STANDING WHEELCHAIRS: EXAMINING THE EVIDENCE

AMY MORGAN, PT, ATP
Permobil, Inc.

Standing is an intervention that has been gaining attention in recent months. In addition to the physiological benefits of weight bearing (standing), the increase in functional performance that standing provides makes it a desirable feature on a wheelchair base. This session will look at the research supporting standing wheelchairs including successful case studies of people using standing wheelchairs (manual and power).

Why Stand?

Standing is an activity capable individuals perform up to 70-80+ times per day. There are many physiologic benefits to standing and upright weight bearing. The medical benefits of standing are strongly supported by research. Likewise, the complications of immobility are also supported and include: decreased bone mineral density, increased risk of pressure ulcers, increased development of joint contractures, impaired bowel and bladder function, decreased respiratory function, and increased gastrointestinal problems. According to the RESNA Position on the Application of Wheelchair Standing Devices, “Standing is an effective way to counterbalance many of the negative effects of constant sitting.”

Osteoporosis

- Loss of bone mineral density occurs with a lack of mechanical weight bearing through the longitudinal axes of the bone (Wolff’s Law). The compromised bone is more prone to fractures.
- Dynamic loading of the skeletal system has been shown to be the most effective for improving bone mineral density.

Pressure ulcers

- Individuals also use standing for more effective pressure relief – reducing the risk of pressure ulcers without negatively affecting one’s line of sight. It has been documented that people who perform a regular standing program have fewer pressure ulcers. When a person achieves an upright position, the pressure is most effectively removed from their seat and back surfaces – the most common areas at risk for skin breakdown in a seated individual.

Contracture Management/ Skeletal deformities

- Standing is an effective way to elongate muscles, which are typically shortened in the seated posture (including iliopsoas, abdominals, hamstrings, and the gastrocnemius/soleus complex).
- During sitting the lumbar spine tends to flatten. The act of standing promotes a natural lumbar lordosis to establish a more erect trunk, thereby reducing the risk of kyphotic thoracic deformity, which would limit respiratory capacity and hinder upright postural alignment.

Vital Organ Function (Gastrointestinal, Cardio-Respiratory, Bowel, Bladder)

- Standing in an upright position with trunk extension, vital organ capacity improves and is less restricted. Gravity is able to assist with digestion, bowel movements, bladder emptying, and also provides improved breathing/chest expansion (increasing vital lung capacity and lessening the risk of pneumonia). This not only improves oxygen consumption, but also will allow the standing individual to speak with improved volume due to greater breath support.
- Standing also improves circulation providing cardiovascular benefits.
Bowel and bladder function have been studied extensively (primarily in patients with spinal cord injuries). These studies show that there is: reduced risk of urinary tract infections3 (likely due to gravity assisting with bladder emptying – eliminating residual volume in the bladder), decreased amount of free calcium in the urine resulting in reduced risk of kidney stones and their complications,17,18,19 fewer bowel accidents have been reported by users who perform a regular standing program, and fewer episodes of constipation.2, 3, 20

**Spasticity Management**

- Weight bearing has been shown to have an immediate and significant effect on reducing muscle spasticity.21 This is consistent and aligns with current teaching regarding weight bearing (proprioceptive input) and its effect on inhibiting muscle tone. This enables safer transfers, improved positioning as well as providing a more effective and restful sleep.

**Functional Benefits (including but not limited to the following)**

- Improved vertical range of reach (kitchen counters, medicine and kitchen cabinets, refrigerator, sinks, drawers, closets, clothes hangers, thermostats, light switches, etc.)
- Improved psychological well being as well as improved productivity at work or at school (visual stimulation, access to educational opportunities, proprioceptive input, appropriate peer interaction, etc.)
- Improved participation in Mobility Related Activities of Daily Living (MRADLs)
  - Toileting - enables some male users to use a public urinal independently, upright positioning promotes bladder emptying – whether catheterizing or self eliminating
  - Feeding - promotes access to food preparation including grocery shopping, cooking, washing dishes, reaching items in kitchen cabinets and refrigerator/freezer
  - Dressing - may reduce spasticity for improved ability to complete dressing tasks, improves access to closets, hanging clothes, and drawers
  - Grooming - increased vertical position improves access to bathroom mirrors and sinks
  - Bathing - improved access to obtain bathing supplies such as towels, soap, etc.

**Fitting and Use of Standing Devices**

Not every standing device is the same: each manufacturer/model has its own unique design, mechanism, and options for standing. Therefore, no "cookbook" exists to provide instructions for properly fitting and using ALL standing devices; however, there are some general rules of thumb.

- Proper seat depth and lower leg measurements are critical for appropriate fit.
- Accurate lower leg length measurement is also extremely important.
- Knee support placement varies with each manufacturer, but is ultimately placed appropriately by the evaluating therapist, and should be snug, but not tight.
- Some standing devices have the option of using various techniques to achieve standing. It is important to understand when different standing sequences are indicated for use.
  - Prone standing is beneficial to facilitate active extension and has various developmental advantages.
  - Supine standing allows gradual progression to upright for individuals with orthostatic intolerance. Also, dependently transferring a client in the supine position may be the safest option for some individuals.
  - Sit to Stand standing provides the client with the ability to have multiple functional positions (sitting, standing, and anywhere between) and is ideal for individuals who transfer independently. This type of standing can best accommodate hip/knee flexion contractures.
  - Multi-positional standers provide use of different types of standing as needed. Some will also allow a combination of sit to stand and supine to stand which is beneficial for clients with significant weakness or paralysis – allowing the body to fully extend before gravity begins to effect the client’s positioning in upright.
**Dose**

- According to the unpublished Snyder Boston Study, it is feasible to have non-ambulatory children participate in a rigorous standing program. The weight bearing "dose" affects BMD at the calcaneous but the benefits appear to be transient if the intensive standing program is not sustained. The intensive use of standing devices (7.5 hrs to 10 hrs a week) may have a beneficial effect on BMD of weight bearing bones in non-ambulatory children.22
- More frequent standing throughout the day has been shown to have a greater impact on bone density, gastrointestinal function, bowel/bladder function, respiratory function, and management of spasticity.2, 3, 21

**References**


Speaker Bio

Amy Morgan (Meyer), PT, ATP has been involved in wheelchair seating since beginning her career as a physical therapist. She has presented lectures both nationally and internationally. Amy is currently the Pediatric and Standing Specialist for Permobil, Inc. and is an active member of RESNA and APTA (Pediatrics and Neurology Section Member).