

REVIEW

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# Optimizing osteoporosis management: targeting to treat — an initiative by the Egyptian Academy of Bone Health

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## Abstract

The overarching goal of treating osteoporotic patients is to reduce the incidence of fractures, yet interventions that support early detection of osteoporosis and prevention of osteoporotic fractures are underutilized. Osteoporosis and, specifically, the associated burden of fractures call for a screening strategy offering an opportunity to intervene early. Such strategy should be clinically feasible and cost-effective, aiming to identify and treat subjects at high or very high risk of fragility fracture.

The low sensitivity of bone mineral density measurements in identifying high-risk patients is evidenced by the high number of osteoporotic fractures occurring in subjects with BMD values above threshold required for a diagnosis of osteoporosis. Consequently, DXA scanning is not considered appropriate as a public screening tool identifying patients at risk of sustaining fragility fractures and current efforts focus on identifying non-BMD-related risk factors.

In Egypt, we are fortunate in having all modalities of osteoporosis therapy and assessment tools available, yet there remains a significant treatment gap in osteoporosis management. Furthermore, screening for fracture risk is not currently advocated nationally. This manuscript describes a national initiative for a population screening intervention to identify patients at risk of developing a fragility fracture aiming to reduce fragility fractures especially in older adults.

**Keywords:** Osteoporosis, Fragility fracture, FRAX, FRAS, SARC-F, Functional disability, Bisphosphonates, FLS

## Background

Osteoporosis-related fractures are a substantial public health burden. A significant body of evidence is available reporting the use of various interventions in the management of osteoporosis in high-risk patients and the prevention of related fractures. Even though evidence from randomized trials has been incorporated into clinical practice guidelines, including new approaches to reduce fracture risk, the interventions are substantially not fully implemented. Consequently, only a minor proportion of eligible patients receives osteoporosis management, representing a significant treatment gap [1–3].

The most common sites of osteoporotic fractures include the hip, vertebrae, and the distal forearm. However, osteoporosis is a systemic condition affecting the entire skeleton, with a consequent surge in fracture risk substantially impacting on all skeletal sites [4]. Apart from an increase in mortality, hip fractures impact negatively on the patients' health-related quality of life causing a substantial reduction in functional abilities when compared to all other fracture sites. In both sexes, the incidence of a hip fracture increases exponentially with age. The estimated number of hip fractures worldwide will rise from 1.7 million in 1990 to 6.3 million in 2050 due to the rapidly growing number of elderly people in the population [5]. Similarly, the prevalence of vertebral fractures increases progressively with age in both men and women [6].

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In an attempt to close the treatment gap in the management of our patients and in concordance with international organizations recommendations including the International Osteoporosis Foundation (IOF), the Egyptian Academy of Bone Health and Metabolic Bone Diseases has launched a specialized healthcare system for fracture liaison services (FLSs). Currently, an estimated 71.8% of the Egyptian population have access to a local FLSs [7]. This national project “targeting to treat” has been launched by the Egyptian Academy of Bone Health in concordance with the Capture the Fracture® global program. It is based on a population screening intervention to identify patients at risk of developing a fragility fracture and aims to reduce the incidence of osteoporosis-related hip and vertebral fractures by 25% by the year 2025. The screening model proposed in this work and the conclusions drawn from it, though designed mainly for Egypt, will likely benefit other healthcare settings internationally; it incorporates for the first-time multiple risk factors for fragility fractures.

## Main text

### Diagnostic vs intervention thresholds

The osteoporosis diagnostic criteria developed by the WHO were primarily intended for descriptive epidemiology [8, 9] but were soon implemented as inclusion criteria for drug trials and subsequently proposed as intervention thresholds and a basis for health technology assessments [10]. The large treatment gap in patients who have sustained a low trauma fracture has stimulated the requirement for a change in diagnostic criteria for osteoporosis and fracture risk. It is widely acknowledged that relying solely on the BMD as a marker of fracture risk is less sensitive than using risk assessment algorithms, e.g., FRAX. FRAX calculate the absolute fracture risk based on the patient’s age, six clinical risk factors, and the patients’ BMD [11]. This approach has been supported by the rapidly growing evidence showing that campaigns such as Capture the Fracture®, which endorse fracture liaison services, have allowed for more accurate identification of patients who subsequently developed fragility fractures. Furthermore, the role of the fracture recency, shown for both vertebral and non-vertebral fracture risk [12], and adjustments to FRAX to identify very high fracture risk as a new separate category from high fracture risk have paved the way for new guidance thresholds and, for the first time, endorsed the use of anabolic agents as a first-line therapy [13–15]. The concept of using anabolic agents as first-line therapy in osteoporosis treatment and early identification of patients who developed fragility fractures have already had positive impact on reducing fragility fractures [16], in keeping with the ultimate goal in osteoporosis management.

### Shifting the focus

Numerous studies have shown that among older adults, other factors are strongly linked to fragility fractures and should be included as risk factors for future fracture [17–21]. Most osteoporotic fractures occur in the setting of a fall. In fact, the severity and type of the fall (considering the fall height, direction, and energy) substantially influence the risk of a fracture occurring [17, 18]. A reduction in the bone mineral density (BMD) by 1 SD surges the fracture risk 2–2.5 times. In comparison, a sideways fall would increase the risk of sustaining a hip fracture 3–5 times. If there is an impact to the greater trochanter of the proximal femur during the fall, the risk of developing hip fracture increases about 30 times [19]. Such “strong” associations between falling and fragility fractures are analogous to the association between smoking and lung cancer [22]. Therefore, an assessment of falls risk among subjects prone to sustaining a fragility fracture is mandatory.

There has been an increasing interest in sarcopenia and its role as a risk for osteoporotic fractures, particularly fractures of the hip. Osteoporosis and sarcopenia, both characteristic features of aging, are linked and often coexist. This is typically seen in frailty syndrome [23]. Frailty is often described as maladaptive response to stressors, causing functional decline and other serious adverse health outcomes [24]. The age-related chronic inflammation, often referred to as “inflammaging,” leads to a decrease in both muscle mass and strength in addition to bone loss [25]. Therefore, the simultaneous assessment of sarcopenia and osteoporosis is important in identifying subjects at higher risk of sustaining osteoporotic hip fractures and provides an additional opportunity to initiate preventive or therapeutic interventions.

Published data confirm that functional impairment has usually been present before the incident hip fracture [8, 26–29]. In fact, more than 90% of hip fractures occur as a consequence of a fall [30], typically in frail and sedentary people [31] with low bone mass [32]. It has been reported that poor physical function and low level of physical activity are associated with an elevated risk for fractures and death in the elderly [33, 34]. Quantifying the role of functional status and its decline, in the prediction of fracture and death, as well as its association with both sarcopenia and falls, revealed its significant association with fractures in both osteopenic and osteoporotic patients [35]. Recognition of this cohort would help in the stratification of those subjects who are most likely to benefit from physical intervention. However, the use of simple functional assessment tools for the prediction of hip fracture and death in postmenopausal women has not been implemented in standard clinical practice.

**Screening for fracture risk**

Systematic strategies to refine the management of patients with osteoporotic fractures are progressively advocated in several countries. However, while low femoral BMD is a risk factor for hip fracture [36], the majority of hip fractures occur in patients with “normal” or “osteopenic” BMD values. This would explain why most people at high risk of sustaining an osteoporotic fracture remain unrecognized and not treated. Consequently, this makes population-based screening of osteoporosis using densitometry alone an inadequate solution and is therefore not recommended [37].

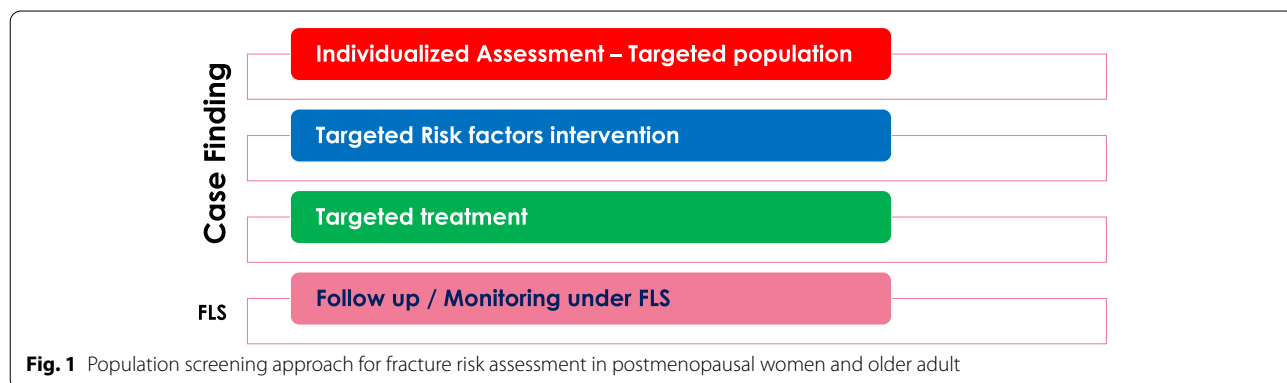
A recent position paper from the International Osteoporosis Foundation Epidemiology/Quality of Life Working Group [38] addressed the question “Is it time to consider population screening for fracture risk in postmenopausal women?” The position paper proposed a strategy based on assessment of hip fracture risk using the FRAX® risk assessment tool. The proposed approach merges low-cost evaluation with targeted intervention using low-cost generic treatments, predominantly oral bisphosphonates. Such strategy is expected to have positive impacts on the personal, clinical, and economic burden of these osteoporotic fractures. This approach is supported by the outcome of a meta-analysis of three prospective, randomized controlled studies of FRAX-based screening which has shown a significant reduction in hip fractures [39]. SCOOP (Screening for Osteoporosis in Older People) study results revealed that community screening, based on the FRAX probability of hip fracture, has led to a significant reduction in hip fractures in older women [40–44].

This approach is in agreement with the recently published Egyptian guidelines for osteoporosis management [45] which adopted fracture risk assessment as a baseline to streamline the osteoporosis service in Egypt and determine the modality of osteoporosis therapy or its escalation according to the patient’s risk factors and fracture risk within an approved framework.

**Targeting to treat approach**

Wilson and Jungner [46] have specified several characteristics of a proposed screening program for diseases. These include whether the target population is sufficiently large to enable safe, clinically, and cost-effective screening and whether effective means exist for identifying, contacting, and informing the whole target population. Osteoporotic fractures are undoubtedly a common public health problem. The incidence of fragility fractures increases markedly with age; hip fractures are relatively rare at the age of 50 years but become the predominant fracture from the age of 75 years [46]. In Egypt, 4.5% of the population are over 65 of age. This includes 2,618,443 females and 2,152,754 males. Mean age for male is 73.26 years, whereas for females, it is 75.72 years. The prevalence of osteoporosis in Egypt has been estimated at 28.4% in women and 21.9% in men, whereas 53.9% of women and 26% of men had osteopenia. In rural areas of Upper Egypt, the prevalence of osteoporosis in postmenopausal women was even higher reaching up to 47.8% [47]. Such high prevalence highlights the magnitude of the problem in terms of public health and the importance of having a national screening tool for prediction of fragility fractures.

The main pillars of the proposed screening program are shown in Fig. 1. Targeted individuals are those above the age threshold (50 years). This reflects the requirement to recognize a suitably high-risk cohort to ensure that the program would have good clinical and cost effectiveness [48]. The risk factors assessed include the following: (1) FRAX risk assessment tool, (2) FRAS falls risk assessment tool, (3) SARC-F for sarcopenia assessment, and (4) functional disability score [35]. These short questionnaires are self-completed and presented in paper format, with a family member assisting if required. Further assessment for falls, sarcopenia, and physical examination will be carried out for those whose scores exceed the high-risk cutoff points. The intervention threshold set by the national Egyptian



**Fig. 1** Population screening approach for fracture risk assessment in postmenopausal women and older adult

guidelines is a major osteoporosis fracture 10-year probability of 20% or a hip fracture probability of 3%. Those with low fracture probability would receive a letter of reassurance with general lifestyle advice, while the remainder would have an additional assessment of spine/femoral neck bone mineral density using local densitometer facilities. The bone density result is to be incorporated in an updated FRAX calculation. The cohort of patients with fracture probabilities, whether spine or hip above the intervention threshold, would be recommended for treatment according to the guidelines. Specific targeted treatment programs will be determined according to the individual patient's other risk factors (falls, sarcopenia, and functional impairment). The patients will be monitored under the FLS service for their adherence as well as response to therapy and the occurrence of fractures.

In conclusion, this article summarizes the proposed screening program for early identification of subjects at high and very high fracture risk. The screening program is based on self-completion of short questionnaires for fracture risk assessment, falls risk assessment, sarcopenia, and functional impairment. Subsequent measurement of spine and hip BMD is carried out wherever appropriate. The patients identified at high risk of fracture are treated according to the guidelines, predominantly with oral bisphosphonates. Data extracted from this program will be used to assess the performance of the proposed screening program against the 4 established key criteria of condition, test, treatment, and effectiveness.

#### Abbreviations

FRAX: Fracture risk assessment; FRAS: Falls risk assessment score; SARC-F: Sarcopenia assessment questionnaire; FLS: Fracture liaison service; DXA: Dual-energy X-ray; BMD: Bone mineral density; SCOOP: Screening for osteoporosis in older people; WHO: World Health Organization.

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The authors shared doing the review of the literature, writing and revising the manuscript. The authors read and approved the final manuscript.

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#### Ethics approval and consent to participate

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#### Consent for publication

NA.

#### Competing interests

The authors declare that they have no competing interests.

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