ASSISTIVE DEVICES FOR AMBULATION

AN UPDATE ON DESIGN

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Background information

- The United States Census Report 2008\(^1\)
- More than 10 million people age 15 or older used a cane, crutches or a walker for at least six months
- More than 8 million adults used an assistive device for longer than six months
- More than 15% of those using ambulation devices over 65 years of age used an ambulation assistive device for more than six months
- With the rapidly aging population, more assistive devices will be used.
Objectives

- Are these assistive devices safe?
- What devices are new on the market?
- What are the uses for these devices?
  - Improved balance and stability
  - Reduce pain or injury to one or both lower limbs by reducing the vertical load
  - Compensate for muscle weakness, sensory loss or other limb injury pathology
Fit of Device

- Poor fitting of any assistive and/or improper training of how to use the device can lead to problems. These include:
  - Inefficient gait pattern
  - Injury to other parts of the body
  - Increased risk for falls
  - Increased cost with little to no benefit
Research on Assistive Devices

- Youdas, Kotajarvi, et. al., 2005 study indicated that healthy subjects could be taught to reduce weight bearing by 50% with axillary or forearm crutches, but this was much more challenging with a wheeled walker or cane.⁴

- Take home message? Gait training requiring reduced weight bearing may be difficult, especially with walkers, or canes.
Research on Assistive Devices

- Stevens JA, Thomas K, et al. in 2009 studied United States emergency room records within a year, finding that 45,312 older adult fall injuries were associated with walking aids. Walkers were associated with seven times as many injuries as canes.\(^5\)

- Certainly, more frail older adults use walking devices and are more likely to fall.

- Take home message? People may have problems using walking aids safely and effectively. They may benefit from a comprehensive falls prevention program.
Research on Assistive Devices

- There is some evidence that assistive devices may inhibit natural balance reactions.
- Bateni and Maki in 2004 found that use of a standard walker or straight cane interfered with compensatory stepping reactions when normal subjects underwent large lateral perturbations.\(^6\)
- Take home message? Normal stepping reactions that occur with a fall may be difficult when using a walker or cane when large and unpredictable balance disturbances occur.
Canes

- Research on canes suggest that there is a need for trained health care professionals to be involved for proper fit and function.
- A comprehensive balance program should be provided whenever an assistive device is recommended.
- Canes are very useful for unweighing a limb with painful osteoarthritis.
- A tripod may add stability and efficiency.
Able Tripod latex rubber base for canes
Hurry Cane

Portable

Stable, flexible base
Hurry Cane Base

Reported to add stability.
No research available.
Internet sales and marketing phenomenon.
Cost is $40.00 to $70.00 based on availability of promotional deals and shipping costs.
Crutches

- Research on crutches indicate that axillary crutches may provide more stability than forearm crutches.
- Crutches may be better than walkers with sternal precautions.
- Spring loaded crutches may reduce the ‘jarring’ of crutches but does not reduce the energy required to walk with crutches.
- There are some new designs for forearm crutches and standard axillary crutches.
Strong-Arm Crutch

Design that shifts weight from the wrist to the forearm
Ergonomic hand grip with an offset hand component
Forearm component which contours the UE limb to provide increased lateral support compared to that offered by standard forearm crutches.
Crutches

Mobi-legs crutches
Mobi-legs

- The saddle grips naturally and is well-ventilated for continuous air circulation. Articulated saddle design pivots and rotates in tandem with body movement and features 1 1/4" of built-in dampening. It maintains full contact and will not abrade the soft tissue. The pliable membrane sling provides suspended support, creating a rest for the underarm of unparalleled comfort.
Mobi-legs

- Ergonomic Handgrips contour to the hand, maintain a natural wrist angle and evenly distribute load across the palm. Ergonomic Handgrips are specifically left/right handed.
Mobi-legs

- The legs are offset to provide hip clearance and limit the potential for tripping.
- Fully adjustable height and arm length to properly fit 96% of all adults 4’9" to 6’4" up to 300lbs.
Mobi-legs

- Rocker Feet with over-molded, natural rubber pads maintain full contact throughout the stride and are proven to require less exertion.
Walkers

- Research on walkers indicates that consideration of the environment as well as the caregivers should influence the decision of type of walker chosen.
- Inappropriate use of walkers may lead to forward bent posturing.
- Gait velocity slows when standard, non-wheeled walkers are used with individuals with Parkinson disease.
- A wheeled walker may be more energy efficient, but only if it is used correctly.
Walkers

Braking devices for standard walkers with wheels on back legs. These brakes engage with weight bearing making the walker more stable, but easy to move forward when walking.
Braking devices for standard walkers
Rollator walker; seated 4 wheel walker
Walkers: Knee walkers or rollaboutes
Walkers

Stair climbing walker manufactured in China
Walking Poles

- Research on walking poles
- Study by Willson JM, Torry JMR, et al. 2001
- The use of walking poles enabled subjects to walk at a faster speed with reduced vertical ground reaction forces, vertical knee joint reaction forces, and reduction in the knee extensor angular impulse and support moment, depending on the poling condition used.
Walking poles

Fitness for all ages and stages
Nordic walking poles help improve posture and balance, while taking stress from hips and knees.
# Summary

<table>
<thead>
<tr>
<th>Assistive device</th>
<th>Potential use</th>
<th>Advantages</th>
<th>Disadvantages</th>
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</thead>
<tbody>
<tr>
<td>Strong arm $50 to $60 each</td>
<td>More lateral support needed</td>
<td>Shits weight from wrist to forearm</td>
<td>Not easily available, more expensive</td>
</tr>
<tr>
<td>Mobilegs $50 to $130/pair</td>
<td>Long term use or need stability</td>
<td>Fit and comfort</td>
<td>More expensive than traditional crutches</td>
</tr>
<tr>
<td>Abletripod cane base $20</td>
<td>More stability</td>
<td>Provides stable base</td>
<td>Amount of stability unknown</td>
</tr>
<tr>
<td>Walking poles $18 to $50 each</td>
<td>Active patients wanting stability</td>
<td>Folding, wide variety of types</td>
<td>Not as supportive as other devices</td>
</tr>
<tr>
<td>Knee walker $170 to $300</td>
<td>Non-weight bearing ankle-foot</td>
<td>Freedom of mobility</td>
<td>Not on stairs, more expensive</td>
</tr>
<tr>
<td>Rollator walker $170 to $600</td>
<td>Long term walker use, provides seat</td>
<td>Durable, brakes, seat</td>
<td>Heavier, more expensive</td>
</tr>
<tr>
<td>Stair walker (not available)</td>
<td>Long term stair use</td>
<td>Level and stair use possible</td>
<td>Not currently available in USA</td>
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References


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Thank you!