Do Not Live in Fear of Pressure and Shear

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Course Objectives

1. Discuss the difference between posture and postural tendency
2. Experience, through various sitting activities, how pressure and shear targeted in one anatomic area, influences postural alignment and pressure and shear in other areas
3. Differentiate between the immersion/envelopment and O&P based approaches to wheelchair cushion design

Critical Questions

As people age with a disability

- Is their skin becoming more or less tolerant of the forces of support, i.e. pressure and shear?
  - How does heat and moisture influence skin outcomes?
- Is their posture and mobility/function improving or deteriorating?
  - Symmetry or asymmetry
- What is needed?
  - Greater postural control AND skin protection including microclimate
  - Evidence
Do wheelchair users tend to slide into or out of their wheelchairs?

WHY?

Posture Vs. Postural Tendency

- What is posture?
- What is tendency?
- When does a tendency become actual movement?
  - Forces acting on body, intrinsic or extrinsic, are stronger than the resistance to movement.
- What is postural tendency?
  - Predicted movement of pelvis at rest.
- What is the difference between posture and postural tendency?

What Is The Only Desirable Postural Tendency During Rest?
Only One Desirable Tendency

Does the posterior postural tendency create a corresponding tendency to slide INTO or OUT OF the wheelchair?

So... How do we keep people from sliding out of their wheelchairs?

- Create a desirable tendency, then resist it!
- How and where?
- What about skin?
Intervention: Posterior Tendency

- 8 Key points of control
  - SEAT
  - 2
  - 4
  - BACK
  - 6
  - 8

Weight-Bearing Through Trunk.

The Problem with FLAT
The Challenge With Immersion/Envelopment

Intervention: Posterior Tendency

- Key points of control
  - Seat
  - Sitting Exercise Alert!

Intervention: Posterior Tendency

- Key points of control
  - Back
  - Sitting Exercise Alert!
Problems with Current Back Supports.

- Typical back shell is flat from top to bottom.

Loss of Thoracic Support

The Solution

- Pivot placement and flexible gluteal support.

The Fitting

- Independently Adjust
  - Depth
  - If necessary
  - Back height
  - Pivot at PSIS
  - Back angle
  - Trunk support
  - Balance
  - Gluteal support
The Outcome

1. Optimal pelvic support at pivot.
2. Full thoracic contact.
3. Comfortable support to gluteal tissue.

WOW!

The Outcome

Our industry is asking for evidence!

- Ride Designs has sponsored university level research studies to examine:
  - Interface Pressure/Dispersion Index
  - Stability
  - Deep Tissue Deformation
  - Cushion Microclimate (pilot study)
Summary

■ OL Cushion – Evidence!
  - Safer?
    • Pressure mapping (Evidence)
    • Tissue deformation (Evidence)
    • Cooler and dryer (Evidence)
    • Low maintenance
      - No air or fluids
      - No essential maintenance
    • Performance
      • Stability (Evidence)
      • Lighter

■ Couple with correct back design for:
  - Support and Balance
  - Decreased stresses of pressure and shear at the cushion-sitter interface.

Interface Pressure Mapping and Sitting Stability Study

■ Methodology
  - 10 subjects with SCI, paraplegic
    • Average age 44.8 years
    • WC user x 20 years (average)
    • Range 3 years to 42 years post injury.
  - Interface pressure measurements completed per accepted industry protocol.
  - Modified Functional Reach

Dispersion Index

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\text{Dispersion Index (DI)} = \frac{\text{sum of pressures in the region containing the ITs and sacrum}}{\text{sum of pressures over the entire interface pressure mat}}
\]

Lower DI means better protection of high risk areas!
IPM Study Results – Dispersion Index

Average Dispersion Index = 11% on OL #1
= 23% on Air

Modified Functional Reach Study

- **Objective**
  - Compare sitting stability between OL Cushion (3 different configurations) and a properly inflated air cushion.

- **Methodology**
  - Same 10 subjects used in IPM Study
  - Right, left and forward reach were measured.
  - Five trials each direction were completed.

Results – Modified Functional Reach

- Right and left lateral reach was significantly longer with OL than with air inflation cushion.
- Forward reach had minimal improvement. Why?
MRI Research

Summary

- Objective
  - Compare deep tissue deformation below IT's under three conditions:
    - Fully suspended
    - Properly inflated air cushion
    - OL cushion
  - Ten different subjects:
    - SCI, paraplegia
    - 18.4 years average time since onset, ranging from 3 to 30 years.

What Was Found

On average, use of the OL cushion results in ~50% less tissue compression than air cell cushion.

Summary

- Leaning against a back support creates a tendency to slide out of the wheelchair
- Flatplanar fails to safely apply the forces necessary to resist the tendency
- Effective immersion/envelopment has low sliding resistance and enhances the user's tendency to slide out of the cushion.
- It is possible to control these postures and postural tendencies through responsible and accurate application of pressure and shear
- Emerging body of evidence to support this theory
THANK YOU

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