Leaders

Physical activity to prevent falls in older people: time to intervene in high risk groups using falls as an outcome

Fall related injuries and the resulting deaths in older adults are a major, and increasing, health problem world wide.[1–3] About 30% of people over 65 years of age fall at least once a year, and about half of these do so recurrently.[1 3 4] A fall may result in a fracture, particularly in an older person, and about 90% of hip fractures result from falls.[5] The outcome of a hip fracture is fatal in 12–20% of cases.[6] The annual cost of fall related fractures in the United States is estimated to be $10 billion.[7] Furthermore, the incidence of hip fractures continues to rise steadily, even when age adjusted figures are used.[1 2]

There are many causes of falls, and they are reviewed in detail elsewhere.[8 9] Some of the major categories of risk factors for falling are:

- General physical functioning
- Gait, balance, and physical performance
- Musculoskeletal and neuromuscular measures
- Demographic factors—for example, age, race
- Sensory impairments
- Medical conditions
- Indicators of general health
- Medication use
- Psychological, behavioural, social, and environmental factors

Even a cursory scan of this list discloses many modifiable factors.[10] Therefore strategies for injury prevention may have an important role in alleviating the problem of fall related injuries. Training that involves strength, balance, and improved transfer must form part of an optimum intervention strategy to prevent falls.[11 12] This editorial aims to highlight opportunities for sports medicine clinicians and scientists who wish to work in a multidisciplinary research setting to limit the epidemic of injuries from falls in the elderly. We discuss research approaches at four overlapping levels of inquiry: basic science, applied science, clinical trials, and health services.

Basic research into biological mechanisms

Basic scientific research into fall prevention is concerned with the mechanisms that control balance, particularly in nerves and muscles. Balance relies on central nervous system integration of the somatosensory, vestibular, and visual systems, and basic science researchers are unravelling this process. For example, new techniques have been developed to measure the potentials that pass along sensory nerves to the vestibular system.[13] Researchers are investigating how sensory nerves age and whether their signals to the central nervous system can be improved with training. Similarly, muscle physiologists are evaluating the cellular mechanisms that may explain the slower peak forces generated by ageing muscle.[14 15]

Applied research into the mechanisms that underlie falls

Applied scientific research into fall prevention looks at areas such as the role of gait in fall risk,[16] fall recovery mechanisms, and fall strategies to minimise injury.[17] Slow gait is a well established, but remediable, fall risk factor. Fall recovery refers to the ability to avoid falling after tripping or stumbling.[17] The rationale behind strategies of falling arose from data showing that hip fractures are usually the result of falls on to the greater trochanter region.[5] Thus, if people can learn to fall in a way that avoids this contact, a hip fracture may be prevented. Acting on the notion that not all falls can be prevented, however, Finnish sports medicine researchers recently reported in the *New England Journal of Medicine* that a specific hip protector reduced fractures in high risk residents of nursing homes.[18]

Multifactorial clinical trials powered to study falls as an outcome measure

There is an urgent need for more good quality clinical trials implementing multifactorial interventions to prevent falls in high risk community and nursing home populations. Multifactorial interventions include rationalisation of medication, physical training to improve strength, balance, and transfers, and removal of hazards in the home that may cause falls.[12 19]

A large number of clinical trials have examined the effect of various interventions on fall risk factors.[9] Fall risk factors—for example, reduced sway, muscle weakness—serve as a surrogate measure of falls and permit investigators to enroll fewer subjects for a shorter period of time than would be needed to measure falls themselves. Only a dozen randomised controlled interventions have measured falls as the primary outcome.[3 11] We believe that clinical trials must now focus on falls as an outcome. Learning from the bone health field, we note that surrogate outcome measures have variously underestimated[20] and overestimated[21] the effects of an intervention on the outcome in question. Pharmaceutical trials in prevention of osteoporosis fractures gained credence when they showed fracture reduction, not just improvements in the surrogate—that is, bone mass.[22]

Thus clinical trials of fall intervention must be powered sufficiently to measure falls as a primary outcome measure. Clearly the more at risk the population is of falling, the smaller the number of subjects that must be studied. The classic (and successful!) clinical trials of fall intervention have recruited 300 70 year olds[12] and 230 80 year olds.[19] Such studies cost around $US150 000–250 000 and are eminently fundable given the costs resulting from fractures, nursing home care, and death.[23]

Involvement of health care services and policy academics in research into fall prevention

Many fall related injuries have well documented health costs—for example, the direct cost of a hip fracture treated in the United States is $US30 000. Furthermore, interventions for fall prevention lend themselves to implementation as public health policy. Thus, there is an urgent need for physical activity researchers to collaborate with scientists and administrators in the health policy and services field. Australian researchers showed that a community based intervention of public education and increased awareness of fall risk factors reduced self reported fall rates by 22% and fall related hospital stay by 20%.[24] This intervention

reached roughly 40 000–60 000 people at a total cost of $A600 000. The study did not report potential cost effectiveness of this intervention. To date, no falls prevention study has had sufficient power to show a reduction in serious injuries from falls such as fractures. However, some studies of falls prevention intervention reported a reduction in health care use as a result of the intervention.[3]

Fall prevention research in the at risk elderly is fertile ground for "sports" medicine

The term "sports" medicine was a useful one in the 1970s as this field emerged, but it is now much too narrow for a discipline that embraces the health benefits of physical activity and exercise. The British Association of Sport and Medicine (BASM) changed its name to the British Association of Sport and Exercise Medicine (BASEM) for precisely this reason. Narrowly defined "sports" medicine research may be some way from intervention to prevent fall related fractures in 90 year old people, but, in truth, exercise medicine may be the most potent treatment for exactly this age group. Appropriately prescribed exercise can at once reduce major fall risk factors[25] by improving upper and lower limb strength, balance, coordination, transfer skills, and reaction to environmental hazards. Physical activity may also reduce the need for sedative medications. Therefore the best methods of fall prevention may involve expert exercise prescription with qualified supervision, rather than a pharmaceutical agent.

We encourage the exercise medicine clinician and researcher to tackle the problem of fall prevention as many of our colleagues have already done.[3 18 26–28] Given the enormous financial burden that fall related injuries place on government coffers, there is no doubt that granting agencies will continue to fund this important area of research. Physical activity researchers can play a pivotal role in this research as all the successful studies of multifactorial fall prevention to date have had a physical training programme at their core.[12 19]

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