Learning Objectives:

- Identify three relevant patient applications of wheelchair standers based on research.
- Verbalize understanding of the purpose of using evidence in justifying the need for wheelchair standing devices.
- List three benefits to integrating a standing feature into a client’s wheelchair base.
- Identify three potential medical benefits of standing.

Options for Standing

- Ambulation/Ambulatory Aids
  - Quality of weight bearing?
- Separate Standing Devices
  - Static or Dynamic
- Wheelchair Standing Devices
  - Manual/Manual
  - Manual/Power
  - Power/Power

Wheelchair Standers

- Improves **compliance** with standing program
- Promotes **functional** independence
- Greater **medical** benefits of weight bearing
  - Higher Frequency
  - Dynamic Loading
- Provides natural means of **pressure relief**
  - Reducing risk of pressure ulcers
  - Helps heal/treat current pressure ulcers

Why Stand?

- **Why NOT?**
  - Potential Complications of Immobility
  - Decreased Bone Mineral Density (BMD)
  - Risk of Pressure Ulcers
  - Development of Joint Contractures
  - Impaired bowel and bladder functioning
  - Impaired respiratory functioning
  - Gastro-Intestinal (GI) problems

RESNA Position Paper on Wheelchair Standers

- Best comprehensive overall summary of research examining wheelchair standers.
- Originally approved in March, 2007.
- Recently published in peer-reviewed journal.
- Benefits, Indications, Contraindications, Case Studies (CP, MS, SCI)


Bone Density - CP

- 8 month duration - Children with Spastic CP
- Activity Group (n=9) had significant increase in BMD (femoral neck)
- Control Group (n=9) had notable loss in BMD (femoral neck)


Bone Density - CP

- 4 children - preschool age - severe CP
- Conventional Stander
- Motorized Stander (Dynamic)
- Phase 1: 8 weeks, 30 min/day, 5x/week
- Phase 2: All in both standers during 3 separate test sessions.
- Results: Bone density increased with dynamic stander and 1 in conventional stander; Behavior - little or no effect.


Bone Density - Children

- Children with “disabling conditions” (n=20)
- Such as: CP, MD
- Dosage: 10 min/day, 5 days/week, 6 months
- Group 1 - Active platform (+6.3%)
- Group 2 - Placebo (-11.9%)


Bone Density - Dynamic Load

- Rubin CT, Sommerfeldt DW, Judex S, Qin Y. Inhibition of osteopenia by low magnitude, high frequency mechanical stimuli. DDT. 2001 Aug; 6 (16): 848-858.

Fracture Risk

- Post-Menopausal Women (n=28)
- Reciprocating Whole Body Vibration (WBV) platform compared to Walking Activity
- 3x/week for 8 months
- BMD at femoral neck and balance improved with WBV - not with walking; BMD at lumbar spine did not change in either group.

Gusi N, Raimundo A, Leal A. Low frequency vibratory exercise reduces the risk of bone fracture more than walking: a randomized controlled trial. BMC Musculoskeletal Disorders. 2006 Nov; 7 (92).
**Contracture Management**

- Patients with Stroke - Spastic Hemiplegia (n=17)
- Single session prolonged calf muscle (triceps surae) stretch x 30 min. on tilt table
- Significant improvement in dorsiflexion ROM as well as increased motor neuron excitability of tibialis anterior.


**Spasticity Management**

- Single Case - T12 SCI
- Tilt table used 5 non-consecutive days
- Immediate and significant effect on spasticity lasting until the following morning
- Particularly useful to improve car transfers
- Indication for wheelchair stander allowing management of spasticity when needed


**Pressure Relief**

- Compared tilt, recline, and standing - looking at seat and backrest pressure
- 6 Able-Bodied (AB) and 10 Subjects with SCI
- Maximum Decreases in Load:
  - Seat - Full Standing and Full Recline (SCI); Full Standing (AB)
  - Back - Standing (Both Groups)


**Pressure Ulcer Management**

- Recommends power wheelchair standing for those who are able to tolerate weight bearing for prevention and treatment of pressure ulcers.


**Constipation Management**

- Single case study - 62 y/o male with T12-L1 ASIA B paraplegia
  - Injured in 1965 - chronic constipation
  - Standing table 5x/week - 1 hour duration
  - Significant increase in frequency of BM’s
  - Significant decrease in bowel care time


**Respiration**

- Patients in ICU who had been intubated and mechanically ventilated more than 5 days (n=15)
- Tilt table to 70 degrees x 5 minutes
- Significant improvement in respiratory parameters during and immediately after tilt table. Not present 20 minutes later.

Compliance

- Single Case - Man with T10 complete paraplegia
- Standing Wheelchair monitored x 2 years
- Exceeded recommended minimum dosage (130.4%)
- Short duration (Mean = 11.57 minutes)
- Average angle = 61 degrees
- Average 3.86 days/week
- Reported improved spasticity and bowel motility


Orthostatic Hypotension - SCI

- Survey to determine how Orthostatic Hypotension affects use of standing devices.
- 293 respondents
  - 38% suffered with Orthostatic Hypotension (majority complete injuries T5 or above.)
  - 52% reported using standing wheelchairs or frames (20% of those stated Orthostatic Hypotension limited their use)
  - 5.5% reported not using standing devices because fear of Orthostatic Hypotension.


School Based Stander Use

- 20-item Survey sent to 500 members of APTA pediatric school-based SIG.
- Respondents reported the following benefits:
  - Pressure Relief, Bone Strengthening, Enhancement of social and educational opportunities
  - Based on clinical judgement and reasoning due to lack of evidence.


Dosage

- Review of current research available in 1992
- Standing common intervention for children with developmental disabilities older than 14-16 months of age.
- “Clinicians must judge frequency, duration, and device type when recommending standing programs, and, because no standards exist, decision are left to the clinician’s intuition or experience.”


Dosage - Bone Density

- Right forelimbs of adult rats loaded 360 cycles, 3 days/week, 4 months duration (16 weeks)
  - Group 1 - 360 cycles at one time
  - Group 2 - 90x4 cycles (3 hours between)
- Loaded limbs (Right) - significantly greater bone density
- Group 2 - significantly greater bone density
- Conclusion: Shorter duration with periods of rest may be better for bone density


Dosage - Bone Density - CP

- Non-Ambulant Children with CP (n=26)
- Increased current standing duration 50%
- Vertebral and Proximal Tibia QCT
  - Significant increase in Vertebral bone density, but not in Proximal Tibia

Why Stand?
Reviewing the Evidence

- Bone Mineral Density
  - Dynamic Weight Bearing – Shorter, More Frequent
- GI/Respiratory/Circulatory
  - Frequency of Standing
- Bowel/Bladder
  - Reducing UTI/kidney stones/constipation/bowel accidents
- Spasticity
  - Immediate and significant effect
- Contractures
  - Providing prolonged stretch
- Pressure Management
  - Reduced frequency when using stander – Best pressure relief overall

Who Can Benefit From Standing?

- Spinal Cord Injury - SCI
- Spina Bifida - MM
- Cerebral Palsy – CP
- Neuromuscular Diseases
  - Duchenne Muscular Dystrophy - DMD
  - Spinal Muscular Atrophy - SMA
- Multiple Sclerosis - MS
- Stroke - CVA
- Fibrodysplasia Ossifficata Progressiva - FOP
- AND MANY MORE!!!

Spinal Cord Injury

- Standing Mobility Devices - follow up to survey
  - People with SCI (n=99) who stood 30 min. or more per day.
  - Improvements noted: quality of life, fewer bed sores, fewer bladder infections, improved bowel regularity, improved ability to straighten legs.
  - Compliance with regular home standing (at least 1x/week) was high - 74%.
  - Benefits were seen - even if standing began several years after injury.


- Survey Based (32% response rate)
  - 87% male (ages 41-50 y/o) - 77% paraplegic
  - 41% - 1-6 times per week
  - 67% - 30 minutes - 1 hour at a time
  - Improved bladder emptying, Bowel regularity, UTI’s, Leg Spasticity, Number of “bed sores”
  - 79% highly recommended use of standing device


Spinal Cord Injury - Children

- 17 item self-report survey looking at patterns of use for standing devices.
  - Adults (ages 18-55) with SCI (n=126)
  - 38 people (30%) stand an average of 40 min/session, 3-4 times/week as a method to improve or maintain health.
  - Perceived benefits include: well-being, circulation, skin integrity, reflex activity, bowel and bladder function, digestion, sleep, pain, and fatigue.
  - Most common reason respondents did not stand (88 people) was the cost of standing devices.


Cerebral Palsy

- Meta-Analysis - Review of Literature
- Favorable data:
  - Increasing BMD in spine and femur, temporarily reduces spasticity through prolonged stretch
- No current data to support (in children with CP):
  - Prevention of hip dysplasia, bowel/bladder function, improved self esteem or improved communication


Multiple Sclerosis

- Compared daily standing x30 min. for 3 weeks and an exercise program for a 3-week period.
- Significant ankle and hip ROM improvements in standing compared to exercise.
- No significant difference in spasticity between groups (downward trend noted with standing).


Non-Scientific Articles

- Stainsby K, Thornton H. Justifying the provision of a standing frame for home use – a good case to quote. Synapse. 1999 Spring: 3-5.

PERCEPTIONS OF WHEELCHAIR STANDERS??

- Funding Challenges
- Positioning Challenges
  - Sitting and Standing
- Bone Density Requirements
  - Safety
- Complexity of Equipment
- Range of Motion Requirements

Benefits of Wheelchair Standers

- Gain medical benefits of weight bearing in upright position
- Perform functional activities in standing position
  - More natural position (esp. pressure redistribution)
- Reduce amount of caregiver assistance required
  - Often paid attendants (by insurance)
- Improved compliance with standing program
- Provide energy conservation
  - Less transfers required
- Psycho-social benefits
- Supports clients self-chosen desire to stand
  - Improved autonomy

Functional Benefits

- Improves vertical range of reach
  - Kitchen counters/cabinets, medicine cabinets, refrigerator, sinks, drawers, closets, thermostat, light switches, window shades/blinds, etc.
- Improves productivity at work or school
- Improves psychological well being
- Improves performance of MRADLs
  - Toileting, Feeding (cooking), Dressing (access to closets/drawers), Grooming (access to mirrors/sinks), Bathing (access to supplies)
Funding Challenges

• What is covered? Non-covered?
  – Know your policy
  – Medicaid regulations
• What do you do when meeting resistance for the mobility device requested?
  – Appeal…Don’t give up!
  – Involve the manufacturer
• Private Pay options
  – Fund raising
  – Philanthropy organizations

Thank You!

• Any Questions?

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