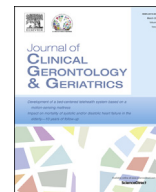




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Special article

Strategies on fall prevention for older people living in the community: A report from a round-table meeting in IAGG 2013



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ABSTRACT

Over the past decade, a number of programs and strategies have been proposed and developed in an effort to reduce risks among the elderly in relation to falling or sustaining fall related injuries. Programs vary in their approach, and also in their target populations. We held a round-table meeting to present each country's research data on fall prevention in older people and summarized them in order to formulate evidence-based suggestions on the prevention of falls in older people. Although the contents and level of progress of each country's studies had some differences with regards to fall prevention, the social issues of fall prevention was of particular interest in large scale cohorts studies and fall prevention guidelines. We recommended some good practice points for the strategies on fall prevention for older people living in the community based on clinical experience or expert consensus.

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1. Introduction

Falls are a significant cause of harm in older people. To prevent falls, various strategies should be put in place for all elderly people. In several countries over the past decade, a number of programs and strategies have been proposed and developed in order to reduce risks among the elderly in relation to falling or sustaining fall-related injuries. Programs vary in their approach and their target populations. Although the importance of fall prevention has been widely acknowledged, health care professionals from different fields in Asia and Australia need to facilitate the design and implementation of culturally-appropriate evidence-based

interventions, in order to significantly reduce the number of falls or relating factors among elderly people in the community.

A round-table meeting was organized during the 20th International Association of Gerontology and Geriatrics (IAGG) World Congress in Seoul (June, 2013) with the aim of collaborating on strategies for preventing falls in the elderly living in the communities of Asia and Australia. The aims of the round-table meeting was to present each country's research data on fall prevention in older people, to summarize them, and to formulate evidence-based suggestions on the prevention of falls in older people based on the best consensus available to the panel of experts.

2. Methods

2.1. Invitation of speakers

Nine experts panels (3 from Korea and 6 from other Asian countries and Australia) were selected before the IAGG 2013

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meeting. They were all experts in fall prevention, and were also geriatricians. The nationalities of the invited geriatricians from Asia were Korean, Japanese, Chinese, Hong Kong (Cantonese), Taiwanese, Malaysian, and Australian.

2.2. Preparing the round-table meeting

Each panel expert was asked to summarize research papers from literature searches including meta-analyses, systematic literature reviews, randomized controlled trials (RCTs), controlled before-and-after studies, and cohort studies for fall intervention. These studies were written for each country and published in the speaker's country. During the round-table meeting, the speakers presented the results of the studies. Literature searches were carried out with the aim of identifying the highest quality information for each intervention [systematic reviews (SRs), particularly Cochrane Reviews, meta-analyses, and randomized controlled trials]. This is in line with the recommended method for evidence-based practice, when in an event of emergency where clinical questions need to be answered quickly; Cochrane Reviews provide the best quality literature for clinicians. The information retrieved was checked and supplemented through discussions from the extensive round-table meeting of expert panels.

3. Results

3.1. Korea

Electronic literature searches were carried out using PubMed, and three Korean medical databases (KMBase, KISS, and MEDLIS). The search terms "fall" and "Korea" were among those that appeared to retrieve studies that met the inclusion criteria. They included fall prevention studies with a reduction in falls/fall-related injuries, and a reduction in risk factors that did not necessarily lead to a reduction in falls/fall-related injuries. The experts categorized the studies based on the level of research evidence, and searches generating at least 34 hits. Three SRs,^{1–3} six RCTs,^{4–9} 18 controlled clinical trials (CCTs),^{10–27} and seven noncontrolled pre-post trials met the inclusion criteria, all of which had been published between 2000 and 2013. Fall prevention strategies were categorized into three groups: exercise intervention programs, programs including exercise, and environmental modification programs.

In the exercise program, two SRs,^{1,2} five RCTs,^{4–8} and 13 CCTs^{10–22} were incorporated. One SR¹ covered a wide range of conditions with regards to the effectiveness of Tai Chi from Korean, English, and Chinese electronic databases. According to the SR, there is relatively clear evidence suggesting that Tai Chi is effective in fall prevention, the improvement of psychological health, and is associated with general health benefits in older people. Another SR² was on the muscle strengthening effects of exercise programs for the prevention of falls among the elderly in Korea, which was published between 1996 and 2011. In this study, the effect of increased muscle strength on the prevention of falls can only be indirectly suggested, because there are few studies available that report the frequency or history of falls in Korea. Moreover, various kinds of exercise components (balance, strengthening, stretching, and aerobic components), the duration (from 3 weeks to 7 months), and the intensity (30–50minutes) in RCTs, showed positive effects on elderly people's physical health, psychological health, and also improved fall prevention efficacy.^{4–8}

In programs including exercise, one SR,³ one RCT,⁹ and five CCTs^{23–27} were searched. One RCT⁹ examined the effects of FPEP (fall prevention exercise program) on the physical and emotional states of the elderly community in Korea. Components of the program included a range of motion (ROM), strengthening, weight-

bearing, balance, breathing exercises, relaxation techniques, and health education to prevent falls by incorporating self-care skills into the home environment. As a result, the FPEP was found to be effective in improving the physical and emotional wellbeing of the elderly. In environmental modification, there was one pre-post study²⁸ regarding the effectiveness of bathroom grasp bars in fall prevention in the elderly. Though there were no differences in the number of people falling, the "fear of falling" score decreased after the intervention.

In summary, exercise programs can be an effective prevention strategy but more research is needed to determine if one type of exercise is more effective than another type, as well as which exercises are best for the elderly living in the community. There is insufficient evidence to conclude whether or not programs, including exercise programs or environmental modification programs, are effective prevention methods. However; they all play a role as part of a multifactorial strategy that includes clinical assessment followed by targeted intervention.

3.2. Japan

Six RCTs were presented. Five of them were exercise intervention^{29–34} and one of them was olfactory stimulation with relaxation intervention.³⁰

The exercise programs consisted of various interventions such as balance, coordination (complex obstacle negotiation), walking, strengthening, Tai Chi, and exercise. RCT consisted of olfactory stimulations with lavender odor that was carried out in nursing homes with residents. The results all showed a lower rate of falls and fractures, and improvement in the physical conditions of those in the intervention groups when compared with the control group. The experts evaluated whether or not a complex course obstacle negotiation exercise (CC) and a 24-week exercise program can reduce falls and fractures in older adults, compared with a simple course obstacle negotiation exercise (SC) program. This trial was carried out using older adults of ≥ 75 years of age from Japan.³¹ A total of 157 participants were randomized into the CC group ($n = 78$) and the SC group ($n = 79$). The intervention was completed in 24 weeks. The outcome measure was the number of falls and fracture rates among the two groups for a period of 12 months post exercise classes. Two participants (2.8%) in the CC group and 19 participants (26.0%) in the SC group experienced falls during the 12 month period. During the 12-month follow-up period after the intervention, the incidence rate ratio (IRR) of falls in the SC group compared to the CC group was 9.37% (95% confidence interval = 2.26–38.77). One participant (1.4%) in the CC group and eight participants (10.9%) in the SC group experienced fractures during the 12 months post exercise classes. The IRR of fractures in the SC group compared to the CC group was 7.89% (95% confidence interval = 1.01–61.49). The results of the present trial showed that participants who received individualized obstacle avoidance training under complex tasks combined with traditional intervention, had a lower incidence rate of falls and fractures during the 12 months after the intervention, compared to the other group.

3.3. China

Falls have a significant impact on the physical and psychological health of the elderly population, and are highly associated with mortality, hospitalization, and quality of life. The Ministry of Health (MOH) of China recently published the first Fall Prevention Guideline. However, there are few longitudinal studies on elderly falls in community-based cohorts that can prevent the first fall and prevent recurrent falls in the elderly. Using data from our longitudinal community cohort study in Beijing, the incidence of falls

and recurrent falls was investigated in people older than 55 years, and the data was compared with reports from other areas of China. The incidence of falls and recurrent falls in elderly people older than 65 years in Beijing is 7.06% and 19.27%, respectively, according to one follow-up survey. After adjusting for age, gender, intervention effect, living urban districts, living alone and taking more than four medications, diabetes, depression, eye diseases, and mental health problems were issues that were all significantly associated with an increased risk of falls. Environmental conditions, including stair-rail problems, and dark hallways or room lighting can increase the risk of falls. A general community educational intervention has been negatively associated with falls (odds ratio = 0.81, $p = 0.0480$). Tinetti's Balance score is a good predictor for falls.³⁵

Two RCTs and one CCT were researched. One of the RCTs analyzed the effectiveness of an educational intervention on improving the knowledge level of Chinese registered nurses on the prevention of falls in hospitalized older patients.³⁶ The other RCT evaluated the effect of a KAP model (Knowledge, Attitude and Practice model) intervention that is appropriate for fall-induced injuries among the elderly in the community.³⁷ One CCT studied the effectiveness of a community-based multifaceted fall prevention program in older Chinese adults, and the components of the intervention were behavioral-based, which included educational programs and environmental modification programs. After intervention, 7.19% of the intervention community sample reported falls, compared with 17.86% reported falls from the control community sample. These results were not significantly different.³⁸ The last of the two studies showed good psychological results, whereas the first RCT showed a reduction in fall rates compared to the control group.

3.4. Australia

According to the 2012 Cochrane Review of fall prevention among older people in a community setting, 27 of the reported randomized controlled trials conducted worldwide took place in Australia.³⁹ These include a number of studies on older people, as well as a number of effective interventions; specifically high fall risk groups such as elderly people presented to the emergency room after a fall, or those returning home from hospital after hip fracture rehabilitation. The types of fall interventions in the 27 RCTs are exercise (12 RCTs, 42% positive fall outcomes), vision (2 RCTs, 0% positive fall outcomes), home modification (3 RCTs, 0% positive fall outcomes), vitamin D (2 RCTs, 0% positive fall outcomes), medications (1 RCT, 100% positive fall outcomes), and multifactorial (7 RCTs, 57% positive fall outcomes). In the exercise intervention program, exercise aimed to provide moderate to high challenges, or high challenges for balance, or a total exercise program of >50 hours, which showed more reduction in the number of reported falls in this study (Table 1).³⁹

A number of successful randomised trials were discussed. Lifestyle-integrated functional exercise (LIFE) programs led to a 31% reduction in falls.⁴⁰ Single lens glasses are responsible for the reduction of outdoor falls in those with regular outdoor activities.⁴¹ Cognitive-behavioral learning reduced falls by 31%.⁴² The use of quality medicine programs also reduced the risk of fall injuries.⁴³ Multifactorial interventions for people returning home from a stroke⁴⁴ or in the elderly presented to the emergency room with chronic falls showed no difference compared to other groups.⁴⁵

The experts provided a snapshot of successful and unsuccessful randomized controlled trials conducted in Australia that contributed to our current understanding regarding effective interventions in fall prevention. Additionally, they included brief references to the lack of change in national indicators of fall-related hospitalizations

Table 1

Randomized controlled trials using older people living in the community by types of interventions in Australia from early 2013.

	N	Positive fall outcomes (%)
Exercise	12	42
Vision	2	0 ^a
Home modification/OT	3	0 ^a
Vitamin D	2	0
Medication review	1	100
Multifactorial	7	57

OT = occupational therapy.

^a Sub group analysis indicated some positive outcomes.

over the past 15 years, and also suggested a future direction for research in this area.

3.5. Hong Kong

Studies in Hong Kong revealed that the prevalence of falls and recurrent falls in the elderly, older than 65 years, is 20% and 6% respectively. According to the Hospital Authority, there were 32,636 elderly people admitted to hospital after falls in 2008, of which 28,539 suffered fractures, and 198 subsequently died. Fall prevention programs are highly advocated in the community, but the best outcomes are from those that take fall risks into consideration. RCTs of Tai Chi and resistant exercises for the general public 65–74 years of age showed no difference in their balance, flexibility, or the number of falls. Most study populations were recruited from acute hospitals and emergency departments, but there was a small sample that came from local health centers with suboptimal pick-up rates. Programs varied from out-patient clinics, geriatric day hospitals, health education centers, exercise classes, balance training classes, Tai Chi, case management programs, as well as more sophisticated multi-disciplinary intervention programs.

One cohort study, two meta-analyses, and two CCTs were presented in this paper.⁴⁶ The prospective cohort study is from a multidisciplinary fall clinic with an extended step-down community program that was composed firstly of 3 months data from fall clinics including fall evaluation, balance training, home hazard management program, and medical referrals. This was then followed by 9 months of a community step-down program which included fall prevention education, a weekly exercise class, and two home visits. After 12 months of intervention, it led to a reduction in fall rates (74%), injurious falls (43%), fall-associated medical consultations (47%), and an improvement in the physical condition of patients was shown.⁴⁶

Meta-analysis studies revealed that in the elderly, Tai Chi is beneficial for balance improvement, can lead to a fall reduction, and can affect the whole body vibration (WBV) in areas of balance, mobility, and fall reduction. The results are based on 13 RCTs which indicate that Tai Chi is effective in improving the balance of older adults, but may not necessarily be superior to other interventions. The effect of WBV on other balance/mobility outcomes and fall rates remains inconclusive.⁴⁷

3.6. Malaysia

The annual prevalence of falls in the elderly population, older than 60 years, attending primary care clinics at teaching hospitals in Malaysia was 71/151 (47%), with 57% attending for recurrent falls, 61% injury rate, and 61% due to home falls (27% of falls occurred in the bathroom and 27% occurred on the stairs). In rural dwellers

older than 60 years in Malaysia, the annual prevalence of falls was 141/256 (27%), with 27% having recurrent falls, 67% due to home falls (34% occurred in the living room and 30% occurred in the bathroom), and there was no association found between home safety and the falls. A 10-year follow-up of older individuals presenting with falls to the emergency department revealed 1 year, 3 year, 5 year, and 10 year mortality rates of 22%, 37%, 49%, and 80%. Seventy percent of falls occurred indoors, with 50% occurring between the hours of 06.00 and 12.00. There was a significant reduction in the Barthel ADL score at the 1 year interval compared to prefall levels. Age, indoor falls, hospital admission, and Barthel ≤ 18 were independent predictors of mortality.⁴⁸

The Malaysian Falls Assessment and Intervention Trial (MyFAIT), a single-center randomized-controlled study of individually-tailored, multifactorial intervention has been ongoing in Malaysia since 2012.⁴⁹ Inclusion criteria of participants are older patients older than 65 years with more than two falls or one injurious fall within 12 months in the Primary Care clinic, Geriatric In-Patient clinic, and the Emergency Department. Intervention programs comprised of cardiovascular investigations, strength and balance exercises (Otago), visual assessments and interventions, home hazards intervention, and medication reviews (<http://www.controlled-trials.com/iscrt11674947>). The Malaysian Elders Longitudinal Research (MELoR) project consists of 3000 community-dwelling elderly individuals older than 55 years, and is planning to commence in 2014 in Malaysia.

3.7. Taiwan

Taiwan has become an aging country since 1993, and is estimated to become a geriatric country in 2017, which makes Taiwan one of the fastest aging countries in the world. Rapid population aging may pose special challenges to the health care system and the society. Falling is an important issue and deserves special attention in local communities. A previous study in Taiwan showed that the effectiveness of home-visit fall prevention programs for community-dwelling elderly people, as well as fall prevention programs should be individualized according to the elderly person's needs.⁵⁰ Moreover, a community-based Tai Chi program is effective in preventing the decline of functional balance, gait, as well as the fear of falling. However, Tai Chi did not show significant effectiveness in reducing the number of falls.⁵¹ Nevertheless, a combined Tai Chi plus education program can significantly reduce the risk of falls and shorten the intervention period for fall prevention.⁵² Multilevel community-based intervention programs are considered more effective than a single intervention program. A recent large-scale prospective study confirmed that the multifactorial fall prevention program can significantly improve physical function and reduce fall incidence.⁵³ However, the control group who participated in the education program and recommendations, also led to a reduction in the incidence of falls even without the exercise program. In conclusion, the effectiveness of fall prevention among community-dwelling elderly in Taiwan is dependent on multifactorial interventions, with or without exercises. Exercises and Tai Chi significantly improve physical function, balance, and alleviate the fear of falling but not the actual incidence of falls. Further prospective randomized-controlled trials for community-based fall prevention programs will be of great benefit.

4. Discussion

Studies in Korea on fall prevention programs for primary outcome variables (mainly on the improvement of physical or psychological function in the majority of studies) as opposed to

the frequency of falls looked at the exercise interventions that were most widely used in fall prevention. Even though components of the exercise program were varied according to the type of exercises, (balance, strengthening, stretching, aerobic exercise, etc.), exercise duration (from 3 weeks to 7 months), and exercise intensity (30–50 minutes), most of the results showed positive effects in physical, psychological, and fall efficacy. Intervention studies in Japan, through decreased incidence of falls and fractures in exercise intervention groups, showed improvements in physical factors, especially when a variety of different types of exercise programs were introduced. In China, educational intervention programs, as well as exercise intervention studies on fall prevention were introduced, with the first fall prevention guideline just recently published. According to the research conducted in Taiwan, Tai Chi programs were effective in the treatment of balance, gait, and alleviating the fear of falling, but it was not effective with regards to a reduction in fall incidence rates. Nevertheless, a combined Tai Chi plus education program significantly reduced the risk of falls and shortened the intervention period for fall prevention.

A systematic approach for fall prevention has been progressing in some Asian countries for some time now. The prospective cohort, a meta-analysis for the elderly in Hong Kong has been in progress, and a reduction of falls has been reported by multifactorial intervention. Malaysia is conducting the Malaysian Falls Assessment and Intervention Trials (MyFAIT), individually-tailored intervention programs for fall intervention, which also consists of a multifactorial intervention.

Compared to the other Asian countries, Australia had the most research evidence, as well as the Cochrane Review, on fall prevention methods for elderly people in the community-setting in 2012. A number of studies showed that exercise programs, drug interventions, and multifactorial interventions were effective in reducing falls among community-dwelling elderly people.

Even Although the contents of the studies from each country and their level of progress was different in terms of their fall prevention programs, the social issues in fall prevention has been particularly interesting, and has led to large scale cohort studies or fall prevention guidelines to be worked on. In terms of national-centered programs, community-based programs, or clinic-centered fall prevention programs provided to the elderly, is dependent on each country's national health care policy and their evaluation of the incidence of falls, physical function, social function and the psychological functions of the elderly.

In general, clinical guidelines showed the level of evidence and levels of recommendations, but in this round-table meeting we have decided to recommend GPPs (good practice points) for fall prevention strategies for older people living within the community. GPPs have been developed for clinical practice where there has not been any studies done, and is based on clinical experience and expert consensus.

Firstly, the Asian community recommendation for fall prevention is necessary for the community-dwelling elderly. Secondly, the community-dwelling elderly should use an effective fall prevention program. Thirdly, exercise programs can be an effective single prevention strategy, but more research is needed to determine if one type of exercise will be more effective than others, as well as which exercises are best for seniors. Fourthly, environmental modifications can be effective, particularly in high-risk older people. Fifthly, multifactorial interventions, including exercise programs can be recommended, but more research is needed.

In addition to the topics regarding GPPs, public health policies and prevention programs are needed to integrate the evidence of fall prevention into clinical practice. To effectively address the

growing problem of falls in an ageing society, public policies are needed to provide a vision, to set priorities, and to establish institutional standards. Practice settings are where fall prevention programs should be translated into feasible and affordable interventions.

In summary, the conversion of research results into clinical practice is important, with the need of being more proactive in carrying out a systematic approach in each individual country.

5. Conclusion

We presented each country's strategies on fall prevention in the elderly, summarized them, and discussed GPPs on the prevention of falls in the elderly based on the consensus reached. In the future, progressive academic exchanges with proactive and systematic approaches for fall prevention are expected to integrate policies, preventive measures, and evidence-based clinical practices.

Conflicts of interest

The authors declare no conflicts of interest.

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