

## Periodic Assessment of Walking Devices in Senior Living Communities

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### Introduction

Currently, the proportion of the United States population age 65 or older is nearly 40 million [1]. Of these older adults, approximately 14 to 18% of them use an assistive ambulatory device (AAD) on a daily basis [2]. In senior living communities, canes (Figure 1 - left) and rolling walkers or rollators (Figure 1 - right) are the most common walking devices used by the older residents in order to improve mobility, prevent falls, and maintain functional independence [2].

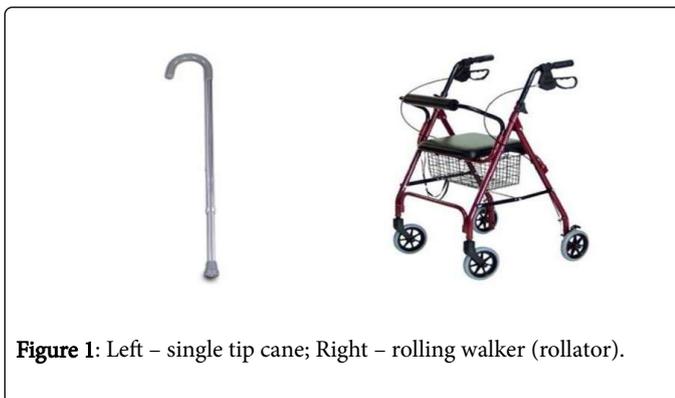


Figure 1: Left – single tip cane; Right – rolling walker (rollator).

However, the association between using an AAD and a potential fall has been reported in older adults [3-6]. Such an association could result from both the impact of normal aging and the use of an AAD itself. As one ages, he or she may experience decline in cognition, visual acuity, sensitivity, alertness towards surrounding environment, endurance, and strength for daily activities [5-7]. On the other hand, when an individual ambulates with a walker or a cane, his or her body mechanics may change [8-11], which may cause balance, gait, and strength deficits. The changes may include 1) missing or altered rhythmic alternating arm movement in walker and cane users; 2) gradual adjustment of somatosensory input and loading (body weight) stimulation from normal bilateral (bi-pedal) to adapted quadra-lateral (quadra-pedal) input in walker users or to tri-lateral (tri-pedal) input in cane users; and 3) tendency to lean body forward in walker users or lean toward the side holding the cane in cane users. Therefore, it is necessary to conduct frequent and periodic assessment for older AAD users in order to identify and avoid potential risks as early as possible.

First, an AAD user's cognition needs to be evaluated using tests like the Mini-Mental State Examination (MMSE). Declined cognitive level is associated with potential falls and mobility deficits have been reported [8]. As evident from our previous studies, older adults who use an AAD on a daily basis for a minimum of 2 months could develop a fear of falling [9] and dependence on the AAD for mobility [10], which could be evaluated by Falls Efficacy Scale and Assistive

Ambulatory Device Dependence Scale (AADDs) [10]. Fear of falling is the main nature of the AAD-dependence. The longer a person uses an AAD every day, the more he or she is going to depend on the AAD for mobility [10]. With the dependence increases, an older AAD user may gradually avoid or even give up more and more activities without using an AAD or without the AAD easily reachable. Mechanically, consequently the AAD user may develop certain body adaptation described above [5,6]. So, it is necessary to conduct frequent evaluation on cognition, fear of falling, and dependence on an AAD before things turn to be urgent.

Second, an AAD user's balance ability should be assessed or reassessed. It was reported that the majority of older adults selected an AAD on their own without medical professional consultation [5-6]. It was found that two older adults with similar physical conditions, but selected different walking devices (a cane or a walker) for ambulation, could actually develop different side effects from using an AAD, such as a deficit of functional stability [7]. Therefore, it is necessary to conduct periodic assessment of these AAD users before the side effects occur. Usually, rolling walkers provide great stability but much less mobility for the user, while a cane allows more mobility but less stability. A rolling walker could be provided to a person who may have a severe deficit on both static and dynamic balance; while a cane could be provided to someone who may have poor dynamic balance but less affected static balance. The static balance could be assessed through static standing on both legs [12], single leg [13] and tandem [12] stance; while the dynamic balance might be assessed with step-up test [14], 360° left/right turn test [15], four-square step test [16], and the timed-up & go test (TUG) [17]. Assessment or reassessment with these tests could not only help the AAD user select and use a proper device for daily mobility, but also for clinicians to figure out appropriate interventions for the AAD user to improve their balance.

Third, functional mobility secondary to neurological and musculoskeletal deficits should be re-evaluated periodically in addition to balance. The evaluations could include time-efficient and cost-effective Snellen chart for visual acuity, modified sensory organization test (mSOT) [18] for neurological integration, Timed Up & Go (TUG) [17] for functional mobility, 6-minute walk test (6MWT) [19] for endurance, and 5 times sit to stand test (STST) [20] for lower extremity strength. These are particularly essential for those transitional AAD users who could have used their AADs temporarily before fear of falling and/or psychological dependence on an AAD developed after long-term usage [10]. The transitional AAD users are those who are ambulatory with their AADs, and have no fixed or uncorrectable body part (upper and lower extremities, trunk) deformity and pain scale at 4 or below. Thus, an older AAD user with generalized weakness, cardiopulmonary dysfunction, fear of falling and/or dependence on an AAD might be able to benefit from the periodic assessments described above to identify any potential functional improvement or

deterioration to decide if the currently used AAD is appropriate for this person.

Fourth, the AAD height should be adjusted for individualized use. In clinic, many clinicians strongly recommend that one needs to consult medical professionals when he or she is planning to purchase an AAD. However, the public has not yet completely accepted this recommendation. For instance, recent studies [5,6] showed that of people older than 65-year-old, more than 60% of them obtained their walker or cane on their own through self-purchase, family members, or friends without receiving any instructions from a medical professional. As a consequence, the incorrect AAD height is very common among AAD users, nearly 55% [5,6]. Pierson [21] states that the AAD height for an individual is set by measuring the distance from the ground (or floor) to the wrist joint line while the individual maintains an upright standing position with both upper extremities relaxed at the side of the body. If a walker or a cane is set too high, the user's shoulder may become elevated and cause shoulder muscle tightness or shoulder and neck pain. If the AAD is set too low, the AAD user may have to lean forward (in walker users) or leaning toward the cane-held side (in cane users) during ambulation. Posture like this may overstretch the user's back (particularly the lower back) and cause lower back muscle strain. This may explain why lower back or shoulder tightness and pain is frequently treated among the older AAD users.

Fifth, the AAD maintenance should be conducted periodically. Walkers or canes are durable medical instruments that provide balance assistance to the walker or cane user. As time goes on, some parts of the walker or cane may become worn out and need maintenance attention and knowledge to prevent the instrument from further deterioration. Based on our experience, every 2-3 months a walker or a cane should get maintenance check up to see if there is a needed repair for each individual's walker or cane. It was reported [5,6] that approximately 17% of the AADs (walkers and canes) used by older adults had maintenance problems; including, worn out and loose rubber caps, tennis balls or sliding guards covering the tips of the canes, or 2-wheeled RW legs, worn out and loose hand grips on 2, 3, and 4-wheeled rolling walkers, and loose or excessively tight brakes or joint areas on 4 wheeled rolling walkers. It is highly likely that these poorly maintained walkers or canes could be potential risk factors causing falls among the older AAD users.

Sixth, incorrect hand used by cane users to hold the cane should be corrected. One of the purposes to use a cane is to alleviate pain or reduce load to a lower extremity. As suggested by Norikin and Levangie [22], a cane is supposed to be held by the hand contralateral to the lower extremity that is hurting or needs load reduction. For example, a patient with right knee osteoarthritis needs to hold his cane in his left hand. Biomechanically, holding a cane in the contralateral hand decreases stress or pressure to the hurting leg. Otherwise, if the cane is held on the ipsilateral hand, the stress /load to the hurting leg will increase [22]. One study [6] in the geriatric population revealed that 59% of older cane users needed to hold the cane in their left hand, but 95% of them still use their right hand (the dominant hand) to hold. The improper hand holding a cane may aggravate the users' hurt leg by increasing biomechanical disadvantage to the leg.

In summary, periodic re-assessment could help identify factors that may affect AAD users' mobility. This is particularly important for those who use the device temporarily for recovery from a post-hospitalized surgery or for prevention of balance deficit from a short-term illness due to cardiopulmonary or other systems. Understanding these factors and their potential effects on balance can assist clinicians to determine

which walking device could be provided to a potential AAD user. From our experience, continuing or discontinuing to use a walking device will depend on results of static and dynamic balance assessment. For a person with poor static balance (e.g., standing on both feet), a rollator could be considered; while for a person with good static balance, but poor dynamic balance (e.g., marching in place), a cane might be provided.

In term of how soon a re-assessment should be conducted, our recommendation is to do it on a reasonable basis of every 2-3 months. With our previous studies and observations, a person who has used an AAD for 2-3 months might develop psychological dependence on the device for daily activity [10]. Also, it is found that the tip of the AAD might get worn or torn after being used for 2-3 months [5,6].

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