

# Integrated care for people at high risk of fragility fractures: a partnership between bone specialists and primary care professionals

Silvia Grignaschi<sup>1\*</sup>, Ilaria Giovanna Macchione<sup>2\*</sup>, Marta Baroni<sup>2</sup>, Giuseppe Giuffrè<sup>3</sup>, Andrea Giusti<sup>4</sup>, Riccardo Bogini<sup>5</sup>, Alessandro Rossi<sup>6</sup>, Giuliana Duranti<sup>5</sup>, Maria Cristina Caffetti<sup>1</sup>, Carmelinda Ruggiero<sup>2</sup>

<sup>1</sup> Rehabilitation Unit, Ospedale Unificato di Broni-Stradella, ASST Pavia, Pavia; <sup>2</sup> Gerontology and Geriatric Section, Department of Medicine and Surgery, University of Perugia, Perugia, Italy; <sup>3</sup> General Practitioner, ASST Pavia, Pavia; <sup>4</sup> Internal Medicine, ASL 3 Genova, Genova; <sup>5</sup> Local Health Unit (USL) Umbria1, Perugia; <sup>6</sup> Local Health Unit (USL) Umbria2, Terni. \* These authors gave an equal contribution

## ABSTRACT

Fragility fractures represent a major and growing public health challenge, with high socio-economic costs. Despite the availability of effective pharmacological and non-pharmacological interventions, secondary fracture prevention remains inconsistently delivered, particularly at the hospital–community interface. Real-world evidence shows that initiation of anti-osteoporosis treatment after hip fracture has increased over time, but remains inadequate. We describe an integrated model of care for people at high risk of fragility fractures, grounded in orthogeriatric principles and fracture liaison service (FLS) coordination and operationalised through structured collaboration with primary care. The model aligns acute care excellence (early geriatric co-management, early surgery, early rehabilitation) with longitudinal community-based management (case finding, fracture-risk assessment, treatment initiation and follow-up, fall prevention, adherence support and review). Evidence from randomised trials and meta-analyses supports orthogeriatric co-management for improved functional outcomes, while systematic reviews demonstrate that FLS models increase the initiation and persistence of osteoporosis therapy and reduce long-term refracture risk. We discuss core components, implementation enablers (shared indicators, digital communication, workforce training, case management), and policy opportunities—highlighting how contemporary territorial care reforms (e.g., Italy's DM 77/2022) can support scalable “falls and fractures” pathways anchored in primary care and community services.

## KEYWORDS

Fragility fractures, integrated care, hospital–community care.

## Unmet needs of people with fragility fractures

Fragility fractures are highly prevalent in older adults and, especially after hip fracture, generate disproportionate downstream morbidity, with the burden of disability exceeding that of premature mortality<sup>[1]</sup>. According to risk-stratified frameworks, approximately 16% of the population has experienced a major fragility fracture and is classified as being at highest or imminent fracture risk. The imminent risk period refers to a two-year window following an index major fragility fracture, during which individuals face the greatest likelihood of re-fracture, underscoring the need for timely assessment and initiation of effective therapy<sup>[2,3]</sup>. Notably, approximately 50% of expected hip fractures will occur within this subgroup, which is recognized as the primary target for secondary prevention<sup>[1]</sup> (Figure 1).

Despite this evidence, the secondary-prevention care gap remains substantial, with many eligible patients untreated<sup>[4]</sup>. In Canada, between 2000 and 2015, the proportion of individuals receiving osteoporosis medication within one year of a major fracture peaked at 26.1% in women and 16.9% in men

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## Contact

Carmelinda Ruggiero  
Department of Medicine and Surgery, University of Perugia, Perugia, Italy

in 2008–2009, before declining through 2014–2015 (both  $p$  for trend  $<0.001$ )<sup>[5]</sup>. This failure has been attributed largely to historical reliance on indirect interventions, including educational programmes, protocols and guidelines that aimed to change patient outcomes without patient engagement, systematic case finding, or structured follow-up.

In the UK, following the introduction of the NICE recommendations, anti-osteoporosis drug prescribing within one year of hip fracture by primary care physicians rose from 7% in 2000 to 46% in 2010, yet remained inadequate<sup>[6]</sup>. At the system level, therapy initiation after hip fracture shows marked geographical variation, and long-term persistence remains poor, with only approximately 15% of patients on treatment five years after the index event<sup>[7]</sup>.

Current challenges in fracture care delivery include poor

networking and inconsistent management across orthopaedic wards, orthogeriatric services, and fracture liaison service (FLS) programmes; lack of structured follow-up after hospital discharge; absent or fragmented engagement with primary care providers; regional variability in infrastructure and capacity to address re-fracture risk; and inadequate communication and automated clinical data sharing between hospital and community care teams. These barriers collectively highlight the urgent need for a clinically and cost-effective secondary prevention model capable of closing the treatment gap at scale.

## Orthogeriatrics as the foundation for integrated fracture care

Orthogeriatrics (OG) is a patient-centred care model designed to treat fragility fractures while simultaneously addressing the individual's frailty, multimorbidity, physical and cognitive functioning deficit, and integrated social needs via multidisciplinary approach<sup>[8,9]</sup>. Its main clinical component is joint orthopaedic–geriatric admission with early comprehensive geriatric assessment (CGA), aimed at minimising time to surgery, with surgery typically performed within 24–36 hours. This approach reduces delirium risk, supports multi-systemic homeostasis to prevent hospital complications, promotes early mobilisation to restore baseline independence, initiates secondary fall and fracture prevention<sup>[10,11]</sup>, and maximises the proportion of days alive and at home within the 90 days following admission<sup>[12]</sup>. Indeed, time spent at home is emerging

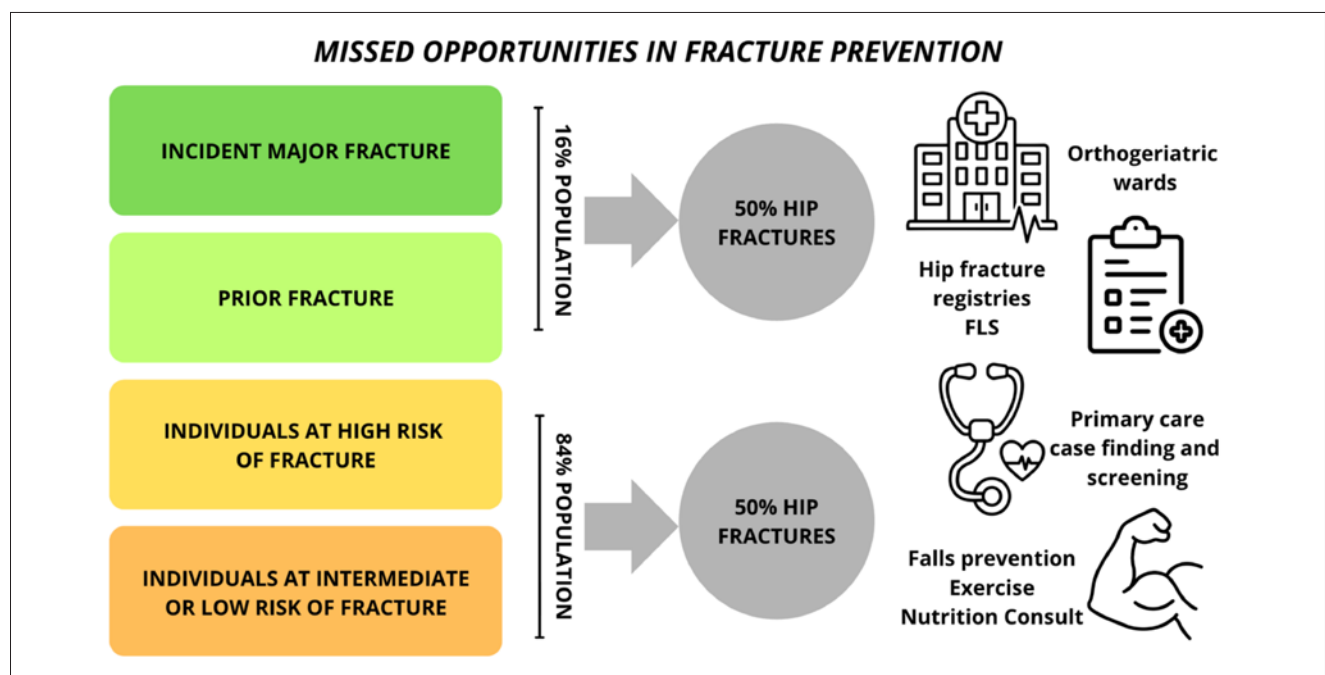
as a robust, patient-centred macro-indicator of the quality of acute care<sup>[13]</sup>.

Evidence strongly supports the OG co-management model as the standard of care for older adults with fragility fractures, originally focused on the hip but now also applied to other major fracture events<sup>[14]</sup>. In a randomised controlled trial by Prestmo *et al.*<sup>[15]</sup>, which reported no differences in time to surgery linked to theatre availability, immediate admission to comprehensive geriatric care significantly reduced mortality and improved mobility at 4 months compared with usual orthopaedic care ( $p=0.001$ ). Data from a meta-analysis by Grigoryan *et al.*<sup>[10]</sup>, based on 18 studies, confirmed that OG collaboration models are associated with low mortality, short length of hospital stay, and higher rates of home discharge. Complementing these findings, Moyet *et al.* showed that early admission to a dedicated OG ward confers many additional advantages for both patients and hospital organisation, representing a practical and locally adaptable model of care that optimises available resources<sup>[16]</sup>.

Large-scale merged clinical databases additionally confirm that patients assigned to structured OG care score significantly higher on both basic and instrumental activities of daily living scales up to 12 months post-fracture<sup>[17]</sup>. Early mobilisation protocols managed through integrated multiprofessional care reduce acute hospital stays by 2.4 to 3.4 days per patient<sup>[18]</sup> and prevent the onset of hospital-acquired sarcopenia, deep vein thrombosis, and delirium, thereby ensuring that the patient returns to the community with a status closer to their pre-fracture baseline<sup>[17,18]</sup>.

**Figure 1** Population stratified by risk of fragility fractures with appropriate interventions and care models. (Modified from Department of Health Prevention Package for Older People: Falls and Fractures – Effective Interventions in Health and Social Care, 2009.). FLS: fracture liaison service.

*Legend: Prior major fragility fracture is the main risk factor for a further fragility fracture, mainly at the hip. The figure shows hip fracture incidence by population risk and associated interventions: subjects with incident major fragility fractures may warrant orthogeriatric admission and care; those with prior fragility fractures should receive priority access to FLS, hospital or community based. A registry based on electronic health records may support auditing to improve overall management; case finding of individuals at high risk of fracture and shared screening protocols are a priority in primary care; individuals at intermediate or lower risk benefit from exercise, nutrition, and fall prevention strategies based on an integrated primary care model.*



## The role of the fracture liaison service in secondary prevention

The FLS is a coordinated care model designed to provide patient-centred, multiprofessional and transmutual secondary prevention of fragility fractures. It is characterised mainly by patient identification, fracture risk assessment, initiation of evidence-based osteoporosis treatment, and adherence monitoring across care transitions. Operationally, FLS care is typically delivered by a case manager (often an advanced practice nurse) who bridges hospital services and community health centres by applying the “5I” framework: Identify, Inform, Investigate, Initiate treatment, and Integrate follow-up care, ensuring systematic delivery of evidence-based interventions throughout the continuum of care.

The International Osteoporosis Foundation’s “Capture the Fracture” programme provides internationally endorsed standards for FLS design, implementation and quality improvement [19]. Ganda *et al.* [20] defined four types of FLS based on the degree of coordinator involvement. Type A, the most effective, directly involves coordinators in identifying patients, arranging assessment, initiating treatment, and providing long-term monitoring. Type B coordinators identify and assess patients but defer treatment decisions to primary care providers. Type C coordinators identify patients and refer them to primary care professionals for both assessment and management. In type D, patient management remains the responsibility of the primary care provider, with minimal coordinator involvement. Evidence consistently supports the effectiveness of type A FLS. To be effective and ensure continuity of care, the FLS, typically initiated in hospital, must extend into community and domes-

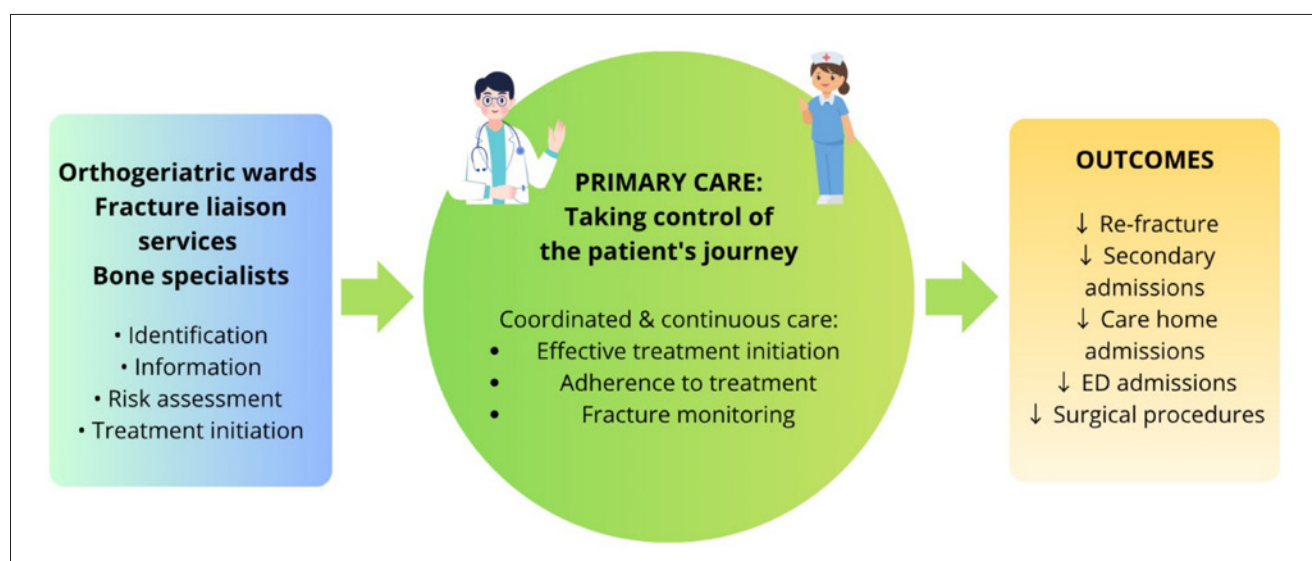
tic settings [21,22]. The implementation of such a structured and individualised pathway has been shown to reduce re-fractures (particularly in adults aged  $\geq 50$  years with  $\geq 2$  years’ follow-up [23]), long-term care admissions, and recurrent hospitalisations, thereby leading to substantial health system cost savings (Figure 2).

Clark *et al.* [24] synthesized 11 systematic reviews (including 19 randomised trials, seven before–after studies, 44 cohort studies, 26 case series, one cross-sectional study, and four database analyses) and found that despite substantial variability in secondary fracture incidence (2–20% across studies reporting on different populations and with different follow-up durations), the effect consistently favoured FLS programmes compared to traditional approaches. A meta-analysis by Wu *et al.* [24] further confirmed that FLS programmes significantly reduce the risk of any subsequent fracture (RR 0.80; 95% CI: 0.68–0.92) and hip fracture (RR 0.61; 95% CI: 0.48–0.76), while also increasing treatment initiation (RR 2.48; 95% CI: 1.92–3.21) and improving persistence with osteoporosis therapy. A notable challenge of isolated FLS models is the low capture rate of inpatients admitted with acute hip fractures, as these individuals often bypass specialist outpatient screening [26].

## Orthogeriatrics and FLS optimise care pathways for patients with falls and osteoporosis

OG and FLS originally operated as distinct entities, the former focused on acute in-hospital care to avoid multi-systemic complications, and the latter serving as an outpatient system to

**Figure 2** From hospital-centred care to coordinated primary care: where to apply the “5I” framework for optimal fragility fracture treatment and prevention. Legend: In an optimally integrated model of care, orthogeriatric wards, fracture liaison services, and bone specialists are responsible for: identifying patients with osteoporosis and fragility fractures; informing them of their imminent risk of subsequent fractures and of available therapeutic options; investigating whether patients have sustained non-clinical (subclinical or morphometric) fractures; assessing them for potential causes of secondary osteoporosis; and initiating pharmacological and non-pharmacological interventions to reduce the risk of re-fracture. Primary care physicians are tasked with integrating and coordinating follow-up care, in collaboration with community nurses, to optimize patient outcomes. Their responsibilities include monitoring the timely initiation of anti-fracture therapy, assessing adherence to prescribed treatment, detecting adverse effects, and identifying any new fractures. Implementation of this integrated care model is expected to reduce the incidence of re-fractures, subsequent hospital admissions, institutionalization in long-term care facilities, and emergency department (ED) attendances. A reduction in re-fracture rates is also associated with a decreased need for surgical interventions.



bridge the osteoporosis treatment gap. Evidence now supports their integration as complementary approaches capable of optimising global patient outcomes, targeting secondary falls and fracture prevention. Combining these services is both conceptually and operationally coherent.

From a clinical viewpoint, hospital-based programmes provide excellent initial case identification, but are frequently undermined by handover deficits and suboptimal monitoring of metabolic bone therapies, with diagnostic or therapeutic pathways often discontinued in primary care<sup>[27]</sup>. Therefore, integrating bone specialists and orthogeriatricians within the primary care pathway may increase long-term treatment adherence and substantially improve the patient's long-term prognosis. Indeed, when an FLS model is fully integrated into the inpatient OG ward via a dedicated nurse coordinator, medication initiation rises to 91% at discharge, with a 75% adherence rate at six months<sup>[26]</sup>. Notably, a population-based longitudinal study demonstrated additional benefits in terms of reducing 30-day mortality and narrowing the care gap when FLS was added to OG, with the two models functioning as parallel lifelines for the same vulnerable group<sup>[6,28]</sup>.

Furthermore, previous experience by our group confirmed that the combined OG–FLS pathway is associated with lower mortality, fewer recurrent falls, fewer hospital and emergency department re-admissions, and significantly improved survival rates after a 5-year observation window<sup>[29]</sup>. Notably, survival benefits were linked to early postoperative recovery, which is largely determined by pre-fracture functional independence, reinforcing the value of the CGA in guiding patient stratification and personalised interventions<sup>[29]</sup>. The interdisciplinary OG–FLS pathway, based on seamless communication loops back to primary care, boosted anti-osteoporosis medication initiation to 75.1% compared with the 8.0% in traditional uncoordinated systems, and maintained a verified 1-year treatment adherence rate above 72%. Formally involving general practitioners (GPs) in the OG–FLS pathway improved the impact of communication and clinical data sharing on long-term monitoring, as shown by significantly higher re-hospitalisation-free survival (176.4 days versus 88.7 days in traditional care models) and a significantly lower tendency for patients to become “multiple fallers”<sup>[29,30]</sup>.

From a socio-economic perspective, fragility fractures, generating average per capita healthcare costs exceeding \$30,000 within the first year alone, represent a major financial burden<sup>[27]</sup>. Integrating specialised OG–FLS models with primary care may shift health resource consumption from high-cost reactive treatments to lower-cost proactive maintenance. Orthogeriatrician-led and nurse-coordinated FLS systems are highly cost-effective compared with standard care<sup>[31]</sup>. For example, from a lifetime perspective of post-hip fracture care in older adults, an integrated model satisfies the stringent healthcare threshold of £22,709 per quality-adjusted life year (QALY) gained<sup>[31]</sup>. By shortening acute hospital stays and limiting preventable medical complications, including non-surgical infections, integrated OG–FLS care generates immense direct savings<sup>[18]</sup>. Health economic audits indicate that such a pathway results in projected savings of €2.7 million per 1,000 patients treated as a result of reductions in bed-days and secondary surgeries<sup>[18]</sup>.

To date, there are few examples of interdisciplinary attempts explicitly targeting the integration of acute and community services to achieve optimal long-term fracture management. The interFRACT programme is a co-designed initiative aimed at embedding post-fracture osteoporosis care into primary care settings through stakeholder-driven service design and feasibility testing, directly addressing the gap in diagnosis and treatment<sup>[32]</sup>. However, building on our experience of developing an integrated hospital-based orthogeriatric–FLS model, we highlight the need for structured involvement of the primary care physician within the FLS pathway. Key elements for better integration are effective communication and clinical data sharing among professionals, better knowledge of risk assessment, initiation and monitoring of pharmacological treatments, and ultimately the availability of tools automatically supporting medium- and long-term monitoring of identified and initiated patients, especially beyond 1 year after the index event.

## Integrating secondary prevention into primary care

The hospital-to-community transition currently represents a critical window for discontinuation of care and treatment, and to prevent gaps, shared protocol-based processes are essential.

Within an integrated OG–FLS model, the CGA may serve as a pivotal clinical tool to inform personalised care plans extending from hospital to community management and monitoring, leveraging the active ageing framework. Indeed, rather than passive follow-up, the role of primary care must be to deliver active secondary prevention through three main evidence-based pillars: systematic case finding and risk assessment, pharmacological optimisation and long-term management, and fall prevention.

## Case finding and risk assessment

In the absence of universal population screening policies, a targeted case-finding strategy is the most effective approach to identify individuals with an existing fragility fracture or those at imminent risk. Primary care is uniquely positioned to identify patients with previous fractures and to diagnose osteoporotic vertebral fractures, which often present as acute-onset back pain, especially thoracic pain. Targeted use of spinal imaging can substantially improve the identification of high-risk cases, allowing appropriate treatment of symptoms and rapid prevention of secondary fractures<sup>[33]</sup>. The Vfrac decision support tool represents a potentially practice-changing intervention for older people with back pain in primary care settings. A feasibility study demonstrated that Vfrac improves the detection of vertebral fragility fractures and enables timely intervention<sup>[34]</sup>. By facilitating appropriate treatment with medications that reduce fracture risk by 30–70%, implementation of Vfrac is likely to confer major benefits in the older population and would meaningfully change clinical practice, especially for older women with back pain.

Several validated fracture risk assessment tools are available to estimate fracture risk and guide clinical management of high-risk subjects in primary care, namely: FRAX (Fracture

Risk Assessment Tool)<sup>[35]</sup>, QFracture<sup>[36]</sup>, Garvan Fracture Risk Calculator<sup>[37]</sup> and FraHS (Fracture and Heart disease risk assessment in Seniors)<sup>[38]</sup>. Tool-based risk assessment may facilitate appropriate access to dual-energy X-ray absorptiometry (DXA) where clinically indicated, or additional imaging if required. Notably, FRAX-based clinical screening is followed by bone mineral density (BMD) assessment in those at increased risk, an approach that prioritises women likely to comply with screening (as indicated by their willingness to independently complete a risk assessment questionnaire). Screening reduced hip fracture risk by approximately 20% in the highest-quality studies (evidence level Ia)<sup>[36]</sup>. A 2023 systematic review by Gates *et al.*<sup>[39]</sup> suggested that primary care screening for osteoporosis and fracture risk in community-dwelling women aged ≥65 years results in a small but meaningful reduction in the risk of clinical fragility fractures and hip fractures compared with no screening (absolute risk reduction of approximately 1–2% over 5–10 years)<sup>[39]</sup>.

### Pharmacological management

A critical requirement in primary care is the alignment of prescribing practices with evidence-based guidelines and the safe management of sequential therapies, including discontinuation of treatments such as denosumab, teriparatide and abaloparatide<sup>[40]</sup>. Current guidelines recommend oral bisphosphonates (alendronate or risedronate) or intravenous zoledronic acid as cost-effective first-line options for most patients<sup>[3,41]</sup>. The guidelines emphasise that parenteral therapies must be available in community settings alongside procedures ensuring safe access to treatment, and that denosumab should not be stopped or delayed without clinical review due to the significant risk of rebound fracture<sup>[40,42]</sup>.

Still, real-world data indicate that treatment initiation after hip fracture remains suboptimal. Persistent inequities affect men, patients with dementia, and those on polypharmacy. There is also substantial geographical variation<sup>[6,43,44]</sup>. Emerging implementation research, such as the InterFRACT programme<sup>[32]</sup>, suggests that primary care-led secondary prevention could prevent an estimated 25% of hip fractures per year and reduce annual healthcare system costs by over 250 million AUD in Australia alone. However, achieving this goal requires a robust osteoporosis and fracture care service embedded within primary care, with effective communication systems linking hospital and community providers<sup>[45,46]</sup>.

### Fall prevention

Within this framework, fall prevention is a core component of comprehensive fracture prevention pathways, not an optional adjunct or secondary consideration. The World Guidelines for Falls Prevention and Management<sup>[47]</sup> provide evidence-based and consensus-based recommendations emphasising the importance of person-centred implementation across settings, including resource-limited contexts. A cluster-randomised clinical trial conducted in rural primary care settings in China found that integrating balance and functional exercise programmes with community-engaged health education significantly reduced self-reported risk of falls (risk ratio 0.67; 95% CI: 0.57–0.79)<sup>[48]</sup>. This evidence strengthens the rationale for

combining bone health promotion and fall prevention within a single integrated pathway rather than treating them as separate, parallel programmes. Fall prevention interventions should be considered an integral component of fracture prevention<sup>[47]</sup> in primary care, providing scheduled review appointments, addressing barriers to medication adherence, and monitoring treatment persistence over the long term<sup>[49]</sup>.

### Lessons from the PROMOTER2 study: integrated models and joint professional training

Coordinated service models with shared accountability between bone specialists and primary care providers may optimise treatment effectiveness. Key components of such models are widespread access to updated clinical guidelines, the availability of adequate training including online learning modules, and timely support or decision algorithms to help professionals translate updated knowledge into clinical choices and behaviours. As a first step, the integration of risk assessment tools within electronic health record systems may facilitate systematic case finding and reduce barriers to implementation<sup>[50]</sup>.

The PROMOTER2 pilot study, conducted in Pavia, Italy (2019–2021), evaluated the integration of bone specialists and GPs in re-fracture prevention. The initiative established the feasibility of a structured collaboration model and identified key success factors and barriers to implementation<sup>[44]</sup>. The study group identified a primary need to build system-level interventions capable of standardising joint workforce education and actions and providing common delivery infrastructure for translating available efficacy evidence from bench to public health. Key lessons to ensure the success of the intervention can be summarised in three main actions: enabling multi-professional communication and protocols, supporting autonomous and effective prescribing, and developing joint educational initiatives. The development of shared clinical protocols and clinical algorithms accessible to both specialists and GPs may help to establish a clear communication pathway between hospital and primary care professionals and may facilitate patients' access to and navigation of services. Implementation success may also be influenced by two pivotal features: recognition of shared prescribing authority between bone specialists and primary care physicians, and the availability of medication locally. Third, joint educational initiatives may empower the multiprofessional network and improve mutual understanding and trust.

The pilot study underscored the need for dedicated joint training to harmonise the actions of bone specialists (geriatricians, rheumatologists, endocrinologists, physiatrists, orthopaedic surgeons) and GPs within a shared care pathway. In addition, to overcome regional variations arising from inconsistent service diffusion rather than lack of efficacy evidence<sup>[51]</sup>, it is recommended that standardised training also include: updates on fracture risk assessment, interpretation of DXA results, pharmacological treatment options, management of treatment-related adverse effects, and recognition of vertebral fractures; structured approaches for communicating fracture risk to patients and sharing decision-making between patients and professionals, along with motivational interviewing to support treatment adherence; understanding of referral pathways, crite-

ria for accessing diagnostic services, triggers for specialist consultation, and mechanisms for information exchange between settings; adoption of quality indicators throughout the process in order to measure quality-of-care outcomes, thereby enabling continuous improvement and accountability.

### Possible outcomes and opportunities of bone specialist–primary care integration: the case of DM 77/2022

For patients with or at risk of fragility fractures, secondary prevention usually fails as a result of difficulties in communication and handover between acute hospitals and local community professionals, and a lack of structural integration and data sharing among professionals and services throughout the pathway. To address discontinuity of care as well as increasing demands due to population ageing, the Italian National Health Service reform (Decreto Ministeriale 77/2022) provides the infrastructure, workforce and digital systems required to anchor integrated fracture prevention pathways within community<sup>[52]</sup> care, thereby creating an enabling environment for their implementation (Table I).

#### Infrastructure

The decree recommends building intermediate community care hubs of different kinds—known as the Community House (CdC), Community Hospital (OdC), and Territorial Operations Centre (COT)—to support networking among services. Each CdC serves as the physical, multi-professional entry point for citizens within a specific district (~50,000 residents) and offers multi-specialty clinics to allow post-fracture or high-risk patients to receive specialist outpatient care for BMD or metabolic reviews, eliminating the need to navigate disparate services and specialists. In this scenario, an outpatient FLS can be physically stationed or routinely integrated within an OdC, functioning alongside local GPs. Each COT operates as the logistics hub for a health district (1 per 100,000 residents), managing the transition of patients between different care settings. For instance, upon admission of an older adult to an OG ward, the COT may be alerted; subsequently, upon surgical stabilisa-

tion, it may coordinate the transfer process, ensuring the patient receives osteoporosis care. It automates referral from the acute inpatient phase to the outpatient FLS or community rehabilitation programme. The OdC offers short-stay, low-intensity inpatient facilities (15–20 beds) for patients who do not require acute care but are too frail to be discharged home. For patients with fragility fractures, the OdC serves as an extension of the OG rehabilitation continuum, allowing step-down physical therapy to take place closer to home, ensuring continuation of physical activity to counteract sarcopenia while bone therapies are stabilised.

#### Workforce

DM 77/2022 expands the role of healthcare professionals such as the GP and family and community nurse (IFeC), enabling them to operate as part of structured networks (such as *Aggregazioni Funzionali Territoriali*) within the CdC framework. This allows healthcare services to be delivered in patients' homes. In this context, the FLS bone specialist may co-manage the patient, share clinical data, and empower the GP and IFeC to safely monitor metabolic laboratory parameters and renew treatment plans. This represents an important advance compared with traditional approaches in which GPs usually hesitate to continue or switch highly specific, long-term anti-osteoporosis drug treatments (e.g., zoledronic acid infusions or teriparatide injections) initiated by an FLS. In addition, the IFeC (one per 3,000 residents) may act as a proactive, home-based health manager, helping to promote long-term medication adherence and, through home health visits, monitoring or verifying compliance with oral bisphosphonates (including complex fasting and upright posture requirements) or subcutaneous biological injections. To prevent secondary falls, the IFeC may also carry out home-hazard assessments (evaluating lighting, loose rugs, etc.), and directly provide gait and balance coaching. There is, however, a strong need for workforce education, based mainly on joint training programmes designed to build capacity and confidence in the management of osteoporosis.

#### Digital transformation

The digital transformation based on the availability, across all regions, of electronic health records such as the *Fascicolo*

**Table I** Operational guide based on the provisions of DM77/2022.

DM77/2022: Italian ministerial decree no. 77/2022; DXA: dual-energy X-ray absorptiometry; COT: Territorial Operations Centre; FLS: fracture liaison service; FSE 2.0: Italian electronic health record; GP: general practitioner; IFeC: family and community nurse; CdC: Community House. The table summarises the benefits, stratified by care phase, that "falls and fragility fractures" clinics could derive from the optimised use of community services under the provisions of DM77/2022. All three phases may benefit from the different structural solutions and services envisaged by the decree.

| CARE PHASE      | TRADITIONAL CARE GAP                                                                                                         | DM 77/2022 STRUCTURAL SOLUTION                                                                                                  | EXPECTED HEALTH OUTCOME IMPACT                                                                                  |
|-----------------|------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| Initiation      | Fracture occurs; patient is discharged from orthopaedics without anti-osteoporosis medications, lab assessment or DXA scans. | COT automates the hand-off from Orthogeriatrics to the outpatient FLS. FSE 2.0 alerts GP of a fragility trauma event.           | Appropriate treatment initiation with regard time to treatment and personalized bone protection therapy.        |
| Adherence       | Drop-outs occur at 6–12 months because the patient forgets medication or struggles with primary care prescription renewals.  | IFeC conducts proactive home check-ins and monitors adherence. Remote consultations facilitate coordination between FLS and GP. | Sustained 1- to 2-year treatment adherence rates above 75%.                                                     |
| Global Outcomes | High rate of secondary falls leading to devastating refractures and high institutionalisation costs.                         | CdC co-locates multidisciplinary clinics. IFeC-led home evaluations address physical safety hazards and declining mobility.     | Marked reduction in secondary fracture incidence; decreased 1-year mortality; lower long-term dependency rates. |

*Sanitario Elettronico 2.0* (FSE 2.0) is pivotal in ensuring data flows seamlessly alongside the patient. FSE 2.0 allows primary care physicians and community nurses to receive real-time notifications of fragility fractures diagnosed in the emergency department or OG ward, bypassing traditional letter-based discharge notes that frequently get lost or mislaid. For instance, an automated digital alert or “red flag” may be attached to patient’s FSE 2.0, and both the FLS coordinator and the primary care physician may receive it and activate the cascade of care. This policy also represents an important opportunity to scale integrated “falls and fractures” services and anchor them into primary care and community infrastructure, with the potential for substantial population health impact. DM 77/2022 also formalises the integration of remote visits, remote consultations, and remote monitoring platforms into standard and reimbursable clinical workflows. In the case of patients with mobility limitations, telemedicine may help the outpatient FLS specialist to conduct a virtual check-in with the patient and their family at the local CdC, or even directly in the patient’s home assisted by the IFeC. This reduces the barriers generated by

geographical distances and long-term medical follow-ups, directly protecting against early treatment discontinuation.

### Quality indicators and performance monitoring

Under DM 77/2022, the FLS aligns conceptually with an effective transition of care “from hospital to community–home infrastructure” and with the potential for more integrated and supervised delivery. Bone specialists and primary care professionals operating within the CdC may quickly coordinate the identification, investigation, and initiation of treatment leveraging on the COT, and enhance long-term monitoring building on telemedicine models. However, to test the effectiveness of this advanced integrated model and of workforce networking, healthcare systems should adopt standardised quality indicators (QIs) monitored through regular audit and feedback cycles at practice, community and regional levels. Key QIs, already available and spanning the continuum of care, include: the proportion of patients aged  $\geq 50$  years presenting with a new fragility fracture correctly captured by the FLS pathway; the percentage of patients completing a formal fracture risk assess-

**Figure 3** Key quality indicators specific to hip fracture patients over the pathway of care.

*Legend: Following a fall, the resulting hip fracture should be identified and classified as a fragility fracture in an orthogeriatric (OG) ward. In this setting, patients should have access to surgical intervention within 36–48 hours following the index event and should be mobilized with progression to full weight bearing the day after surgery and walking recovery within 6 days from the surgery. The first 30–40 days after the fracture are critical for reducing the risk of subsequent falls. During the OG hospitalization or the Fracture liaison service (FLS) assessment, patients should undergo a structured medication review with potential de-prescribing, and receive comprehensive education regarding fall risk and prevention strategies. After hospital discharge, patients should be referred to and evaluated in FLS outpatient clinics. In this context, they should undergo an extensive assessment of osteoporosis risk factors, systematic evaluation for non-clinical vertebral fractures, and initiation of appropriate anti-fracture pharmacological treatment, ideally within 40 days of the index hip fracture. When available, patients should be registered in a dedicated local hip fragility fracture database. Every six months following the hip fracture, patients should be reassessed for treatment adherence and persistence, and at least once yearly they should be evaluated for incident re-fractures. In addition, on an annual basis, bone health specialists working in OG wards, FLS clinics, and general practice should conduct audits to assess the effectiveness of their interventions and to optimise multidisciplinary integration and care pathways.*

*KQI: key quality indicator; OG: orthogeriatric; FLS: fracture liaison service; GP: general practitioner; PROMs: patient-reported outcome measures.*

| KQI AREA                                                                                                           | KQI                                                                                            | TIMING                                                                                               | CARE SETTING                                                                                                          | SERVICE                                                                                                |
|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
|  <b>HIP FRACTURE</b>            | • Major fractures                                                                              |  <b>8–10 days</b> |  <b>OG ward</b>                    |  <b>HOSPITAL</b>  |
|                                                                                                                    | • Surgery $\leq 48$ h                                                                          |                                                                                                      |                                                                                                                       |                                                                                                        |
|                                                                                                                    | • Weight bearing                                                                               |                                                                                                      |                                                                                                                       |                                                                                                        |
|                                                                                                                    | • Walking test                                                                                 |                                                                                                      |                                                                                                                       |                                                                                                        |
|  <b>FALL PREVENTION</b>         | <ul style="list-style-type: none"> <li>• Medication review</li> <li>• Communication</li> </ul> |  <b>8–40 days</b> |  <b>OG ward / FLS clinics</b>      |  <b>BOTH</b>      |
|  <b>OSTEOPOROSIS ASSESSMENT</b> | <ul style="list-style-type: none"> <li>• Vertebral fracture</li> <li>• Database</li> </ul>     |  <b>40 days</b>   |  <b>FLS clinics</b>                |  <b>COMMUNITY</b> |
|  <b>PROMs</b>                   | • Persistence                                                                                  |  <b>24 weeks</b>  |  <b>GP / OG ward / FLS clinics</b> |  <b>BOTH</b>      |
|                                                                                                                    | • Re-fracture                                                                                  |  <b>52 weeks</b>  |                                                                                                                       |                                                                                                        |
|                                                                                                                    | • Audit                                                                                        |  <b>52 weeks</b>  |                                                                                                                       |                                                                                                        |

ment (e.g., FRAX) and documented DXA within 12 weeks of the sentinel fracture; the proportion of high- and very-high-risk patients receiving a pharmacological treatment offer and initiating therapy within a defined post-fracture window (12–24 weeks); the rate of treatment adherence confirmed at regular intervals (3, 6, and 12 months) and at systematic clinical reviews scheduled at 5–10 years for long-term management (Figure 3). Once in place, FSE 2.0 records may help automatically capture clinical practice-related performance and milestones across the care pathway, and subsequently support the implementation of systematic audits to adapt and improve final outcomes.

## Conclusions

Evidence from randomised controlled trials, meta-analyses, and real-world implementation studies supports orthogeriatric care models and coordinated post-fracture programmes. The complementary nature of these approaches—with OG targeting acute mortality, morbidity and function, and FLS and GPs focusing on long-term fracture prevention—gives rise to a comprehensive care pathway that addresses the full spectrum of patient needs. National healthcare reforms, particularly Italy's DM 77/2022, provide an important policy opportunity to scale integrated secondary prevention services. The implementation of community infrastructure, multiprofessional teams with integrated care pathways, case management functions, digital integration, quality indicators and regular performance monitoring may positively affect patient health outcomes and system sustainability related to secondary prevention pathways. The emphasis on community infrastructure, multiprofessional teams and functions, and digital integration aligns perfectly with the requirements for effective and efficient long-term fracture prevention. Additionally, this may be an opportunity to involve local stakeholders, including local health authorities, municipalities, healthcare professionals, patients, caregivers, and third-sector organisations, in the achievement of better care for future older adult populations. We believe that integrated models, by bridging the gap between acute and community care and formalising structured collaboration between bone specialists and primary care professionals, have the potential to substantially reduce the burden of fragility fractures and improve prospects for healthy ageing among adults at highest risk.

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