Editorial

Fall Risk Assessment

Arvind Mathur

Physical fitness determines the level of functional ability of the elderly. Muscle strength and endurance, cardiovascular and pulmonary endurance, flexibility, and body composition are health-related components of physical fitness. With age physical and cognitive functions decline, compromising optimum physical performance among older adults which result in a higher risk of fall and injury. In older adults age (>65 years), arthritis, impairment in activities of daily living, depression, diabetes and hypertension are the factors predicting falls. Decreased processing of visual stimuli, limitations to cognitive processing, and slow reaction time also contribute to falling incidents. Falls among older adults lead to loss of physical function and independence, hospitalisation from trauma, injury-related deaths and fractures, decrease in quality of life, and associated healthcare cost.

The causes of falling are multi-factorial and include extrinsic (environment-related), intrinsic (person-related) and behavioural (activity-related) factors. Early screening for the risk of fall and thus fall prevention in older adults is essential for effective utilisation of healthcare resources. Numerous simple and composite physical performance tests assessing balance, agility and gait are used for screening risk of falls among older adults. Simple assessment tools include gait speed, limits of stability, and 30-second chair stand that focuses primarily on mobility, balance, or strength function. Meanwhile, composite tests measure physiological impairments (sensation, vision, strength, postural sway, and reaction time) and a battery of physical performance tasks (sit-to-stand (STS), static standing balance, and gait speed) such as physiological profile assessment (PPA) and short physical performance battery (SPPB), respectively. Though these tools identify patients at risk of falling, however, the sensitivity and specificity of existing tools are low.[1]

The short version Physiological profile assessment (PPA) includes contrast sensitivity, proprioception, muscle strength, simple hand reaction time, and postural sway tests to identify falls risk. Short physical performance battery (SPPB) is a composite outcome measure of lower limbs function including strength, endurance, gait, and balance. SPPB measures three components, namely, walking speed, chair stands, and standing balance. SPPB can predict disability, institutionalisation, falls, and mortality among older adults. Ten-step test (TST) is a modified agility test for older adults. Static balance test (SBT) is measured using an intelligent balance board. The balance board detects anteroposterior, and mediolateral sways in degrees and an overall function scores are calculated using the balance board computer software interface. SBT measured objectively using a balance board is one of the most robust physical performance measures for physiological falls risk. Dynamic balance is assessed using functional reach test (FRT) that mainly focuses on anterior and posterior stability. FRT has excellent reliability and can predict falls risk among older adults. Dominant hand-grip strength (DHGS) is measured using a handheld dynamometer. DHGS has good-to-excellent reliability in older adults. Gait speed test (GST) is a measure of mobility and has been reported to be able to predict falls risk among older adults. Timed Up and Go test (TUG) test is a measure of functional mobility for assessment of gait and balance among older adults. TUG test has a significant correlation with physiological falls risk among community-dwelling older adults. TUG test is recommended as a routine screening tool to assist clinicians in identifying patients at risk of falling. However, the Timed Up and Go test should not be used in isolation to determine individuals at high risk of falls in the community.[1]

Current assessment tools of balance in clinical and community settings such as the Berg Balance Scale (BBS), Performance-Oriented Assessment of Mobility (POMA), Community Balance and Mobility Scale (CB&M), the Dynamic Gait Index (DGI) and Balance Evaluation Systems Test (BESTest) intend to

evaluate dynamic balance control. These traditional balance measures are time-consuming and are limited by the subjectivity in the scoring.

Furthermore, physical performance measures which are designed to assess fall-risk show poor ability to provide a quantitative prediction of gait stability and fall-risk in healthy and active elderly populations. Physical performance tests may not be used as a stand-alone test to screen for falls risk among community-dwelling older adults.

Effective fall risk screening is still underutilised and not routinely integrated into clinical practice due to overreliance on unreliable subjective measures, lack of cost-effective assessment technology and clinical time constraints.

The 'gold standard' for measurement of balance control in the laboratory involves kinetic force platform (FP) posturography and/or kinematic motion analysis technology. These are time-consuming, complex and too expensive for everyday clinical use. Recent advancement in sensing technology offers the possibility of objective, accurate, low-cost and easy-to-implement fall risk assessment. Four major sensing technologies (inertial sensors, video/depth camera, pressure sensing platform and laser sensing) can efficiently capture and analyse movement data and though with limitations may provide an easy-to-implement objective fall risk assessment. Smartphone technology and wearable sensing technology are being utilised for the same.[2,3]

Individual physical exercise programs which aim to increase strength, walking, balance, moves and climbing stairs reduce the incidence of falls.[4] In the present issue, Naik *et al.* in a small number of subjects have demonstrated that there's a significant improvement in stability and functional activity for the performance of ADL's after the ankle exercise program and proprioceptive training.[5] Regular physical activity reduces the risk of various chronic diseases and maintains functional ability in older adults. A multicomponent exercise program with aerobic activity, muscle-strengthening, flexibility and balance exercises is recommended for older adults.[6] Integrative exercise training of sensorimotor, neuromuscular, and cardiovascular functions addressing physical performance indices improve balance confidence in the elderly. Besides exercises in the high-risk population, it is necessary to add intervention in the house, infrastructure and furniture facilities for fall prevention.

Fall risk assessment is an essential aspect in the clinical evaluation of older adult. Hopefully simple, precise, fast and inexpensive screening tools developed with novel technology for fall risk assessment will be easy to administer in busy clinical settings and will reduce the assessment burden for health care providers and patients.

References

1. Devinder KA Singh, Sharmila GK Pillai, Sin Thien Tan, Chu Chiau Tai, and Suzana Shahar Association between physiological falls risk and physical performance tests among community-dwelling older adults *Clin Interv Aging*. 2015; 10: 1319–1326
2. Ruopeng Sun and Jacob J. Sosnoff Novel sensing technology in fall risk assessment in older adults: a systematic review *BMC Geriatrics* 2018;18:14
3. Kathleen L Roeing, Katherine L Hsieh, Jacob J Sosnoff. A systematic review of balance and fall risk assessments with mobile phone technology *Archives of Gerontology and Geriatrics*, 2017;73: 222-226
4. Howe TE, Rochester L, Neil F, Skelton DA, Ballinger C Exercise for improving balance in older people. *Cochrane Database Syst Rev*. 2011 Nov 9;(11): CD004963. doi: 10.1002/14651858.CD004963.pub3.
5. Naik S and Nagarwala R. Effect of Ankle Exercise Program and Proprioceptive Training on Stability, Functional Activity Performance in Elderly Population *Journal of The Indian Academy of Geriatrics,* 2018; 14: 5-8
6. Soonhee Kang, Sujin Hwang, Aimee B. Klein, and Seok Hun Kim, Multicomponent exercise for physical fitness of community-dwelling elderly women *J Phys Ther Sci*. 2015 Mar; 27(3): 911–915.