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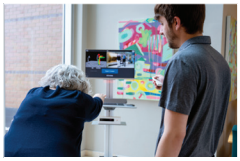

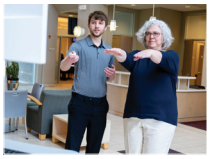

Using Technology as Part of a Multifactorial Approach to Falls

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Statistics Related to Falls

According to the Centers for Disease Control and Prevention, each year, millions of older people—those 65 and older—fall. In fact, more than one out of four older adults fall each year; this results in about 36 million falls each year. Despite these numbers, less than half of those who fall address the fall with their healthcare team or physician. Evidence also shows that falling once doubles your chances of falling again. While not all falls result in an injury, about 37% of those who fall reported an injury that required medical treatment or restricted activity for at least one day, resulting in an estimated 8 million fall injuries. Older adults who have fallen typically report moderate to severe injuries, including deep bruises, head trauma and hip fractures. Fall-related injuries may alter mobility and limit independent living, requiring both formal and informal care-giving. Data also shows that falls are the leading cause of injury-related death among adults age 65 and older. The age-adjusted fall death rate is 64 deaths per 100,000 older adults and this number is increasing. Fall death rates among adults age 65 and older increased about 30% from 2009 to 2018 (CDC, 2021).

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With these statistics in mind, it is easy to imagine the cost of falls in the United States. Each year, a typical nursing home with 100 beds will report between 100 and 200 falls. According to this data, these facilities can expect healthcare costs in excess of $279,000 per year as a result of falls with injury. According to the CDC (2021), each year about $50 billion is spent on medical costs related to non-fatal fall injuries and $754 million is spent related to fatal falls.

As the percentage of Americans age 65 and older grows, it is expected that the number of falls, fall-related injuries, and the cost to treat these injuries will continue to escalate. But there is good news! These facts of falling put into perspective the importance of reducing fall risks. Falls can, in fact, be addressed and reduced by screening for fall risks and intervening to address risk factors such as use of medicines that may increase fall risk, or poor strength and balance. In fact, many falls can be prevented through simple changes to daily life and a rehabilitation program to meet an individual's specific therapeutic needs.

Falls are not part of normal aging process. Falls generally occur because of various and diverse risk factors and situations, many of which can be corrected. This interaction is modified by age, underlying physical dysfunction, cognitive deficit overlay, medications, disease, and the presence of hazards in the environment. Several studies have shown that the risk of falling increases dramatically as the number of risk factors increases. In fact, according to Morse (2008), 78% of all falls are anticipated physiologic falls – meaning that an individual's score on a risk assessment scale indicate he or she is at risk for falls.

While these statistics are familiar, and many national, state, and local agencies have published volumes of information about the perils of elders' falls, the problem is putting into place a comprehensive and multi-factorial approach to fall prevention. Many programs have been proposed, but despite awareness of statistics and best efforts at motivation, often these are not feasible due to time, consistency, staffing, and most

Revolutionizing care for seniors by reducing adverse events using artificial intelligence (AI), with predictive analytics based on balance and gait analysis to identify deficits and forecast fall risk.

recently, COVID-19 restrictions. So, what is the answer? The answer is a multi-factorial approach that uses the best available evidence, education, and technology to identifying elders at risk of falling and to emphasize the proactive solutions that can be effective.

A Multi-Factorial Approach to Falls

Falls prevention activities are carried out across a range of health disciplines including occupational therapy, physical therapy, nursing, activities, physicians, and social work. There is evidence in the falls prevention research literature which suggests that in excess of 50% of potential falls in older adults are avoided as a result of ongoing therapeutic efforts and interventions from these disciplines. But, those approaches need to be multi-factorial. Various studies on reducing the number of falls have shown that a single intervention is less effective than multifactorial interventions (Oliver et al 2010).

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According to guidance from the American Geriatric Society (AGS) related to fall prevention, a strong program should include education. Education interventions are developed to increase knowledge about falls prevention and educate individuals regarding risk of falling and fall prevention strategies based on the available evidence-based literature. Education should be tailored to an individual's cognitive function and language; typically, education takes the form of fact sheets with evidence-based materials. Many education materials are available in the public domain for use in all areas of senior living. This intervention, though, while it can lead to enhanced awareness and behavior change (e.g., decreased fear of falling and increased mobility), should not be provided as a single intervention/component as it has not been proven effective as a stand-alone service (AGS, 2011).

Home environment assessment and intervention carried out by a health care professional, typically an occupational therapist, should be included in a multifactorial assessment and intervention for older persons who have fallen or who have risk factors for falling (AGS, 2011). Home assessments are carried out and assistive or adaptive equipment is recommended to reduce falls within the home environment. Typically, home assessments involve clinicians visiting the older adult's home to assess the suitability of the home environment in relation to the mobility of the patient. Clinicians then propose adaptations, often via the installation of assistive equipment, in order to facilitate independent living and to mitigate any potential fall risks, which could arise during performing activities of daily living (ADLs). This intervention, as part of a multi-factorial approach, has been shown to decrease fall rates by one-third among men and women who had experienced one or more falls in a year (Keglovits et al., 2020). Similar to education, reviews in the falls literature have revealed that home assessments and adaptations as a single intervention do not, in general, significantly reduce the risk of falling.

Of course, a person's physician plays a role in fall prevention, too. Seniors are strongly encouraged to talk with their doctor about medications that might make them sleepy or dizzy and influence falls; specific conditions like diabetes or arthritis that might contribute to falls; and other health-related conditions such as vision, orthostatic hypotension, and cognition as fall-related intrinsic factors.

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So, what is the best intervention for fall prevention? Exercise!! It is the one intervention, that even as a stand-alone service, can significantly reduce falls in the elderly. Most researchers agree that exercise, particularly weight resistance, presents the best option for older adults. However, many older adults who would benefit from such training are strangers to lifting weights or running on treadmills. For individuals in their 70s and 80s, this form of training was not widespread years ago and health clubs offering such exercises simply weren't in existence. Unfortunately, many older adults make little or no effort to exercise or adopt physical activity. So, where do we go from here?

The multifactorial fall risk assessment should be followed by direct interventions tailored to the identified risk factors, coupled with an appropriate exercise program. All older adults who are at risk of falling should be offered an exercise program incorporating balance, gait, and strength training (AGS, 2011). The physical therapist on the rehabilitation team, following evaluation of deficits, can recommend a tailored exercise program that includes resistance exercises, balance retraining, and activities focusing on safe gait and mobility. In recent years, exercise programs like Yoga, Tai Chi, Otago, aquatics, and A Matter of Balance have complemented traditional physical therapy programs offering seniors fun alternatives to exercise.

For many residents, the consequences of a single fall last well beyond the initial incident and can have a significant impact on physical and emotional well-being. Many residents, even if they are not seriously injured from the fall, become anxious about falling again, which decreases daily activity level and mobility, leaving them prone to suffering recurrent falls. Many physical and occupational therapists, facing the daunting task of developing a durable and effective fall management program for an individual, are looking to technology for assistance. An ever-increasing range of technology-based applications have been developed with the goal of assisting in the delivery of more effective and efficient fall prevention interventions. Technology-based interventions have been deployed in a wide range of falls prevention contexts and include diagnosing and treating fall risks, increasing adherence to interventions, detecting falls and alerting clinicians in case of falls (Hamm et al, 2016).

There are myriad technology-based applications available in the marketplace ranging from those that address pre-fall prevention to post-fall prevention and practice. Application types range and can include static, interactive, game-based and virtual reality applications. Adding to the diversity of options are the platforms including desktop computers, game consoles, free-standing units, and smart phones. So how do you weed through the options and choose? Providers are encouraged first to determine, based on fall risk assessments, what they would like the technology to do for them as different platforms offer different outcomes. Requesting a demonstration and a test period with the senior population is a must to see the product in action. Finally ask to see the research! A well-developed product will have research to support intervention and outcomes.

One such product available for senior care is VirtuSense. At VirtuSense, their mission is to revolutionize care for seniors by reducing adverse events using artificial intelligence (AI). Their product called VSTBalance, uses predictive analytics based on balance and gait analysis to identify deficits and forecast fall risk. Each VSTBalance assessment offers an individualized comparison with age-related normative data and calculates each person's mobility level and additionally, for individuals over the age of 70, a gait assessment will also calculate the probability of expe-

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riencing a fall within the next 12 months. Following this, the AI engine, along with therapist feedback, can create clinical pathways to facilitate a patient-specific care plan that addresses their specific musculoskeletal movement deficiencies. This in-depth data offers a very detailed treatment plan for therapists to follow. Using machine-vision infrared sensors and artificial intelligence, a system like this can objectively assess and identify musculoskeletal and sensory deficiencies—all in less than three minutes and provide therapeutic recommendations to improve mobility. In addition, a system such as this is multi-faceted in that it does not only address risk factors, but therapists also use the biofeedback training games into their plan of care to create a meaningful, challenging, yet fun experience for the patient (VirtuSense, 2020).

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So, does it work? Yes! The developers at VirtuSense partnered with the Centers for Medicare and Medicaid Services and several senior living communities in Ohio and Mississippi to help reduce falls and keep residents mobile using its proprietary VSTBalance technology. The proof is in the results. In the first two quarters of 2020, results at partner facilities far exceeded expectations, with a fall reduction of nearly 41%, and of those falls, there were 41% fewer injuries. What's even more remarkable, is this reduction in falls occurred during the height of the COVID-19 pandemic. COVID-19 has had a tremendous impact on senior living communities, from safety and staffing issues to isolation and anxiety among residents. Virtual reality and AI, when used via telehealth can offer therapists an opportunity to continue screening patients, obtaining data, and implementing individualized fall-related treatment plans (VirtuSense, 2020).

Technology as Intervention

Technology is rapidly evolving and there are many high- and low-tech options available to providers. It is important that providers continue to use a multifactorial approach to fall management addressing person-specific intrinsic and extrinsic risk factors. Technology is a remarkable addition to a traditional fall management program and one that holds a lot of promise for creating programs that are not only effective, but feasible to implement and lasting.

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