Considerations for Wheelchair Seating and Positioning for the Older Adult- An Introduction

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Expectations from Wheeled Mobility...

Therapist
Patient
Insurance company
Society

Sitting is a developmental process

- Prop sitting
- Sitting with hands free
- Round back sitting
- Straight back sitting
- Ring sitting
- Tailor sitting
- Long sitting
- Side sitting
- Sit independently
Physiological changes as we age

Musculoskeletal and Neuromuscular

- Decreased joint flexibility
- Decreased mass and strength
- Decreased reaction time
- Increased postural sway
- Decreased nerve conduction velocity and reaction time

Integumentary

- Moisture content decreases
- Epidermis separates more easily
- Decreases in sweating, wound healing and thermal regulation
- Decreased pain perception
- Collagen changes
Cardiopulmonary

- Decreased lung capacity
- Decreased cardiac output
- Changes in responses to stress
- Orthostatic hypotension

Sitting involves an unstable structure

- Design of our bodies
- Upright postures
- Muscles help to balance

Stability, Function, and Comfort

- Stability = Balance
- Comfort = Pressure Relief

- What makes us sit a certain way?
- Instability results in compensation
Upright sitting position facilitates:

- Musculoskeletal Integrity
  - Prevent contractures
- Self Care, Work and Leisure
  - Independence
- Social Interaction and Communication
  - Increase respiratory support for speaking
  - Increase position for alternative communication

What is positioning?

- How one attains and maintains:
  - Lying or sitting in bed
  - Lying or sitting in a wheelchair or everyday chair
  - Standing or walking

Something to think about...

- What happens when you flex your hip?
- What happens when you sit in the wheelchair and put your hip into 90°?
Resulting complications of poor posture:
- Contractures and deformities
- Tissue breakdown
- Masked ability
- Reduced performance and tolerance
- Infection, UTI, Respiratory insufficiency
- Fatigue and discomfort
- Function

Biomechanical Considerations
- Prevent orthopedic complications
- Maintain vital organ capacity
- Reduce soft tissue strain
- Comfort
- Increase endurance and tolerance

Instead of 90/90/90...
- Consider
  - Function
  - Comfort
  - Stability and balance
  - Joint range of motion
  - Flexibility
  - Tone/reflexes/spasticity
  - Individuality
The Wheelchair

- Improper equipment can be a frequent cause of positioning issues:
  - Chairs
  - Backrests
  - Armrests
  - Footrests
  - Other

Biomechanics Considerations

- Ideal position is balanced position of muscle groups
  - Axle in alignment with shoulder
  - Seat width
  - Camber
  - Seat angle
  - Seat to floor height
- Standing

Additional Risks and Considerations

- Fatigue-ability of the patient
- Repetitive Strain Injuries
  - Shoulder pain- want the shoulder to be positioned properly
    - Rotator cuff tears
    - Aseptic necrosis
  - Wrist Pain
    - Carpal Tunnel Syndrome
- Pressure ulcer
Complications of continuous sitting...

- Osteoporosis
- Pressure ulcers
- Deformities
- Atrophy/contractures
- UTI’s
- Spasticity
- GI complications
- Orthostatic hypotension

Standing can be functional

- Reach shelves
- Cooking
- Light switches
- Payphones
- Vending machines
- Transfers
- Shopping
- Exercise

OPTIMAL POSITIONING
Optimal Sitting Position

- Symmetrical alignment laterally to midline
- The spine is aligned to the normal cervical, thoracic, and lumbar curves or "S"-shape
- No pelvic rotation nor obliquity
- Slight anterior tilt is present
- The hips at a 90-degree angle, slightly abducted, and without rotation
- Weight bearing evenly distributed over ischial tuberosities
- Elbows rest comfortably on the armrests or lap tray
- Shoulders relaxed and depressed
- Head Position midline with slight neck extension and neutral chin

Benefits of Maintaining Optimal Position

- Increased level of arousal
- Improved vital functions
- Skin integrity maintained
- Improved visual tracking
- Perception improved
- Muscle Tone normalized

Positioning
Positioning principles and goals

- Goal: maintain joints in a position that is as close to the normal anatomical position as possible
  - results in less joint strain and stress
- Proximal joint stability allows movement distally

Pelvic Tilt

- Posterior Pelvic Tilt
- Anterior Pelvic Tilt
- Pelvic Obliquity

Pelvic tilt

Pelvis leans forward.

Posterior pelvic tilt
Pelvis leans backward.
“sacral sitting”
Posterior Pelvic Tilt

- Clinical considerations:
  - Trunk muscle strength
  - Limited hip flexion
  - Abnormal tone
  - Tight hamstrings
  - Increased thoracic kyphosis

Anterior Pelvic Tilt

- Clinical considerations:
  - Tight hip flexors, quadriceps
  - Weak abdominals
  - Obesity
  - Increased lumbar lordosis
Pelvic Obliquity

- One side of pelvis is higher than other side during sitting
- Due to abduction of one hip and adduction of the other
- "windswept deformity"

Pelvic Obliquity

- Clinical considerations:
  - Asymmetrical muscle strength, tone, soft tissue/muscle mass
  - Scoliosis
Pelvic Rotation

- Pelvis twisted toward one side of the body.
- Appears as a leg length discrepancy due to position of the knees in sitting.

Pelvic Obliquity / Rotation

- **Obliquity:** resulting from asymmetries due to trunk strength or tone, pelvis, soft tissue or muscle mass, hip flexion, Scoliosis
- **Rotation:** resulting from asymmetrical hip abduction/adduction, leg length discrepancy, posterior dislocated or subluxed hip, muscle tone, use of one foot to propel

Lordosis

- Excessive spinal curvature in the lumbar area.
**Kyphosis**

- Spine curves outward at the chest area.

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**Wheelchair measurements**

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**How to Measure for the Proper Chair**

- Guidelines provided are just that
- Need to address individual concerns
Seat $\rightarrow$ Floor Height

- Arms should be able to reach rear axle
- If lower to floor, will allow for foot propulsion
- Consider drop seat if needed
- Under distal thigh to heel of commonly used shoe
- Allow 2 inch clearance for footrests
- Seat cushion changes the height as well

Seat Depth

How to measure:
- Most posterior part of buttocks is start point
- Measure to popliteal fossa of each knee
- Subtract 2 inches

Considerations:
- Need to be aware of leg length discrepancies
Seat Width

- Widest point across the hips/thighs
- Add 2 inches (5cm)
- May change the overall width of chair

Back Height

- Seat surface to:
  - Mid-back just under scapula
  - Mid-scapula or axilla
  - Top of shoulder
- Based on need for:
  - Postural stability
  - Arm swing
  - Shoulder girdle should be free to move

General Seating Standards

- Seat Height
  - Should be equal to lower leg length from popliteal fossa to heel (in shoe)
  - Need to ensure cushion is in place when measuring
- Armrest Height
  - 1 inch to the distance from the seating surface to the axilla when arm is at side
- Back height
  - Same as the distance from seating surface to mid scapula in standard situations
  - Approximately 4 inches between armpit and top of back of upholstery
- Seat Width
  - 1.5 to 2 inches wider than hips at widest point
- Seat Depth
  - 2 to 3 inches less than the distance from back of buttocks to popliteal fossa (when measuring, ensure hip is flexed at or near 90 degrees and trunk is upright)
### Common Wheelchair Types

<table>
<thead>
<tr>
<th>Types</th>
<th>Width</th>
<th>Depth</th>
<th>Back Height</th>
<th>Floor to Seat Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Adult</td>
<td>18”</td>
<td>16”</td>
<td>33 ½” to 36”</td>
<td>19 ½”</td>
</tr>
<tr>
<td>Narrow Adult</td>
<td>16”</td>
<td>16”</td>
<td>33 ½” to 36”</td>
<td>19 ¾”</td>
</tr>
<tr>
<td>Bariatric</td>
<td>Up to 34”</td>
<td>20”</td>
<td>Up to 36”</td>
<td>17 ½” to 19 ½”</td>
</tr>
<tr>
<td>Hemi-Height</td>
<td>18”</td>
<td>16”</td>
<td>33 ½” to 36”</td>
<td>17 ½”</td>
</tr>
<tr>
<td>Reclining</td>
<td>18”</td>
<td>17”</td>
<td>Up to 52 1/2”</td>
<td>21 ¾”</td>
</tr>
</tbody>
</table>

### Seat Cushion Requirements

- Function
- Comfort
- Low Weight
- Easy to use
- Maintenance
- Stability
- Pressure Relief

### Seating Considerations

- Off the shelf
  - No adjustment
- Custom
- Modular
Factor to Consider with Cushion Selection

- Pressure redistribution
- Temperature/Moisture/Incontinence
- Stability
- Shear
- Pressure Ulcers
- Medical co-morbidities
- Compliance/cognition

Cushion Properties and Types

- Pressure distribution
- Stability
- Interface temperature
- Reliability
  
  - Solid base
  - Foam
  - Viscous fluid
  - Air flotation

Solid Base

- Good stability
- Wood insert
Foam

• Flat Foam
• Contoured
• Light, economical
• Most sitting stability
• Can absorb moisture but causes heat buildup
• Can minimally inhibit function
• Least affective for pressure distribution
• Easy to maintain

Gel

• Heavy
• More expensive
• Good pressure distribution
• Moderate sitting stability
• Can cause moisture, however reduces heat distribution
• Most effective for minimizing shear (active patients)
• Can moderately inhibit function
• Relatively easy to maintain

Foam and Gel Cushions
Air

- Relatively Heavy
- Expensive
- Best pressure reduction
- Least sitting stability
- Can cause moisture buildup
- Can inhibit function
- Difficult to maintain

Screening for seating and positioning

Screening process is completed:

- Upon admission to a SNF
- Referral
- Quarterly / annually
- Identification/requested by the patient/family
- Decline in status
Positioning screen:

- Conduct Interviews
- Observe
  - In bed
  - In wheelchair
  - During functional tasks
    - Mealtime
    - Activities
  - Signs and symptoms common to referral

Areas to screen

- Related to positioning concerns may include (but are not limited to):
  - Impaired strength
  - Skin integrity
  - Impaired sensation
  - Contractures
  - Restraints
  - Falls
  - Ambulation status/ balance ability
  - Changes in proprioception
  - Amputations
  - Deconditioned status

Mat Evaluation

1. Observation
2. Supine Position
3. Sitting Position
4. Body Measurements

Mat Eval Part 1
Mat Eval Part 2
Measuring 101- Mat eval

SEAT WIDTH: A
- Add an extra inch to each side to allow movement and any extra width to allow for bulky clothing if appropriate
- Measure widest width for windswept hips

SEAT DEPTH: B
- Behind Hips / Popliteal Fossa
- Subtract two inches

SEAT HEIGHT: C
- Popliteal Fossa / Heel

FOOT PLATE: D
- Heel / Toe

Measuring

BACK HEIGHT:
- Sitting surface / lower scapula – E
- Sitting surface / top of shoulders – F

• WIDTH Across head height across head – G
• High Back Rest – sitting surface / crown of head – H
• Armrests – sitting surface / hanging elbow – I
• Width across trunk – J
• Trunk depth – K

Body Measurements for wheelchair fitting
Questions?