Evidence-based Test Method Development

Jon Pearlman
Anand Mhatre

- International Society for Wheelchair Professionals
- Department of Rehab Science & Technology
Agenda

• Motivation
• Project Goals
• Test Method Development
• Free Resources
• Focus on Caster Test Method
• Takeaways & Future Work
Motivation: Evidence of Poor WC Quality


Work completed in USA, Mexico & Indonesia.
Motivation: Evidence of Poor WC Quality

Adverse Incidence 2009-2017: Frequency of Component Type involved in Powered Wheelchair incidence

Source: WestMARC Adverse Incidence Database (n-1100)
Projects & Goals

1. Identify and address gaps in test methods for adverse conditions (USAID Funded)
   - WHO Guidelines on MWCs in Less Resourced Settings
   - AJOD Publication listing priorities

2. Use Standards To guide Clinical Decisions
   - Supported by NIDILRR (US GOVT)
   - Standards Development: Cushions, Casters, Rolling Res.
   - Data mining of failure data to identify gaps in standards
Test Method Development
Test Method Development
Free Resources
Focus on Castor Test Method
Castor Failures

• Among all parts, castors fails most often with different failure modes based on research evidence
Castor Testing

• Develop reliable castor testing protocol
• ISO & ICWM Standards do not reproduce field failures
  • Lack of environmental factors
• Testing needs
  • Include environmental factors
  • Include a range of shock conditions
  • Ability to change caster load, speed and direction of travel
Shock Validation

- Field data
- ISWP Chakra shock exposure
- ISO Double drum shock exposure

2 half inch obstacles

2 half + 1 three quarter inch obstacles
Corrosion Validation
Abrasion (tire wear) validation
Castor Testing Study
Testing Outcomes

• Field failures comparison
  • 73% testing failures match field failures

• Environmental factors have impact on
  • Durability – 25% models
  • Failure mode change – 75% models
    • 2/3 changed failures modes pose higher risk for user injuries
Takeaways

• Environmental conditions affect wheelchair quality
  • No progress towards inclusion of environmental conditions in testing
  • Outcomes from caster testing showed impact of environmental factors on quality
  • Inclusion of environmental factors in wheelchair testing

• Need for Evidence-Based Test Method Development
  • Field data collection
  • Include impacts, heat and other testing factors

• Free Resources
  • Castor design guidelines
  • Test equipment assembly instructions
Acknowledgements

Grants
APC/USAID: APC-GM-0068 & 0107
NIDILRR: 90REGE0001, 90SI5014, 90DP0078, 90DP0025

Team at Pitt, ISWP, NHS
jpearlman@pitt.edu
anand.mhatre@pitt.edu
www.wheelchairnet.org (resource hub)