Seat Functions

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Acknowledgements

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PARALYZED VETERANS OF AMERICA

Acknowledgements

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Review of Seating

Review:

- Body not designed to sit
- 90-90-90 doesn't always work
- Sitting can be pathological
- Different positions for functions
- Body wants to move
- What can we do?

Providing Movement

- Tilt
- Recline
- Tilt and recline
- Seat elevator
- Power elevating leg-rests
- Standing

RESNA Position Papers

- Arva, J., Schmeler, M.R., Lange, M.L., Lipka, D.D., & Rosen, L.E. (2009). RESNA position on the application of seat-elevating devices for wheelchair users. *Assistive Technology, 21* (2): 69-72.
- Dicianno, B.E., Margaria, E., Arva, J., Lieberman, J.M., Schmeler, M.R., Souza, A., Phillips, K., Lange, M., Cooper, R., Davis, K., & Betz, K.L. (2009). RESNA position on the application of tilt, recline, and
- elevating legrests for wheelchairs. *Assistive Technology, 21*(1), 13-22.
- Arva, J., Paleg, G., Lange, M.L., Lieberman, J., Schmeler, M.R., Dicianno, B.E., Babinec, M., & Rosen, L. (2009). RESNA position on the application of swheelchair standing devices. *Assistive Technology,21* (3): 161-168.

What is a RESNA position paper?

- Official statement by the organization that, based on the consensus of experts, summarizes current research and best-practice trends in relevant areas.
- These position papers are the first in the wheeled mobility and seating industry issued by an international professional organization declaring the medical and functional necessity of specific assistive technology devices

Why do we need position papers?

- Best summary of related scientific evidence
- considers "clinical evidence"
- It comprehensively reviews all benefits and disadvantages
- Fills a void resulting from the lack of scientific evidence

Use of a position paper

- Teaching tool in colleges and universities
- Teaching tool in the clinical setting, whether to help educate other team members or the client
- Guide to practitioners in the development and provision of interventions
- Support material to help obtain funding
- Evidence in organized lobbying efforts for policy changes

Seat Elevators

- Summary/Introduction
- Definition
- Addresses the following medical needs:
  - Transfers
  - Reach
  - Psychological considerations
  - Additional physiological aspects
  - Pediatric considerations



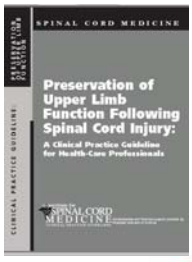


Clinical Practice Guideline

(PVA, 2005)

#13. "Provide seat elevation or possibly a standing position to individuals with SCI who use power wheelchairs and have arm function." (p.1)

#15. "Instruct individuals with SCI who complete independent transfers to:
- **Perform level transfers when possible.**
- Avoid positions of impingement when Possible...." (p.1)



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Standing

- Summary/introduction
- Definitions
- Functional reach and access to ADLs
- Passive Range of Motion, Contractures
- Vital Organ Capacity
  - Respiration
  - Gastro-intestinal problems
  - Bowel function
  - Bladder emptying
- Urinary Tract Infections
- Bone Mineral Density
  - Loss of BMD
  - Fractures and loss of independence
  - Supplements
  - Mechanical weight loading
  - Dynamic loading
  - Maintenance of weight bearing

Standing

- Circulation
- Tone
- Spasticity
- Pressure sores
- Skeletal deformities
- Community environments
- Additional benefits
- Psycho-social indications
- Contraindications
- Frequency of Standing
- Summary
- Case Examples
- References (43)

Popular among Clients

- Survey study of people with ALS;
  - tilt, recline, & elevating legrests were the most desirable features

(Trail, Nelson, Van, Appel, & Lai, 2001)

Postural Alignment

Tilt & Recline:

- Alter center of gravity by altering angles to gain balance & stability (Kreutz, 1997; Lange, 2006)
- important for children or adults with progressive or static scoliosis (Lange, 2000b)

Function

- Functional reach - ADLs
- Balance/Stability
- Safe positioning during braking
- Ground clearance
- Vehicle loading
- Stability when driving downhill
- Carrying objects in lap
- Pediatric stimulation/access to environment

Orthostatic Hypotension

- **High prevalence in the general population** (Bradley & Davis, 2003)
  - Cardiac Disease, Spinal Cord Injury (SCI), Diabetes, Neuropathy, Multiple Sclerosis, & Parkinsonism.
- Management - **assuming a recumbent/semi-recumbent position** (Claydon, Steeves, & Krassioukov, 2006)
  - Using a combination of tilt, recline, & power legrests can help to achieve such a position (Kreutz, 1997)
- Sleeping in bed with the **head elevated at 10 to 20°** improves symptoms (Ten Harkel, Van Lieshout, & Wieling, 1992)

Other Functions

(D. Cooper, 2004; Kreutz, 1997; Lange, 2000a; Lange, 2006)

Visual Orientation
- Orient the trunk and head position
- Improve line of sight

Stimulate the vestibular system

Allow for better communication

Maximize breathing and speaking ability
- Reduce risk for aspiration

Improve digestion after meals
- Rotational Tilt

Bowel & Bladder

- Changing protective undergarments
- Intermittent self-catheterization
- Reduce assistance needed
  - (Wyndaele, 2002)
- Increase compliance
  - reduce urinary tract infections and morbidity
  - (Salomon et al., 2006)

Transfers & Biomechanics

- **Shoulder forces = 2.5 times mean arterial pressure**
  - (Bayley, Cochran, & Sledge, 1987)
- **Better positioning = Reduced Loading on Shoulders**
  - (Herberts, Kadefors, Hogfors, & Sigholm, 1984)
- **Enhance sliding transfers or add momentum to transfers**
- **Preservation of upper limb function using seat elevators**
  - (Boninger & Stripling, 2007)
- **Reduce need for assistance & caregiver injury**
  - (Edlich, Heather, & Galumbeck, 2003; Fragala & Bailey, 2003)
- **Reduce frequency of transfers**

Spasticity/Tone

- Independent management of tone
- Tilt systems maintain static joint angles
  - muscle fiber length
  - positional changes w/out increasing tone
    (Kreutz, 1997)
- Judiciously prescribe recline systems
  - can increase tone
  - especially in spine extensors
    (Lange, 2006)

Orthopedic Issues

- Static seating systems = contractures, hamstrings
  (Lange, 2006)
- Power elevating legrests;
  - manage contractures or orthopedic deformities
    (Levy, Berner, Sandhu, McCarty, & Denniston, 1999)
  - passive movement to the knee joints
    (Lange, 2006)
  - adjusted to prevent undue tension on the hamstrings and hip joints.
  - combination with recline when passive extension is limited
  - Extending near end range can elicit reflex spasticity
- Tilt and/or recline systems used for limited hip flexion, with seat to back angle appropriately configured (Kreutz, 1997)
  - The impact of seat to back angle on function must always be considered

Edema

- **Power elevating legrests help manage edema**
  (Levy et al., 1999)
- **Lower limbs of wheelchair users may act as a reservoir**
  (Kinzer & Convertino, 1989)
- **Elevate the legs above the heart**
  (Abu-Own, Scurr, & Coleridge Smith, 1994; Douglas & Simpson, 1995; O'Brien, Chennubhotla, & Chennubhotla, 2005)
  - reduction in venous pressure
  - increases arterio-venous pressure and capillary flow
  - most effective when legrests used in combination with tilt
  - Sometimes must be combined with both tilt and recline systems for adequate elevation of legs

Pressure Distribution

- **Higher pressure focused over smaller surface areas in those w/ disabilities**
  (Aissaoui, Kauffmann, Dansereau, & de Guise, 2001; Hobson, 1992; Vaisbuch, Meyer, & Weiss, 2000)
- **A tissue's tolerance for pressure depends on disability & number of factors** (Edlich et al., 2004; Sprigle, 2000)
- **Good overviews of types of forces responsible**
  (Sprigle, 2000) & (Bennett, Kavner, Lee, & Trainor, 1979)
- **Claims more than 32 mmHg are harmful**
  - Historical article (Landis, 1930) – nailbed
  - Reconfirmed with microscopic studies (Kosiak, 1959, 1961)
  - no scientific cutoff value known to cause ulcer formation
- **Cushions inadequate if the individual sits too long** (Lacoste et al., 2003)
- **Provide cushion AND means for position changes**
  (Henderson, Price, Brandstater, & Mandac, 1994)

Pressure Distribution

- **Pushups often done every 15-30 seconds**
  (Coggrave & Rose, 2003)
  - recommendations ranging from 1/min to 1/hr (Boninger & Stripling, 2007)
  - each lift should last nearly 2 minutes, regardless of frequency
    (Coggrave & Rose, 2003)
  - predispose to repetitive strain injuries
    (Bayley et al., 1987; Reyes, Gronley, Newsam, Mulroy, & Perry, 1995)
- **Forward or side to side leaning**
  - Can be effective
    (Coggrave & Rose, 2003; Henderson et al., 1994; Hobson, 1992; Vaisbuch et al., 2000)
  - not all have the UE strength or trunk control required to perform
    (Lacoste et al., 2003)
  - autonomic dysreflexia or neurogenic bladder limiting
    (Vaisbuch et al., 2000)
  - may not be effective with some cushions (Koo, Mak, & Lee, 1996)

Effects of Position

- **Best tilt 20-25 degrees**
- **Better combined w/ recline & ELR**
  - (Aissaoui, Heydar, Dansereau, & Lacoste, 2000)
  - (Carlson, Payette, & Vervena, 1995)
  - (Vaisbuch et al., 2000)
  - (Aissaoui, Lacoste, & Dansereau, 2001)
  - (Pellow, 1999)
  - (Henderson et al., 1994)
  - (Hobson, 1992)
  - (Aissaoui, Lacoste et al., 2001)
  - (Stinson, Porter-Armstrong, & Eakin, 2003)
- **Recline used alone can increase shear but reduce seating interface pressure**
  - **(Hobson,** 1992)
  - (Aissaoui, Lacoste et al., 2001)
  - (Gilsdorf, Patterson, Fisher, & Appel, 1990)

Pressure Distribution

- No studies on "shear reducing" recline systems
  (Pfaff, 1993)
- Less than 35% used these features for pressure relief
  (Lacoste et al., 2003)
- Insufficient research on duration and frequency
  - clinicians estimate a duration of 30 seconds with a frequency of 15-30 minutes or 60 seconds every 60 minutes
    (Coggrave & Rose, 2003; PVA 2000; Vaisbuch et al., 2000)

Pain, Fatigue, Sitting Tolerance

- Comfort does not equal anthropometry
  (Kolich, 2003)
- Seating should not be configured based on static postures
  (Porter, Gyi, & Tait, 2003)
- More than 2 hours are needed to observe most of the postures
  (Gyi & Porter, 1999)
- Higher pressure may be related to seating tolerance
  (de Looze, Kuijt-Evers, & van Dieen, 2003; Goossens, Teeuw, & Snijders, 2005)
- Users primarily use features to promote comfort
  (Lacoste et al., 2003)
- Back pain is one of the most common symptoms
  (Porter & Gyi, 2002; Gyi & Porter, 1998)

Dynamic Movement

- People are usually in constant motion
  (Branton, 1969)
  - Cannot tolerate unsupported and static sitting
    (S. Reinecke, Bevins, Weisman, Krag, & Pope, 1985)
  - Need to change position constantly
    (Lueder, 2005)
  - Change postures up to 30 times per hour while sitting
    (Graf, Guggenbuhl, & Kreuger, 1991)
- Static seating restricts the variety of postures that are natural
  (Bendix & Biering-Sorensen, 1983; Bhatnager, Drury, & Schiro, 1985; Kroemar, 1994)

Dynamic Movement

- **Dynamic movement is healthy for the spine**
  - (S. M. Reinecke, Hazard, & Coleman, 1994)
  - (Andersson, 1981)
  - (Kolditz, Kramer, & Gowin, 1985)
  - (Holm & Nachemson, 1983)
  - (M. Adams & Hutton, 1983)
  - (M. A. Adams, Green, & Dolan, 1994)
  - (M. Adams & Hutton, 1985)
  - (Kumar, 2004)
  - (M. Adams & Hutton, 1985)
  - (Bendix & Biering-Sorensen, 1983)
  - (Andersson, Murphy, Ortengren, & Nachemson, 1979)
  - (Keegan, 1953; Lueder, 2005; Nachemson, 1981)
- **Most need varying degrees of recline to maintain function**
  - (Lueder, 2005)
  - (Grandjean, Hunting, & Pidermann, 1983)
  - (Engstrom, 1993)

Rhonda

Powered Seat Functions Are Not a Luxury

"There is nothing luxurious about having a disability."
-Darren Jernigan

Summary

- Body not designed to sit
- No one perfect position
- Facilitate opportunity to move
- Evidence to support
- Not a luxury rather medically necessary