



## **ProFouND: Prevention of Falls Network for Dissemination**

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### **DELIVERABLE D 4.2 FIRST EVIDENCE SYNTHESIS AND GENERIC GUIDANCE**

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## 1 Description of deliverable, tasks and Milestones for WP4

### Objectives:

A central objective of ProFouND is to construct a system for providing customised information to users, e. g. for health care provider organisations, health or social care professionals, NGOs, or older people themselves. WP4 will provide the content for the ProFouND Fall Prevention App PFPApp. This will be done by constructing a library of evidence based best practice objects (as if they were component atoms which can be assembled into full guidance) for each domain of the customisation tool, based on reviews of evidence. WP4 will also be responsible for ensuring that these objects are available in the various languages used by partners.

The deliverable for WP4 month 19 was the following:

D4.2) First evidence synthesis and generic guidance [Month 19]

WP4 has performed the following task described in the DOW the first 19 months:

Task 4.1: WP4 will draw on existing systematic reviews and evidence syntheses to identify and operationalize best practice in requisite areas and will put specific attention onto how to implement evidence and overcome barriers to innovation in practice as recommended in Journal of Safety Research Special Issue Vol42, N6, 2011. We will start in areas where the evidence is strong and relatively clear cut, regarding strength and balance exercises, medication review, environmental modification for specific high risk groups etc. In these cases we will present specific recommendations of best practice and guidance of how to implement this in practice. Where evidence is lacking or poorer we will where possible undertake our own review and synthesis, and failing that undertake consensus exercise using (e.g.) Transparent Expert Consultation techniques successfully used in previous fall prevention and research method guidance. However, we know from reviews already undertaken that the evidence base for ICT and other technologies being effective in falls prevention/detection is emerging is meagre. Thus we will initially focus on where evidence is strong and only provide recommendation related to technology when the evidence in this area is better. We will use ICT to provide training in effective solutions and in the use of potential ICT solutions to detection/management and prevention. Our first guidance will be aimed at professional groups. [M1-M19]

Task 4.2: We will unashamedly go for some quick wins in producing guidance. Thus the first guidance will be generic but customisable by each partner to their own house style. This will be based on the review and evidence synthesis undertaken as part of Task 4.1 and will comprise e.g. service level decision and risk assessment algorithms. Translation of this material will be the responsibility of partners, but we will explore crowd sourcing and automated options. [M1-M19]

WP4 has reached the following Milestones the first 19 months:

MS21 Consensus meeting on evidence synthesis

## **2 Development of deliverable**

### **2.1 Introduction and aims**

Up to 2005 the European thematic network ProFaNE (Prevention of Falls Network Europe) was the key resource for fall prevention not only in Europe with more than 4,000 regular users. In the last ten years several countries and organizations have developed valuable new resources on fall prevention. Several systematic reviews and meta-analysis have covered this area. Examples for these activities are the Cochrane Reviews (last update in 2012 and next update expected in 2015), the website of the Centre of Disease Control and Injury Prevention in Atlanta (USA) and similar activities in Canada and Australia. Having this in mind the ProFouND consortium aims to build a repository and more important to extract and compress consented information for practitioners to enhance uptake and adherence. In order to disseminate evidence based knowledge to the service level the consortium decided therefore to keep the messages as comprehensive and short as possible. Another decision taken in order to maximize uptake was to use the 2012/2013 Cochrane Reviews on fall prevention as the main resource and only add other sources when absolutely needed.

### **2.2 Writing process**

The work package leaders agreed on the topics for the facts sheets and the format in the March 2014 meeting. After the initial search a first version of the generic guidance and the fact sheets was circulated in spring 2014 for comments by the consortium. During the network meeting in Vilanova the concept was presented. A revised version of the guidance and factsheets was circulated within the work package leaders in August 2014. For each subject an external expert was identified and was approached in September 2014.

- Exercise: Cathie Sherrington
- Vision: Stephen Lord
- Bone health: Ian Cameron
- Vitamin D: Ian Cameron, Sirpa Hartikainen
- Footwear and protective clothing: Hylton Menz
- Home and environment: Lindy Clemson
- PERS and other ICT-devices: Helen Hawley-Hague, Elisabeth Boulton

Ian Cameron, Sirpa Hartikainen, Helen Hawley-Hague and Elisabeth Boulton contributed so far. Lindy Clemson has agreed to support us.

It is expected that other topics will be proposed by the partners and associates. If useful these can be produced once consensus has been reached in the consortium. Other modifications might occur with the publication of new systematic reviews such as the expected Cochrane Reviews.

One major topic is the fact sheet on risk assessment algorithms. In this area the current approaches are unsatisfactory. The sensitivity and specificity for fall prediction is unsatisfactory. The AUC values of commonly used procedures are 0.6 or less meaning that they are clinically not useful. It is expected that ICT methods will indeed have a major impact in this area and several projects funded by the EC might cause a breakthrough in this area. ProFouND will include these findings as soon as possible to disseminate this knowledge.

### **2.3 Target audience: professionals**

For this deliverable the pre-defined professional target group was service delivery personnel such as health and social care professionals or health care / NGO personnel. The decision taken by the WP leaders was to write the fact sheets and generic guidance in a manner that would allow trans-European uptake and not only for the countries that have already sophisticated fall clinics. At a later stage it is planned to adapt the version for other target audiences.

## **2.4 *Setting: community dwelling older persons***

For the 2014 version of the generic guidance and evidence synthesis it was decided that community-dwelling older persons were the most relevant group. At a later stage it is planned to adapt the version for other groups such as acute, subacute and long-term care.

## **2.5 *Adaptation and translation***

As stated in the DoW we expect that ProFouND partners and associates will translate the material and customize it to their local branding. Whenever major changes or adaptations will be made these should be pre-discussed with the responsible WP leaders. Translated material will be circulated and uploaded via the project website.

## **2.6 *Format and dissemination***

The main resources for the dissemination will be the ProFouND website and the APP. Other printed versions such as leaflets are encouraged. They are within the responsibility of the partners and associates. This process is supported by the uploaded video material already available via the website. There are no deviations from the DoW.

## **3 *Evidence synthesis***

As described before another decision taken in order to maximize uptake was to use the Cochrane Review on interventions for preventing falls in older people living in the community (Gillespie et al., 2012) as the main resource and only add other sources when absolutely needed (e. g. "Falls in Older People. Risk Factors for Prevention." by Lord et al., 2007).

## 4 Generic guidance and implementation guidelines

### Target group:

Older people living in the community

### Multifactorial interventions:

**Multifactorial interventions** assess an individual's risk of falling, and then carry out individualised treatment or arrange referrals to reduce the identified risks. Multifactorial interventions aside from an exercise intervention often comprise other components described below. They are complex interventions and need to be carried out by specific health care professionals working together in an interdisciplinary process. Overall, current evidence shows that this type of intervention reduces the number of falls but not the number of people falling. This shows that they are particularly recommended for persons who have recurrent falls.

### Exercises:

**Selected group and home-based exercise programs** containing progressive balance exercises and strength training effectively reduce the number of falls and the number of people falling. The programs with the best evidence are the Otago Exercise Program (OEP), Tai Chi, and the Falls Management Exercise program (FaME). Evidence suggests that new programs such as Lifestyle integrated Functional Exercise (LiFE) might achieve similar or even better results. Exercise alone has been demonstrated to be effective for persons after a first fall /with lower risk of falling. Overall, exercise interventions reduce fall-related fractures.

### Medication and medical intervention:

Taking **vitamin D supplements** may be effective in reducing falls in persons with low vitamin D levels in the blood before treatment. This needs to be carefully discussed with the responsible physicians.

**Some medications increase the risk of falling.** Gradual withdrawal of psychotropic medication (e.g. benzodiazepines, Zolpidem) for improving sleep, reducing anxiety and treating depression has been shown to reduce falls.

**Insertion of a pacemaker** can reduce falls in people with frequent falls associated with carotid sinus hypersensitivity and cardiac dys-/arrhythmias.

**Causal treatment, specific therapy, medication reviews and prescription modification programs** can also be effective to reduce risk of falling, for e.g. in persons with falling due to hypervolemia (restoring haemodynamic stability) or orthostatic hypotension (discontinuing medication).

### Home and environment:

Interventions to improve **home safety** appear to be effective for people with high risk of falling, particularly those with severe visual impairment. They should be carried out by occupational therapists.

### Footwear:

**Footwear assessment and adjustment** in people with disabling foot pain can reduce the number of falls but not the number of people falling. This shows that they are particularly recommended for persons who have recurrent falls.

### Vision and vision aids:

**Adjustment of optical aid / eyeglasses** (single lens instead of multifocal glasses) and cataract surgery on the first eye can reduce falls.

### Implementation guidelines for fall prevention interventions:

- Falls are everyone's business as there are multiple factors associated with them. Therefore establishing links between acute, community and primary health and social care services, the voluntary sector and charities and private companies is very important.
- It is beneficial to assess the patient in their own environment as you are more likely to identify underlying problems and understand their needs.
- If the team assessing the patient also carries out the interventions, success and take-up is more likely (Gates, Fisher, Cooke, Carter, & Lamb, 2008)
- Follow-up any referrals to other services to ensure action has been taken, communication with all other services is important.
- Further information (e.g. leaflets) should be discussed with the patient and personalised to their needs (not just handed out).
- One size does not fit all. Ensure that the older person knows that the intervention is tailored to their needs. They are more likely to be motivated to comply with it.
- They may have specific goals they want to achieve, assisting them to set these goals and then work towards them will help them understand the importance of the changes they want to make and increase their confidence (Hawley-Hague et al., 2014)
- Older adults can be easily put off engaging in a falls prevention programme if something goes wrong e.g. transport does not turn up, they were not told a session was cancelled. Ensure good communication is maintained at all times.
- Where your intervention is provided in a group environment, encourage group interaction and feedback on success and achievements as it will help motivate participants to stick with any changes they have made (Hawley-Hague, Horne, et al., 2014)
- Engage family members and friends where possible as these can be a key source of support (Hawley-Hague, Horne, et al., 2014; Yardley et al., 2008; Yardley, Donovan-Hall, Francis, & Todd, 2007).
- Give feedback to the person's general practitioner, as positive affirmation from them can support action from the patient (Horne, Skelton, Speed, & Todd, 2010).
- Ensure you follow the person up either by phone call or preferably in person to monitor their progress. Give feedback on their progress, highlighting what they have achieved, it will help with motivation and it will also provide evidence for commissioners.
- When promoting your service focus on the positive action that older people can take to promote healthy ageing, not falls prevention (Yardley et al., 2008, 2007).
- Here are some suggestions:
  - If they are highly fearful of falls and pro-actively seek advice about preventing falls then you can talk to them about risk management and prevention of falls.
  - For all other older people **do not** talk about risk and reducing their risk of falling, they are unlikely to identify themselves at risk. You may want to invite them to an 'ageing well' assessment rather than a 'falls' assessment.
  - Instead talk about:

How strength and balance training will improve their function e.g.  
Getting up and down stairs more easily.

How practicing techniques for getting down and up from the floor means  
that they can play with their grandchildren.

How being given a full health assessment and tailored advice gives them the  
knowledge and opportunity to take control of the situation and promote  
their own health and well-being (for the future if they do not see an issue

now).

How interventions you can offer will help them to manage their health conditions e.g. Osteoporosis, arthritis, parkinsons, stroke.

- Consider getting other older adults who have had positive experiences of your service to share their thoughts and support others, peer support can be very effective (Dorgo, King, Bader, & Limon, 2011; Laventure, Dinan, & Skelton, 2008).

### **What did not work**

There is no evidence of effect for cognitive behavioral interventions on rate of falls. Trials testing interventions to increase knowledge and educate about fall prevention alone did not significantly reduce the rate of falls.

### **References, Links and Resources**

- References
  - Gillespie et al., 2012
  - Sherrington et al., 2008
  - Gates, Fisher, Cooke, Carter, & Lamb, 2008
  - Hawley-Hague et al., 2014
  - Hawley-Hague, Horne, et al., 2014
  - Yardley et al., 2008
  - Yardley, Donovan-Hall, Francis, & Todd, 2007
  - Horne, Skelton, Speed, & Todd, 2010
  - Yardley et al., 2007
  - Dorgo, King, Bader, & Limon, 2011
  - Laventure, Dinan, & Skelton, 2008
- Links
  - <http://profound.eu.com/>
- Resources
  - Factsheets:
    - Exercise
    - Vision
    - Bone health
    - Vitamin D
    - Footwear and protective clothing
    - Home and environment
    - PERS and other ICT-devices



## 5 Factsheet Exercise

### Poor balance, muscular weakness and sedentariness as a risk factor for falls and what can be done to reduce these risk factors

Many older persons experience **balance deficits** and a **reduction in muscular strength and power**. These are the two most important modifiable risk factors that can be influenced by a regular training program. Programs must be tailored individually (see summary) in order to be effective and to reduce the risk of falls.

#### What works

**Exercise** is included in nearly the entire effective multiple interventions. The emphasis should be on strength and balance and healthy, active ageing, not falls.

#### Programs with multiple categories of exercise:

*Multiple-component group and home-based exercise programs (e.g. Otago, FaME, LiFE)*, usually containing at least balance and strength training, have been proven to reduce falls. Other categories of exercise may be *3D training* (constant repetitive unsupported movement through all three spatial planes) like *Tai Chi* and *square stepping*, *general physical activity* like walking groups, *flexibility training* or *endurance training*. The *LiFE-program* (Clemson 2010) comprising balance and strength exercises, embedded in daily life activities, effectively reduce the rate of falls.

#### Programs with one category of exercise only:

*Tai Chi* as a group exercise reduces falls, but it appears to be more effective in participants that are not at high risk of falling. *Balance exercises* as well as *gait and functional training* reduce the rate of falls, whereas *strength/resistance training* and *general physical activity* (walking) only are not effective in reducing falls.

#### Multiple Interventions:

A study with „*multifaceted*“ *podiatry* (customized orthoses, footwear review, falls prevention education), including foot and ankle exercises is proven as effective for preventing falls in older people with disabling foot pain (Spink 2011).

#### Who can help older people with exercise

Physiotherapists, sport scientists and exercise Instructors, who are appropriately trained in delivering falls prevention exercise programs.

#### Assessment tools

Participants should be carefully assessed before intervention to ensure the correct type of programme is chosen and that the programme is tailored to their needs. Appropriate **assessment** tools should be chosen to show progress.

- *Berg Balance Scale* to assess balance
- *Short Physical Performance Battery* to assess balance and strength
- *Senior Fitness Test* to assess balance, strength and endurance

### **What does not work**

There is no evidence for *chair-based exercises* in reducing falls.

### **Summary**

In order to be effective, exercise programs must:

- Focus on challenging balance and muscle strength and power
- Challenge balance in a standing position and/or gait
- Exercise should be progressive and tailored to participants needs (help them to meet specific goals they have set, designed to consider health conditions).
- Be carried out 2-3 times a week
- Be continued over a duration of at least 50 hours of at least 3 month
- Be delivered by instructors specially trained in one of the following programs (Regular contact and feedback from the instructor is helpful)

### **Evidence based programs**

- Otago Exercise Program
- Falls Management Exercise program (FaME)
- Lifestyle integrated Functional Exercise (LiFE)
- Square stepping
- Tai Chi

### **References, Links and Resources**

#### **References on exercise and falls**

- Gillespie et al., 2012

#### **Links related to exercise and falls**

<http://profound.eu.com/>

<http://www.ageuk.org.uk/>

#### **Other resources related to exercise and falls**

##### Videos:

- Gait, balance and functional training:  
<http://profound.eu.com/video-clip-of-stronger-seniors-balance-exercise-program-english/>
- Strength/resistance training:  
<http://profound.eu.com/exercises-online-strengthening-video-english/>
- Square Stepping Exercise:  
<http://www.youtube.com/watch?v=IfCD7qB2l1k>
- Assessments:  
<http://profound.eu.com/three-simple-assessment-tests-to-assess-the-patients-risk-for-falling/>

Updated: July 2014

## 6 Factsheet Vision

### Vision as a risk factor and what can be done to reduce these risk factors

Low vision, impaired vision, unfamiliar glasses with a new vision correction or impaired vision affected by medication can increase the risk of an older person falling.

Many eye diseases such as cataract, macular degeneration, glaucoma and vascular eye disease are common in older persons. Age related loss of contrast sensitivity and depth perception can cause balance problems. Impaired vision is an independent risk factor for falls in older persons.

When regular wearers of multifocal glasses were given **single lens glasses** falls were significantly *reduced* in the subgroup that regularly took part in outside activities. Conversely, there was a significant *increase* in outside falls in intervention group participants who took part in little outside activity. New environment and a **changed or first prescription of eyeglasses can increase the risk of falls** during first weeks because of the altered unfamiliar viewing conditions. This highlights education role that optometrists and ophthalmologists can play.

Cataracts have been associated with increased risk of falls and fall related injury. **First eye cataract surgery** is a successful optimizing treatment and has been shown to reduce the risk of falling and fall related injuries.

Age related macular degeneration (AMD) is the most common form of age related vision loss in Europe. Currently there is no curative treatment for dry AMD, however compensating strategies have been tested. In persons with very low vision and macular degeneration **home visits by occupational therapists** have been shown to reduce falls. A key element is the **adaptation of the home environment**.

For patients suffering from glaucoma, diabetic and/or vascular eye disease or vision loss such as hemianopia no specific fall prevention programs have been tested so far. The treatment should be coordinated using best clinical practice and vision rehabilitation principles.

### What works

- Identifying new visual problems and ensuring eyeglasses are appropriate by testing visual acuity and glasses prescription every year
- Cataract surgery
- Occupational therapy
- Home safety modifications for persons with very low vision such as AMD

### Caution

- During the first days and weeks after a vision correction (e.g. new or changed prescription of eyeglasses)
- Using multifocal or bifocal lenses in new environment
- Side effects of medication affecting vision acuity or adaptation
- Glare effects

### **Who can help older people with their vision**

- Ophthalmologists
- Optometrists
- Occupational therapist

### **Assessment tools**

- Eye chart for testing visual acuity (e.g. Snellen chart)
- Melbourne Edge Test (MET) for testing contrast sensitivity

### **References, Links and Resources**

#### **References on falls and vision**

- Gillespie et al., 2012
- Stephen R. Lord, Smith, & Menant, 2010

#### **Links related to vision and falls**

<http://profane.co/vision-and-falls-prevention-infographic/>

Updated: July 2014

## 8 Factsheet Bone health

### Bone-health as a risk factor for fall-related injuries / fractures and what can be done to reduce this risk factor

In older people falls and fractures are intimately linked and are major causes of morbidity, mortality and economic cost. Low bone mineral density in osteopenia and osteoporosis with increased bone fragility are important risk factors for fractures. Low vitamin D status is associated with a variety of negative skeletal consequences including osteomalacia, reduced bone mineral density, impaired calcium-absorption and secondary hyperparathyroidism.

Falls risk should be taken into consideration when assessing whether or not to commence medication for osteoporosis and should also alert the physician to the opportunity to target falls risk directly.

#### What works

- **Combined vitamin D (see factsheet vitamin D) and calcium supplementation is effective in reducing *bone loss, falls* and *osteoporotic fractures*:**
  - Vitamin D (1000-2000 IU/day; target levels: 50 nmol/l)
  - Calcium (1000 to 1500 mg/day; if possible by nutrition intake, rather than tablets)
- **Nutrition/ lifestyle:**
  - Caloric intake (Body Mass Index > 20 kg/m<sup>2</sup>)
  - 1 g/kg body weight of protein/day
  - Sufficient nutritional intake of Vitamin B12 and folic acid & sufficient nutritional intake of Vitamin B12 (2,4 µg/day) and folic acid (400 µg/day)
  - Cessation from nicotine
- **Withdrawal of medication altering bone-health**
  - E.g. glucocorticoids, glitazone, proton-pump inhibitors and antiepileptics
- Evidence-based **anti-osteoporotic drugs**
  - Bisphosphonates, denosumab, strontium ranelate, parathyroid hormone peptides
  - Reduce the risk of vertebral fracture when given with calcium and vitamin D supplements.
  - Indicated at (according to the latest guideline of the German DVO which may differ in some reference values from other national guidelines):
    - Women with a prior fragility fracture should be considered for treatment without the need for further risk assessment,

- Fragility vertebral fractures (single level 2 or 3, multiple level 1-3),
  - Fragility pertrochanteric fracture,
  - Fragility femoral neck fracture and T-score < -2,0 SD, Therapy with glucocorticoids over > 3 month and T-score < -1,5 SD or fragility vertebral fractures,
  - Femoral neck T-score less than or equal to -2,5 SD (respectively depending on age and gender)
- **Identification and treatment of secondary causes of bone loss**
- **Bone-health exercise programs** combined with fall prevention /exercise (s. fact sheet Exercise and Falls):
  - Require a duration of 12 month and weight-bearing components to show effects on BMD
  - Weight-bearing components are indicated in proven osteoporosis and / or after fractures
    - Weight-bearing and resistance training with challenging balance exercises enhance bone and muscle health and improve functional ability
    - A combination of weight-bearing impact exercise (jogging, stair-climbing, jumping activities) and progressive resistance training (PRT) is effective for maintaining bone mineral density (BMD) and preventing bone loss at clinically relevant sites such as the hip and spine

#### **Who can help older people with impaired bone health**

- General physician, geriatrician, bone health specialist /endocrinologists
- Consulting pharmacist
- Physiotherapists, sport scientists and exercise instructors, who are appropriately trained in delivering bone health and falls prevention exercise programs.

#### **Assessment tools**

- European and/or national guidance for osteoporosis
- Bone mineral density (BMD) using dual-energy X-ray absorptiometry (DXA)
- X-ray (thoracic and lumbar spine) if vertebral fractures are suspected after clinical examination

- World Health Organization's Fracture Risk Assessment Tool (FRAX®)
- Blood testing for differential diagnosis and specific treatment

### **Caution**

Non-adherence to treatment with specific anti-*osteoporosis* drugs is a substantial problem

### **References, Links and Resources**

#### **References on bone-health**

- Edwards et al., 2013
- Gianoudis et al., 2012
- Gomez, Curcio, Suriyaarachchi, Demontiero, & Duque, 2013
- Health Quality Ontario, 2008
- Rizzoli et al., 2009

#### **Links related to bone-health**

<http://www.iofbonehealth.org/europe-guidelines>

<http://www.dv-osteologie.org/uploads/Leitlinie%202014/Entwurf%20Kurzfassung%20 DVO%202014.pdf>

The WHO fracture risk assessment tool: [www.shef.ac.uk/FRAX](http://www.shef.ac.uk/FRAX)

<http://onlinelibrary.wiley.com/cochranelibrary/search>

Updated: July 2014

## 9 Factsheet Vitamin D

### Low vitamin D levels as a risk factor for falls and what can be done to reduce these risk factors

Taking **vitamin D supplements** may be effective in reducing falls in persons with low blood levels of vitamin D before treatment. It appears that low blood levels of vitamin D are associated with falls and some fall-related fractures types.

In most industrialized countries older persons have modest to severe vitamin D deficiency. More than 70 % of the octogenarians living in continental in northern Europe suffer from vitamin D deficiency. This is caused by a combination of factors such as nutritional deficiency, reduced renal function, skin atrophy and aggravated by a reduced sun exposure that is related to being home bound, seasonal (fall / winter) or cultural (clothing). Severe vitamin D deficiency causes myopathy and loss of muscle strength. Moderate deficiencies are linked to osteoporosis and possibly impaired balance.

#### What works

- Maintaining adequate vitamin D levels especially during winter
- Adequate sun exposure (face and arms) without sunscreen of about 30 min in the middle of the day (depending on clothing, skin type, latitude and season)
- Adequate nutritional intake
  - From cod liver oil and fatty fish such as salmon, tuna or mackerel, beef liver, eggs, sardines and mushrooms
  - When endogenous synthesis is missing, adequate vitamin D intake is estimated as 800 IU per day
- Supplementation of cholecalciferol
  - Currently 1000 – 2000 I.U. per day depending on baseline levels

#### Caution

- Overdosage of cholecalciferol is possible leading to hypercalcaemia
- Relevant reduction of dermal vitamin D synthesis through sun protection factor > 8

#### Who can help older people with their low vitamin D levels

- General physician
- Geriatrician
- Bone health specialist /endocrinologist
- Consulting pharmacist



**Assessment tools**

- Blood levels of vitamin D (Target: Serum-25-Hydroxy-Vitamin D > 20 ng/ml (50 nmol/l))

**References on vitamin D and falls**

- Gillespie et al., 2012

Updated: July 2014

## **10 Factsheet Footwear and protective clothing**

### **Footwear as a risk factor for falls and what can be done to prevent falls and injuries including protective clothing**

Footwear is very personal, partially being culturally determined. Inappropriate footwear can increase the risk of slips, trips and falling or certain shoes can decrease the base of support. This increase of risk has been shown for poor fitting shoes, slippers with a lack of heel support, high heel shoes.

#### **What works**

- Footwear counseling
- Spikes during icy and snowy season
- Protective clothing such as hip protectors for subjects with high risk of fracture

#### **Caution**

- Self-esteem, stigma

#### **Who can help older people with footwear**

- Podiatrics
- Trained nursing staff
- Orthopedic specialist for severe deformities

#### **References on footwear**

- S. R. Lord, Sherrington, Menz, & Close, 2007
- Parker, Gillespie, & Gillespie, 2005
- Gillespie et al., 2012

Updated: July 2014

## **11 Factsheet Home and environment**

### **Home and environment as risk factors for falls and what can be done to reduce these risk factors**

Numerous environmental factors, identified from reports of older fallers and structured observations, have been associated with falls in older persons. Recent research considers environmental hazards as a modifier and not as an intrinsic risk factor. Key is the interaction between an older person's physical capacity and action. The action is influenced by lifestyle, risk taking, behavior and exposure and compatibility of environmental stressors.

Some home safety assessment and modification interventions have demonstrated to be effective in reducing number of falls and number of people falling. At the bottom line they appear to be effective for people at higher risk of falling (previous history of falls), particularly those with severe visual impairment. In a multifactorial intervention the home modification component should be implemented by occupational therapists and other trained specialist after a careful assessment of the personal environment.

#### **What works**

- Ergonomic height of furniture (e.g. bed, chair, toilet seat)
- Adequate stability of furniture
- Barrier-free homes
- Handrails /-holds
- Even and non-slip floorcoverings with optimized levels of friction
- Type of surface on which an older person falls may reduce fall-related injuries (e.g. carpet floors)
- Sufficient light and contrast in dark areas and at night, particularly on stairs
- Removal of trip hazards
- Urban planning considering the older person's needs (places to rest, even pathways / pavements, ramps etc.)

#### **What did not work**

- Home safety assessment and modification alone / as a single component intervention

#### **Caution**

- Fall, injury or fracture in an older person is commonly multi-factorial in origin.
- There is little high-level scientific evidence for modification of the built home environment as a method of reducing the risk of injury.

- Vigorous people living with more environmental hazards are more likely to fall than frail people. Risk of falling is even increased in vigorous people depending on their perception of risk and their outside participation. Frail people are more likely to fall because of their own limitations.
- Many study designs should be viewed with caution due to the lack of control groups and investigator blinding, short timescale, low penetration, undersized sample size / power, the use of volunteer subjects and the difficulty to identify home modifications as the effective component, even in multi-faceted interventions with other interventions happening simultaneously.
- Compliance barriers like stigmatizing effects, subjective challenging for health and independence, low financial or education status can limit implementation (community and education programs may help)

#### **Who can help older people with home safety**

- occupational therapists
- other trained specialist

#### **Assessment tools**

- home hazard checklists, such as Westmead Home Safety Assessment

#### **References on home safety and falls**

- S. R. Lord et al., 2007
- Turner et al., 2011
- Gillespie et al., 2012

#### **Links related to home and environment**

Westmead:

[https://www.google.com/url?url=https://www.maa.nsw.gov.au/getfile.aspx%3FType%3Ddocument%26ID%3D44479%26ObjectType%3D3%26ObjectID%3D3919&rct=j&frm=1&q=&esrc=s&sa=U&ei=OQMSVK2qE8HVP1awgNAE&ved=0CCYQFjAC&usg=AFQjCNEL\\_Ny70wKn-qEEBZDdsKjudqCQ-A](https://www.google.com/url?url=https://www.maa.nsw.gov.au/getfile.aspx%3FType%3Ddocument%26ID%3D44479%26ObjectType%3D3%26ObjectID%3D3919&rct=j&frm=1&q=&esrc=s&sa=U&ei=OQMSVK2qE8HVP1awgNAE&ved=0CCYQFjAC&usg=AFQjCNEL_Ny70wKn-qEEBZDdsKjudqCQ-A)

Updated: July 2014

## 12 Factsheet PERS and other ICT-devices

### Personal Emergency Response Systems (PERS) and other information and communication technology (ICT)-devices

There are a number of Information and Communication Technologies (ICTs) aimed at falls prevention, fall detection and alarms for use in case of a fall, these can alert professionals or carers (Brownsell & Hawley, 2004) if a fall occurs and include home automation systems. There are also a range of ICT interventions which have been created or adapted to be pro-active in preventing falls, such as those which provide strength and balance training to older adults in the prevention of falls e.g. exergames, Wii-fit, Kinect (C. A. Miller, Hayes, Dye, Johnson, & Meyers, 2012; Williams, Soiza, Jenkinson, & Stewart, 2010).

#### What works

- PERS can help to reduce a long lie (lying on the floor for long periods of time can cause serious health complications) and allow help to be brought quickly to the person who has fallen.
- Simple touchscreen interfaces and other easy to use technologies have been more readily accepted than those that are more complex and multi-faceted (Silveira, van het Reve, Daniel, Casati, & de Bruin, 2013).
- Focussing on the possibility of maintaining independence has led to successful uptake of PERS and ICT-devices (Hawley-Hague, Boulton, Hall, Pfeiffer, & Todd, 2014).

#### Caution

- Main issues with use of ICT devices in the home relate to adoption and use of the systems; older adults need to understand the value and potential of the technologies on offer and receive suitable training and support in using them.
- Evidence is weak around the use of virtual reality and gaming systems for the promotion of physical activity (K. J. Miller et al., 2014). Emerging evidence suggests that games should be designed specifically for older adults (Ystmark, 2013).
- Evidence is weak around the effective use of bed alarms in hospitals (Shorr et al., 2012)

#### Who can help older people with ICT

- Occupational therapists/physiotherapists
- Social care services
- Sheltered and assisted housing
- Providers of telecare and telehealth equipment and services

#### Further information

Further information on encouraging the use of technologies for falls prevention can be at: <http://farseeingresearch.eu/2014/07/17/preliminaryguidelines/>

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