that can provide evidence of improved pulmonary function with customized wheelchair seating and components. Objective measures of cardiopulmonary function should be included in letters of medical necessity for wheelchairs and other assistive technologies.

Conclusion

Wheelchair users with neurological disabilities have high rates of morbidity and mortality related to cardiopulmonary impairments. Studies have shown that customized wheelchair seating addresses postural and respiratory mechanics and can improve chest wall expansion and pulmonary function; however more research needs to be conducted in this area specific to various populations of people with neurological disabilities.

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IC102: Using the HINE and GMA to Predict Equipment Needs

Ginny Paleg, PT, MPT, DScPT

Learning objectives

1. Describe the General Movement Assessment
2. Describe the HINE
3. List three ways that standers and support walkers/ gait trainers/dynamic mobility devices can enhance participation

Introduction

The Motor Optimality Score of the Prechtl General Movement Assessment (at 2-5 months adjusted age) and the Hammersmith Infant Neurological Exam (at 9-24 months) can help identify which infants and toddlers are most likely to be non-ambulators (GMFCS IV and V). Using this new information, we can support families and children in achieving the "F-Words" (Fun, Fitness, Family, Function, Future, and Friends) through the application of appropriate postural management and mobility equipment. The goal is to develop a care path including early detection of cerebral palsy and early intervention with strategies to build capacity in families and caregivers so that children with serve sensory-motor impairments can participate fully in natural routines.

Early detection of cerebral palsy (CP) has traditionally occurred between 12 and 24 months in most high-income countries. New international guidelines1 recommend strategies that lower this age to 6-12 months and offer an interim diagnosis of "at-high risk" for CP. Children with genetic, anatomic, metabolic, and traumatic causes of lifelong non-progressive sensory and motor impairment2 may be best served by adding a diagnosis of CP to access early intervention and durable medical equipment (DME). A motor optimality score (MOS) on the Prechtl General Motor Assessment (GMA) of 5-8 with a median of 6 may indicate the child will be at GMFCS level IV or V3. A Hammersmith Infant Neurological Exam (HINE) score of below 40 at 9 months (should be 2-3 exams about 2 weeks apart) may also suggest the child will be non-ambulatory4. The American Academy of Cerebral Palsy (AACPDM) has published a carepath for children with Central Hypotonia (https://www.aacpdm.org/publications/care-pathways/central-hypotonia). This can be used as a template for DME and evidence-based interventions for children at GMFCS Level IV and V.

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Additional Learning Resources

https://www.aacpdm.org/publications/care-pathways/central-hypotonia

Conflict of Interest

I am a paid educational consultant for Prime Engineering. I claim no bias for this presentation

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Age in months	1-3	3-6	9	12	18	24	36	48	60	72	To age 21 years
Postural Management in Lying											
Individualized Seating											
Supported Standing											
Stepping Devices											
Power Mobility											
Bathing/Toileting											
Lift Systems											

Figure 1.

PO.1: Interprofessional Education at an Assistive Technology Camp

Alison Kreger, PT, DPT, EdD
Ryan Kasper, PT, DPT
David Ritchie, PT, DPT

Learning objectives

1. Understand interprofessional education
2. Understand different types of teaming styles
3. Understand pertinence of interprofessional experience with at selection.

Introduction

A challenge in selection is finding equipment that best meets the needs of the user but also helps meet those needs across the developmental and functional spectrum. To facilitate selection and team work, interprofessional work is key. Many healthcare professional programs are integrating interprofessional educational experiences into curriculum to ensure that students are familiar with their own profession's scope of practice and that of others they may encounter or work with. The interprofessional experience such as AT selection/recommendation requires appropriate communication and awareness of who is involved. Camp Gizmo is an AT camp that brings the world of AT to families and practitioners, offering an environment for exploration and learning. This environment encourages interaction of both students and professions from a variety of healthcare fields. A significant improvement in was found between student pre and post camp scores on the ICCAS.

Interprofessional education (IPE) is a mechanism of how students and health care professionals are incorporating a team-based approach to patient care. IPE is defined as the development of cohesive practice between professionals from different disciplines. It has become a requirement of Doctor of Physical Therapy programs for accreditation. Literature has supported the benefits of IPE across health care professions on how it optimizes patient care through the collaborative works of different medical fields. The purpose of this study is to assess the impact of an IPE experience of health care students during participation at an assistive technology camp. It was hypothesized that the students would experience an increase in confidence, communication and awareness of educational aspects of other health care professions following the camp experience as measured on the Interprofessional Collaborative Competencies Attainment Survey (ICCAS).

Health care students in attendance at an assistive technology camp were invited to participate in this study. Students were enrolled in physical therapy, occupational therapy, and speech pathology programs from 3 different universities. Students who agreed to participate in the study were asked to complete the. The ICCAS is a 20 question self-assessment tool of six categories related to IPE: communication, collaboration, roles and responsibilities, collaborative patient/family-centered approach, conflict management/resolution, and team functioning.

Occupational therapy, physical therapy, and speech pathology students were participating in a 5 day assistive technology camp. Families are brought to camp who each have at least one child needing assistive technology, ages 2-8 year old. Students are assigned to family teams to help families explore different labs and educational sessions at camp. Each team had representation of each student group. Labs include mobility, self-help, augmentative communication, sensory integration, feeding, and others. Students help complete child assessments during these sessions, including working together to discover what assistive technology may and may not work for each specific family and child. Students during camp were able to consult with and were mentored by licensed professionals from their given professions.

The means of the ICCAS were obtained once before camp participation and once following camp. A general linear means of assessment was performed to determine the significance between pre-post responses in all participants by using SPSS. The p-value for statistical significance was set at .05. The results of the responses of the ICCAS indicated significant differences between pre-test scores and post-test scores in all of the questions. The results concluded that there were no significant differences between the responses of physical therapy and occupational therapy students that participated in the study. 11 individuals participated in the study, representing occupational and physical therapy students.

Scores indicated an increased in student perception in their ability to focus on the interpersonal complexities involved with the team and conflict resolution. Significant improvement was found regarding communication, roles and responsibilities, collaborative patient/family-centered approach, conflict management/resolution, team functioning,

Conclusion

From this study it was found that all of the categories included in the ICCAS were significantly improved. There was no significance found between the student groups of occupational versus physical therapy students. The sample size was not large enough to make conclusions that the interprofessional experience does in fact benefit the health care professional student in general. It did demonstrate that for the small group of participants, a 5 day assistive technology camp with integrated IPE did improve student scores on the ICCAS and their comfort with working on interprofessional teams. This does support other published literature that IPE experiences can vary in structure and setting and still be beneficial to student participants. An AT camp with a team approach exposed health care students to a variety of types of technology and health care professions while incorporating student interaction and IPE.

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Conflict of Interest

The authors doe not have any conflict of interest to disclose.

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PO.2: Generating evidence for supported seating postures in mobile shower commodes and chairs: study protocol

Emma Friesen, PhD
Jessica Presperin Pedersen, OTD, OTR/L, MBA

Learning objectives

1. Explain at least three reasons why generating evidence on impact of postural support seating is crucial in crt provision;
2. Describe at least three activities, completed by adults with spinal cord injury using mobile shower commode chairs, that may require postural support seating; and
3. List at least three outcomes measures that are described in the study protocol.

Availability of published evidence is crucial for evidence-based practice in seating interventions. Published evidence is also needed in preparing letters of medical justification and other reports to secure reimbursement for Complex Rehab Technology (CRT). In wheeled mobility and seating provision, evidence is required to justify both the wheelchair or seating frame, and various components such as seating accessories for postural support. This is also true for other CRT products, such a mobile shower commode chairs (MSCCs). Increasingly, funding organizations require evidence justifying provision of both MSCC frames, and associated postural support components. In 2017, researchers identified an urgent need to generate evidence for provision of seating components to support spinal curves for adults with spinal cord injury (SCI). Researchers subsequently completed studies demonstrating the impact of supportive postural seating on posture and functioning for adults with motor complete SCI (T4-C6). The research was the first to provide evidence to underpin provision of postural seating supports for this user group. Further, the results and analysis led to a series of recommendations on "appropriate and realistic" outcomes measures for use in clinical settings. Anecdotal evidence suggests that adults with SCI requiring postural supports in wheelchairs are likely to require similar supports in MSCCs. The limited evidence on MSCCs for adults with SCI suggests postural supports influence functioning and performance of key activities associated with pressure and skin integrity management, showering, and completing bowel management routines. This poster documents a proposed project to address this evidence gap. The study's objectives are to: (1) test the efficacy of adjustable back supports designed to maintain spinal alignment for persons sitting in MSCs; (2) identify validated and administratively-feasible outcome measures that capture objective and subjective effectiveness of adjustable back supports; and (3) generate clinical evidence to for use by users, funders, and policy-makers. The study hypotheses are that adjustable back supports will provide better outcomes than non-adjustable back supports for: - Postural measurements of the pelvis and spine (Waugh & Crane, 2013); - Vertical forward reach (May, et al., 2004); - User-rated satisfaction (devices subscale of the Quebec User Evaluation of Satisfaction with assistive Technology (QUEST 2.0); Demers et al., 2002); - User-rated usability (electronic Mobile shower commode ASsessment Tool (eMAST 1.1); Friesen, et al., 2016); - Interface pressure mapping (Teleten, et al., 2019); and - Numerical Pain Scale Rating. With the initial research methodology and outcome measures identified, focus will now shift to identifying appropriate study sites, gaining necessary research and ethical approvals, and implementing the study protocols.

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PO.5: Ultralight wheelchair for individuals with stroke: a preliminary study

Sujay Galen, PhD, PT
Jordan Nourse
Amber Wise
Emily Buchman, OTD, OTR/L

Learning objectives

1. Participants will describe and contrast the features and differences in ultralight and standard manual wheelchair design
2. Participants will describe the challenges individuals with unilateral stroke can face while using a standard wheelchair.
3. Participants will describe how an ultralight wheelchair compares to a standard wheelchair during wheelchair skills tests

Introduction

There is an estimated 7 million stroke survivors in the US (Virani et al., 2020). Mobility is commonly affected post stroke, with over 50% of persons unable to walk after the initial acute phase of injury (Craig, Wu, Bernhardt, & Langhorne, 2011). Optimization of functional mobility is important to promote health and wellbeing and reduce the risk of further stroke. Use of manual wheelchairs (MWC) following hospital-discharge is common (Mountain, Kirby, MacLeod, & Thompson, 2010), however, wheelchair usage can be irregular with individuals with paresis developing compensatory strategies and inefficient propulsion patterns to mobilize the wheelchair. Ultralight MWC are designed to increase efficiency and promote functional mobility and therefore may be of significant benefit post-stroke. However, there is limited research on the use of ultralight wheelchair design on manual wheelchair performance (Kirby et al., 2004) and whether these wheelchairs could benefit individuals with paresis.

Methods:

In this preliminary pilot study, 4 healthy participants (mean age ± STD: 24.8 ± 0.5) without a history of stroke were fitted for a standard commercial wheelchair (Blue Streak, Drive International LLC, UK) and ultralight wheelchair (Permobil, Sweden) and asked to complete a series of mobility and propulsion tasks. Throughout the study participants were asked to propel the wheelchairs using only their dominant arm and leg, simulating a hemiparesis. Both the order of tasks and the order of wheelchairs used for each task were randomized. Individual's with stroke will follow the same methodology for testing, and recruitment is will begin soon. IRB approval for the study was provided by Georgia State University.

Results:

In forwards and backwards propulsion during the wheelchair skills tests, individuals propelled faster and initiated fewer propulsive cycles in the standard wheelchair compared to the ultralight chair (17.4% difference in propulsion speed (m/s)). However, in the tasks requiring maneuvering the chair around obstacles and turning in place, improved performance was noted using the ultralight wheelchair (70.3% difference in offset of axis from starting position (inches) during turning the wheelchair on spot and 2.5% difference in time (s) to maneuver around obstacles).

Conclusion

Initial results suggest the ultralight design may improve ability to maneuver turns and obstacles, which may benefit individuals with unilateral stroke by improving functional mobility at home and in the community.

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Conflict of Interest

this study was funded by Permobil Foundation.

PO.7: A Qualitative Study Exploring Stakeholder Perspectives of Pediatric Standing Power Wheelchairs

Lisa K. Kenyon, PT, DPT, PhD, PCS
Sarah Johnson, PT, DPT
Kelsey Harrison, PT, DPT
Megan Huettner, PT, DPT

Learning objectives

1. List 3 potential health benefits of pediatric PWSDs that were uncovered in this qualitative study
2. List 3 community-based participation activities participants perceived as being enhanced through PWSD use
3. Discuss 3 potential barriers to a child's procurement of a PWSD that were identified in this qualitative study

Introduction

Research exploring use of standing power wheelchairs, also known as powered wheelchair standing devices (PWSDs), in pediatric populations is limited to a few studies involving adolescent boys who have Duchenne muscular dystrophy (DMD) (Dicianno e al 2016; Townsend et al 2016; Vorster et al 2019; Bayley et al 2020). The purposes of this study were to explore and describe the perspectives and experiences of various stakeholders regarding use of pediatric PWSDs (Kenyon et al 2021). Standing was defined by each study participant based on his/her perspectives and experiences.

Participants:
Thirty-five participants from the United States, representing 4 stakeholder groups, partook in the study: (1) Children ages 6-18 years with varying diagnoses who used a SPWC (n=8); (2) Parents of children who used a SPWC (n=12); (3) Rehabilitation professionals working with children who used a SPWC (n=12); and (4) Manufacturers working for companies supplying SPWCs for children (n=3).

Methods:
Prior to the start of the study, stakeholder-specific interview guides were developed through iterative processes, piloted with non-participants, and modified based on feedback. Qualitative interviews were conducted in-person or via Zoom©. Interviews were transcribed verbatim and independently coded by 4 researchers to develop an initial coding scheme. Data were then individually reviewed and coded by three researchers. Discrepancies were resolved through discussion and a final codebook was created. After all data were coded, codes were amalgamated into themes and main themes. Consensus was used to resolve any discrepancies throughout the analysis process. Member checks and inquiry audits were used to ensure trustworthiness of the findings.

Results:
Three main themes emerged in the data: 1) 'Stand-on-demand' revealed how participants perceived PWSDs as permitting children to stand whenever and wherever they wanted, thereby increasing opportunities for participation and potentially decreasing caregiver burden; 2) 'It's more than weight-bearing' revealed participants' perceptions of psychological and physical benefits from PWSD use; and 3) 'Ecosystems influencing PWSD acquisition and use' revealed both non-child-related and child-related factors that participants perceived as influencing a child's procurement and use of a PWSD.

Discussion:
The perceived health and psychosocial benefits revealed in this study were consistent with previous research exploring use of stationary standing devices. The ability to stand whenever and wherever a child desired; however, was found to be unique to PWSD use. The physical capacity to stand independently in a variety of social settings as a result of PWSD use may increase children's feelings of belonging. Caregiver burden also may be decreased as use of a PWSD may eliminate the need for the to be transferred into another piece of equipment (i.e., a stationary standing device). Funding and the size of the PWSD base were reported as primary barriers to PWSD acquisition and use. Findings suggest the possible transdiagnostic application of PWSDs.

Conclusion

This study highlights the perceived benefits of pediatric PWSDs, including physical, psychosocial, and participation benefits. Given the possible transdiagnostic application of PWSDs, it is conceivable that the results from both the quantitative studies involving boys with DMD (Townsend, 2016; Bayley 2020) may also be relevant for children who have conditions other than DMD. Future research, including replication of studies involving boys with DMD with children who have conditions other than DMD, are indicated to augment the knowledge base surrounding PWSDs and the unique opportunities and issues that accompany the use of pediatric PWSDs. Since being submitted for presentation at the International Seating Symposium, originally scheduled for March 2021, this study has been published in Developmental Medicine and Neurology (Kenyon et al, 2021).

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Conflict of Interest

No conflicts have been disclosed for any of the authors.

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PO.8: A Feasibility Study Assessing a Novel Fall Detection System Using Machine Learning and Computer Vision Techniques

Nadim Barakat, BA
Margaret Bujor
Kathryn Reid, PhD, RN, FNP-C, CNL

Learning objectives

1. Recognize that accidental falls are a major source of morbidity and mortality in patients with cognitive or physical disability and be able to explain how these adverse events are a pervasive threat to the health and wellbeing of these populations.
2. State the two (2) major categories of commercially available fall detection/prevention technologies that exist on the market today.
3. Summarize two (2) potential pros and two (2) potential cons of a system that applies machine learning and computer vision to predict and prevent falls among vulnerable patient populations.

Falls are among the leading causes of injury and mortality in the United States in older adults, as well as in patients with movement disorders. To exemplify this risk, 38% to 87% of patients diagnosed with Parkinson's Disease have experienced a lifetime fall; additionally, 57% of these patients experience an additional fall within three months (1). In 2015, the total medical costs associated with falls exceeded $50 billion in the U.S. (2), placing falls in the top 20 most expensive medical conditions (3). In addition to the physical and financial consequences of falls, fear of falling leads to many negative effects for at-risk adults such as a decline in mental health and less overall physical activity, thus potentiating the risk for future falls in these patients (1). Currently, there are no commercially available monitoring systems capable of accurately detecting and preventing falls. This is likely due to the fact that fall etiologies are complex and multifactorial, consisting of intrinsic patient characteristics and environmental risk factors. As a result, most current systems focus exclusively on fall detection. Additionally, current systems are unable to provide real-time feedback to patients and clinicians and do little to decrease a patient's immediate fall risk or frequency of recurrent falls (3). Thus, there exists a need for a fall detection and prevention system able to decrease fall risk and recurrent falls. In the context of the shortcomings in current fall detection and prevention technologies, an automated video-monitoring technology that effectively utilizes artificial intelligence to detect and prevent falls in real-time will have great utility in patient care. The purpose of this current study is to quantify the feasibility of this novel method of both detecting and preventing falls in healthy subjects, using a newly-designed machine learning algorithm. A total of twenty-four (24) participants will serve as simulated patients and model six different movement scenarios that will be pre-randomized before subject enrollment. Each scenario will be performed both in the presence and absence of a research associate to test the technology's ability to differentiate between multiple people in the video feed. Each scenario will be repeated five times, for a total of 60 scenarios per subject. The described technology will record and analyze each of the scenarios and will attempt to correctly identify which scenario occurred. This recorded output will then be compared to the scenario that occurred after participants complete the 60 scenarios, in order to assess the system's accuracy. This study will be carried out at the University of Virginia School of Nursing during the month of August. Using the data from the study, we will determine the predictive capabilities (sensitivity and specificity) of this new method of fall detection and alerting.

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PO.9: "We would be lost without this": A Visual Journey of Supportive Mobility Device Use by People with Cerebral Palsy

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Learning objectives

1. Identify the role of photovoice narratives as a participatory action research method applied to the field of positioning and mobility.
2. Understand at least three perceived facilitators and barriers of smd access and use by people with cp across the lifespan.
3. Discuss how smd user experiences can be leveraged to improve products and processes related to mobility equipment.

Supportive Mobility Devices (SMDs) such as wheelchairs, lift equipment, walkers, and adaptive recreation equipment play an important role in the lives of many children and adults with cerebral palsy (CP) to facilitate function and participation in community life. Although SMD use in this population is ubiquitous, little is known from stakeholders themselves about their perceived mobility priorities and experiences with SMD on a daily basis. We aimed to empower people with CP to share their mobility stories and SMD experiences in words and pictures, using Photovoice Narratives. From an overarching study of 166 focus group participants across four US cities, a subset of 25 individuals completed this participatory study as co-researchers. Each participant was given a digital research camera with a blank SD card and a list of guiding questions, but had the freedom to take photos of anything they felt was meaningful or important related to their SMD use. Participants selected their favorite or most meaningful photos, and provided brief narrations, which were transcribed verbatim and grouped into themes alongside the photos using constant comparison. Three themes emerged from the data: 1) 'The World is Not Built for Us' describes accessibility challenges faced daily by people with CP using their SMD, and the innovative solutions they create as a result; 2) 'Equipment Should Work For Us, Not Against Us' describes user perspectives of challenges with SMD design and maintenance, as well as user design ideas for next generation technology; and 3) 'Life is Good with the Right Support' describes user perspectives of how 'right place, right time' SMD is critical in facilitating agency, participation, and enjoyment throughout the lifespan. This study demonstrates that Photovoice Narratives are an accessible and visually compelling way to understand how SMD and their environments of use can either facilitate or hinder function and participation of people with CP.

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PO.10: Transition of wheelchair models related to neuropsychomotor development: A case study.

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Learning objectives

1. Describe the transition of wheelchair models related to neuropsychomotor development

The proper prescription of a wheelchair for children reverberates in different sectors of their life, such as in the educational field, functionality, and psychosocial demands. It is worthy to highlight that the appropriate assessment is carried out individually, considering all the child's potential and performance when using the appropriate assistive technology device1. The evaluation by specialized Professionals is essential for the effective prescription of the use of the wheelchair in a safe and functional way. Throughout child development, neuronal changes resonate in cognitive, motor, and social aspects, directly influencing the performance of activities of daily life and social constructs. The wheelchair must be a powerful link for greater functionality of the child and family2. Therefore, the present study aimed to monitor, understand, and demonstrate the importance of adequate wheelchair prescription during different stages of child development of a child with a disability. This is a case study of a seven-year-old child diagnosed with level IV Cerebral Palsy on the GMFCM (Gross Motor Function Classification System) scale, who changed from a manual wheelchair to a motorized wheelchair. The study took place in São Paulo, Brazil. The wheelchair user is accompanied in a network of assistance of children with disabilities to perform therapies, subsidized by the Brazilian Unified Health System (SUS), which in addition to providing resources in terms of support and health for the population in the national territory, provides assistive technology equipment. The child received his first manual wheelchair at the age of two, through SUS, and at the age of 6, he acquired, from a private company, a power wheelchair with his family's own resources. The motorized wheelchair was suggested by a team of specialist therapists in order for the child to have independent mobility, cognitive, social, motor, and language benefits. The granting of SUS wheelchairs is based on a list of Orthotics, Prostheses, and Special Materials (OPM) that considers some stages and aspects, proposed by WHO, and which have been adapted according to the reality of SUS. This list of wheelchairs is subdivided according to structural characteristics of the equipment and within a portfolio of pre-established models, which the child did not fit for dispensing motorized equipment, a Thus, we reinforce the need for studies that consider the theme and research in the direction of seating and positioning, and adequate prescription of assistive technology devices and power wheelchairs for this population, aiming at scientific contributions and expanding the look at the use of power wheelchairs for children with motor disabilities.

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