Falls among the Elderly - Preventive Physiotherapy Aspects

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ABSTRACT

A fall is an incident that results in an individual coming to rest unintentionally on the floor or ground or other lower level[1] and can result in fracture, dislocation, traumatic brain injury, and even death. [2]. Not all falls will result in injury, but even a minor fall could have catastrophic effects on physical and mental health[3,4]. Falls represent the most frequent and serious type of accident in people aged 65 years and older and are the most common mechanism of injury in elderly trauma patients presenting to accident and emergency units. The risk of falls and related complications dramatically increases with age and can be an indication of increasing frailty, as per the research report of the Scottish government[6]. A major component of age-related weakness and frailty is the gradual loss of muscle tissue (sarcopenia). As age advances, the role of preventive physiotherapy is to help recondition muscle strength and restore movement, balance, and function[15.]

Hence, there is a role for preventive screening in evaluating an older person's likelihood of falling using the Physiological Profile Assessment (PPA) [16]. It involves a comprehensive series of simple tests of vision, muscle force, reaction time, peripheral sensation, and postural sway that can be administered quickly with portable equipment. The results can differentiate people at risk of falls ("fallers") from people less at risk ("non-fallers") as the tests identify specific contributions of the visual, vestibular, proprioceptive, and musculoskeletal systems to create a 'balance profile'.

Physiotherapy Assessment

History Taking: A good history allows you to identify fall risk factors or causes, leading to a possible explanation or clinical diagnosis. A thorough physiotherapy assessment may identify additional cause(s) of falls, not previously known, that might be addressed[9].

Physical examination: This should include assessment of gait, balance, joint range of movement, and muscle strength. The 'timed get up and go' test (TUGT), a validated assessment tool, is more used as compared to the 'Berg balance test.' TUGT is to determine fall risk and measure progress of balance, sit-to-stand, and walking and needsone chair with armrests, a stopwatch, and inch tape (to mark 3 meters) for the test. The patient starts in a seated position and stands up upon the therapist's command, walks (3 meters), turns around, walks back to the chair, and sits down. The time stops when the patient is seated. The subject is allowed to use an assistive device, and it should be documented. A practice trial should be completed before the timed trial cut-off time of 14 seconds, and those taking more than that are at high risk for falls. This test was initially designed for elderly persons, but it is also used for people with Parkinson's disease, multiple sclerosis, hip fracture, Alzheimer's, cerebrovascular accident (CVA), Huntington's disease, and some others.

Functional ability: This can be reviewed through subjective questioning, e.g., how a person manages personal and domestic activities in daily settings. e.g., walk and carry objects. A poor response in a dual-task setting is a

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possible prognostic value for multiple falls[13]. Falls Efficacy Scale International (FES-I) is used to determine a patient's confidence when performing activities.

Physiotherapy intervention

Physiotherapists can influence the elderly to increase their physical activity levels through various types of exercise and educate them to improve their general state of health and well-being. Physiotherapy intervention is multifactorial, aiming to prevent and minimise future fall risks through achieving a number of physiotherapy goals. Four major physiotherapy goals have been identified when working with older fallers[11].; (i) prevention of further falls—by working on mobility, balance, and strength (ii) training clients to cope with further falls and minimise the consequences of a long lie—teaching them ways to get off the floor or means to call for help, and in the meantime, how to keep warm; (iii) ensuring their living environment is as safe as possible; and (iv) restoration of confidence and self-esteem to improve their quality of life. The goals of the therapeutic intervention in each phase of increasing risk for falls are

(a) *Early phase* (patients have no or little limitations)—prevention of inactivity, prevention of fear of moving or falling, and preserving or improving physical capacity. e.g., exercising for a minimum of sixty minutes per week; the optimum frequency of exercise is three times a week; balance and strength training should be moderate to high challenge[12, 13]

(b) *Mid phase* (more severe symptoms)—performance of activities becomes restricted, balance problems and an increased risk of falls, with problems in transfers, body posture, reaching and grasping, balance, and gait. e.g., exercising for a minimum of forty-five minutes per week; the optimum frequency of exercise is two times a week; balance and strength training should be a mild to moderate challenge [12, 13]

(c) *Late phase* (patients are confined to a wheelchair or bed)—preserve vital functions and prevent complications, such as bed sores and contractures. e.g., exercising for a minimum of thirty minutes per week, the optimum frequency of exercise is one time a week, and balance and strength training should be a mild challenge[12, 13]

Physiotherapy management in fall prevention among the elderly

Physiotherapists are expanding their service to deliver fall intervention with standard inpatient care and moving to several different settings—for example, within hospitals, home care, and community clinics. In addition, their role has been expanding in emergency departments to assess and treat trauma and soft tissue injuries and to undertake frailty and falls risk screening[13] Exercise therapy programs have been shown to have the most effective outcomes (for strength and balance) in the reduction of fall rates [14].

Resistance Training

Sarcopenia is the gradual loss of muscle tissue, resulting in decreased strength, and 2% of skeletal muscle mass is lost each year past the age of fifty, [15]. It also increases the risk of frailty and falls and, in turn, hospitalisation in the elderly [16]. Resistance training has an important role in the prevention and treatment for sarcopenia. It improves muscular fitness by exercising a muscle or a muscle group against resistance [19], improves function, increases quality of life, and reduces likelihood of falls[20,21]

A few good examples of resistance training for elders are;

(i) Arm Curl with Resistance Band: Sit in a sturdy, armless chair with your feet flat on the floor, shoulder-width apart. Place the centre of the resistance band under both feet and hold each end of the band with palms facing inward. Keep your elbows at your sides and breathe in slowly. Keep wrists straight and slowly breathe out as you bend your elbows and bring your hands toward your shoulders. Hold the position for one second and breathe in as you slowly lower your arms. Repeat 10-15 times. GI rest; then repeat 10-15 more times.

(ii) Seated Row with Resistance Band: Sit in a sturdy, armless chair with your feet flat on the floor, shoulder-width apart. Place the centre of the resistance band under both feet and hold each end of the band with palms

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facing inward. Relax your shoulders and extend your arms beside your legs. Breathe in slowly. Keep pulling both elbows back with your breath out until your hands are at your hips. Hold the position for 1 second. Breathe in as you slowly return your hands to the starting position. Repeat 10-15 times. Give rest; then repeat 10-15 more times.

Balance Re-education

Balance disorders are very common in frail older adults and are a key cause of falls in the older population. They are associated with decreased level of function, as well as an increased risk of disease. Most balance disorders comprise several contributing factors, including long-term conditions and side effects of medications.[20]. The balance training is highly challenging and should be individualised and progressive. Exercise should be at least twice a week and for a minimum duration of 6 months, and along with a high-intensity or high-dose program, walking should also be prescribed[20].

A few good examples of balance training for elders are:

(a) Balance Walk: Raise arms to sides, shoulder height. Choose a spot ahead of you and focus on it to keep you steady as you walk. Ask to walk in a straight line with one foot. Place one foot in front of the other, and while walking, lift your back leg and pause for one second before stepping forward. Repeat this process for 20 steps, alternating between legs.

(b) Progressing to Improve Balance—Strengthening legs and ankles can help improve your balance, and as you progress, try adding the challenges. For example, start by holding on to a sturdy chair with both hands for support. To challenge yourself further, try holding on to the chair with only a single hand. As you feel steady, try using just one finger to balance you. Then, try balancing without holding on. When you are steady on your feet, try doing the exercises with your eyes closed.

Improve Flexibility

Flexibility is the ability to move freely a joint or joint complex without restriction of movements. Muscle strength is the ability of contractile tissue to produce muscle tension. Muscle endurance is the ability of a muscle to contract repeatedly against a load (resistance), generate a sustained tension, and resist fatigue over an extended period of time. Flexibility or stretching gives more freedom of movement for everyday physical activities such as getting dressed, reaching objects on a shelf, and washroom activities. Stretching exercises can improve flexibility but not improve your endurance or strength.

A few good examples of flexibility exercises for elders are:

(a) Thigh Standing—Stand behind a sturdy chair with your feet shoulder-width apart and your knees straight, but not locked. Hold on to the chair for balance with your right hand. Bend your right leg back and grab your foot in your right hand. Keep your knee pointed to the floor. If you can't grab your ankle, loop a resistance band, belt, or towel around your foot and hold both ends. Rhythmically pull your leg until you feel a stretch in your thigh. Hold the position for 10-30 seconds and repeat at least 3-5 times. Then repeat the same at least 3-5 times with your left leg.

(b) Calf Standing—Stand facing a wall slightly farther than arm's length from the wall, feet shoulder-width apart. Put your palms flat against the wall at shoulder height and shoulder-width apart. Step forward with your right leg and bend your right knee. Keeping both feet flat on the floor, bend your left knee slightly until you feel a stretch in your left calf muscle, not feeling uncomfortable. If you don't feel a stretch, bend your right knee until you do and hold the position for 10-30 seconds, and then return to the starting position. Repeat with the left leg. Continue alternating legs at least 3–5 times per leg.

Exergaming

It is a relatively new treatment concept and is thought to increase motivation and enjoyment. Nintendo Wii has designed a balance exercise program that could improve balance ability in the frail elderly population.[22]. It is

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really a fun way to engage people in intergenerational physical activity to improve physical function. The Wii balance training has been shown to reduce falls by 69% compared with conventional training.[25]. The Wii balance training allows people to practice at home and to monitor their goals in a guided manner by a trained physiotherapist. *For example, a person stands on a particularly designed board in front of a computer screen. The computer screen captures this person's complete image with an infrared light sensor, including direction, speed, and acceleration, that enables him/her to perform foot movements. In this exercise board, there are four pressure sensors for both feet to observe their movement pattern in real time as projected on screen. The screen captured the person's movement with pressure sensors that control movement acceleration. Finally, the person can control his or her movement balance with auditory and visual feedback from the computer screen.*

Backward Chaining

Backward chaining is a method to re-educate patients in rising from the floor without support. It consists of a sequence of movements combined together to help teach someone to be able to get down to the floor safely. Once learnt, the sequence is reversed and can apply to teaching a safe and effective way to get up from the floor. The movement is broken into several stages depending on the patient's ability, namely (i) face your chair, holding onto the arms or the seat; (ii) lunge back with one leg; (iii) bend your back knee down to the floor; (iv) bring your other knee down to the floor; (v) bring one hand off the chair and onto the floor; (vi) bring your other arm down to the floor so that you are kneeling with both arms supported; (vii) lower your hips onto the floor; and (viii) lower yourself down until you are lying on the floor. Once a patient completes the first sequence of the stage, they will then return to a stand. This is repeated until the patient can stand from lying on the floor. The effect of backward chaining on an individual's ability to rise at least 20-40% unassisted from the ground has been proven to be beneficial.[28].

Tai chi

Tai chi, originally an ancient 13th-century Chinese martial art, has recently become more prevalent around the world as a health-promoting exercise, especially in fall prevention.[24]. It's really a newly emerging exercise incorporating breathing, relaxation, and slow and gentle movements with strengthening and balance exercises. Additionally, in a high-quality systematic review, Tai chi not only significantly reduced the rate of falls but also lessened the risk of falls.[14]. As tai chi is considered a low-impact exercise, it is suitable for most elderly people.

Role of Health Care Education

The role of health care Education in health care commonly uses the fear avoidance model to prevent acute musculoskeletal pain from becoming chronic [28,29].The hypothesis in this model is to explain fear of falling and avoidance of activity in health care counselling[27.] Extreme avoidance can lead to a decline in physical function and ultimately an increased risk of falls. Once a patient has a fall experience, there is further fuelling of fear and avoidance of activities throughout life, and this can definitely affect long-term outcomes.

The physiotherapist is in an ideal position to steer the individual towards the route of confrontation and recovery as opposed to activity avoidance and disability [30]. There is evidence from two systematic reviews highlighting the benefits of treatment to improve confidence and reduce fear of falling [31, 24]. Recommended interventions are guided exercise protocols, including Tai Chi and multi-component falls prevention programs [33, 24]. In the Guided Exercise Protocol, exercise should be a high dose, ideally, at least twice per week on an ongoing basis. Multicomponent exercise programs focusing on general strength, high-level balance, backward chaining, etc., are recommended in reducing the risk of falls and could result in reducing hospital admissions. Physiotherapy can take place in either individual or group settings or in clinic- or home-based settings. Brisk walking training should not be prescribed to those at a high risk of falls; instead, focus only on guided exercise programs that include a high-level challenge to balance, strength, flexibility, and walking training[21].It should also be done for at least two hours weekly, and not just for high-risk people.

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CONCLUSION

To conclude, just 'being elderly' is not an acceptable justification for a fall, and not all falls can be explained easily. Most falls are multifactorial in origin and usually require several interventions that include a combination of medication review, health care education, environmental modification, and a systematic guided exercise program[34]. It should ideally be delivered by an interdisciplinary team of a family physician, nurse, physiotherapist, and community health worker, with each member having their duties and responsibilities. It is to be highlighted that interventions provided through physiotherapy, or physiotherapists as part of a team, can be provided in different settings and can modify the risk and help to prevent future falls among the elderly. Hence, the physiotherapist's role is to work with the interdisciplinary team, assessing possible fall causes, planning interventions, and educating health workers, thus working holistically to address the issues of the elderly.

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