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

# DELIVERABLE D 4.6
# Updated EVIDENCE SYNTHESIS AND GENERIC GUIDANCE

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## Contents

## 1 Description of deliverables, tasks and milestones for WP4

Objectives:
A central important objective of ProFouND has been to construct a system for providing customised and personalised information to users, be they health care provider organisations, health or social care professionals, NGOs, or older people themselves.

WP4 has provided a first version of the evidence and generic guidance in month 19 and has updated twice according to the recent literature. This was done by constructing a library of evidence for each domain based on reviews of evidence.

The factsheets have been disseminated via directly to different stakeholders, via the website and extensive support from members, associates of the consortium and external reviewers.

Comments, advice and critiques have been received and have been discussed within the consortium. The literature has been continuously updated to include new landmark studies and systematic review papers.

The deliverable for WP4 month 34 was the following:

| **D4.4 Updated evidence synthesis and generic guidance [Month 36]** |
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WP4 has performed the following tasks:

| Task 4.1: WP4 used existing systematic reviews and evidence syntheses to identify and operationalize best practice in requisite areas and put specific attention into how to implement evidence and overcome barriers to innovation in practice.<br><br>We started 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. In these cases we presented specific recommendations of best practice and guidance of how to implement this in practice.<br><br>Where evidence was poorer we have, where possible, undertaken our own reviews and evidence synthesis.<br><br>We knew from reviews already undertaken that the evidence base for ICT and other technologies being effective in falls prevention/detection is emerging but is still limited.<br><br>This updated guidance is aiming at patient interest groups, policy makers, health care funders as well as other professional groups. |
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WP4 has reached the following Milestones between months 19 and 34. A key component was the conduction of a meeting attached to the first European Falls Festival (EUFF2015).

| MS24 network consensus meeting on evidence synthesis |
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## 2 Development of deliverable. Updated evidence synthesis, generic guidance and APP development

During the third year the evidence and guidance has been successfully disseminated, distributed and more importantly used in several regions and countries. This process is based on the successful co-operation with partners, associates, with groups of the EIP AHA 2 initiative, stakeholder organizations such as the Special Interest Group on falls of EUGMS, other NGOs and governmental organization. The factsheets have been accessed and downloaded by several thousand visitors (3660 at 29/02/2016) demonstrating interest and relevance.

The following example illustrates the dissemination process by a governmental organization. In Germany, the the Bundeszentrale für Gesundheitliche Aufklärung (BZgA) was approached by ProFouND as a branch of the German Ministry of Health (BMG). BZgA showed a strong interest to start a campaign on fall prevention based on ProFouND material after a visit of the WP leader (Prof. Becker) and PI (Prof. Todd) in May 2014. In July 2015 this led to web based material, printed brochures and poster material for GP offices and pharmacies across Germany (> 5,000 posters). More than 40,000 copies of the brochures were distributed in the first 6 month after the release (http://www.gesund-aktiv-aelter-werden.de/). The material was displayed at the second European Falls Festival (EUFF2016). The activity and co-operation will continue after the end of the ProFouND funding period.

A second German example is a rural campaign for fall prevention in five states (Bundesländer) which is an often neglected area of health promoting initiatives. The health care fund for farmers that is crucial for rural areas has started a campaign on fall prevention in rural areas in Germany for several 10,000 older persons. The decision was taken in 2014. In this campaign ProFouND materials are included and helped to start the campaign (www.trittsicher.org). Other examples (e.g. Sichere Gemeinden in Vorarlberg, Austria) can also be identified were the guidance and the summarized evidence have been stimuli and facilitators for dissemination campaigns.

In line with the DoW the third year also led to a factsheet on fall prevention in settings such as long-term care (nursing homes) and acute care (hospitals). These have been developed with feedback from European and Non-European leaders in this area.

As expected we have received not only positive feedback but also critical comments. This has led to modifications in the App development. These are illustrated in chapter 3. They were finally discussed in the last ProFouND network meeting in Bologna in February 2016.

Valuable comments were received from our advisory board and non-European international experts. Most of these led to (minor) changes of the Factsheets now documented in a printable format.

# 3 Generic guidance and implementation guidelines

## 3.1. Factsheets on acute care and falls and long-term care and falls

### ProFouND Factsheet on institutional long-term care (LTC) and fall prevention

**Falls, fallers and long-term care**

Falls and fall related injuries are common, important and costly. Less than 6 % of the older population live in long-term care in Europe, however about 20 – 25 % of severe fall related injuries occur in LTC. On the resident level they can have detrimental effects on walking and sit-to-stand transfers, psychological measures such as fear of falling and cause pain even without fractures. Two falls per residents can be expected per annum. Almost all residents with walking capacity are at risk of falling. Programmes should be implemented that have sufficient reach and sustainability. Ensuring mobility and safety are equally important goals for residents, families and staff members. In the past a misunderstood emphasis on safety alone has led to perverse intervention to avoid falls such as restraints. The most recent Cochrane review concludes that a considerable proportion of falls can be prevented (Cameron 2012). This factsheet summarises the most relevant components of fall prevention for older persons in LTC.

**What can be done to reduce falls**

Single risk factor strategies that have been described in the fact sheets for community dwelling older persons mostly apply for LTC. In order to be effective the strategies must be combined and adapted in a sensible manner. The Cochrane review clearly states that multifactorial approaches are needed in LTC. The priorities are often different. This requires an interdisciplinary approach of licensed care, nursing aides, medical care, physiotherapy, other health care professionals and managers. Components such as regular medication review, adapted ergonomics of furniture, maintenance of and training with walking aides, proper footwear, appropriate lighting should be part of a general risk management and safe mobility strategy. More than 50 % of falls in LTC occur in transfer situations like sit-to-stand or stand-to-sit maneuvers. Therefore, safe transfer strategies should be a core part of care giving routines. Urinary incontinence management, compensation of vision loss, ensuring adequate fluid intake and nutrition are part of a good nursing practice and thereby relevant in this context.
Exercise programmes are part of a state-of-the art facility enhancing safe mobility. Best practice programme examples are the Swedish High-Intensity Functional Exercise (HIFE) programmes (Toots 2016) or the Ulm fall prevention programme. Physical activity is stimulated by meaningful activities.
LTC fall prevention programmes need leadership and evaluation. Implementation without an organisational commitment and strategy are less effective. This strategy includes quality improvement strategies, risk management and critical incident reporting.

**What works**

The land mark studies supported by systematic reviews have used multifactorial programmes including explicit organisational leadership, regular staff training, systematic monitoring, discussion of severe fall related injuries, regular exercise classes, medication review, and environmental adaptations. Required is a sustainable strategy, often over several years.

**Caution**

- Exercise interventions without interdisciplinary components have often had no effect or even negative effects (Kerse 2004).
- Activity restriction or even restraints to prevent falls are not justified. Restrictive approaches can have severe side effects such as functional loss.

- Vitamin D supplementation and bone health intervention are still under debate for the LTC setting and should be discussed on an individual basis. There is no evidence for mostly bedridden residents.
- Hip protector and other protectors (e.g. helmets) are not a generally recommended strategy in LTC but are useful in frequent fallers such as atypical Parkinsons' disease or epileptic patients with recurrent seizures. This should be individually assessed and personal support is needed.

**Who can help older people with fall prevention and long-term care facilities?**

- Licensed nurses and nurse's aides are key in the sustainable fall prevention in LTC

  Other professions are needed to develop, assess and improve the programmes

- Geriatricians: programme development and evaluation
- Specialised nurse practitioners: development and implementation of programmes
- Specialised physiotherapists: exercise programmes, walking aids
- Specialised occupational therapists: assistive devices, environmental adaptations
- General physicians: medication review focusing on psychotropics and orthostatic hypotension
- Consulting pharmacists: medication review

**Assessment tools**

Simple scales for risk factors at admission are not useful and not recommended. Their predictive capacity is low. Assessment should be part of a comprehensive process. Risks change over time. The first weeks after admission are a high risk period that requires additional attention, support and reassurance. Assessment requires the analysis of the build environment and the care processes based on the continuous analysis of fall reports.

**Research on falls and long-term care**

Cameron ID, Murray GR, Gillespie LD, Robertson MC, Hill KD, Cumming RG, Kerse N. Interventions for preventing falls in older people in nursing care facilities and hospitals. Cochrane Database Syst Rev. 2012; CD005465. doi: 10.1002/14651858.CD005465.pub3..

Rapp K, Becker C, Cameron ID et al. Epidemiology of falls in residential aged care: analysis of more than 70,000 falls from residents of bavarian nursing homes. J Am Med Dir Assoc. 2012;13:187.e1–6.

Kron M, Loy S, Sturm E, Nikolaus T, Becker C. Risk indicators for falls in institutionalized frail elderly. Am J Epidemiol. 2003 Oct 1;158(7):645-53.

Luukinen H, Koski K, Laippala P, Kivela SL. Risk factors for recurrent falls in the elderly in long-term institutional care. Public Health. 1995 Jan;109(1):57-65.

Lundin-Olsson L, Jensen J, Nyberg L, Gustafson Y (2003) Predicting falls in residential care by a risk assessment tool, staff judgement, and history of falls. Aging Clin Exp Res. 15:51-59

Becker C, Kron M, Lindemann U, Kapfer E, Can H, Walter-Jung B, Nikolaus T (2003) Effectiveness of a multifaceted intervention on falls in nursing home residents. J Am Geriatr Soc 51:306-313

Jensen J, Lundin-Olsson L, Nyberg L, Gustafson Y (2002) Fall and injury prevention in older people living in residential care facilities. A cluster randomized trial. Ann Intern Med 136:733-741

Kerse N, Butler M, Robinson E, Todd M. Fall prevention in residential care: a cluster, randomized, controlled trial. J Am Geriatr Soc 2004,52:524-531.

Toots A, Littbrand H, Lindelof N, Wiklund R, Holmberg H, Nordstrom P, Lundin-Olsson L, Gustafson Y, Rosendahl, E. Effects of a high-intensity functional exercise program on dependency in activities of daily living and balance in older people with dementia. J Am Geriatr Soc 2016, 55-64. doi: 10.1111/jgs.13880.

Robinovitch SN, Feldman F, Yang Y, Schonnop R, Leung PM, Sarraf T, Sims-Gould J, Loughin M. Video capture of the circumstances of falls in elderly people residing in long-term care: an observational study. Lancet. 2013 Jan 5;381(9860):47-54. doi: 10.1016/S0140-6736(12)61263-X.
Santesso N[1], Carrasco-Labra A, Brignardello-Petersen R. Hip protectors for preventing hip fractures in older people. Cochrane Database Syst Rev. 2014 Mar 31;3:CD001255. doi: 10.1002/14651858.CD001255.pub5.

**Other resources related to long-term care and falls**

http://www.sfu.ca/tips/mission.html videos on real falls in LTC
https://www.youtube.com/watch?v=MjNkxCBZI5c video on hip protector guidance
Version 2.0: February 2016

**ProFouND Factsheet on acute care and fall prevention**

**Falls and acute care**

Falls and fall related injuries are very common in accident & emergency (A&E) services (Close 1999). Falls trigger many hospital admissions, not only to trauma services, and they are quite common during the time of hospital treatment. A fall during the inpatient period will often lead to an increase in the length of stay (LoS) and increase costs. Around 5 % of severe fall related injuries occur in acute care Oliver 2010). The most recent Cochrane review states that a considerable proportion of falls can be prevented during the stay (Cameron 2012). However, not all studies have succeeded in reducing falls despite major efforts (Barker 2016). A recent milestone study from Australia (Hill 2015) has addressed some of the shortcomings of former studies.

Most successful trials have achieved positive results for patients with LoS periods of longer than one week. A consistent finding is the role of precipitating (time dependent) factors such as fluctuating attention caused by delirium and functional deterioration due to acute intercurrent problems such as dehydration, fever etc. Impaired self-perception improvement can also lead to an increase in non-assisted or non-supervised activities which are major causes of falls (Oliver 2010).

This factsheets summarises the understanding of fall prevention for older persons in acute care settings. Aspects regarding A&E are addressed in the factsheets for persons living at home or long-term care. A second aspect is the prevention of falls after discharge which is equally important.

**Falls in acute cares and what can be done to reduce falls**

Most strategies that have been described in the single risk factor ProFouND fact sheets for community dwelling older persons apply in the acute care setting. Immediate medication review to avoid orthostatic hypotension, conservative strategies for psychotropic medications, identification of vision impairment, training of safe transfer strategies, and ensuring appropriate footwear are relevant factors. Progressive strength and balance exercise, vitamin D supplementation and bone health interventions have no immediate effect but action should be taken, including recommendations or post-discharge referral should be made. The key component for fall prevention is the implementation of a proactive organisational strategy that includes leadership, careful monitoring, supportive risk management, change agent.

**What works**

- Patient and linked staff education programmes (Hill 2015)
  Accident and Emergency identification of fallers with a planned secondary visit to develop a fall prevention plan such as a Fall and Fracture Liaison Service (Close 1999)
- Post-discharge planning of fall prevention (GEM-HIT, Cumming)

**Caution**

- Simple screening tools are not recommended for fall preventions purposes in acute care
- The appointment of fall liaison specialists can lead to a withdrawal of staff commitment by others.

**Who can help older people with fall prevention and acute care facilities?**

- Geriatricians: development, implementation and evaluation
- Specialised nurse practitioners: development, implementation and evaluation
- Specialised physiotherapists: goal setting, transfer strategy, walking aid, post-discharge planning
- Specialised occupational therapist: assistive devices, environmental adaptations

**Assessment tools:**
Different assessment instruments have been developed. The replication of measurement has been mostly disappointing (Oliver 2010).

**Research on falls and acute care**


1. Cameron I et al. (2012) Interventions for preventing falls in older people in care facilities and hospitals Cochrane Database Syst Rev. CD005465. doi: 10.1002/14651858.CD005465.pub3.
2. Haines, T.P., Lee, D.-C.A., O'Connell, B., McDermott, F. and Hoffmann, T. (2015) Why do hospitalized older adults take risks that may lead to falls? Health Expectations: An International Journal of Public Participation in Health Care and Health Policy, 18, 233–49. http://dx.doi.org/10.1111/hex.12026
3. Hill, A.-M., Waldron, N., Etherton-Beer, C., McPhail, S.M., Ingram, K., Flicker, L. et al. (2014) A stepped-wedge cluster randomised controlled trial for evaluating rates of falls among inpatients in aged care rehabilitation units receiving tailored multimedia education in addition to usual care: a trial protocol. BMJ Open, 4, e004195. http://dx.doi.org/10.1136/bmjopen-2013-004195
4. Hill, A.-M., McPhail, S.M., Waldron, N., Etherton-Beer, C., Ingram, K., Flicker, L. et al. (2015) Fall rates in hospital rehabilitation units after individualised patient and staff education programmes: a pragmatic, stepped-wedge, cluster-randomised controlled trial. Lancet (London, England), 385, 2592–9. http://dx.doi.org/10.1016/S0140-6736(14)61945-0
5. Oliver D, Healey F, Haines TP (2010). Preventing falls and fall related injuries in hospitals. Clin Geriatr Med:645-92. doi: 10.1016/j.cger.2010.06.005.
6. Oliver, D., Papaioannou, A., Giangregorio, L., et al. (2008). A systematic review and meta-analysis of studies using the STRATIFY tool for prediction of falls in hospital patients: how well does it work? Age Ageing, 37, 621-627
7. Cumming, R.G., Sherrigton, C., Lord, S.R., et al (2008). Cluster randomized trial of a targeted multifactorial intervention to prevent falls among older people in hospital. BMJ, 336, 758-760
8. Barker A, Morello R, Wolfe R, Brand C, Haines T, Hill K, Brauer S, Botti M, Cumming R, Livingston P, Sherrington C, Zavarsek S, Lindley R, Kamar J. The 6-PACK program to decrease fall injuries in acute hospitals: A cluster randomised controlled trial. BMJ 2016 Jan 26;352:h6781. doi: 10.1136/bmj.h6781.
9. Close J et al. (1999) Prevention of falls in the elderly trial (PROFET): a randomised controlled trial, Lancet: 93-7 1999
10. Hoffmann VS[1], Neumann L, Golgert S, von Renteln-Kruse W. Pro-Active Fall-Risk Management Is Mandatory to Sustain in Hospital-Fall Prevention in Older Patients - Validation of the LUCAS Fall-Risk Screening in 2,337 Patients. J Nutr Health Ageing; 2015;19(10):1012-8. doi: 10.1007/s12603-015-0557-1.


**Other resources related to acute care and falls**
Workbook: http://www.med.monash.edu.au/physio/staff/files/srtp.pdf
Videos:
https://www.youtube.com/channel/UCT7sYTGgu2tbcktv2fYG4HQ
https://www.youtube.com/watch?v=zlJgXkvELPg&index=1&list=PLJUbV7WX-EFhmazYlSTTzAwSUqpQIJBGq
Website: http://www.med.monash.edu.au/physio/staff/thaines.html

### 3.2. ProFouND App development and personalized recommendations

#### 3.2.1. Modifications of the App

Based on the feedback of the consortium and usage within the RBMF working environment several adaptations of the decision tree were performed.
The original tree was based on the following variables / questions:

Fall history (0/1 vs. multiple/injurious falls)
Balance concerns or fear of falling (Y/N)
Performance of Up and go test (Y/N)
Environmental misfits at home (Y/N)
Vision problems (Y/N)
Medication problems (Y/N)
Footwear problems (Y/N)

Setting: physician/physiotherapist/accident & emergency department/fall clinic

Patient preference: group vs. home exercise vs. no preference vs. physiotherapy

Mobility status: indoor vs. outdoor

Access to fall prevention service/s such as specific exercise programme, home visit by OT, vision check, podiatric specialist

The type of recommendation was classified as direct action (DA), referral (R) or written recommendation (WR).

Age and gender

It was realized that the written recommendations would have to be heavily based on the setting and regional differences to make them acceptable. A recommendation of a physiotherapist vs. a physician would lead to different personalized recommendations based on the professional skills of the expert using the App. The following case scenarios will illustrate the difference.

### 3.2.2. Examples of personalized recommendations

#### 3.2.2.1

**Recommendations for a patient who had one recent fall**

Setting: Visit to a **physiotherapist**
Testing: Up and go with problems
Preference: None (home or group activity)
Mobility status: Outdoor

Personalised written recommendation (comments are not part of the recommendations):

There are many things you can do to stay steady on your feet. Based on your visit today here are my recommendations to help you to improve your balance and to feel more confident if you are worried about falling.

**Exercise**
I recommend that you focus on activities that challenge your balance and strengthen your legs. Your exercise should be progressive and regular. Continue to improve your skills. Many of these activities are weight-bearing and help to maintain strong bones. You can visit a tailored balance and stability exercise group in your neighborhood and practice a home-based exercise programme such as the Otago Exercise Programme or the LiFE programme.

Instruction in the Otago and LiFE programmes can be provided by our practice.
For the group activities I have provided you some addresses.

Once you have improved your balance, try to increase your physical activity level. It is recommended that adults do at least 150 minutes of moderate physical activity a week. This can be anything that makes you feel warmer and breathe slightly harder than usual. Activities can be done in bouts of ten minutes or more. Endurance such as outdoor walking, cycling and swimming will optimize your performance and make you feel better and healthier.

**The following recommendations are optional for falls prevention and but are recommended as a part of your personal health plan.**

**Check your eyes and hearing**
Poor vision and difficulties with hearing can affect your balance, safety and co-ordination. Regular sight tests and reporting problems with your hearing to your GP can be helpful.

**Visit your GP and ask about your medication**
Certain medicines can negatively affect your balance. Let your GP or a pharmacist know if you sometimes feel dizzy. Sometimes it makes sense to adapt the medication dose or look for a different medication.

**Check for home hazards**
Make sure your home is well lit and is free of hazards. Organize your things so that you are not at risk of tripping and slipping.

**Vitamin D, calcium and bone health**
Vitamin D and Calcium are essential for keeping your bones strong. You can find calcium in milk and dairy products such as yoghurt and cheese, canned fish and fortified soya products.
The best source for Vitamin D is sunshine. Go regularly outside around lunchtime every day. But, do not let your skin redden or burn.

**Look after your feet**
Problems with your feet such as pain, can negatively affect your balance. Be sure to wear well-fitted shoes and report foot problems to your GP or a podiatrist.

If you want to read more have a look at the following brochure:
Top tips for staying steady from Age UK

*Comment: the physiotherapist correctly prioritizes exercise (direct action). The other components are secondary recommendations (WR) in this case scenario. No referral is addressed.*

**3.2.2.2**

*In the next example the same case scenario is now being addressed via the GP of the patient. This will lead to a different wording and sequence.*

**Recommendations for a patient who had one recent fall**

Setting: Visit to a **general physician**
Testing: Up and go with problems
Preference: None (home or group activity)
Mobility status: Outdoor

There are many things you can do to stay steady on your feet. Based on your visit today here are my recommendations to help you to improve your balance and to feel more confident if you are worried about falling.

**Exercise**
I recommend that you focus on activities that challenge your balance and strengthen your legs. Your exercise should be progressive and regular. Continue to improve your skills. Many of these activities are weight-bearing and help to maintain strong bones. You can visit a tailored balance and stability exercise group in your neighborhood and practice a home-based exercise programme such as the Otago Exercise or the LiFE programme.

*The Otago and LiFE programme can be instructed by a physiotherapist.*
For the group activities I have provided addresses.

Once you have improved your balance, try to increase your physical activity level. It is recommended that adults do at least 150 minutes of moderate physical activity a week. This can be anything that makes you feel warmer and breathe slightly harder than usual. Activities can be done in bouts of ten minutes or more. Endurance such as outdoor walking, cycling and swimming will optimize your performance and make you feel better and healthier.

***Medication***
I have checked your medication and we made no changes in the dosage or type. We should reassess your medication annually and after each new prescription.

**Check your eyes and hearing**
Poor vision and difficulties with hearing can affect your balance, safety and co-ordination.
Your vision check was performed last year with no abnormalities. This should be controlled each year.

**The following recommendations are optional for falls prevention and but are recommended as a part of your personal health plan.**

**Check for home hazards**
Make sure your home is well lit and is free of hazards. Organize your things so that you are not at risk of tripping and slipping.

**Vitamin D, calcium and bone health**
Vitamin D and Calcium are essential for keeping your bones strong. You can find calcium in milk and dairy products such as yoghurt and cheese, canned fish and fortified soya products.
The best source for Vitamin D is sunshine. Go regularly outside around lunchtime every day. But, do not let your skin redden or burn.

**Look after your feet**
Problems with your feet such as pain, can negatively affect your balance. Be sure to wear well-fitted shoes. In case of problems visit a podiatrist.

**For further information**

**If you want to read more:**
Top tips for staying steady from Age UK.

**Web link:**
More information can be found at: http://profound.eu.com/patient-info/

*Comment: the physician prioritizes exercise. The patient is being referred (direct action).*
*As the family physician he/she must comment on medication, vision and footwear in a different manner.*
*The other components remain secondary recommendations (WR) in this case scenario.*

**3.2.2.3**

*The next example moves on to consider a more complex scenario the following personalized recommendation was given after a visit in an accident & emergency service visit. After ruling out of an injury the patient received an appointment in the fall clinic. A major difference here is that an evidence-based assessment has been performed and the recommendation summarizes the main findings.*

**Recommendations for a patient who had multiple falls**

Setting: fall clinic after a recent visit to an accident & emergency department
Testing: up and go with problem
Assessment for fall risk factors
Preference: home exercise
Mobility status: mostly indoor

Based on your visit to the fall clinic the following recommendations ae summarized. There are many things you can do to stay steady and strong on your feet and to feel more confident.

**Exercise**
We recommend that you participate in a tailored home-based exercise programme such as the Otago Exercise Programme (OEP). The exercises must be progressive and regular. This will improve your balance and reduce your risk of falling.

The following physiotherapists offer the programme (insert the following details):
Name
Address
Phone number
Weblink

The programme will be paid by your health care plan.

**Regularly speak with your GP and discuss your medication**
Certain medicines can negatively affect your balance, make you feel dizzy, impair your vision or even alter your bone-health. Let your general physician check the medication. He/she may want to adapt the dosage or stop a medication. It is especially important to discuss the use of psychotropic medication or medication affecting your blood pressure with your physician.
At your visit we did not identify any problematic medications.

**Check your eyes and vision**
Good vision can help to avoid falls. At the visit we noticed that you wear bifocals. Try to wear monofocal glasses when you leave home for outdoor activities. We recommend that you see an ophthalmologist or optometrist every year.

**Check for home hazards**
Make sure your home is safe well lit. Organize your environment so that you are not at risk of tripping over wires, clutter or loose carpets. Ensure adequate stability and adjustments to the height of furniture such as the bed, chair and toilet seat. Handrails and holds can support your mobility. We recommend that you ask an occupational therapist for advice.

**Vitamin D, calcium and bone health**
Bones become more fragile as you get older. Vitamin D and calcium are essential for keeping your bones strong. The best sources of Vitamin D are nutrition and sunshine. Go outdoors without sunscreen for about 30 minutes in the middle of the day but take care not to let your skin redden or burn. Vitamin D helps our body to absorb calcium, a key component of bone tissue. Calcium can be found in mineral water, milk and dairy products such as cheese, yoghurt and fish.
Based on the measurement we recommend that you take 1,000 IU Vitamin D daily as a supplement. Please discuss this with your GP. You also need to discuss bone health, such as the need for a bone density measurement and medication with anti-osteoporotic drugs with your GP.

**Look after your feet**
Problems with your feet, such as pain, can affect your balance. Be sure to wear well-fitted shoes.

**For further information**

**Web link:**

More information can be found at: http://profound.eu.com/patient-info/

**Written information:**

Top tips for staying steady by Age UK

**3.2.2.4**

*The next case scenario illustrates the use of the App. However, this time the patient has already seen the GP and an assessment has been performed.*

**Recommendations for a patient who had multiple falls**

Setting: GP office after a recent visit to an accident & emergency department
Testing: Up and go with problems
Assessment for fall risk factors
Preference: Home exercise
Mobility status: Mostly indoor

Based on your visit to my office we discussed the following recommendations. There are many things you can do to stay steady and strong on your feet and to feel more confident.

**Exercise**

I recommend that you participate in a tailored home-based exercise programme such as the Otago Exercise Programme (OEP). The exercises must be progressive and regular. This will improve your balance and reduce your risk of falling.

The following physiotherapists offer the programme:
Name
Address
Phone number
Weblink

The programme will be paid by your health care plan.

**We have discussed your medication**

After reporting dizziness we have lowered the medication dosage of your medication to lower the blood pressure. The other medications were appropriate.

**Vitamin D, calcium and bone health**

I recommend that you take 1,000 IU of Vitamin D daily. A bone density measurement is also useful to assess your bone health. II will organize an appointment and will let you know the date.

Bones become more fragile as you get older. Vitamin D and calcium are essential for keeping your bones strong. The best sources of Vitamin D are nutrition and sunshine. Go outdoors without sunscreen for about 30 minutes in the middle of the day but take care not to let your skin redden or burn. Vitamin D helps our body to absorb calcium, a key component of bone tissue. Calcium can be found in mineral water, milk and dairy products such as cheese and yoghurt and canned fish. If you are at risk of getting insufficient Vitamin D or calcium, talk to your health professional about supplements.

**Vision**

I recommend that you see an ophthalmologist next month.

**Home hazards**

Based on my recent home visits it is recommended to make some small adjustments. Make sure your home is safe well lit. Organize your environment so that you are not at risk of tripping over wires, clutter or loose carpets. Ensure adequate stability and adjustments to the height of furniture such as the bed, chair

and toilet seat. Handrails and holds can support your mobility. If needed you can ask an occupational therapist for advice.

**Look after your feet**
Problems with your feet, such as pain, can affect your balance. Be sure to wear well-fitted shoes.

**For further information**

**Web link:**
More information can be found at: http://profound.eu.com/patient-info/

**Written information:**

Top tips for staying steady by Age UK

*The example shows that a GP will use different language and come up with different decisions (DA, referral, recommendations) and priorities.*

**Service models**

The ProFouND App has gone through a testing procedure with different professional and end users in different settings. The original plan to offer this as a universal App has been modified. Whereas the fall scenarios are clearly described and the evidence guidance is straightforward, service models differ widely between countries and even between regions within the same country. Disparities exist based on access to evidence based components, reimbursement but also professional commitment and priorities. In the following section we describe how state-of-the art services can use the App. which currently exists for English, Norwegian, Greek and German language users . Future translation into further languages will be required.

**Physiotherapy (PT)**
In Europe two different systems of physiotherapy coexist. Aside from an academic training some countries still have a majority of professionals that have had a vocational training. Usually, fall prevention requires specific training in assessment and for the intervention.
As part of this specialized service the App is useful for the clinical routine. A typical example is given in the prior section. Many services now offer the Otago programme, the FaME programme or related programmes such as LiFE. The APP is useful in guiding patients for other interventions that are needed (referral or recommendations).
ProFouND App action priority: exercise

**Occupational therapy (OT)**
In Europe, again, two different systems of occupational therapy coexist. Aside from an academic training some countries still have a majority of professionals that have had a vocational training. Usually, fall prevention requires specific training in assessment and for the intervention.
Currently, the main role of OTs are home modifications and training in person-environmental fit problems. Some OT services now offer the LiFE programme. The App is also useful in guiding patients for other interventions that are needed (referral or recommendations).
ProFouND App action priority: environment, foot wear, vision, exercise

**GP / family medicine**
In Europe different systems of health care funding coexist. While many countries are based on national health care plans/funds, other countries have a heterogenous health care funding structures. This leads to major differences in health care planning and priorities.
The curricula for GP training are also different. In some countries like the UK, the Netherlands and some Scandinavian countries fall prevention is a priority in the care of older persons, whereas other countries are lagging behind implementation of this major health target.
The ProFouND App in principle is useful as part of health care plan for GPs. It should be implemented in an integrated IT module.
ProFouND App action priority: medication review, Vitamin D, bone health

**Home care agencies**
Home care staff and family cares have an important role in the daily delivery of fall prevention. In the diagnostic/assessment process their role is relevant on the partner side.
ProFouND App action priority: information and priority setting

**Integrated home alarm services/telemedical/ telecare models**
During recent years some regions (many of them also participating in the EIP AHA AGA2 initiatives) have developed advanced telemedical models for fall prevention. An advanced model is the Scottish model Smartcare: http://sctt.org.uk/programmes/wellbeing/assisted-living/falls-prevention-management-

additional-resources. Such integrated models may provide enhanced services in the future and further work in this area is required. The ProFouND App could be adapted into and form part of such care models.

**Fall clinic / geriatric medicine outpatient clinic**
Not all countries in Europe offer specialized fall services. If they do the role of these institutions is mostly kept for multiple fallers, persons with a high risk of falling or persons after an injurious fall. These situations will lead to an assessment process which usually cannot be performed in a GP service or a PT/OT practice. A multidimensional assessment is costly, takes time and often requires specialized equipment. This implicitly means that most of the App referral recommendations will be done as part of the process and the results are clear and should be communicated to the other professionals and informal caregivers.
ProFouND App action priority: direct action including addresses, contact names etc.

**Fracture liaison service (FLS) and trauma service**
Not all countries in Europe offer fracture liaison services. The evidence indicates that they can be an effective component of a secondary fracture prevention strategy. In some but not all countries the FLS are linked to fall clinics. An emphasis is the assessment of bone health usually via DXA measurement. However, FLS do not offer fall risk identification at the same level of expertise. The PFN APP can help to identify fall risk factors and thereby promote non-pharmaceutical interventions as part of a comprehensive prevention strategy.
ProFouND App action priority: non-pharmaceutical components to supplement medication strategies.

**Patient web portals**
Currently, we are not aware of a patient portal for self-assessment that has been tested. To some extend the CDC programme Steadi is offering this approach with limited evidence. The European Frat-up App might also be useful in this context.

For consideration on business cases and the APP see deliverable D 1.8.

Other web based applications:
Steadi APP (CDC)
http://www.evidenceinmotion.com/products/fall-prevention-app/
Steadi $ 4.99

Safe Step App: http://www.ltu.se/research/subjects/fysioterapi/Nyheter-och-aktuellt/Traningsapp-for-aldre-minskar-fallskador-1.123630?l=en

Frat up App: http://www.jmir.org/2015/2/e41

Smartcare Scotland: http://sctt.org.uk/programmes/wellbeing/assisted-living/falls-prevention-management-additional-resources/

## 4 Summary and perspectives

WP 4 reached many stakeholder organisations, policy makers and health care managers to inform them about best evidence, implementation needs and current developments.
A final highlight of this effort was the second European Falls Festival. The work on fact sheets on fall prevention in long-term care and acute care has been finalized. The ProFouND App has been tested in several countries and surroundings and will be further customized during the upcoming months and years.

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## Appendix 1 Updated Falls Intervention Factsheets

# Falls Prevention Intervention Factsheets

# Content

# Generic guidance and implementation guidelines

## Implementation Guidance

**Target group:**
Older people living in the community (see individual factsheets alongside this guidance).

**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 often comprise the components described below. They are complex interventions and need to be carried out by specific health care professionals working together in a multidisciplinary process. Overall, current evidence shows that this type of intervention reduces the number of falls but not the number of people falling. This suggests that they are particularly recommended for people who have recurrent falls.

**Exercise:**
Selected group and home-based exercise containing progressive balance exercises and strength training effectively reduce the number of falls and the number of people falling. The programmes with the best evidence are the Otago Exercise Programme (OEP), Tai Chi, and the Falls Management Exercise programme (FaME -sometimes called PSI). Evidence suggests that new programmes 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. Exercise must be challenging, progressive and
regular, last more than 50 hours, and the regimen should be adhered to in the long term to be effective.

**Medication and medical intervention:**
Taking vitamin D supplements may be effective in reducing falls in people 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. Treatment of specific underlying causal factors, specific therapy, medication reviews and prescription modification programmes can also be effective in reducing the risk of falling, e.g. in people who fall because of hypervolemia (restoring haemodynamic stability) or orthostatic hypotension (discontinuing medication).

**Home and environment:**
Interventions to improve home safety appear to be effective for people at high risk of falling, particularly those with severe visual impairment. They should be carried out by suitable qualified health care professionals usually occupational therapists.

**Feet and Footwear:**
Feet and Footwear assessments followed by podiatric care, foot and an- kle exercises and provision of appropriate footwear can reduce the num- ber of falls in people with disabling foot pain.

**Vision and vision aids:**
Adjustment of optical aid / spectacles (wearing single lens instead of multifocal glasses when outdoors if already active outdoors) and cataract surgery can reduce falls.

## Acute and Long term care:

**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, charities and private companies is very important.

It is beneficial to assess the older person in their own environment as you are more likely to identify underlying problems and understand their needs.

If the team assessing the older person also carries out the interventions, success and uptake is more likely.

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 older per- son 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.

Older people 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.

Older people 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.

Engage family members and friends where possible as these can be a key source of support.

Give feedback to the older person's general practitioner, as positive affirmation from them can support action from the patient.

Ensure you follow the older 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 (funders of services).

When promoting your service focus on the positive action that older people can take to promote healthy ageing, rather than falls prevention itself.

**Here are some suggestions:**
If an older person is highly fearful of falls and pro-actively seeks advice about preventing falls then you can talk to them about risk management and prevention of falls. For all other older people do not initially talk about risk and reducing their risk of falling, they are unlikely to identify themselves as being 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. Get- ting up and down stairs more easily and how it will help them to main- tain their independence.

How practising 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, Parkinson's, stroke.

Consider getting other older adults who have had positive experiences of your service to share their thoughts and support others, peer sup- port can be very effective.

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

**Links and Resources:**
www.profound.eu.com

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# Exercise

Many older people experience balance deficits and a reduction in muscular strength and power, due to ageing and to medical conditions and impairments that make movement less appealing. Yet, these are the two most important modifiable falls risk factors and can be influenced by a regular exercise training programme. Programmes must be tailored to the individual, be intensive enough to challenge balance and increase strength, progress in intensity and challenge over time, and last a sufficient duration, in order to be effective and to reduce the risk of falls.

**What works?**
Exercise is included in nearly all effective multiple interventions. To
engage older people the emphasis should be primarily on strength and balance and healthy, active ageing and rather than falls prevention.

**Programmes with multiple categories of exercise:**
Multiple-component group and home-based exercise programmes (e.g. evidence based programmes such as Otago, FaME, LiFE), usually containing at least balance and strength training, have been proven to reduce falls. Other categories of exercise that can be included in multi-component exercise interventions include 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-programme comprises of balance and strength exercises embedded into daily activities of living and effectively reduces the rate of falls.

**Exercise only interventions:**
Multiple-component group exercise (eg. FaME) significantly reduces rate of falls and risk of falling, as does multiple-component home-based exercise (eg. Otago, LiFE). For Tai Chi, the reduction in rate of falls bordered on statistical significance but Tai Chi does significantly reduce risk of falling.

The greatest relative effects of exercise on fall rates are seen in programmes that included a combination of a higher total dose of exercise (greater than 50 hours over the trial period) and challenging balance exercises (exercises conducted while standing in which people aimed to stand with their feet closer together or on one leg, minimize use of their hands to assist, and practice controlled movements of the center of mass) and did not include a walking program.

**Multiple Interventions:**
A study with "multifaceted" podiatry (customised ortheses, footwear re- view, falls prevention education), including foot and ankle exercises has been demonstrated to be as effective for preventing falls in older people with disabling foot pain.

**Who can help older people with exercise?**
Physiotherapists, sport scientists and specialist exercise instructors, who are appropriately trained in delivering falls prevention exercise programmes.

**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, eg.

- Berg Balance Scale to assess balance
- Timed Up and Go to assess balance and mobility
- Short Physical Performance Battery to assess balance and strength
- Senior Fitness Test to assess balance, strength and endurance
- FES-I to assess fear of falling

**What does not work?**
There is no evidence for chair-based exercises in reducing falls. Brisk walking is not recommended for those at high risk of falls and can in- crease risk of falls for older people. Programmes that are only delivered for a short period of time may increase confidence without sufficiently improving strength and balance and reducing risk.

**Summary**
In order to be effective, exercise programmes must be challenging,
progressive, at sufficient dosage and continued over time, they should:

- Focus on improving muscle strength/power of the lower limbs, ankles and feet
- Challenge balance in a standing position and/or gait (eg sideways, backwards walking)
- 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
- At least 50 hours of strength and balance exercise should be carried out over a minimum of 3 months. Ideally exercise should be continued for maintenance of reduced risk.
- Be delivered by instructors specially trained in one of the following evidence based programmes (Regular contact and feedback from the instructor is helpful):

## Evidence based programmes

**Otago Exercise Programme**
For the exercise booklet in a variety of languages please go to: *www.profound.eu.com/otago-exercise-program*

For further information on the Otago Home Exercise Programme, visit *www.cdc.gov/homeandrecreationalsafety/pdf/cdc_falls_compendium_ lowres.pdf*

Or *www.acc.co.nz/PRD_EXT_CSMP/groups/external_providers/docu- ments/publications_promotion/prd_ctrb118334.pdf*
For information about Cascade Training in Otago across Europe, visit *www.profound.eu.com/about/wp5-best-practice-exercise-regimen-net- work-development*

**Falls Management Exercise programme (FaME)**
For the exercise booklet in a variety of languages please go to: *www.profound.eu.com/strength-and-balance-home-exercise-booklet-for- older-people-english*

For further information on the FaME exercise programme, visit *www.cdc.gov/homeandrecreationalsafety/pdf/cdc_falls_compendium_ lowres.pdf*

Or *www.laterlifetraining.co.uk/fame-rationale-for-an-exercise-programme- to-prevent-falls*

**Lifestyle integrated Functional Exercise (LiFE)**
*www.profound.eu.com/life-lifestyle-integrated-functional-exercise-reduc- ing-falls-and-improving-function*
Or *purl.library.usyd.edu.au/sup/9781743320372*
*trove.nla.gov.au/work/190816170?selectedversion=NBD52778501*

**Square stepping**
For more information about this programme including the evidence base please go to: *square-step.org/en/home.html*

**Tai Chi**
You can find out more about Tai Chi, Taijiquan and Qigong across Europe, visit *taiji-europa.eu* and *www.tcfe.org*

## Links and Resources

Links related to exercise and falls
*www.profound.eu.com*
*www.ageuk.org.uk/Documents/EN-GB/For-professionals/Research/Falls_ Prevention_Guide_2013.pdf*

## Other resources related to exercise and falls

Gait, balance and functional training
*www.profound.eu.com/video-clip-of-stronger-seniors-balance-exer- cise-programme-english*

Strength/resistance training
*www.profound.eu.com/exercises-online-strengthening-video-english*

Square Stepping Exercise
*www.youtube.com/watch?v=IfCD7qB2I1k*

Assessments
*www.profound.eu.com/three-simple-assessment-tests-to-assess-the-patients-risk-for-falling*

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# Vision and falls

Impaired or low vision is an independent risk factor for falls in older people and unfamiliar glasses with a new vision correction or impaired vision affected by medication can increase the risk of older people falling. Many eye diseases such as cataract, age related macular degeneration, glaucoma and vascular eye disease are common in older people. Age related loss of contrast sensitivity and depth perception can cause balance problems.

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 out- side falls in intervention group participants who took part in little outside activity. New environments and a change in glasses or first prescription of glasses can increase the risk of falls during the first weeks because of altered and unfamiliar vision. This highlights the 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 treatment that 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 people 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 and behavioural strategies for safe negotiation of the internal and external environment.

For patients suffering from glaucoma, diabetes and/or vascular eye dis- ease or vision loss such as hemianopia no specific fall prevention pro- grams 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 spectacles are appropriate by testing visual acuity and glasses prescription every year
- Cataract surgery
- Occupational therapy
- Home safety and behavioural modifications for older people 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 or following cataract surgery) risk of falls can increase
- Using multifocal or bifocal lenses in new environments can increase the risk of falls
- There can be side effects of medication affecting visual acuity or adaptation

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

- Ophtalmologists
- Optometrists
- Occupational therapist

**Assessment tools**

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

**Links and Resources**

*www.profound.eu.com*

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# Bone health

In older people, bone health is an important risk factor for fractures. Osteopenia and Osteoporosis, characterised by low bone mineral density (BMD), lead to bone fragility. Low vitamin D status is associated with a variety of negative skeletal consequences including osteomalacia, Reduced BMD, impaired calcium-absorption and secondary hyperparathyroidism. Falls risk should be taken into consideration when assessing whether or not to commence medication for osteoporosis. Bone health and fracture risk should be considered in a falls assessment.

**What works?**

- 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:**

- Adequate calorie intake (Body Mass Index > 20 kg/m²)
- 1 g/kg body weight of protein per day
- Sufficient nutritional intake of Vitamin B12 (2,4 µg/day) and folic acid (400 µg/day)
- Cessation from smoking

Consideration of withdrawal of medication altering bone-health. Such as, glucocorticoids, glitazones, proton-pump inhibitors and antiepileptics in consultation with your doctor

Evidence-based anti-osteoporotic drugs (Bisphosphonates, denusomab, strontium ranelate, parathyroid hormone peptides):

Reduce the risk of vertebral fracture when given with calcium and vitamin D supplements.

Recommended for (see clinical guidelines in resources section or local Osteoporosis guidelines):

- Women with a prior fragility fracture, who should be considered for treatment without the need for further risk assessment
- Fragility vertebral fractures (single level 2 or 3 [moderate to severe], multiple level 1-3 [mild to severe])
- 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 to –2,5 SD (dependent on age and gender)

Identification and treatment of secondary causes of bone loss e.g. hypogonadism (low testosterone levels), reducing glucocorticoid medications, reducing alcohol consumption

Bone-health exercise programmes combined with fall prevention/exercise (see factsheet Exercise and Falls):

- Meta-analysis results suggest a relatively small statistically significant, but possibly important, effect of exercise on bone density compared with control groups. Exercise has the potential to be a safe and effective way to avert bone loss and reduce the risk of fracture
- Require a duration of 12 month and weight-bearing components to show effects on bone mineral density
- Weight-bearing components are successful 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-climb- ing, 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/specialist osteoporosis nurse
- 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®)
- QFracture®, which uses falls risk in the algorithm
- Blood testing for differential diagnosis and specific treatment

**Caution**

Non-adherence to treatment with specific anti-osteoporosis drugs is a substantial problem. Medication can be inconvenient to take and unpleasant. Recommendation to monitor adherence.

## Links and Resources

Links related to bone-health *www.iofbonehealth.org/europe-guidelines*

The WHO fracture risk assessment tool: *www.shef.ac.uk/FRAX*

QFracture risk tool: *www.qfracture.org*

*www.nice.org.uk/guidance/ta160 www.nice.org.uk/guidance/cg146*

Also see guidelines on osteoporosis collected at *www.profound.eu.com/guidelines/*

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# Vitamin D

Low blood levels of vitamin D are associated with falls and some fall-re- lated fractures. In many industrialised countries older people have mod- est to severe vitamin D deficiency. More than 70% of people in their 80s living in northern Europe suffer from vitamin D deficiency. This is caused by a combination of factors, such as nutritional deficiency, reduced renal function and skin atrophy. It is aggravated by a reduced sun exposure either through being housebound or institutionalised, seasonal lack of sun exposure due to weather (especially autumn/ winter) and lack of sunlight because of cultural factors (clothing which covers the skin from the sun). Severe vitamin D deficiency causes myopathy, loss of muscle strength and reduced bone health. Moderate deficiencies are linked to osteoporo- sis and impaired balance.

**What works?**

Taking vitamin D supplements may be effective in reducing falls in people with low blood levels of vitamin D. Maintaining ade- quate vitamin D levels, especially during winter, can be achieved through:

- 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). Longer periods should be avoided to limit the risk of skin cancer.
- 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 (vitamin D from sun expo- sure), adequate vitamin D intake is estimated as 800 IU per day
- Supplementation with cholecalciferol for those at high risk of deficiency may require higher doses and should be discussed with the physicians.
- Supplementation can be taken as a weekly dose in drop form or a daily dose as a sweet. Both options are particularly suitable for older people in long-term care

**Caution**

- Overdosage of cholecalciferol is possible (but rare), leading to hyper- calcaemia.
- Calcium levels must be monitored after four weeks to identify hyper- calcemia and possible hyperparathyroidism
- Large doses of cholecalciferol should not exceed 30,000 IU per week and should not be given for more than 10 weeks for a total of 300,000 IU.
- Check for contraindications
- Relevant reduction of dermal vitamin D synthesis through sun protection.

**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)

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# Home & Environment

Numerous home and environmental factors, identified from reports on older fallers and structured observations, have been associated with falls in older people. Recent research considers environmental hazards as a modifiable external factor. The key factor is the relationship between the person's physical competence level and environmental stressors, e.g. an older person with some level of compromise of competence will fall at a lower level of perturbation than a younger or fitter older person. The level of risk of environmental hazards is influenced by lifestyle, risk taking, behaviour and exposure to environmental stressors, e.g. exposure to icy pavements, rooms with low lighting.

Some home safety assessment and modification interventions, alongside behavioural intervention, have been demonstrated to be effective in reducing both number of falls and number of people falling. Home safety assessment and modification appears 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.

**Important components of environmental modifications (what works)**

- Adjustments to 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 optimised levels of friction
- Type of surface on which an older person falls, as this may reduce fall-related injuries (e.g. carpeted floors)
- Sufficient light and contrast in dark areas and at night, particularly on stairs
- Removal of trip hazards
- Urban planning considering the needs of older people (places to rest, even pathways/ pavements, ramps etc.)

**What did not work?**

Home safety assessment and modification alone / as a single component intervention. (Effective interventions have been accompanied by education, training with transfers and provision of mobility aids).

**Caution**

- There is little high-level scientific evidence for modification of the built home environment as a method of reducing the risk of injury.
- Active people living with more environmental hazards are more likely to fall than frail people. Risk of falling is even increased in active people depending on their perception of risk and their outside participation. Frail people are more likely to fall because of their own limitations.
- Compliance issues are also caused by the stigmatising effects of home modifications (e.g. grab rails), and the perceived challenge to health and independence. Low financial or education status can also impact on older people's understanding of the need for home modification, limiting implementation (community and education programmes may help).

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

- Occupational therapists (interventions appear to be more effective when carried out by an occupational therapist)
- Other trained specialist

**Assessment tools**

Home hazard checklists, such as Westmead Home Safety Assessment, HomeFast, EnableAge

**Links related to home and environment**

Westmead assessment tool
*www.google.com/url?url=https://www.maa.nsw.gov.au/getfile.aspx-%3FType%3Ddocument%26ID%3D44479%26ObjectType%3D3%26Ob- jectID%3D3919&rct=j&frm=1&q=&esrc=s&sa=U&ei=OQMSVK2qE8H- VPIawgNAE&ved=0CCYQFjAC&usg=AFQjCNEL_Ny70wKn-qEEB- ZDdsKjudqCQ-A*

HomeFast assessment tool
*www.bhps.org.uk/falls/documents/HomeFast.pdf*

EnableAge assessment tool
*www.enableage.arb.lu.se/pub.html*

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# Footwear & Protective Clothing

Footwear is very personal and can be culturally determined. Inappropriate footwear can increase the risk of slips, trips and falling and some certain shoes can decrease the base of support. An increased risk of falls has been linked to poor fitting shoes, slippers with a lack of heel support and high heeled shoes. Walking barefoot or with only stockings or socks in- doors is also associated with an increased risk of falls.

Hip protectors can reduce the risk of fracture for older people living in nursing or residential care settings but has little effect for community dwelling older people due to low compliance.

**What works?**

- Footwear counselling- where older people are counselled on the spe- cific identified hazardous features of their footwear and are provided with a handout on what constitutes a safe shoe.
- There is some evidence for the use of a non-slip device (Yaktrax® walker) on outdoor shoes in hazardous winter conditions.
- There is a reduction in rate of falls in people for people with disabling foot pain receiving "multifaceted podiatry" (customised orthoses, foot- wear review, foot and ankle exercises, fall prevention education, and "usual podiatry care").
- Protective clothing such as hip protectors for older persons with high risk of fracture

**Caution**

Inappropriate footwear has been defined as a heel height >4.5 cm, or any two of the following:

- no fixation
- no heel counter (plastic or leather insert at the heel upper of the shoe)
- a heel counter that could be compressed greater than 45 degrees
- a fully worn or smooth sole
- or a shoe heel width narrower than the participant's heel by at least 20%.

Older people may not want to wear appropriate footwear or hip protectors because they do not fit with their personal identity. Having to wear sensi- ble and practical footwear or hip protectors can identify them as 'a faller' and may cause issues with self-esteem and stigma.

**Who can help older people with footwear**

- Podiatry services
- Orthopedic specialist for severe deformities
- Trained nursing staff

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# Falls detection and prevention technologies

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, that can alert professionals or carers if a fall occurs or if falls risk increases. 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.

**What works?**

Personal Emergency Response Systems 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 called quickly to the person who has fallen. However, there is evidence that people often do not press the alarms for fear of being a burden or nuisance. There is an emergence of automatic alarms that do not require the person to press them.

Simple touchscreen interfaces and other easy to use technologies have been more readily accepted than those that are more complex and multi-faceted.

Focusing on the possibility of maintaining independence is more likely to lead to successful uptake of PERS and ICT-devices.

**Caution**

- This is an emerging area and the evidence is currently not robust and is lacking completely in many areas, but this is changing rapidly.
- The main issues with use of ICT devices in the home are related 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. Emerging evidence suggests that games should be designed specifically for and with older adults.
- Evidence is weak around the effective use of bed alarms in hospitals.

**Who can help older people with ICT**

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

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# Falls and acute care

Falls and fall related injuries are very common in accident & emergency (A&E) services (Close 1999). Falls trigger many hospital admissions, not only to trauma services, and they are quite common during the time of hospital treatment. A fall during the inpatient period will often lead to an increase in the length of stay (LoS) and increase costs. Around 5 % of severe fall related injuries occur in acute care (Oliver 2010).

The most recent Cochrane review states that a considerable proportion of falls can be prevented during the stay (Cameron 2012). However, not all studies have succeeded in reducing falls despite major efforts (Barker 2016). A recent milestone study from Australia (Hill 2015) has addressed some of the shortcomings of former studies.

Most successful trials have achieved positive results for patients with LoS periods of longer than one week. A consistent finding is the role of precipitating (time dependent) factors such as fluctuating attention caused by delirium and functional deterioration due to acute intercurrent problems such as dehydration, fever etc. Impaired self-perception improvement can also lead to an increase in non-assisted or non-supervised activities which are major causes of falls (Oliver 2010).

This factsheets summarises the understanding of fall prevention for older persons in acute care settings. Aspects regarding A&E are addressed in the factsheets for persons living at home or long-term care. A second aspect is the prevention of falls after discharge which is equally important.

### Falls in acute care and what can be done to reduce falls

Most strategies that have been described in the single risk factor ProFouND fact sheets for community dwelling older persons apply in the acute care setting. Immediate medication review to avoid orthostatic hypotension, conservative strategies for psychotropic medications, identification of vision impairment, training of safe transfer strategies, and ensuring appropriate footwear are relevant factors. Progressive strength and balance exercise, vitamin D supplementation and bone health interventions have no immediate effect but action should be taken, including recommendations or post-discharge referral should be made. The key component for fall prevention is the implementation of a proactive organisational strategy that includes leadership, careful monitoring, supportive risk management, change agent.

### What works?

- Patient and linked staff education programmes (Hill 2015)
- Accident and Emergency identification of fallers with a planned secondary visit to develop a fall prevention plan such as a Fall and Fracture Liaison Service (Close 1999)
- Post-discharge planning of fall prevention (GEM-HIT, Cumming)

### Caution

- Simple screening tools are not recommended for fall preventions purposes in acute care
- The appointment of fall liaison specialists can lead to a withdrawal of staff commitment by others.

### Who can help older people with fall prevention and acute care facilities?

- Geriatricians: development, implementation and evaluation
- Specialised nurse practitioners: development, implementation and evaluation
- Specialised physiotherapists: goal setting, transfer strategy, walking aid, post-discharge planning
- Specialised occupational therapist: assistive devices, environmental adaptations

### Assessment tools:

Different assessment instruments have been developed. The replication of measurement has been mostly disappointing (Oliver 2010).

**Other resources related to acute care and falls**

Workbook:
*http://www.med.monash.edu.au/physio/staff/files/srtp.pdf*

Videos:
*https://www.youtube.com/channel/UCT7sYTGgu2tbcktv2fYG4HQ*
*https://www.youtube.com/watch?v=zlJgXkvELPg&index=1&list=PLJUbV7WX-EFhmazYlSTTzAwSUqpQIJBGq*

Website:
*http://www.med.monash.edu.au/physio/staff/thaines.html*

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# ProFouND Factsheet on institutional long-term care (LTC) and fall prevention

**Falls, fallers and long-term care**

Falls and fall related injuries are common, important and costly. Less than 6 % of the older population live in long-term care in Europe, however about 20 – 25 % of severe fall related injuries occur in LTC. On the resident level they can have detrimental effects on walking and sit-to-stand transfers, psychological measures such as fear of falling and cause pain even without fractures. Two falls per resident can be expected per annum. Almost all residents with walking capacity are at risk of falling. Programmes should be implemented that have sufficient reach and sustainability. Ensuring mobility and safety are equally important goals for residents, families and staff members. In the past a misunderstood emphasis on safety alone has led to perverse intervention to avoid falls such as restraints. The most recent Cochrane review concludes that a considerable proportion of falls can be prevented (Cameron 2012). This factsheet summarises the most relevant components of fall prevention for older persons in LTC.

**What can be done to reduce falls**

Single risk factor strategies that have been described in the fact sheets for community dwelling older persons mostly apply for LTC. In order to be effective the strategies must be combined and adapted in a sensible manner. The Cochrane review clearly states that multifactorial approaches are needed in LTC. The priorities are often different. This requires an interdisciplinary approach of licensed care, nursing aides, medical care, physiotherapy, other health care professionals and managers. Components such as regular medication review, adapted ergonomics of furniture, maintenance of and training with walking aides, proper footwear, appropriate lighting should be part of a general risk management and safe mobility strategy. More than 50 % of falls in LTC occur in transfer situations like sit-to-stand or stand-to-sit maneuvers. Therefore, safe transfer strategies should be a core part of care giving routines. Urinary incontinence management, compensation of vision loss, ensuring adequate fluid intake and nutrition are part of a good nursing practice and thereby relevant in this context.

Exercise programmes are part of a state-of-the art facility enhancing safe mobility. Best practice programme examples are the Swedish High-Intensity Functional Exercise (HIFE) programmes (Toots 2016) or the Ulm fall prevention programme. Physical activity is stimulated by meaningful activities.

LTC fall prevention programmes need leadership and evaluation. Implementation without an organisational commitment and strategy are less effective. This strategy includes quality improvement strategies, risk management and critical incident reporting.

**What works?**

The land mark studies supported by systematic reviews have used multifactorial programmes including explicit organisational leadership, regular staff training, systematic monitoring, discussion of severe fall related injuries, regular exercise classes, medication review, and environmental adaptations. Required is a sustainable strategy, often over several years.

**Caution**

- Exercise interventions without interdisciplinary components have often had no effect or even negative effects (Kerse 2004).
- Activity restriction or even restraints to prevent falls are not justified. Restrictive approaches can have severe side effects such as functional loss.
- Vitamin D supplementation and bone health intervention are still under debate for the LTC setting and should be discussed on an individual basis. There is no evidence for mostly bedridden residents.
- Hip protector and other protectors (e.g. helmets) are not a generally recommended strategy in LTC but are useful in frequent fallers such as atypical Parkinsons' disease or epileptic patients with recurrent seizures. This should be individually assessed and personal support is needed.

**Who can help older people with fall prevention and long-term care facilities?**

Licensed nurses and nurse's aides are key in the sustainable fall prevention in LTC

**Other professions are needed to develop, assess and improve the programmes**

- Geriatricians: programme development and evaluation
- Specialised nurse practitioners: development and implementation of programmes
- Specialised physiotherapists: exercise programmes, walking aids
- Specialised occupational therapists: assistive devices, environmental adaptations
- General physicians: medication review focusing on psychotropics and orthostatic hypotension
- Consulting pharmacists: medication review

**Assessment tools**

Simple scales for risk factors at admission are not useful and not recommended. Their predictive capacity is low. Assessment should be part of a comprehensive process. Risks change over time. The first weeks after admission are a high risk period that requires additional attention, support and reassurance. Assessment requires the analysis of the build environment and the care processes based on the continuous analysis of fall reports.

**Other resources related to long-term care and falls**

*http://www.sfu.ca/tips/mission.html videos on real falls in LTC*
*https://www.youtube.com/watch?v=MjNkxCBZI5c* video on hip protector guidance

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