EULAR/EFORT recommendations for management of patients older than 50 years with a fragility fracture and prevention of subsequent fractures

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W F Lems,[1] K E Dreinhöfer,[2] H Bischoff-Ferrari,[3] M Blauth,[4] E Czerwinski,[5] JAP da Silva,[6] A Herrera,[7] P Hoffmeyer,[8] T Kvien,[9] G Maalouf,[10] D Marsh,[11] J Puget*,[12] W Puhl,[13] G Poor,[14] L Rasch,[1] C Roux,[15] S Schüler,[2] B Seriolo,[16] U Tarantino,[17] T van Geel,[18] A Woolf,[19] C Wyers,[20,21] P Geusens[22,23]

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For numbered affiliations see end of article.

Correspondence to
Professor Willem Lems, Department of Rheumatology, Amsterdam Rheumatology and Immunology Center, VU University Medical Center, Postbox 7057, 1007 MB Amsterdam, The Netherlands wf.lems@vumc.nl

WFL and KED are co-first authors.

*Jean Puget has since passed away.

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ABSTRACT

The European League Against Rheumatism (EULAR) and the European Federation of National Associations of Orthopaedics and Traumatology (EFORT) have recognised the importance of optimal acute care for the patients aged 50 years and over with a recent fragility fracture and the prevention of subsequent fractures in high-risk patients, which can be facilitated by close collaboration between orthopaedic surgeons and rheumatologists or other metabolic bone experts. Therefore, the aim was to establish for the first time collaborative recommendations for these patients. According to the EULAR standard operating procedures for the elaboration and implementation of evidence-based recommendations, 7 rheumatologists, a geriatrician and 10 orthopaedic surgeons met twice under the leadership of 2 convenors, a senior advisor, a clinical epidemiologist and 3 research fellows. After defining the content and procedures of the task force, 10 research questions were formulated, a comprehensive and systematic literature search was performed and the results were presented to the entire committee. 10 recommendations were formulated based on evidence from the literature and after discussion and consensus building in the group. The recommendations included appropriate medical and surgical perioperative care, which requires, especially in the elderly, a multidisciplinary approach including orthogeriatric care. A coordinator should setup a process for the systematic investigations for future fracture risk in all elderly patients with a recent fracture. High-risk patients should have appropriate non-pharmacological and pharmacological treatment to decrease the risk of subsequent fracture.

INTRODUCTION

Osteoporosis is the most common cause of fragility fractures. These fractures—most frequently occurring at the hip, vertebra, proximal humerus and distal radius—are associated with an increased morbidity and mortality and have a large medical and economic impact on healthcare systems.[1]

Fragility fractures in women and men older than 50 years are among the most frequent musculoskeletal manifestations for which patients consult healthcare providers from more than one medical specialty. Immediately following a fracture, the patient needs acute fracture care, supplied by an orthopaedic or trauma surgeon, and perioperative medical care for the, often fragile, patient. This is followed by the implementation of fracture prevention modalities in patients at risk for a subsequent fracture. This is usually executed under the supervision of general practitioners, rheumatologists or other metabolic bone disease experts. Obviously, a close collaboration between these specialties is necessary at a local level.

Both the European League Against Rheumatism (EULAR) and the European Federation of National Associations of Orthopaedics and Traumatology (EFORT) have recognised the importance of optimal multidisciplinary care for patients with a recent fracture, followed by prevention of subsequent fractures in high-risk patients, and have therefore collaboratively initiated this recommendation.

METHODS

This is the second combined task force for EULAR/EFORT: in line with the first combined recommendations on the swollen knee[2] the EULAR standardised operating procedures for the elaboration and implementation of evidence-based recommendations[3] were initially followed and later updated, when possible, to the 2014 update of the recommendations.[4]

The executive committee comprised the convenors (KD invited by EFORT, WL invited by EULAR), a senior advisor (PG), a clinical epidemiologist (CW) and three research fellows (SS, LR, TvG). Subsequently, the executive committee invited 7 rheumatologists from 7 countries and 10 orthopaedic surgeons from 10 countries selected on the basis of their field of interest and knowledge, while allowing for a broad coverage in the field ensuring in their selections an appropriate geographic distribution of experts across Europe.

During the first group meeting, we started with a general discussion about the management of the patient with an acute fracture and subsequent fracture prevention, and asked all committee members to bring up 10 propositions for research questions. Consensus on the research questions was reached following the Delphi technique. We started with a list of all proposals; overlapping propositions were merged. The list was sent to the experts and they were asked to select the 10 most important propositions from the list. Propositions were accepted automatically if selected by over half of participants in any round, whereas propositions receiving three votes or less were removed. The other propositions

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entered the subsequent Delphi round. The procedure was performed 3 times until we had 15 propositions, which were merged by KD, PG and WFL into the 10 final research questions, as a base for formulating recommendations. In total, three Delphi rounds, facilitated by the convenors, were performed by email.

A systematic literature research (SLR), based on these 10 research questions, was undertaken by the research fellows supported by their mentors in three groups: LR/WL, SS/KD and TvG/PG and the epidemiologist (CW), in Medline and the Cochrane Database of Systematic Reviews (2000–2014). Study designs of interest were systematic review/meta-analysis, randomised controlled trials (RCT)/controlled trials (CT) and observational studies. For every recommendation, all results obtained by the research fellows were discussed with the convenors. First all titles and afterwards all abstracts were scanned for relevance: studies that were clearly out of the scope of the SLR were rejected by the research fellows. Studies that were clearly within or doubtful within the SLR were discussed with the convenors. For every recommendation, all results obtained by the research fellows were discussed with the convenors.

Data from the literature reviews were categorised and presented at the second taskforce meeting according to study design, using a hierarchy of evidence in descending order according to quality. The results were presented and broadly discussed at the second meeting. In addition, these results were the starting point for discussions within the committee, finally leading to consensus about 10 recommendations (table 1). Recommendations were developed and circulated to all members three times in total, to achieve consensus on the final formulation of recommendations.

The level of evidence for each recommendation was rated according to the EULAR standard operating procedures (4) and by the Oxford Levels of Evidence, which define the level of evidence based on the type of research (see online supplementarytable S1).The strength of each recommendation is defined by a combination of the information from the SLR (categories of evidence) and expert opinion (see online supplementary table S2).

Finally, every member of the task force had to indicate the level of agreement with each recommendation. This was scored on a numerical rating scale ranging from 0 (completely disagree) to 10 (completely agree). The average, the median and the range have been calculated (see online supplementary table S1).

Finally, after receiving feedback from the EFORT and EULAR boards, the recommendations were again adapted and circulated to the expert group for feedback and agreement. Key publications which appear after the literature search in 2015 were added to the manuscript.

In the 2014 update of the EULAR recommendations the subtle, but important, differences between recommendations and points to consider were discussed.[4] Since the majority, although not all, of the 10 recommendations had evidence-based answers, we mention them as a set of recommendations, and not as 'points to consider', as proposed recently by the EULAR.[4]

RESULTS

The combined search from the systemic literature review for Q1–10 identified a number of articles for each research question, as shown in online supplementary table S3. Articles that were relevant to >1 research question were included in the review more than once. The 10 recommendations, level of evidence, strength of recommendation and the level of agreement are presented in table 1.

RECOMMENDATIONS

Recommendation 1: preoperative and perioperative management

Fragility fractures should be managed in the context of a multidisciplinary clinical system, guaranteeing adequate preoperative assessment and preparation of patients including adequate pain relief, appropriate fluid management and surgery within 48 hours of injury.

Patients with fragility fractures often have pre-existing chronic diseases, which will have an influence on their general management, short-term and long-term survival rate and their functional recovery. Minimising delirium and avoiding complications is critical for achieving good outcomes. Rapid optimisation of fitness for surgery and early surgery seem to improve morbidity and mortality.

Appropriate pain management should be provided to every patient as soon as possible and before starting diagnostic investigations.[5] A meta-analysis has demonstrated that the use of nerve blocks reduces acute pain in patients suffering from a hip fracture.[6]

The systematic multidisciplinary and comprehensive admission assessment of the patient's medical conditions should include investigations for the most common modifiable variables: malnutrition, electrolyte or volume disturbances, anaemia, cardiac or pulmonary diseases, dementia and delirium and glycaemic control.[7–10] Preoperative investigations should include chest X-ray, ECG, full blood count, clotting studies, blood group, renal function, in addition assessment of cognitive baseline function. This should allow identification and treatment of exacerbations of chronic medical conditions or acute medical illness when appropriate.[11]

Safe and timely transfer from the emergency room to an orthogeriatric ward and definitive treatment including early surgery within 24–48 hours after admission significantly reduces short-term and mid-term mortality rates[12] and reduces minor and major medical complications due to immobility and its accompanying effects (eg, decubitus ulcer, pneumonia, increased length of hospital stay).[9 13 14] Delay to the operation theatre to enable optimisation of acute medical problems has to be weighed up against the effects of prolonging pain and immobility.

Recommendation 2: orthogeriatric care

To improve functional outcome, and to reduce length of hospital stay and mortality, orthogeriatric comanagement should be provided, especially in elderly patients with hip fracture.

Elderly fracture patients admitted to the hospital will benefit from multidisciplinary comanagement, including a comprehensive geriatric assessment[15] of medical, functional and psychological capabilities and adequate preparation before surgery.[16 17] In patients with hip fracture, the joint care model between geriatrician and orthopaedic surgeon on a dedicated orthogeriatric ward has been shown to have the shortest time to surgery, the shortest length of inpatient stay and the lowest inpatient and 1-year mortality rate.[18–20]

Patients with fragility fractures are at risk for multiple postoperative complications: some are patient related, while others are related to the surgical treatment. In the elderly multimorbid patient, complications are frequent and may increase the length of stay and perioperative mortality.[21] Complications are related to increased mortality and morbidity, and therefore should

Table 1 Recommendations for patients with fragility fractures in patients aged 50 years and older

Recommendation		Level of evidence	Strength of recommendation	Level of agreement Average Median Range
1	Fragility fractures should be managed in the context of a multidisciplinary clinical system, guaranteeing adequate preoperative assessment and preparation of patients, including adequate pain relief, appropriate fluid management and surgery within 48 hours of injury	IIA	B	9.8 10 8–10
2	To improve functional outcome, and to reduce length of hospital stay and mortality, orthogeriatric comanagement should be provided, especially in elderly patients with hip fracture	IA	A	9.2 10 0–10
3	Appropriate treatment of the fractures in these, often elderly and multimorbid, patients with frail bones requires a balanced approach with regard to operative vs non-operative treatment and careful selection of fixation devices and techniques	III	C	9.3 10 7–10
4	Each patient aged 50 years and over with a recent fracture should be evaluated systematically for the risk of subsequent fractures	IA	A	9.5 10 5–10
5	Evaluation of the risk of subsequent fractures includes a review of clinical risk factors, DXA of the spine and hip, imaging of the spine for vertebral fractures and evaluation of falls risk and the identification of secondary osteoporosis, which together predict subsequent fracture risk	III	C	9.3 10 6–10
6	Implementation requires a local responsible lead, that is, a person/group that coordinates secondary fracture prevention based on guidelines, liaising between surgeons, rheumatologists/endocrinologists, geriatricians in case of elderly with a hip or other major fracture, and general practitioners	IV	D	9.1 10 6–10
7	An appropriate rehabilitation programmes should consist of both early postfracture introduction of physical training and muscle strengthening and the long-term continuation of balance training and multidimensional fall prevention	IIA	B	9.5 10 5–10
8	Patients should be educated about the burden of the disease, risk factors for fractures, follow-up and duration of therapy	IV	D	9.2 10 5–10
9	Non-pharmacological treatment is important in the prevention of fractures in high-risk patients; it includes at least an adequate intake of calcium and vitamin D, stopping smoking and limitation of alcohol intake	IV	D	9.3 10 6–10
10	Pharmacological treatment should preferably use drugs that have been demonstrated to reduce the risk of vertebral, non-vertebral and hip fractures, and should be regularly monitored for tolerance and adherence	IB	A	9.9 10 9–10

DXA, dual energy xray absorptiometr.

preferably be prevented, if possible: delirium,[22] deep venous thrombosis,[23–25] pressure sores[26] and malnutrition.[27 28]

Postoperative care should include appropriate pain management and antibiotic prophylaxis, correction of postoperative anaemia, routine systems examinations, regular assessment of cognitive function, assessment for pressure sores, nutritional status and renal function, assessment and regulation of bowel and bladder function, wound assessment and care and early mobilisation.[20]

Recommendation 3: treatment of the fracture

Appropriate treatment of the fractures in these often elderly and multimorbid patients with frail bones requires a balanced approach with regard to operative versus non-operative treatment and careful selection of fixation devices and techniques.

Recommendations for surgical treatment are of course dependent on the type of fracture and on the individual patient.[29]

Distal radius fracture

Distal radius fractures after a fall from standing height can be treated by cast immobilisation or by operative methods including locking plates, Kirschner wires or external fixation. Recent RCTs have not identified clear recommendations for the optimal treatment in the elderly population.[30–32] In a systematic review cast immobilisation had the worst radiographic outcome but the least complications and a comparable functional outcome with surgical treatment options.[31] Radiographic alignment after closed reduction and the functional demand of the patient should guide the decision for further operative stabilisation.[29]

Vertebral fractures

Only one out of three vertebral fragility fractures are symptomatic and about 10% of patients will require hospitalisation because of pain. Most symptomatic fractures are treated with analgesics, activity modification and bracing,[33 34] and so far there are inconclusive results on surgical versus non-surgical interventions.[35–38]

Hip fractures

Hip fractures are common, have often devastating effects on the patients and usually require surgical intervention. Treatment options are depended on fracture location and classification, age, functional status of the patient and pre-existing osteoarthritis.

Femoral neck fractures

Stable non-displaced fractures can be addressed with cannulated screw fixation in a percutaneous manner.[39] Displaced femoral neck fractures in healthy, active and independent older individuals without cognitive dysfunction are best treated by total hip

arthroplasty allowing immediate full weight-bearing.[40 41] In frail patients, hemiarthroplasty might be preferred, since operative time is shorter and the subsequent dislocation risk is lower while the functional outcome is acceptable.[42] Total hip arthroplasty may offer improved function and long-term results,[43] but patient factors and surgeon experience need to be considered in order to justify the risk of a more complex and costly procedure.[13]

Trochanteric fractures

For stable intertrochanteric fractures a sliding hip screw is favoured, unstable intertrochanteric fractures are treated with an antegrade cephalomedullary nail. Strong evidence supports that cephalomedullary devices should also to be used in subtrochanteric or reverse oblique fractures.[44]

Humerus fractures

Most proximal humeral fractures can be treated non-operatively with good functional outcomes. Treatment of displaced three-part and four-part fractures remains controversial: open reduction and locking plate osteosynthesis is associated with considerable complication, the outcome of hemiarthroplasty is closely related to tuberosity healing. Reverse shoulder arthroplasty may provide satisfactory shoulder function in geriatric patients with pre-existing rotator cuff dysfunction or after the failure of first-line treatment.[45–47]

Recommendation 4: organisation of postfracture care

Each patient aged 50 years and over with a recent fracture should be evaluated systematically for the risk of subsequent fractures.

Since the treatment gap is high, many programmes have been developed to address secondary fracture prevention.[48] The simplest form of intervention is to provide only specific patient education; a more elaborate scheme is alerting the primary care physician (PCP) by means of a discharge letter containing medical information on the fracture of the patient. However, a systematic review and meta-analysis has shown that the Fracture Liaison Service (FLS) is the most effective organisational structure for risk evaluation and treatment initiation.[49]

The central element of an FLS model is a dedicated coordinator who takes care of all aspects of the process (identification, investigation and intervention with therapy).[50] The coordinator is often a well-educated nurse, who works under supervision of an orthopaedic surgeon, an endocrinologist or a rheumatologist. The coordinator is responsible for the identification of all elderly patients with a recent fracture in the hospital, to organise the diagnostic investigations and to start interventions and providing adequate medical information to patients and PCPs.[48]

RCTs[51–53] proved that a nominated coordinator significantly improves the implementation of osteoporosis treatment after a fragility fracture, for example, in a cluster RCT within 6 months after the fracture 45% of patients received appropriate management, while in the control group only 26%.[51]

Recommendation 5: evaluation of subsequent fracture risk

Evaluation of the risk of subsequent fractures includes a review of clinical risk factors, DXA of spine and hip, imaging of the spine for vertebral fractures, evaluation of falls risk and the identification of secondary osteoporosis, which together predict subsequent fracture risk.

Secondary fracture risk is high immediately after the fracture, and gradually decreases over time. Our expert opinion is that in most FLS, patients with fractures 3–6 months before are receiving diagnostic investigations, but investigations at a later stage might also be worthwhile.

Box 1 Tools for evaluation of subsequent fracture risk after an initial fracture

- Clinical risk factors for further fractures:
  - fracture location and severity
  - suboptimal preoperative, operative and postoperative phase with complications and suboptimal rehabilitation
  - high age, low body mass index, personal and family history of fracture, diseases, medications and lifestyle (smoking, alcohol, lack of exercise)
  - fall risk
- DXA of lumbar spine and hips
- Imaging of the spine, by vertebral fracture assessment or by conventional radiographs
- Screening for underlying secondary osteoporosis or other metabolic bone diseases

NB: Clinical risk factors can be integrated in FRAX, Garvan or Q-Fracture algorithms to estimate future fracture risk.

Fracture risk evaluation is recommended to inform therapeutic decisions regarding the prevention of subsequent fractures prevention in high-risk patients[54 55] (box 1).

Apart from the recent fracture location and severity, perioperative complications and suboptimal rehabilitation, clinical risk factors such as advanced age, female gender, low body mass index, lifestyle, personal and family history of fracture, and falls risk all play an important role in subsequent fracture risk.[6 56 57] These are included in fracture risk assessment tools such as FRAX,[58] Garvan[59] and Q-Fracture.[60] In some guidelines, these tools are considered sufficient to make treatment decisions when the risk is identified as being high (based on post hoc analyses), but most guidelines and reimbursement criteria include the results of bone mineral density (BMD) and/or a prevalent hip or vertebral fracture for treatment decisions.[54 55 61 62]

DXA of the lumbar spine and hip is the standard method for measuring BMD, and independently contributes to the assessment of fracture risk.[63] Imaging of the spine by radiography or with vertebral fracture assessment (VFA) (a measurement based on additional software on a DXA device which involves lower irradiation than plain radiographs or CT) allows the detection of subclinical vertebral fractures, which are frequent (20%) in patients with a recent non-vertebral fracture.[64] The presence, number and severity of vertebral fractures are related to fracture risk and contribute to therapeutic decisions, independent of BMD and other risks.[65]

Fall risk evaluation starts with history of falls during last year, followed by specific tests when indicated. A limited standard laboratory examination including erythrocyte sedimentation rate, serum calcium, albumin, creatinine and thyroid-stimulating hormone and other tests (such as vitamin D, protein electrophoresis, testosterone in men, etc) when clinically indicated, allows diagnosis of frequently present subclinical disease (in 30%), which increases the risk of fractures.[66]

Recommendation 6: implementation of guidelines

Implementation requires a local responsible lead, that is, a person/group that coordinates secondary fracture prevention based on guidelines liaising between surgeons, rheumatologists/

endocrinologists, geriatricians in case of elderly with a hip or other major fracture and general practitioners.

Implementation of clinical guidelines in routine daily practice is often difficult. Effective implementation should focus on three basic issues: (a) the level of evidence (eg, RCTs), (b) barriers and facilitators and (c) effectiveness of dissemination and implementation strategies.[67]

Several guidelines or recommendations are available for patients with a recent fragility fracture, such as those from American Association of Orthopedic Surgeons (AAOS),[68] British Orthopaedic Association (BOA),[69] American Society of Bone and Mineral Research (ASBMR)[54] and International Osteoporosis Foundation (IOF);[55] however, our recommendations are unique since they are the first that combined recommendations for acute fracture care and for subsequent fracture prevention.

The National Hip Fracture Database initiative was conceived as a clinician-led collaboration between the BOA and the British Geriatrics Society, in which six clinical standards for hip fracture care were agreed.[69] This clinician-led audit initiative has led to substantial improvements in care and survival of older people with hip fracture in England.[70] The implementation of an evidence-based algorithm for hip fracture surgery in Denmark facilitated a low reoperation rate.[71] In the acute fracture care phase, orthogeriatric comanagement are recommended for the frail, elderly patient with multiple comorbidities and polypharmacy[17 18 72] and has been shown to bring about a decreased length of stay[73] and improved mobility.[17]

Implementation of guidelines should adapt to local needs and restrictions and should be based on collaboration between orthopaedic surgeons, rheumatologists/endocrinologists, geriatricians (in case of elderly with a hip or other major fracture) and general practitioners.[18 48 54 55]

Recommendation 7: rehabilitation

An appropriate rehabilitation programme should consist of both the early postfracture introduction of physical training and muscle strengthening and the long-term continuation of balance training and multidimensional fall prevention.

The most important aim for all patients sustaining a fragility fracture is to regain the level of mobility and independence they enjoyed before the fracture occurred. Early identification of individual goals and needs are essential for each patient, before the rehabilitation plan can be developed. Especially in the elderly, a multidisciplinary and multifactorial comprehensive rehabilitation programme is recommended.[74–77]

Early mobilisation following surgery, preferably starting on the first postoperative day, is critical for a patient's functional independence and prevention of postoperative complications.[76]

In patients with hip fracture, this comprises immediate weight bearing,[78] early ambulation[79] as tolerated by the patient and transfer training in and out of bed. Based on the initial condition of the patient, appropriate physical therapy includes upper-extremity and lower-extremity strength exercises, gait training (eg, on a treadmill),[80] balance and functional training (eg, ambulation and stair climbing) as well as aerobic[81] and stretching exercises for tight soft tissues and joints.

For patients with vertebral fractures, a recent Cochrane Review[82] found inconclusive results for the effect of exercise or active physical therapy interventions in these patients and no definitive conclusion could be drawn. Only moderate evidence seems to exist with regard to improvement of walking speed, back extensor strength, trunk muscle endurance, quality of life and pain.

After casting or surgery for distal radius fracture, early finger motion is essential to prevent oedema and stiffness. When immobilisation is discontinued, aggressive finger and hand motion is necessary to facilitate the best possible outcomes.

Following surgical treatment of a fracture of the shoulder, range-of-motion exercises including shoulder, elbow, wrist and hand motion should begin within the first postoperative days. A sling is usually worn for comfort only and may be discarded as early as the patient's pain allows. Above chest level activities should be restricted in the case of both operative and non-operative management until fracture healing is evident. Overly aggressive physical therapy and exercises may increase the risk of fixation failure in the postoperative period.

Exercise programmes and fall prevention programmes are hallmarks of ideal non-pharmacological treatment for the prevention of fractures. Positive effects on BMD and muscle strength are described in patients who exercise rigorously, as well as a reduction in the frequency of falls, but the evidence for fracture prevention is limited.[83]

Recommendation 8: education

Patients should be educated about the burden of the disease, risk factors for fractures, follow-up and duration of therapy.

Perception of fracture risk and the use of BMD testing are higher in patients with a recent fracture when compared with patients without a fracture history.[84]

In RCTs, a systematic review and meta-analyses, written materials with and without video supplements, behavioural frameworks sent out in three mailings for patients, and in patient education to the provider did not affect diagnosis of underlying osteoporosis and subsequent treatment.[48 49 85–87] In a meta-analysis, BMD testing and treatment initiation were lowest in patients who had only education.[87] In a randomised study, a more personalised approach with a phone call plus follow-up letter to patients did not significantly increase osteoporosis follow-up care compared with simply sending out a letter.[88]

Patient education is recommended as an overarching principle and is incorporated in the guidelines as part of fracture prevention programmes.[89]

Recommendation 9: non-pharmacological treatment

Non-pharmacological treatment is important in the prevention of fractures in high-risk patients; it includes at least an adequate intake of calcium and vitamin D, stopping smoking and limitation of alcohol intake.

A non-healthy lifestyle may have negative effects on BMD, bone quality and the risk of falling[83] and should be corrected (stop smoking, limit alcohol intake).

Data on the effects of non-pharmacological treatment on fracture incidence are limited. Calcium and vitamin D were part of the medical treatment in all RCTs, and adequate total calcium intake (diet and when necessary supplementation) of 1000–1200 mg/day together with vitamin D 800 IU/day is advocated when using anti-osteoporosis drugs.

Calcium alone has no demonstrated effect on fracture reduction, and is associated with gastrointestinal side effects, while there is uncertainty whether high calcium intake is associated with cardiovascular events.[90]

Vitamin D deficiency is endemic worldwide, as it is in patients with a recent fracture.[91] Vitamin D supplementation (800 IU/day), with adequate calcium intake, is associated with a 15%–20% reduction in non-vertebral fractures, and also with a

20% reduction in falls.[92–95] High pulse dosages of vitamin D seem to be associated with increased fall risk and fracture risk.[96 97]

Recommendation 10: pharmacological treatment

Pharmacological treatment should preferably use drugs that have been demonstrated to reduce the risk of vertebral, non-vertebral and hip fractures, and should be regularly monitored for tolerance and adherence.

Only one study evaluated the effect of drugs following a recent fracture, namely zoledronic acid, after a recent hip fracture.[98]

Other RCTs have been performed in patients at high risk for subsequent fractures based on the presence of one or more vertebral fractures, and/or a low T-score. Alendronate, risedronate, zoledronic acid (all bisphosphonates) and denosumab (a monoclonal antibody against RANKL) demonstrated a reduction in vertebral fractures, non-vertebral fractures and hip fractures in the primary analyses.[99–102] A reduction in vertebral fractures was demonstrated with raloxifene and ibandronate, and of vertebral and non-vertebral fractures with strontium ranelate and teriparatide.

Alendronate[99] and risedronate[102] are first-choice agents, because these drugs are usually well tolerated, have a low cost (generic forms are available) and physicians may have a lot of experience with oral bisphosphonates. For patients with oral intolerance, dementia, malabsorption and non-compliance zoledronic acid (intravenous)[100] or denosumab (subcutaneous)[101] are alternatives. For patients with very severe osteoporosis, the use of anabolic agents such as teriparatide is an option.[103]

Based on the length of these RCTs, these drugs are usually prescribed for 3–5 years, and longer in patients who remain at high risk. Since long-term adherence to drug treatment is poor, a systematic follow-up is advocated, as part of a five-step plan including identifying patients with a recent fracture: inviting them for fracture risk evaluation; differential diagnosis; therapy and follow-up.[104] Risk communication and shared decision making in the care of patients with osteoporosis may have a positive influence on adherence.[105 106] Adherence to therapy is substantially higher in the FLS (up to 90%), probably because these patients are more motivated because of their recent fracture, and their positive response to an invitation from the FLS.[107]

DISCUSSION

In addition to these recommendations, the group formulated overarching principles that are relevant for optimal care of patients over 50 years of age with a recent fragility fracture.

Overarching principles

First, although both in the acute care phase after the fracture and in the subsequent prevention of secondary fractures, many different medical specialties can be involved, the critical point is not who is taking care of the patient, but that all patients receive optimal care. Obviously, a structured collaboration between healthcare workers is a prerequisite, reflected in several of our recommendations.

Second, optimal acute fracture care is dependent on the type of fracture and the age, presence or absence of comorbidity and the needs of the patient.

Third, especially in the frail elderly person with a major fracture, an orthogeriatric and multidisciplinary approach is warranted.

Fourth, optimal care in the preoperative, operative and postoperative phases has an important effect on clinical outcome. As a consequence, it is very likely that limited mobility and a poor quality of life in the postoperative phase may be associated with an elevated risk of future fractures.

Fifth, for prevention of subsequent fractures, it is important that in all patients fracture risk should be investigated systematically.

Sixth, for subsequent prevention of fractures in high-risk patients, effective and safe drugs should be prescribed, and non-pharmacological treatment options and patient education also need to be considered.

These recommendations and overarching principles can be used as a template for discussions with the local stakeholders (including specialists, general practitioners, fracture nurses, local coordinators, patients and health authorities). Finally, we have included suggestions for further research (box 2).

Box 2 Research agenda

- Factors and interventions that improve the clinical condition of patients with a recent fracture before surgery
- Effects of orthogeriatric assessment on mortality and morbidity in elderly patients with major fractures
- Prevention and treatment of delirium
- Evaluation of the best postfracture rehabilitation strategies for fragility fractures: intensity, duration and content
- Effects of a complex biopsychosocial intervention on early and long-term rehabilitation effects
- Role of muscle loss, sarcopenia and nutrition on recovery following hip fracture, and the role of physical and pharmacological approaches in managing these deficits
- Initiatives for multidisciplinary collaboration for secondary fracture prevention
- What is the long-term effect of fracture liaison service (FLS) and its implementation on adherence to therapy and reduction of fractures, morbidity and mortality
- 'Real-world' cost-effectiveness of orthogeriatric care and for FLS
- Subsequent fracture prevention of individuals who are not able to visit the FLS, for example, patients with hip fracture
- Optimal timing of start and duration of antiosteoporotic drugs
- Benefits of combining exercise, nutrition, pharmacological and other intervention strategies
- Optimise strategies for early fall prevention in patients with fragility fractures
- Effects of drugs (antiresorptive and osteoanabolic drugs, biologics, non-steroidal anti-inflammatory drugs) on fracture healing (delayed or non-union) and on atypical femoral fractures
- Implementation of recommendations.

Limitations

First, the 10 recommendations do not cover all aspects of fragility fracture patient management. Nevertheless, they deal with the main principles of fracture care and secondary fracture prevention, based on the 10 clinical research questions identified by an expert committee. Second, there is a large degree of heterogeneity in patients with a recent fracture, for example, an elderly woman aged 85 years with a hip fracture versus a woman aged 55 years with a wrist fracture. It is understandable that some elderly patients with immobility and comorbidities, as

often seen in patients with a hip or pelvic insufficiency fracture, do not respond to invitations for FLS. For these patients, anti-osteoporotic treatment can be started even without a DXA scan. Third, there is significant heterogeneity of healthcare systems between countries. A fourth limitation is that the scoring of agreement on the level of evidence is best applicable on interventions, but is more difficult to apply to diagnostic procedures. Fifth, we (unfortunately) did not have included a non-medical health professional in the task force. This project started before 2014, and at that time it was not obligatory, and less customary than it is nowadays. Nevertheless, we have described extensively the role that the fracture nurse, as a health professional, could play centrally in the FLS.

CONCLUSION

In conclusion, we provide recommendations for each step of fracture care, which can be integrated into a multidisciplinary approach. This combined EULAR/EFORT task force was characterised by intensive discussions between orthopaedic surgeons and rheumatologists, which strongly increased insight into the thoughts and behaviours of each specialty. We hope that the manuscript will stimulate work between these specialties with fracture patients, both in daily practice and in research projects.

Author affiliations
[1]Department of Rheumatology, Amsterdam Rheumatology and Immunology Center, VU University Medical Center, Amsterdam, The Netherlands
[2]Department of Orthopedics and Traumatology, Center for Musculoskeletal Surgery (CMSC), Charité Universitätsmedizin Berlin Medical Park Berlin Humboldtmühle, Berlin, Germany
[3]Departemnt of Geriatrics and Aging Research, University Hospital and University of Zurich, Zurich, Switzerland
[4]Department for Trauma Surgery, Medical University Innsbruck, Innsbruck, Austria
[5]Department of Bone and Joint Diseases, Jagiellonian University, Faculty of Health and Sciences, Krakow Medical Centre, Krakow, Poland
[6]Department of Rheumatology, Faculdade de Medicina e Centro Hospitalar, Universidade de Coimbra, Coimbra, Portugal
[7]Department of Surgery, University of Zaragoza, Zaragosa, Spain
[8]Department of Surgery, Division of Orthopaedics, Faculty of Medicine, University of Geneva, Geneva, Switzerland
[9]Department of Rheumatology, Diakonhjemmet Hospital, Oslo, Norway
[10]Faculty of Medicine, St. Joseph University, Bellevue University Medical Center, Beirut, Lebanon
[11]University College London, London, UK
[12]Department of Orthopaedic Surgery, Hopital Rangueil, Centre Hospitalier Universitaire de Toulouse, Toulouse, France
[13]Past President EFORT, University Ulm, Germany
[14]Department of Internal Medicine III, National Institute of Rheumatology and Physiotherapy, Rheumatology Chair, Semmelweis University, Budapest, Hungary
[15]Department of Rheumatology, INSERM 1153, Cochin Hospital, Paris Descartes University, Paris, France
[16]Research Laboratory and Academic, Division of Clinical Rheumatology, Department of Internal Medicine, University of Genova, Genova, Italy
[17]Department of Orthopedics and Traumatology, Tor Vergata University of Rome, Rome, Italy
[18]Department of Family Medicine, Maastricht University, CAPHRI—School for Public Health and Primary Care, Maastricht, The Netherlands
[19]Bone and Joint Research Group, Knowledge Spa, Royal Cornwall Hospital, Truro, UK
[20]Department of Internal Medicine, NUTRIM School of Nutrition and Translational Research in Metabolism, Maastricht University, Maastricht, The Netherlands
[21]Department of Internal Medicine, VieCuri Medical Center, Venlo, The Netherlands
[22]Department of Internal Medicine, Rheumatology, Maastricht University Medical Center, Maastricht, The Netherlands
[23]University Hasselt, Hasselt, Belgium

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