

A comprehensive fracture prevention strategy in older adults: the European Union Geriatric Medicine Society (EUGMS) statement

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Abstract Prevention of fragility fractures in older people has become a public health priority, although the most appropriate and cost-effective strategy remains unclear. In the present statement, the Interest Group on Falls and Fracture Prevention of the European Union Geriatric Medicine Society, in collaboration with the International Association of Gerontology and Geriatrics for the

European Region, the European Union of Medical Specialists, and the International Osteoporosis Foundation–European Society for Clinical and Economic Aspects of Osteoporosis and Osteoarthritis, outlines its views on the main points in the current debate in relation to the primary and secondary prevention of falls, the diagnosis and treatment of bone fragility, and the place of combined falls and fracture liaison services for fracture prevention in older people.

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Introduction

Three-quarters of all vertebral and non-vertebral fractures occur among adults aged 65 years or older, and over three-quarters of hip fractures occur in people aged 75 or over [1]. The major influence of ageing on fracture risk is mainly due to the strong impact of age and age-related conditions on bone strength and fall risk [2, 3]. Although fractures of the hip are the most serious and costly fractures, those at the spine, pelvis, distal femur, proximal tibia, proximal humerus, and ribs are also major fractures, associated with excess morbidity and mortality, increased hip fracture risk, decreased quality of life, and high healthcare costs [4–8]. With the global growth of the older population, prevention of fractures has become an international public health priority [4, 9, 10]. The most appropriate and cost-effective strategy to prevent major fractures in older people, however, remains a hotly debated topic [11–14]. In the present statement, the Interest Group on Falls and Fracture Prevention of the European Union Geriatric Medicine Society (EUGMS), in collaboration with the International Association of Gerontology and Geriatrics for the European Region (IAGG-ER), the European Union of Medical Specialists (EUMS), and the International Osteoporosis Foundation–European Society for Clinical and Economic Aspects of Osteoporosis and Osteoarthritis, outlines its views on the main points in the current debate.

Primary and secondary prevention related to falls

In adults, falls occur predominantly in older people. In populations over age 65, a third of community-dwelling people fall at least once per year, and in those aged 80 years or more, a half fall over the course of a year [15, 16]. More than 80 % of non-vertebral fractures result from a fall [2, 3]. Around 10 % of falls result in a fracture [17, 18] and 2 % in a hip fracture [19]. The efficacy of falls prevention interventions to reduce fractures is debated [13, 14], in part because it depends on the fall risk profile of people and the type of intervention programme [20, 21].

There is no international consensus for assessing the fall risk profile of older people, even if it is well understood that people at higher risk of future falls are those aged 75 or older, those who have fallen during the previous 12 months or those who have fear of falling or significant gait, muscle strength, or balance problems [16, 22–28]. The fall risk profile is also dependent on the setting and some other factors, including cognitive impairment which may be associated with increased risk taking. Even though balance, gait, and muscle function decline increase the risk of falling, the relationship is not completely linear since those with most problems (i.e. bedridden) usually have a lower falls risk, similar to those without such problems, presumably due to low exposure to risk [29].

Notwithstanding the lack of consensus in assessing fall risk profile, there is rather consistent evidence in subjects with low to moderate falls risk, usually community dwelling, that multicomponent exercise programmes, including progressive, challenging and regular exercises designed to improve balance, muscle strength, and protective responses in case of destabilization, are effective in the reduction of serious falls and non-vertebral fractures [21, 24, 30, 31]. The studies are, however, insufficiently powered to demonstrate a significant effect on hip fracture risk [21, 24, 30]. Single interventions including treatment of some vision problems or carotid sinus hypersensitivity, vitamin D supplementation in deficient patients, gradual withdrawal of psychotropic medication, or improving the safety of indoor activities and outdoor walking environments are also effective for suitable patient groups in the prevention of falls, but the effect on fracture risk is not clear [21, 32, 33]. Multifactorial interventions, a combination of interventions linked to the individual's risk profile, seem no more effective in preventing falls than single targeted interventions (e.g. community exercise or fall prevention programmes) [21, 34].

In people at high risk of falls, single targeted interventions seem less effective, e.g. in older nursing home residents, the only single intervention that has reduced falls is vitamin D supplementation [20]. Other interventions have

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been ineffective or inconsistent for falls although the rate of recurrent falls may be reduced [35]. A multifactorial and interprofessional approach, determined by individual assessment of functional, medical, and social concerns, may be a more appropriate strategy to prevent falls in older people at high risk of falling [20, 22–34, 36]. Moreover, this tailored approach [37] may provide opportunities to address previously unidentified health problems (e.g. impaired cognition, diabetes, Parkinson's disease, osteoporosis) [9, 38], conferring benefits beyond falls prevention [39, 40]. People at high risk of fall are most often frail patients [40], and multifactorial approach in this population has been shown to improve the ability to live safely and independently [41].

Taken together, the EUGMS supports (1) the set-up of a working group that would develop consensus international operational definitions and diagnostic criteria for assessing the risk of falling to be used in clinical practice as well as in research studies, (2) the 2010 American Geriatrics Society/British Geriatrics Society joint guideline urging practitioners to screen, at least annually, older patients for risk of falling [42], (3) that above evidence-based measures, especially evidence-based community exercise fall prevention programmes, should be widely available to prevent non-vertebral fractures in older people at low or moderate risk of falling [9], and (4) that people at high risk should be able to access individually tailored multifactorial measures based on a comprehensive geriatric assessment. EUGMS recommends continued and expanded provision of evidence-based fall prevention programmes such as those being promoted by ProFouND (www.profound.eu.org).

Primary and secondary prevention related to bone health

It is widely recognized that lifestyle measures (regular weight-bearing exercises, balanced diet, including calcium intake, avoiding smoking and excessive alcohol consumption) and measures aimed at reducing adverse effects on bone of drugs and diseases, including renal diseases, have to be recommended throughout life in everyone. They are beneficial in optimizing skeletal development [43–46] and limiting bone loss during adulthood [47].

Whereas there are well-established definitions of osteoporosis [13, 14], there is much current debate on what is the target population that may potentially benefit from treatments acting on bone metabolism (TABM) [13, 14, 48–51].

Osteoporosis is currently defined by bone densitometry (densitometry osteoporosis) when the bone mineral density (BMD) is 2.5 SD or more below that of the mean level for a young adult reference population (T score ≤ -2.5 at the

lumbar spine or the hip, or at the distal radius when the hip and lumbar spine cannot be measured or are unusable or uninterpretable) [52–54]. Aortic calcification and osteoarthritis that increase progressively with age may be a source of accuracy error in the measurement of lumbar spine BMD in older people [55, 56]. However, for a given BMD, the risk of major fractures depends on other risk factors for bone fragility, of which age is the most important one, which are taken into account in different fracture prediction tools such as the most used FRAX[®] tool (www.shef.ac.uk/FRAX) or the Garvan Fracture Risk calculator (www.garvan.org.au/bone-fracture) or the Q-fracture Risk Calculator (www.qfracture.org). Fragility fracture risk should therefore take into account not only BMD but also other risk factors of bone fragility, by using fracture prediction tools, and falls risk [57]. Since falls and osteoporosis are independent risk factors of non-vertebral fractures, osteoporosis should be ascertained not only in patients with conditions known to induce bone fragility but also in patients at risk of falls and vice versa [58]. The prevalence of osteoporosis detected by DXA BMD measurement is high in fallers with sarcopenia, impaired mobility, and weight loss, which are risk factors for both falls and osteoporosis [58].

A fracture is considered a fragility or low-energy fracture when it is the result of a minimal trauma, such as a fall from a standing height or less. However, a fall from standing height without any protective response generates an amount of energy which is at least ten times the energy required to fracture the proximal femur of an elderly woman [59]. Diagnosis of fragility fracture should therefore be set after a careful comprehensive assessment including (1) fracture mechanism consideration (energy of the trauma) and (2) bone strength estimate, based on bone mineral density (BMD), considering that densitometry osteoporosis is observed in around 60 and 40 % hip fractured women and men, respectively [60], fracture type (comminuted or not, for example) and operator's subjective assessment of bone quality in the case of surgery.

The cost-effectiveness of the pharmacological approach of treating osteoporosis (and therefore on searching for osteoporosis by dual-energy X-ray absorptiometry (DXA)) is also debated [13]. However, several licensed TABM have shown their ability to prevent major fractures in people (most often women) with a T score ≤ -2.5 at the spine or the hip (raloxifene has only been shown effective in preventing vertebral fractures) [14, 61] or after a hip fracture [61]. Relative risk reductions of spine and non-vertebral fractures by TABM in subjects with bone densitometry-diagnosed osteoporosis are 40–60 and 20–40 %, respectively [14, 61]. Number needed to treat (NNT) to prevent a fracture is lower in people at high risk of fractures, especially in those with prior fragility fractures [13, 37, 61–73].

Taken together, EUGMS supports recommendations that (1) osteoporosis should be ascertained by DXA, at best combined with vertebral fracture assessment (VFA) or radiography examination to detect vertebral fractures, in individuals at risk of fracture, i.e. at risk of falling [58] or at risk of bone fragility (history of fracture, low body weight, parental history of hip fracture, use of glucocorticoids, excessive alcohol consumption, diseases with bone adverse effects) [74], (2) TABM should be considered after a careful assessment of the benefit/risk ratio in patients at high risk of fracture, i.e. with a prior fragility fracture or in those with densitometry-diagnosed osteoporosis associated with other risks factors of fractures, assessed both by fracture prediction scores and by risk of falling, and (3) TABM should not be initiated when the life expectancy is less than 6–12 months, the minimum time needed for drugs to be effective in fracture prevention [66].

EUGMS recommends that prospective studies be conducted in non-selected older people (particularly in those aged over 80 years) to determine whether this strategy is effective, considering that age and health status may modify compliance with treatments and the number to treat/number needed to harm (NNH) of TABM [61].

Fracture Liaison Services and screening for spine fragility

As the diagnosis of fragility fracture and the assessment of benefit/risk ratio of the above measures are complex, EUGMS recommends that patients aged 65 years or older with vertebral or non-vertebral fractures should be referred to a fracture liaison service (FLS) (as proposed by the International Osteoporosis Foundation in the Capture the Fracture initiative) [75], which should be linked to or have strong input from geriatric medicine services (combined fall and fracture liaison service). Such an approach will allow commencement of appropriate interventions and ensure locally agreed arrangements for follow-up of patients. This model of care has been shown to be cost-effective [76, 77].

EUGMS emphasizes that vertebral compression fractures are common and often unrecognized in older people. X-ray examination should be more systematically performed in older patients with back pain, significant height loss (e.g. 5 cm or more), or significant incident kyphosis. Radiologists should be encouraged to report on the presence or absence of vertebral deformities as “fractures” when assessing chest radiographs so as to identify patients who need referral to the combined fall and fracture liaison services [78], as these are mostly fragility fractures in older people [53].

Conclusion

EUGMS advocates a comprehensive and multidisciplinary fracture prevention strategy in individuals aged 65 or older requiring: (1) better education for both older people and healthcare professionals with regard to general lifestyle and medical measures to optimize bone health and prevent falls; (2) improved knowledge about screening and optimizing management of older people with bone fragility or high risk of falling in primary and community care as well as institutional settings; and (3) strong collaboration between fracture liaison services, geriatric medicine departments (combined falls and fracture liaison services), and primary care. Policy makers will need to play a major role in developing community and institutional programmes on falls prevention, to establish falls and fracture liaison services and appropriate pathways for fracture prevention that include both assessment and management of fallers and optimizing medical management in those with bone fragility to reduce fracture risk.

The EUGMS believes strongly that the focus for fracture prevention should not be polarized into either falls prevention or improving bone health camps. Rather the ideal strategy should be on optimizing bone health, especially in those with bone fragility, in addition to implementing measures to prevent falls.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflicts of interest concerning this article.

Statement of human and animal rights All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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