

Public Health Needs Paper

Strength, Mobility, and Balance in later years focusing on fall prevention and exercise promotion, including benefits of Tai Chi for balance.

As people age, it is common for functional ability and mobility to decrease. Levels of endurance, balance, strength, and flexibility decline which often leads to an increase in the number of falls. Debilitating injuries, hospitalizations, loss of independence, and premature death often result. A frequent misconception is that falls are a normal part of the aging process. Fortunately, this myth is slowly being debunked, and older adults are focusing more time and energy on staying fit to prevent injuries. Healthy People 2020 is the federal government's health prevention plan for building a stronger nation. It promotes living long and healthy lives by creating a social and structural framework to decrease injury, disease, disability, and premature death.

To address this public health need, Healthy People 2020 has set forth a robust agenda to improve the health and quality of life of people 65 and older, by promoting fall and injury prevention.¹ Specifically, HP 2020 declared functional mobility a high priority, and by promoting fall prevention, they hope to enable older Americans to live longer, healthier more self-sufficient lives.¹ A person's functional mobility is defined by the physical strength that allows them to safely move within their environment. It is often measured by their ability to manage their Activities of Daily Living (ADL's) such as walking, rising from a chair, bathing, feeding, grooming, dressing, etc. A target objective to reach this goal is to reduce the proportion of older adults who have moderate to severe functional limitations.¹ Healthy People 2020 reports that in 2012, 29.3 percent of the adult population had at least one ADL limitation or were living in a long-term care facility. The goal is to decrease this and reach a target of 26.4 percent by the year 2020.¹

Fall prevention is of personal interest to me because my parents are currently in their 70's and 80's and I want them to remain as healthy and active as possible during their older years. As a PA, I

also anticipate caring for patients 65 years and older and want to provide them with the most current research and up-to-date information to help them remain self-sufficient and at their peak health.

As Americans live longer, and the baby boomer generation ages, it is projected that 20 percent of the population will be 65 and over by 2029, and one in five Americans will be over the age of 65 by 2030.^{2,3} In 2015, unintentional injuries in the U.S. ranked 7th in leading cause of death in people 65 and older.⁴ In 2014 one in four older adults reported a fall bringing the total to 29 million that year, of which 24 percent required medical treatment or experienced restricted activity for at least a day.⁵ Within this population, nearly 2.8 million are treated in the emergency department every year due to falls.⁶ The increase in the population of older adults, coupled with the increase in traumatic injuries and hospitalizations in this age group, have warranted federal and state programs that promote functional mobility programs for older adults.

Falls in the adult population 65 years and older in The State of Oregon are of special concern. This population experienced an astonishingly 46% increase in the rate of fatal falls since 2000.⁷ It is projected that the number of people 65 and older will increase in all counties in Oregon until 2040, and falls will continue to be the leading contributor of debilitating injuries.⁸ According to the CDC's State Report Card on Healthy Aging, Oregon ranked third-highest out of four quartiles for percent falls, a gloomy statistic that would benefit from change.⁹ It is projected that Oregon will exceed \$32 billion in direct costs from fall injuries by the year 2020, with Multnomah County and several others leading the way.⁸

The target audience for this project are adults 65 years and over who live at a retirement community in Portland, OR. The retirement community offers independent and assisted living, memory care, skilled nursing, and home care. The philosophy of the community embraces healthy aging by promoting physical activities that also allow for social exchange among participants. The residents vary in their stage of physical ability and cognitive functioning, which makes it an applicable audience for

this topic. Although the facility is progressive in caring for their residents, there are many other publicly funded programs aimed at keeping older adults active and healthy.¹⁰

The State of Oregon along with regional counties are also ardently promoting exercise and fitness for the older adult population.¹⁰ The Oregon Health Authority (OHA) website provides a wealth of information with links to community classes in specific counties that include Tai Chi, Pilates, swimming, and 'Better Bones & Balance' classes.¹¹ There are links to virtual health coaching to encourage physical activity, links to home exercises, and access to free park passes to encourage walking.¹² Multnomah county specifically promotes fall prevention by offering free home visits to ensure home and environmental safety for people of lower income.¹³ The state is investing in fall prevention and functional mobility programs not only because they foster a healthful lifestyle and self-sufficiency, rather they have broad-reaching health benefits such as minimizing debilitating falls, decreasing expensive hospitalizations, and staving off traumatic injuries that lead to premature death.

Falls in the older adult population stem from a myriad of physical and cognitive changes, along with emotional, pharmacological, and environmental causes.^{5,9,14} As bodies age, there are physical and physiological changes that affect strength, mobility, balance, and proprioception. Bones shrink in size and mineral density. Muscles, tendons, and joints lose strength and flexibility. Metabolism slows down often causing weight gain, and changes in vision and hearing decrease a persons ability to sense surrounding environmental alterations or obstacles.¹⁵ Changes in brain size and neuronal plasticity can lead to cognitive deficits. The changes of the aging body affect gait and balance, and how people move within their environment and function in their daily living. They are often slow and insidious. Due to the physiological effects of aging and consequences of mobility restrictions, one fall can initiate a cascade of continuing deterioration.⁹ Unless a person has experienced a considerable traumatic injury that immediately changes their physical mobility, a significant fall may seem to come out of nowhere.

Along with the physical changes of aging, mental health issues can also exacerbate balance-related problems and make older adults more susceptible to falls. Many older adults suffer from depression as they manage multiple health issues, confront caregiver stressors, and experience loved ones passing. They are often placed on antidepressants to manage their sadness, adding to their long list of medications. CNS drugs have a greater risk of causing falls in the older adult patient due to issues of pharmacokinetics and/or pharmacodynamics, and providers must be especially cognizant to these age-related changes.¹⁶

Although less obvious than physical or psychological causes of falls, environmental factors can pose a multitude of problems related to falls in the older adult population. Most falls occur at home from a standing height.¹⁷ Throw rugs, dimly lit rooms, extension cords, and broken stairs are but a few environmental factors at home that lead to falls. Many older adults requiring home oxygen units must ambulate with long tubing, easily leading to tripping and falling. The causes of falls are diverse, the results can be devastating.

The consequences of falls in the older adult population are broad and include physical changes, psychological shifts, loss of functional mobility and self-sufficiency, and traumatic death. Some of the most common fractures to occur from falls are hip(s), distal radius, vertebral, and skull.¹⁸ Traumatic brain injuries lead to serious and long term cognitive consequences and even death. Large and small bone fractures are obvious major injuries that usually receive rapid medical attention followed by convalescent care and physical therapy treatment. Unfortunately, many older adults experience minor injuries such as muscle or tendon strains that are not treated by medical professionals, which can fester and lead to deceptive loss of ADL's.

When an older adult experiences a fall, they often begin to develop a fear of falling that causes them to reduce their activity involvement, or avoid activity altogether.^{19,20} Fear of falling can lead to isolation, loss of social interaction, and depression. As social isolation and depression develop, there is

a tendency to limit activity, and physical strength subsequently declines. Limitations in physical strength can lead to a decrease in one's ability to perform ADLs, which can result in falls and a subsuming downward spiral of depression and limited functional mobility.

Although the physical and physiological processes of aging cannot be stopped, they can be slowed down, and sometimes reversed, through exercise, healthy eating, restful sleep, and continued health maintenance to prevent disease progression.⁹ Exercise that promotes balance and mobility helps people maintain muscle strength and flexibility and adapt to environmental changes around them, decreasing the chances of suffering traumatic falls. It is estimated that every 20 minutes a senior citizen in the U.S. suffers a life ending fall.⁵ The best exercise plan addresses endurance, strength, balance, and flexibility as a means to maintain ADLs and reduce fall risk.²¹ Activities such as walking, Tai Chi or yoga, swimming, and weight lifting build muscle, maintain joint flexibility, and promote cardiac health. Exercising to maintain functional mobility, which allows people to successfully move around in their environment, is a key component to healthy aging and is the cornerstone to fall prevention and long term independent living. It keeps people 65 and older living healthy independent lives.

Falls can be prevented by focusing on exercise that targets endurance, strength, balance, and flexibility. The physical activity recommendation for individuals 65 years and older that are in good health, is 2 hours and 30 minutes of moderate intensity aerobic activity per week, along with muscle strengthening activities on 2 or more days a week that work all major muscle groups.²² The best way to accomplish this is to help your patients set an exercise goal, making sure it can be an easy routine to add to their day. Suggest they make their activity social – tell them to ask a friend to join them, or recommend they join a community or health club fitness class, or a virtual group.^{23, 24} Endurance training includes activities such as brisk walking and doing yard work. Flexibility exercises, such as straight leg raises while seated in a chair, will allow seniors to continue to bend over and tie their shoes. Strength training with small hand weights will allow them to continue to carry a full laundry basket or

shop vac in the garage. Balance training, one of the best for fall prevention, will allow them to stand on their tiptoes to reach something on a top shelf, walk on uneven ground, or safely walk down stairs.

Balance exercises are essential to preventing falls because they promote both static and dynamic balance. Static balance allows the body to remain stable in place. Dynamic balance allows a body to move outside its base of support, and change balance to move through space, such as reaching for an object located on a high shelf. Tai Chi has gained much attention in the past years and is now thought to be the best balance training to promote fall prevention in older adults.^{5, 25, 26, 27} Yang Tai Chi, one of the most popular forms, is an ancient Chinese practice that dates to the 19th century and is commonly referred to as ‘meditation in motion.’ It involves slow and controlled gentle movements combined with breathing that builds dynamic balance, reduces stress, and improves cardiovascular function.^{28, 29} Tai Chi exercises help prepare people to adapt to split-second unpredictable motions, such as trips and falls, that cause the body to move from its base of support. For one individual, a 90-year-old man, the movements he learned in Tai Chi saved him from falling on his head, an accident which could have been life-ending since he was anticoagulated. The movements are very adaptable to standing or seated positions, making it easy to accommodate for all physical abilities in classes.²⁹

Exercise programs at residential living facilities, community centers, and health fitness centers not only increase functional mobility, they also promote social time, build friendships, alleviate depression and isolation, and improve mood.³⁰ Group fitness and balance classes can help reduce the stress of aging, help people lose weight, all while helping people maintain muscle, bone, and joint strength and flexibility. Fitness programs offer socialization within the context of increasing functional mobility. As mood increases, the need to add antidepressants to participants’ long list of other medications may be eliminated.

Older adults may need special help to organize, rearrange, and fall-proof their home to prevent unnecessary hazards. Small changes such as adding lamps by the bedside, moving furniture to clear

walking paths, or adding non-slip mats to bathtubs or shower stalls can make significant safety changes to living quarters.³¹ Falls in the older adult population can be prevented by developing a physical conditioning routine, addressing social opportunities, reviewing prescribed medications, and decreasing environmental hazards.

When considering a new exercise routine, even if slow and gentle, it is always best for people to talk with their healthcare providers.^{32, 5} A multi-team approach to health promotion and fall prevention includes pharmacists, physical therapists, doctors, PAs, nurses, nutritionists, and others. It will be important to have loved ones, family members, and/or caregivers join the conversation to learn about functional mobility and lifestyle changes that promote independent living. Honest and candid dialogue between all parties will help people address all aspects of healthful aging.

For providers working with the older adult population, special consideration must be taken to help patients maintain functional mobility and independence. It is not uncommon for older adults to be taking multiple medications, suffer from complex comorbidities, and experience stressors specific to aging. A new functional disability within this population, even if transient, may lead to later health decline due to the patient suffering from comorbid conditions or environmental complexity at home.¹⁴ For these patients, team based care must be vigilant in the assessment of ongoing health conditions within the context of a new impairment when assessing functional mobility or change thereof. Open dialogue with patients and loved ones or caregivers must be established to discuss physical and cognitive changes, social changes and depression, residential environmental hazards, and poly-pharmacy.

In 2011 the American Geriatrics Society updated guidelines for fall prevention and established an algorithm which includes specific questions regarding a history of fall circumstance: frequency of falls, symptoms at the time of falls, and injuries from falls.³³ The CDC's STEADI (Stopping Elderly Accidents Deaths & Injuries) program offers a special link for providers which provides algorithms,

screening and intervention tools, medication review sheets, fact sheets, and extra clinical tools.⁵ The STEADI program is strongly endorsed by The OHA, The American Board of Family Medicine, and American Board of Internal Medicine.³¹ According to a conversation with a physician for the retirement community, she follows the STEADI guidelines for residents and uses it to assess balance confidence, define healthcare management, and promote a team-based approach to caring for residents (written communication, April 2017). The NIH's Go4Life campaign, and the National Council On Aging – National Falls Prevention Resource Center offer a wealth of information for older adults and healthcare providers interested in all aspects of healthy aging, mobility, and fall prevention.^{21,34} The OHA also endorses the Otago Exercise program, which was originally designed in New Zealand, and employs the expertise of a PT to design a home-based fall prevention program that addresses posture, flexibility, leg strength, and balance skills.¹⁰

The baby boomer generation is aging, and statistics show that the U.S. will have an ever-increasing population of people 65 and older by the year 2030. It is up to healthcare professionals to help discredit the myth that falling is a part of the normal aging process. Healthy People 2020 declared functional mobility a high priority, and by promoting fall prevention, older Americans can live longer, healthier more self-sufficient lives.¹ Falls and loss of functional mobility are caused by a multitude of physical and cognitive changes in the setting of potential environmental, pharmacological, and social constraints. Fortunately, there are a wealth of local, state, and federal interventions in place that promote healthful aging. Research has proven that activity that promotes balance, flexibility, strength, and endurance allows seniors to remain active, self-sufficient, and free of debilitating falls that cause hospital visits, long recovery, or tragically, death.

References

1. ODPHP. Healthy People 2020; Topics and Objectives; Older Adults; Objective OA-5. 2017; <https://www.healthypeople.gov/2020/topics-objectives/topic/older-adults/objectives>. Accessed June 30, 2017.
2. USCB. Projections of the Size and Composition of the U.S. Population: 2014 to 2060. *Population Estimates and Projections: Current Population Reports 2015*; <https://www.census.gov/content/dam/Census/library/publications/2015/demo/p25-1143.pdf>. Accessed July 21, 2017.
3. USCB. The Baby Boom Cohort in the United States: 2012 to 2060. *Current Population Reports, P25-1141 2014*; <https://www.census.gov/prod/2014pubs/p25-1141.pdf>. Accessed July 21, 2017.
4. CDC. *10 Leading Causes of Death by Age Group, United States - 2015 2015*; https://www.cdc.gov/injury/images/lc-charts/leading_causes_of_death_age_group_2015_1050w740h.gif. Accessed July 31, 2017.
5. CDC. STEADI - Older Adult Fall Prevention. *STEADI: Stopping Elderly Accidents, Deaths & Injuries 2017*; <https://www.cdc.gov/steady/index.html>. Accessed July 17, 2017.
6. CDC. Check for Safety Brochure. *STEADI - Older Adult Fall Prevention* https://www.cdc.gov/steady/pdf/STEADI_CheckforSafety_brochure-a.pdf. Accessed July 17, 2017.
7. OHA. Falls Among Older Adults in Oregon. *Oregon Falls Fact Sheet 2014*; http://www.oregon.gov/oha/PH/DiseasesConditions/InjuryFatalityData/Documents/FactSheets/Falls_Older_Adults_2015v02262015.pdf. Accessed July 31, 2017.
8. OHA. Healthy Aging in Oregon Counties. <http://www.oregon.gov/oha/PH/DISEASESCONDITIONS/CHRONICDISEASE/LIVINGWELL/Documents/Data/hlthyaging.pdf>. Accessed June 27, 2017.
9. CDC. The State of Aging & Health in America 2013. 2013; <https://www.cdc.gov/aging/pdf/State-Aging-Health-in-America-2013.pdf>. Accessed June 28, 2017.
10. OHA. Helping Older Adults Reduce Their Risk of Faling. *Falls Prevention for Older Adults* <http://www.oregon.gov/oha/PH/PREVENTIONWELLNESS/SAFELIVING/FALLPREVENTION/pages/index.aspx>. Accessed July 17, 2017.
11. OHP. Fitness Classes for Older Adults. 2017; <http://www.oregon.gov/oha/PH/PREVENTIONWELLNESS/SAFELIVING/FALLPREVENTION/Documents/FitnessClasses.pdf>. Accessed July 30, 2017.
12. OHA. Resources for Older Adults. *Falls Prevention for Older Adults 2017*; <http://www.oregon.gov/oha/PH/PREVENTIONWELLNESS/SAFELIVING/FALLPREVENTION/Pages/Resources.aspx>. Accessed July 17, 2017.
13. Mult.Co. Aging Safely at Home. 2016; <https://multco.us/health/staying-healthy/aging-safely-home>. Accessed July 17, 2017.
14. Colon-Emeric CS, Whitson He Fau - Pavon J, Pavon J Fau - Hoenig H, Hoenig H. Functional decline in older adults. (1532-0650 (Electronic)).
15. NIH. Aging Changes in the Senses. <https://medlineplus.gov/ency/article/004013.htm>. Accessed August 28, 2017.
16. Hanlon JT, Zhao X, Naples JG, et al. Central Nervous System Medication Burden and Serious Falls in Older Nursing Home Residents. *Journal of the American Geriatrics Society*. 2017;65(6):1183-1189.

17. Hefny AF, Abbas AK, Abu-Zidan FM. Geriatric fall-related injuries. *African Health Sciences*. 2016;16(2):554-559.
18. Medscape. Falls in the Elderly: Causes, Injuries, and Management. 2017; <http://reference.medscape.com/features/slideshow/falls-in-the-elderly>. Accessed Aug. 29, 2017.
19. Schepens S, Sen A, Painter JA, Murphy SL. Relationship Between Fall-Related Efficacy and Activity Engagement in Community-Dwelling Older Adults: A Meta-Analytic Review. *The American Journal of Occupational Therapy*. 2012;66(2):137-148.
20. Landers MR, Oscar S, Sasaoka J, Vaughn K. Balance Confidence and Fear of Falling Avoidance Behavior Are Most Predictive of Falling in Older Adults: Prospective Analysis. *Physical Therapy*. 2016;96(4):433-442.
21. NIH. GO4LIFE. *About Go4Life online modules: Endurance. Strength. Balance. Flexibility*. <https://go4life.nia.nih.gov/>. Accessed July 17, 2017.
22. CDC. Physical Activity. *How Much Physical Activity Do Older Adults Need?* 2015; https://www.cdc.gov/physicalactivity/basics/older_adults/index.htm. Accessed July 19, 2017.
23. NIH. Health & Aging. *Exercise & Physical Activity: Your Everyday Guide from the National Institute of Health* <https://www.nia.nih.gov/health/publication/exercise-physical-activity/introduction>. Accessed July 17, 2017.
24. NIH. Health & Aging. *Workout to Go: A Sample Exercise Routine from the National Institute on Aging at NIH* <https://www.nia.nih.gov/health/publication/workout-go>. Accessed July 17, 2017.
25. CDC. CDC'S Tai Chi: Moving for Better Balance Program. *CDC'S TAI CHI MOVING FOR BETTER BALANCE GUIDE FOR IMPLEMENTATION* <http://www.taichimovingforbetterbalance.org/>. Accessed July 17, 2017.
26. OHA. Falls Prevention for Older Adults. *Tai Chi: Moving For Better Balance* <http://www.oregon.gov/oha/PH/PREVENTIONWELLNESS/SAFELIVING/FALLPREVENTION/Pages/TaiChi.aspx>. Accessed July 31, 2017.
27. Lomas-Vega R, Obrero-Gaitán E, Molina-Ortega FJ, Del-Pino-Casado R. Tai Chi for Risk of Falls. A Meta-analysis. *Journal of the American Geriatrics Society*. 2017;n/a-n/a.
28. Li F, Harmer P Fau - Fisher KJ, Fisher KJ Fau - McAuley E, McAuley E. Tai Chi: improving functional balance and predicting subsequent falls in older persons. (0195-9131 (Print)).
29. Manor B, Lough M, Gagnon MM, Cupples A, Wayne PM, Lipsitz LA. Functional benefits of Tai Chi training within senior housing facilities. *Journal of the American Geriatrics Society*. 2014;62(8):1484-1489.
30. Cooney GM, Dwan K, Greig CA, et al. Exercise for depression. *Cochrane Database of Systematic Reviews*. 2013(9).
31. OHA. STEADI Toolkit for Healthcare Providers. *Falls Prevention for Older Adults* 2017; <http://www.oregon.gov/oha/PH/PREVENTIONWELLNESS/SAFELIVING/FALLPREVENTION/Pages/STEADIToolkit.aspx>. Accessed July 17, 2017.
32. NIH. Health and Aging. *Talking With Your Doctor, a Guide for Older People* 2016; <https://www.nia.nih.gov/health/publication/talking-your-doctor/opening-thoughts-why-does-it-matter>. Accessed July 17, 2017.
33. Panel on Prevention of Falls in Older Persons AGS, British Geriatrics S. Summary of the Updated American Geriatrics Society/British Geriatrics Society Clinical Practice Guideline for Prevention of Falls in Older Persons. *Journal of the American Geriatrics Society*. 2011;59(1):148-157.

34. NCOA. Center for Healthy Aging. *National Falls Prevention Resource Center* 2017;
<https://www.ncoa.org/center-for-healthy-aging/falls-resource-center/>. Accessed July 18, 2017.