CLOSING THE GAP: PREVENTING SECONDARY FRACTURES

The devastating consequences of osteoporotic fractures are well known: pain, disability, and loss of independence. Hip fracture is the most deadly, killing one out of five hip fracture patients within a year of injury and necessitating long-term care in one out of three.1,2,3 Of the 1.8 million fractures suffered in the U.S. every year, most are due to low bone density or osteoporosis.4 Ideally, bone loss would be detected and treated before fractures occur. However, this usually does not happen. In fact, the majority of hip fracture patients are discharged with no diagnosis of osteoporosis and no antifracture treatment.

As the patient’s “medical home,” primary care is the ideal setting for implementing and overseeing evidence-based fracture prevention strategies. This is a time-consuming multi-faceted endeavor. In the current climate of time and budgetary constraints, clinicians are hard pressed to provide this comprehensive level of care to an aging population with multiple chronic conditions. There simply isn’t enough time in a typical office visit. Technological and staffing solutions are needed to streamline and organize the process. Ensuring high-quality patient care will require maximizing our use of electronic practice management systems and collaborating with clinical support staff and allied health professionals -- automating some tasks and handing off others.

This issue of "Osteoporosis: Clinical Updates" explores the problem of repeat fractures and what healthcare providers can do to prevent them. We take a look at an emerging model of care that has shown promise: the Fracture Liaison Service, or FLS, model. Principles of the FLS model can be incorporated into a wide variety of clinical settings, and is uniquely suited for primary care practice.

Angelo Licata, MD, PhD, Editor in Chief

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Angelo Licata, MD, PhD, Editor in Chief
**Preventing Secondary Fractures in Primary Care**

While room for improvement remains, U.S. public health efforts to raise awareness of the need for bone density screening in women age 65-85 have been largely successful. Medicare utilization data show the majority of women in this age group are currently screened by DXA in compliance with HEDIS measures, an increase from 67.8% in 2006 to 75% in 2013.5

Paradoxically, rates of compliance with HEDIS measures for testing and treatment of women 65-85 after fragility fracture lags far behind: increasing from a meager 17.8% in 2007 to only 22.4% in 2013 according to Medicare HMO/PPO data.5 Other studies have shown even worse rates, with up to 95% of patients discharged following hip fracture repair with no antifracture treatment and a 2.5-fold increased risk of future fracture.6-8 The result is avoidable disability and death.

It’s a serious public health issue today. If nothing is done to close this gap in care, the situation will be much worse in the future. By 2025, annual fractures are expected to rise by almost 50 percent.5

Why do the majority of fracture patients fail to receive appropriate diagnosis and antifracture treatment? There are many contributing factors, starting with the challenge of identifying patients at risk. Most fractures occur in people with bone density above the threshold diagnostic of osteoporosis. They have low bone density, but not low enough to meet bone density criteria for intervention.9,10

Another complicating factor is how bone health overlaps multiple specialties and subspecialties of practice, both inpatient and outpatient. In today’s fragmented healthcare system, it can be unclear which member of the healthcare team is responsible for skeletal health: the orthopedic surgeon who repairs a hip fracture may assume the primary care doctor has it covered, while the primary care doctor assumes the orthopedist took care of any needed bone-related diagnosis and/or treatment while the patient was in hospital.

In the past few years, domestic and international efforts have been initiated to ensure that patients who fracture are evaluated, treated, and followed so that the “cascade” of fractures is stopped after the first. Evidence-based practice models have emerged that can be adapted for various clinical practice settings. One such is the Fracture Liaison Service (FLS) model of care supported by the National Bone Health Alliance (NBHA), a public-private partnership of 50-plus member organizations along with representatives from the Centers for Disease Control and Prevention, Centers for Medicare & Medicaid Services, National Aeronautics and Space Administration, National Institutes of Health, and the U.S. Food and Drug Administration.

In an FLS system, a multidisciplinary team of healthcare providers works in collaboration to implement evidence-based diagnostic and treatment protocols following a fragility fracture. The

![Activity Objectives](https://example.com/ActivityObjectives.jpg)

**Activity Objectives**

Upon completion of this CE material, the participant should be able to:

- Identify factors that contribute to very low compliance with standards of care in patients who have experienced fragility fracture.
- Perform a clinical assessment to identify patients at risk of secondary fragility fracture.
- Contribute to postfracture patient care as part of a coordinated multidisciplinary team.
- Utilize technological and clinical tools to implement comprehensive fracture prevention in primary care practice.
- Explain the benefits of using a fracture liaison to organize and oversee the care of postfracture patients.

![HEDIS Measure % Compliance 2013](https://example.com/HEDISMeasure.jpg)

**Figure 1.** Compliance with HEDIS measures for preventive care of osteoporosis is far below that of other chronic diseases. (Source: National Committee for Quality Assurance [NCQA] Medicare. HMO/PMO utilization data.5)
process is overseen by an FLS coordinator (a nurse or other allied health professional) charged with overall organization, tracking, and documentation of postfracture patient care. It is a simple concept, yet its implementation is complicated, requiring planning, division of responsibilities, coordination of staff, systematic and consistent patient monitoring, and knowledge of billing and coding technicalities. Because management of osteoporosis is a multidimensional and long-term undertaking, coordination of the various components of the treatment plan is critical to its effectiveness. Equally critical is patient participation. Every aspect of the plan must accommodate the patient’s needs, goals, values, habits, abilities, and living conditions.11,12

FLS programs have been successful in the U.S. and abroad, particularly in integrated healthcare delivery systems and closed systems such as the Veterans Health Administration and Kaiser Permanente-Southern California. FLS pilot programs outcomes to date include:

• Kaiser Permanente’s Healthy Bones program, which has led to an overall 38% reduction in their program’s expected hip fracture rate since 1998.
• Geisinger Health System osteoporosis disease management program, which achieved $7.8 million in cost savings over 5 years through reduction of secondary fractures.
• American Orthopaedic Association’s Own the Bone program, a voluntary FLS program designed to address the osteoporosis treatment gap and prevent subsequent fractures has achieved change in clinician behavior and improved patient treatment and referral in the open system.
• NBHA FLS Demonstration Project, a “turnkey” FLS solution created for sites to automate, benchmark, and improve performance related to selected osteoporosis/post-fracture quality measures and patient care is currently being piloted in three hospital settings.

Cost savings resulting from fewer fractures make FLS programs financially attractive in closed or integrated healthcare organizations. Although funding can be a barrier, the FLS model is feasible in open healthcare systems. It is hoped that changes in Medicare and Medicaid reimbursement that reflect patient outcomes and "pay-for-performance" measures will promote adoption of FLS programs in open healthcare systems.
The goal of the FLS model, like any practice management program, is to provide high-quality patient care while making best use of the clinician’s time and expertise. Creative approaches optimize electronic medical records and practice management software, delegate select tasks, automate as much as possible, take advantage of the patient’s waiting-room time, and team up colleagues, specialists, allied health professionals, and support staff. There are tools available for every type of practice, from sole practitioner to hospital-based multispecialty clinic.

The FLS approach employs procedures common to any chronic disease management plan:
- Identifying patients at risk
- Initiating appropriate treatment
- Supporting healthy nutrition, exercise, and lifestyle
- Tracking and follow up

What distinguishes the FLS system from other disease management programs is the fracture liaison, a nurse or other dedicated healthcare professional who engages with the patient following fracture and then takes charge of oversight, coordination, and implementation of the patient’s medical management plan.

On the next page is a breakdown of one possible model for comprehensive fracture prevention management indicating steps in the process, parties responsible, information technology applications, as well as supplemental aids and support materials. Keep in mind that in an FLS system each step will be scheduled, tracked, and documented by the FLS coordinator.

**Identifying People at Elevated Risk for Secondary Frailty Fracture**

The risk of secondary fracture is highest immediately after the initial fracture, with a gradual waning of risk thereafter. Once a vertebral fracture occurs, 50% of patients have another fracture within three years. Prompt and effective treatment following fracture is the key to slowing deterioration and preventing future fractures.

In the United States the standard criterion for diagnosing osteoporosis and applying the ICD-9 code 733.0 is a T-score of ≤ -2.5 at the lumbar spine, femoral neck, or total hip by bone mineral density (BMD) testing. As the T-score goes down, the relative risk for fracture

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**CME Program Eligibility**

Method of Participation in the Learning Process: Clinician learners will read and analyze the subject matter, conduct additional informal research through related internet searches on the subject matter, and complete a post-test assessment of knowledge and skills gained as a result of the activity.

After participating in this activity, the reader has the option of taking a post-test with a passing grade of 70% or better to qualify for continuing education credit for this activity. It is estimated it will take 1.0 hour(s) to complete the reading and take the post-test. Continuing education credit will be available for two years from the date of publication.

**Accreditation**

The National Osteoporosis Foundation is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians. The National Osteoporosis Foundation designates this educational activity for a maximum of 1.0 AMA PRA Category 1 Credit(s)™. Physicians should only claim credit commensurate with the extent of their participation in the activity.

The National Osteoporosis Foundation is accredited as a provider of continuing nursing education by the American Nurses Credentialing Center’s Commission on Accreditation.

The National Osteoporosis Foundation designates this educational activity for a maximum of 1.0 continuing nursing education credit(s).

Other healthcare providers will also be able to receive a certificate of completion; nurse practitioners and physician assistants may request an AMA PRA Category 1 Credit(s)™ certificate of participation.

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**Statement Regarding Off-Label Use**

Any publication of the Osteoporosis Clinical Updates that discusses off-label use of any medications or devices will be disclosed to the participant.
<table>
<thead>
<tr>
<th>FRACTURE PREVENTION PROGRAM</th>
<th>PERSONNEL RESPONSIBLE</th>
<th>INFORMATION TECHNOLOGY SOLUTIONS/SUPPORTS</th>
<th>SUPPLEMENTAL AIDS</th>
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<tbody>
<tr>
<td>Identify Patient at Risk of Fracture</td>
<td>PCP (Conducts clinical exam, FRAX®, and lab assessments as appropriate)</td>
<td>PMS/EMR triggers prompt when risk profile for patient indicates elevated risk</td>
<td>Patient fall risk questionnaires and other handouts to be completed before visit</td>
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<td></td>
<td>DXA technician (Based on DXA results, tech sends patient to PCP/nurse educator for treatment and/or education)</td>
<td>PMS/EMR system triggers prompt for needed assessments when fracture occurs or other risk factors are recorded</td>
<td>Records from hospitals, rehab, etc.</td>
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<td></td>
<td>Clinical support staff (Conducts fall risk assessments. Based on results, sends patient to PCP/nurse educator for treatment and/or education)</td>
<td>PMS/EMR records lab, clinical, fall risk, and DXA assessment results for diagnostic, treatment, and tracking/follow-up purposes</td>
<td>Clinical practice guidelines (aps, online, or printed)</td>
</tr>
<tr>
<td>Antifracture Treatment (Support Adherence)</td>
<td>PCP (Discusses options, pros and cons, patient concerns, prescribes treatment.)</td>
<td>PMS/EMR records prescription fill/refill (when possible) triggers alert if unfilled by set interval</td>
<td>Patient handouts and risk/benefit visual aids and graphics to address distorted perception of risk for adverse effects</td>
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<td>PCP, nurse educator, and/or clinical staff (Educates patient on realistic risk-benefit comparisons, etc.)</td>
<td>PMS/EMR system triggers prompt to communicate by phone or email with patient at specified intervals to promote adherence</td>
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<td></td>
<td>PT, OT and/or other trainer (Safe exercise program to build strength and improve balance)</td>
<td>PMS/EMR system triggers motivational and educational patient emails</td>
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<tr>
<td>Support Healthy Nutrition, Exercise, and Lifestyle</td>
<td>PCP, nurse educator, clinical support staff, and/or nutritionist (Assess and prescribe dietary changes and/or supplementation)</td>
<td>PMS/EMR system triggers prompt need to refer/remind/record/follow</td>
<td>Patient education materials on smoking cessation, diet and nutrition, safe exercise, fall proofing home, etc.</td>
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<td></td>
<td>PCP, nurse educator, clinical support staff, PT, OT, and/or home safety consultant (In-office survey and education or onsite consultation to identify and correct falling hazards)</td>
<td>PMS/EMR system triggers motivational and educational patient emails</td>
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</tr>
<tr>
<td></td>
<td>PT, OT and/or other trainer (Safe exercise program to build strength and improve balance)</td>
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Table 1. This breakdown shows one possible model for a comprehensive fracture prevention plan (primary or secondary)  
Abbreviations used: PMS practice management system, EMR electronic medical record, PCP primary care provider (MD, DO, NP, or PA), PT physical therapist, OT occupational therapist.
What is meant by low-trauma? By low-trauma, we mean an injury that resulted from an impact that would not break a bone in a healthy young person. For example, a fall from standing height or less or a low-velocity bump against a solid object would be considered low-trauma. Breaks suffered as the result of falling from a roof or having a motor vehicle accident are examples of medium- or high-trauma impacts and not in themselves diagnostic of osteoporosis. Nevertheless, data suggest that all fractures, regardless of precipitating trauma, should be recognized as potential evidence of bone fragility.22 BMD testing is recommended in older fracture patients with additional risk factors.23

Risk Indicator: History of Clinically Significant Fracture

Strong evidence linking a history of certain fragility fractures with increased future risk has lead to a consensus among experts in the field of bone health that a diagnosis of osteoporosis can be made, regardless of BMD, in individuals who experience certain types of low-trauma fracture: hip fracture, clinical vertebral fracture, proximal humerus fracture, pelvis fracture, or, in some cases, distal forearm fracture.21

What other clinical observations indicate high risk of secondary fragility fracture?
- History of certain types of clinical fractures
- History of vertebral fracture
- History of falls or risk factors for falling
- FRAX score above treatment threshold

With this clinical information, the primary care provider can identify high-risk patients for timely preventive management.

Risk Indicator: History of Vertebral Fracture

The presence of a single vertebral fracture increases the risk of subsequent vertebral fractures 4-fold and the risk of hip and other fractures 2- to 3-fold.4 This risk increases with each subsequent fracture.

Patients may suffer fragility fractures of the vertebrae and not even know it (so-called “silent” fractures). Compression or crush fractures occur when the vertebral body lacks sufficient mineral matrix to support the weight placed on it in normal activities. Vertebrae can

Figure 3. This chart illustrates the distribution of per-person fractures across the spectrum of BMD T-scores, from highest (1.0) to lowest (-3.5). As you can see, most fractures (green) occur in people with T-scores in the range of -1.0 to -2.0, at a relatively low fracture rate per person. Conversely, the highest per-person rate of fracture, at the lowest end of the T-score range, results in a very small number of actual fractures because there are far fewer people in the cohort.

(Adapted from: Siris ES, Baim S, Nativ A. Primary care use of FRAX: absolute fracture risk assessment in postmenopausal women and older men. Postgrad Med. 2010 Jan;122(1):82-90.)
Medications that make a person dizzy, sleepy, or uncoordinated also contribute to fall danger. Multiple comorbid conditions are common in older adults, requiring multiple prescription and over-the-counter drugs. Many have sedating effects either alone or in combination, seriously compromising a patient’s equilibrium and/or agility.

Drugs that increase the risk of falls, especially in older adults, include anticholinergics, psychoactive therapies (e.g. opioids, benzodiazepines, antidepressants, and neuroleptics), sedating antihistamines, and nonsteroidal anti-inflammatory drugs (NSAIDs). In addition to drugs that cause fractures through falls, many medications are associated with elevated fracture risk due to loss of bone mineral density (Table 3 below).

Risk Indicator: Fall History and Fall Risk

Among adults aged 65 or older, falls are the leading cause of both fatal and nonfatal injuries, including the majority of fractures and over 95% of hip fractures. According to CDC statistics, in 2011, an estimated 22,900 adults aged 65 and older were killed by unintentional fall injuries.

There are many risk factors for falls (Table 2). The most important of these are personal history of falling, muscle weakness and disordered gait, medications that cause sedation, and deficits in balance and vision.

Clinical assessment for fall risk should include:
- Physical exam and medication review
- Fall history
- Postural hypotension evaluation
- Vision check
- Gait, balance, and lower extremity strength tests

Physical Exam & Medication Review. Many medical conditions and therapies impair balance and increase fall risk. These include conditions as disparate as depression, cardiac arrhythmia, and foot ulcers.

Medications that make a person dizzy, sleepy, or uncoordinated also contribute to fall danger. Multiple co-morbid conditions are common in older adults, requiring multiple prescription and over-the-counter drugs. Many have sedating effects either alone or in combination, seriously compromising a patient’s equilibrium and/or agility.

Fall History. Has the patient fallen since his/her last visit? What were the circumstances? Past falls are a significant predictor of future falls. Falls engender anxiety,
which can actually increase risk of falling. Once a person has fallen, he or she may lose self-confidence and abandon activities that supported musculoskeletal and overall health. Confidence can be restored with exercise focused on strengthening muscles and improving balance.

Falls can be embarrassing. Without direct questioning, many patients are reluctant to report a fall to their healthcare provider. According to CDC statistics, while one out of three older adults falls each year, fewer than half talk to their healthcare providers about it.\textsuperscript{15,29} Having a friend or family member participate in a patient interview can sometimes elicit more complete information than seeing the patient alone.

**Orthostatic Hypotension.** Does the patient ever feel light headed after getting out of bed or after a large meal? Orthostatic, or postural, hypotension is common in older people as a result of medical conditions such as Parkinson’s disease, hypertension, diabetes, and atherosclerosis or as a result of medications such as diuretics, antidepressants, or antihypertensives. It can also be caused by anemia, dehydration, or vitamin B\textsubscript{12} deficiency.

To evaluate for postural hypotension:
1. Have the patient lie down for 5 minutes.
2. Measure blood pressure and pulse rate.
3. Have the patient stand.
4. Repeat blood pressure and pulse rate measurements after first standing and then again after standing for 3 minutes.

Systolic blood pressure that drops $\geq 20$ mm Hg and/or diastolic blood pressure that drops $\geq 10$ mm Hg are considered abnormal, as are vertigo or light-headedness.

Interventions that prevent blood pooling in lower extremities can be helpful, such as pressure stockings and mattress wedges that elevate the head of the bed — as can decreasing the dose of medications contributing to hypotension or, when possible, discontinuing or substituting other medications. In some cases, medication to increase blood pressure and/or vascular tone may be beneficial.\textsuperscript{30}

**Gait, Balance, and Lower Extremity Strength Assessment.** Several clinical tests have been validated to predict fall risk: the Timed Up and Go Test (TUG), the 30-Second Chair Stand Test, and the Four-Position Balance Test. These can be conducted by a medical assistant and documented in a patient’s electronic medical record. Initial tests can be used to identify patients at risk and provide tangible evidence of their need for therapy and fall-prevention measures. Serial assessments can motivate compliance by indicating functional improvement or lack thereof. Full instructions for these three tests may be found at the end of this newsletter.

**Vision Assessment.** Glaucoma, cataracts, macular degeneration, and other vision disorders prevalent in older adults can significantly impair ability to navigate safely through daily life. Color perception and contrast sensitivity decline with age-related yellowing of the lens. Blues and greens blur together, becoming harder to tell apart. A blue chair on a green rug could present a fall hazard for an elderly person who has a hard time seeing where the chair seat ends and the rug begins. The situation is made worse by impaired depth perception, which is very common in the elderly due to age-related decline and/or Alzheimer’s disease.\textsuperscript{31} It may be difficult for an older person to see the boundaries of obstacles that don’t have high-contrast borders to differentiate them from their surroundings. For example, stairs carpeted in a solid light color would be very hard
Risk Indicator: FRAX® Score Above Treatment Threshold

As we have said, most fragility fractures occur in people who do not have osteoporosis by BMD criteria (DXA T-score ≤ −2.5). Factors besides bone density come into play. Data on these factors and their relative contributions to fracture risk have been validated through study of population-based cohorts from Europe, North America, Asia, and Australia. The models used in the FRAX® software-based algorithm are based on these data. Developed by the World Health Organization, the FRAX® tool projects probability of fracture on the basis of validated risk factors, with or without BMD measurement. Patient specifics are entered into the FRAX® calculator to generate ten-year projections for hip fracture and osteoporotic fracture at other sites. Treatment thresholds based on these predictive scores have been established: ≥ 3% risk of hip fracture and ≥ 20% risk of any major osteoporosis-related fracture (defined as fractures resulting from low-impact trauma, excluding fractures of face, fingers, and toes).

FRAX® projections are based on data for postmenopausal women and men age 50 and older. It is not intended for use in younger adults or children. FRAX® is validated in treatment-naïve patients, those who have not taken medication for osteoporosis at any time in their lives. Data used in the FRAX® algorithm is continuously updated and expanded as new information is available from reference populations. Data are currently being compiled that may extend evidence-based use of FRAX® to individuals who have been treated at some time in the past.

The great value of using FRAX® is its capacity to assign a number to the patient’s fracture risk with clear guidance on when to treat. If the patient’s ten-year fracture probability is at or above 3% for hip fracture or 20% for other fractures, he or she should receive treatment – regardless of BMD T-score.

Like any tool, FRAX® has limitations. Clinical judgment must be applied when interpreting results. For example, the FRAX® model does not include falls, which are the leading cause of fracture. In addition, its yes/no format doesn’t allow for quantitative scaling of risk factors. No duration or dose can be entered for glucocorticoid use, alcohol abuse, or smoking; although they undoubtedly have an effect.

The FRAX® calculator is currently available online at http://www.shef.ac.uk/FRAX/, as an iPhone app, a hand-held device, onboard many DXA machines, and in paper print-out form downloadable at www.shef.ac.uk/FRAX.12

Sustainable Anti-Fracture Treatment

Osteoporosis is a chronic condition that requires long-term multifaceted management including pharmacologic therapy. A variety of treatment options are available with proven efficacy. Women with osteoporosis cut in half their risk of hip, spine, and wrist fractures by taking antifracture medication. To prevent future fractures patients must also follow a regimen of dietary and exercise protocols for the rest of their lives.

Selecting the best drug for a patient requires understanding both the patient’s medical status and his or her personal preferences. All medications have risk of side effects. Awareness of possible side effects will help patients know what to expect, thereby improving the odds that they will persist in taking the medication as prescribed. Unforeseen adverse events can unnecessarily alarm patients and lead to nonadherence. For example, without foreknowledge that zoledronic acid can cause days of flu-like aches, pains, and fatigue, patients who experience these side effects may conclude that the medication “disagrees” with them and not return for their annual infusion. More commonly used drugs such as oral bisphosphonates can cause stomach upset and acid reflux. Alternatives include weekly, monthly, and quarterly doses. Patients armed with this knowledge may feel empowered to bring up concerns with their clinician so that they can be addressed, rather than simply dropping the medication from their daily routine.

Osteoporosis medications have notoriously low patient compliance – it is estimated that 25% of patients don’t even fill their prescriptions and of those who do half
don’t take them as prescribed or stop taking them after one year. How can a clinician increase the likelihood that patients will benefit from these effective drugs? It’s a real challenge. Many approaches have been found to be helpful. All of them focus on the patient, his or her values, needs, and perceptions. For example:

- Eliciting patient perceptions of risks and benefits of drug treatment before prescribing medication
- Correcting misunderstandings about risk of adverse events in the context of reduced risk of fracture
- Directly questioning patients about drug-related side effects they may be experiencing, discussing options for addressing these, following up with periodic calls regarding side-effects
- Sending patients home with printed information about possible adverse effects, their prevalence, seriousness, and expected duration as well as when to seek medical attention
- Seeking out concerns related to dosing schedule and modifying as needed to better suit patient preferences

It can be difficult to counter widespread media messages that exaggerate the risk of rare adverse events such as osteonecrosis of the jaw and atypical femur fracture, which have been associated with long-term use of bisphosphonate drugs in certain patients.

Graphic representations that visually contrast risk of fracture with risk of a particular adverse event can be a great help. The patient education graphics shown below, created by Kaiser Permanente of Southern California, illustrate the comparative risk of atypical femur fracture with that of osteoporotic fragility fracture in a typical postmenopausal patient.

Explaining potential benefits and risks of a therapy may not be sufficient to motivate adherence day in and day out. In some cases, the patient may do better with a change in dosing. For example, a patient who is having difficulties with a daily oral dose might be better served by weekly or monthly oral doses, biannual injections, or yearly IV doses.

While stable BMD and absence of new fractures may not seem like progress, these are both concrete evidence of treatment success. Declines in biochemical markers of bone resorption also indicate that medication is working. This type of objective feedback can help motivate patients to stay the course and adhere to treatment plans.

Many effective antifracture drugs are FDA approved and widely available:

- Bisphosphonates (alendronate, alendronate plus D, ibandronate, risedronate, and zoledronic acid, in oral or IV doses administered daily, weekly, monthly, quarterly, or yearly)
- Calcitonin (daily 200 IU intranasal spray)
- Estrogens (variety of oral doses estrogen, progestin, and combination estrogen-progestin in cyclic, sequential, and continuous regimens)
- Estrogen agonist/antagonist (raloxifene in daily 60 mg tablet)

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Graphic representations that visually contrast risk of fracture with risk of a particular adverse event can be a great help. The patient education graphics shown below,
• Tissue-specific estrogen complex, bazedoxifene acetate in combination with estradiol (daily 0.45mg /20 mg tablet)
• Parathyroid hormone (PTH [1-34], teriparatide, in daily 20 µg subcutaneous injection)
• RANKL inhibitor (denosumab in twice-yearly 60 mg subcutaneous injection)

The antifracture benefits of these drugs have been studied primarily in women with postmenopausal osteoporosis. There are limited fracture data in men or in glucocorticoid-induced osteoporosis.

FDA-approved osteoporosis treatments have been demonstrated to decrease fracture risk in patients who have had fragility fractures and/or osteoporosis by DXA. Some of these drugs may reduce fractures in patients with low bone mass (osteopenia) and no history of fractures, but this evidence is less strong.

**Supporting Healthy Nutritional, Exercise, and Lifestyle Practices**

Simple interventions to preserve bone strength can be recommended at each office visit. These include adequate intake of calcium and vitamin D, regular participation in weight-bearing and muscle-strengthening exercise, cessation of tobacco use, and recognition and treatment of alcoholism.

**Adequate Intake of Calcium and Vitamin D**

Adequate intake of calcium and vitamin D has been demonstrated to reduce risk of fracture. The relative risks and benefits of calcium supplementation versus dietary intake are currently under investigation. Many questions remain: Are dietary and supplemental sources bioequivalent? Does calcium from supplements cause harmful spikes in serum calcium? Do individuals who use supplemental calcium have higher risk for stroke or cardiovascular disease? More research is needed to resolve these issues. In the meantime, the general recommendation is to get as much calcium as possible from foods and supplement only as much as is needed to reach intake goals.

The average daily dietary calcium intake in adults age 50 and older is 600 to 700 mg per day, well below the Institute of Medicine (IOM) recommendation of 1,000 mg (men) and 1,200 mg (women). There is no evidence that calcium intake in excess of recommended amounts confers additional bone benefit. In fact, daily intake in excess of 1,500 mg has been linked in some studies to increased risk for kidney stones, cardiovascular disease, and stroke. The scientific literature is highly controversial in this area.

Patients may be unsure of how much calcium they get in their daily diet. A calculator such as the one shown on the next page can be helpful. It can be completed before each visit, allowing the patient and clinician to assess intake and track progress. Reminders with nutrition tips and recipes can be emailed to patients periodically to help them stay on track.

Vitamin D plays a major role in promoting calcium absorption, maintaining bone health, and preventing falls. Vitamin D deficiency has been associated with weakening of the muscles that come into play when one loses one’s balance. Recent data from a large population-based prospective observational study of elderly community-dwelling men showed a U-shaped association between vitamin D serum level and fracture risk. The highest risk of fracture was observed in men with serum levels of below 36nmol/L or above 72nmol/L (<14 ng/mL or >29 ng/mL). The lowest risk was in men with serum 25OHD between 60 and 72nmol/L (24-29 ng/mL).

Sufficient serum D is necessary for antifracture drugs to work. Unfortunately, a high prevalence of vitamin D deficiency has been found in patients taking osteoporosis medications, and in those with hip fractures.

NOF recommends an intake of 800 to 1,000 international units (IU) of vitamin D per day for adults age 50 and older. Institute of Medicine Dietary Reference Intakes for vitamin D are 600 IU per day until age 70.
and 800 IU per day for adults age 71 years and older. Many factors lead to vitamin D deficiency including malabsorption syndromes (e.g., celiac disease) or other intestinal diseases, chronic renal insufficiency, certain medications (e.g. some antiseizure drugs), limited sun exposure, very dark skin, and obesity.\textsuperscript{35,36} Serum 25(OH)D levels should be measured in patients at risk of deficiency.

Vitamin D intakes required to correct deficiency vary from one person to the next. Frequently, patients will need more than the recommended 800-1,000 IU per day to reach or maintain target serum levels of 30 ng/mL. Correcting severe deficiency may require 50,000 IU of vitamin D once a week or the equivalent daily dose (6,000 IU) for 8-12 weeks to achieve a 25(OH)D blood level of 30 ng/mL. This regimen would be followed by a maintenance dose that supports adequate blood levels. The safe upper limit for daily intake of vitamin D for the general adult population is 4,000 IU per day.\textsuperscript{37}

Dietary sources of vitamin D include vitamin D-fortified dairy milk and cereals, as well as liver and salt-water fish. Some calcium supplements and most multivitamin tablets, as well as some medications, also contain vitamin D. Supplementation with either vitamin D2 (ergocalciferol) or vitamin D3 (cholecalciferol) is acceptable. Vitamin D2 is derived from plant sources and may be preferred by individuals on a strict vegetarian diet.

**CALCIUM CALCULATOR**

**STEP 1: Estimate calcium intake from calcium-rich foods***

<table>
<thead>
<tr>
<th>Product</th>
<th># of Servings/d</th>
<th>Estimated calcium/serving, in mg</th>
<th>Calcium in mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk (8 oz.)</td>
<td>X 299</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yogurt (8 oz.)</td>
<td>X 415</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cheese (1.5 oz. or 1.5 cubic in.)</td>
<td>X 307</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fortified juice (6 oz.**)</td>
<td>X 261</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ice cream (1/2 cup or 4 oz.)</td>
<td>X 84</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Subtotal =

**STEP 2: Add 250 mg for non-dairy sources to subtotal above +250**

Daily Intake Goal: 1,000 mg (men) 1,200 mg (women)

TOTAL CALCIUM = __________ mg

* About 75%-80% of the calcium consumed in American diets is from dairy products.

** Calcium content of fortified foods varies.

Regular Weight-Bearing and Muscle-Strengthening Exercise

Weight-bearing and muscle-strengthening exercise reduces the risk of falls and fractures. Among its many health benefits, exercise can improve agility, strength, posture, and balance. In addition, weight-bearing exercise may modestly increase bone density. NOF strongly endorses lifelong physical activity at all ages, both for osteoporosis prevention and overall health.

Weight-bearing exercise (in which bones and muscles work against gravity as the feet and legs bear the body’s weight) includes walking, jogging, Tai-Chi, stair climbing, dancing, and tennis. Muscle-strengthening exercise includes weight training and other resistive exercises, such as yoga, Pilates, and circuit training programs. Some of these exercises can be dangerous for patients with low bone density or fractures. For example, exercises that require forward bending and twisting can cause vertebral fracture in a person with low spinal bone density.

It is important that patients be evaluated by their clinician before starting such a program and that the exercise program be supervised by a trained practitioner. Guidelines for safe exercise can be found in the NOF publication Boning Up on Osteoporosis and in the Osteoporosis: Clinical Updates issue entitled “Rehabilitation of Patients with Fragility-Related Fractures.”

Cessation of Tobacco Use and Avoidance of Excessive Alcohol Intake

Skeletal health is one of many reasons patients should be helped to stop tobacco smoking. Most patients probably do not know that tobacco is harmful to bone. Discussing smoking in the context of fractures and loss of independence may motivate a patient to quit. NOF strongly encourages smoking cessation as an osteoporosis intervention.

Alcohol intake of more than two drinks a day for women or three drinks a day for men reduces bone density and increases risk of falling.\(^48\) It can be difficult to recognize patients with excessive alcohol intake. Further evaluation for alcoholism may be needed when suspected. Moderate alcohol intake has no known negative effect on bone and may even be associated with slightly higher bone density and lower risk of fracture in postmenopausal women. Note: The WHO FRAX algorithm defines excessive daily alcohol consumption to be three or more units daily — one unit roughly equals 8-10 g of alcohol: 10 oz. beer (285mL), 1.5 oz. liquor (30mL), or 3-4 oz. wine (120mL).

Tips for Effective Patient Communication

The following doctor-patient communication techniques can provide a foundation for productive patient consultations and be a source of motivation, incentive, and reassurance for patients following fragility fracture:

- Be aware of possible hearing loss in older patients. Use a “pocket talker” amplifier for hearing-impaired patients.
- Utilize interpreters when working with non-English-speaking patients.
- Include family members in consultations when possible.
- Use visual and tactile learning aids such as models of bone and graphics like those shown on page 10.
- Practice attentive listening skills, show empathy, and ask open-ended questions.

Tracking and Follow-up: Systematic Patient Outreach & Care Coordination

As with all chronic diseases, osteoporosis treatment is clinician initiated but patient managed. Day to day, week to week, the patient’s actions determine whether treatment succeeds or fails. What can the clinician do to ensure that fracture-prevention plans succeed? A great deal of research has gone into answering this question.\(^49,51\)

Several strategies have shown promise — improving patient outcomes and maintaining bone health. These strategies can be built into a practice management system to automate tasks such as creating work lists with staff assignments, alerting clinicians to needed follow-up testing, and sending reminders to patients for appointments and daily self-care activities such as exercise and nutritional enrichment. Setting up a system like this can be time consuming, but once in place, efficiencies become immediately obvious. In the FLS model, this system is organized and overseen by a designated member of clinical staff, the fracture liaison.

E-mail communication generated by practice management system and/or scripted phone calls can be used to communicate with patients:

- Appointment reminders, tests, therapy sessions, follow-up visits, etc.
- Follow-up questions — encourage patient to please...
call or email questions and concerns
• Support nutritional improvements — calcium checklist, recipes, nutrient target intake charts
• Promote exercise — calendar of workouts to keep track, guidelines for safe movement, resource list for local programs
• Track medication compliance. Higher compliance is observed in patients who initiate treatment within 3 months of fracture, lower compliance if initiated later

Maintaining bone health takes long-term commitment on the part of both patient and caregivers. Older adults frequently have multiple chronic conditions to manage. Keeping on top of all of the diet, drug, and lifestyle tasks involved in an antifracture treatment program can seem overwhelming. Regular patient-clinician/clinician-patient communication can make the difference between independence and disability. Fragility fractures are not an inevitable part of aging. Preserving bone strength enables patients to stay active and independent. The keys are awareness, effective treatment, fall prevention, persistent exercise, and clinical support to stay on track.

CASE STUDIES: PREVENTING SECONDARY FRACTURES

Case 1. 83-Year-Old Man with Wrist Fracture
The first patient we will discuss is a thin, healthy, community-dwelling Caucasian man of 83 who has remained active and independent until recently breaking his right wrist by tripping over a rake in his garage. He is now casted and unable to care for himself without assistance.

The clinical setting is a group practice of primary care physicians. The practice does not have a Fracture Liaison Service, per se; however, it has an on-staff nurse educator and a relationship with occupational/physical therapy practice located in the same facility. The patient is a regular user of email and the “patient portal” he has established with the practice.

Is this wrist fracture evidence of low bone density and increased fracture risk?
Yes. Given his age, this fracture indicates significant risk of future fractures. This wrist fracture may help raise the patient’s awareness and motivate him to get started on a fracture prevention program.

The patient’s workup is remarkable for several additional risk-compounding factors.

Physical Exam and Medical History
• Height: 5’10” (height at age 40: 6’1”)
• Weight: 140 lbs (BMI 20.1)
• Hypertension managed medically
• No DXA or other BMD test
• Postural hypotension evaluation: Vitals Supine – 135/76, 69; Vitals Sitting – 112/75, 76; Vitals Standing – 116/76, 75
• Vision check: Wearing glasses. Acuity 20/30 R, 20/70 L. (History of glaucoma surgically corrected)
• History of vagotomy with partial gastrectomy to treat perforated peptic ulcer (at age 40)
• History of prostate cancer (onset age 66)
• Chronic asthma and multiple systemic allergies controlled with medication

Current Medications
• Valsartan 80 mg daily
• Lipitor 40 mg at bedtime
• Flomax 0.8 mg at bedtime
• Claritin 10 mg daily
• Leukotriene modifiers for asthma
• Albuterol rescue inhaler

Are there red flags for fracture risk in the patient’s medical history?
Yes. If past height measurement is correct, the patient has lost 3” — highly suggestive of vertebral compression fracture. His blood pressure readings indicate postural hypotension. Both point to increased fracture risk.

Is the patient’s history of peptic ulcer surgery relevant to his bone strength?
It very well may be. Vagotomy/gastrectomy surgery is associated with malabsorption of calcium and vitamin D, putting survivors at long-term risk for poor bone quality and fractures. His serum vitamin D should be tested. If below 75 nmol/L (~30 ng/mL), he will be prescribed an oral dose of 50,000 IU vitamin D2 weekly for 6 weeks at which time he will be reassessed. When goal level of ~30 ng/mL is achieved, he will be prescribed vitamin D as needed to maintain sufficiency.

What about his history of prostate cancer and...
asthma/allergies?
Again, they may be relevant. A review of the patient’s medication history will provide a more complete picture. The clinician should be aware that the patient might not connect past medical treatment with current bone health. Specific questions about therapies known to cause bone loss will be instructive.

The patient’s prostate cancer was treated with radiation and one-year course of hormone agonist treatment (leuprolide injection). Urinary dysfunction is a common side effect of prostate cancer treatment. The clinician asks if the patient must get up to urinate at night and if so how many times. The patient reports needing to get up two or three times during the night and often has to rush to the bathroom during daytime hours. Both factors increase fall risk.

The clinician asks if the patient has ever taken other medications to control his allergies and asthma. The patient reports having been on long-term oral and inhaled glucocorticoid therapy (>5 years).

Should this patient be evaluated for metabolic bone disease?
Yes. While he may be diagnosed with osteoporosis on the basis of his fracture alone, we need to measure the severity of his bone loss and rule out modifiable underlying causes.

A bone density scan by DXA is ordered. In addition, he has lateral spine x-ray to assess vertebral fractures.

Significant values:
• 25-hydroxy-vitamin D level is deficient at 12 nmol/L (normal range 20-30 ng/mL)
• Serum C-telopeptide (CTX), a marker of bone resorption, is 271.6 ng/L (normal range 51-70 years - 35-836 pg/mL)
• Serum calcium is low: total calcium 8.2 mg/dL (normal range 8.6-10.5 mg/dL)
• Intact parathyroid hormone (PTH) is elevated at 128 pg/mL (normal range 10-72 pg/mL)

The clinician explains that the patient is at high risk for additional fractures and that antifracture medication would reduce this risk. The patient says he feels fine and that he doesn’t want to take any more medications.

How can the clinician encourage consideration of pharmacologic options by this patient?
First, the clinician can link the patient’s future risk for fracture to his current wrist fracture. Having lost the use of his right arm, the patient is fully aware of the inconvenience and pain associated with a fracture. The clinician can explain that medication is needed to help prevent more serious and disabling fractures from occurring in the future.

To help the patient understand his likelihood for fracture, the clinician enters the patient’s factors into the FRAX® calculator as shown at the bottom of this page.

What is the significance of the patient’s FRAX® score?
This patient’s FRAX score (17/34) puts him well above the threshold for antifracture treatment (>3% hip fracture and >20% major osteoporotic fracture). He is at
very high risk and should be treated.

**What can the clinician discover that could promote treatment compliance?**
The clinician asks if the patient has questions or concerns about starting on an antifracture drug. The patient expresses resistance to taking daily medication. With his peptic ulcer history, he is worried about causing GI trouble.

The clinician suggests that a monthly or yearly dose might be preferable. The patient agrees. The clinician prescribes yearly zoledronic acid injection and daily vitamin D and increased dietary with calcium as needed. The clinician explains that he may experience flu-like symptoms in the day or two following infusion and that these symptoms usually resolve on their own and diminish with each subsequent treatment. He recommends pretreatment with acetaminophen.

**What can the clinician do to raise the patient’s awareness of his risk of fracturing from a fall?**
The “Check Your Fall Risk” questionnaire (page 23) would be very useful in this instance. The patient answers “yes” to four of the questions, (fall in past year, worry about falls, rushing to toilet, and feeling light-headed). Each visit, the patient will complete the fracture checklist. His score will be recorded on his electronic medical record so that results can be compared and discussed.

**How can the clinician encourage this patient to stay active despite fear of falling?**
The clinician can start by reassuring the patient that falls can be prevented through improved fitness and simple safety precautions such as removing tripping hazards, adding grab bars, improving lighting, exercising for stronger muscles and improved balance, updating eyeglass prescription, and standing up slowly to avoid dizziness.

**What measures can the clinician take to initiate a fall prevention program with this patient?**
The clinician refers the patient to the in-house nurse educator to discuss home fall-proofing (which will include take-home checklist, discussion with family members, referral to home safety consultants/resources).

The designated clinical support staff assesses the patient’s mobility, strength, and balance. Results from these tests will be entered into patient’s electronic medical record.

Not surprisingly, the 30-Second Chair Stand, 4-Stage Balance, and Timed Get-Up-and-Go tests show the patient to be in the high-risk range.

Patient’s risk factors for fractures/falls:
- Advanced age
- Low BMI
- History of fracture
- History of falls
- Height loss (possible vertebral compression fracture)
- Orthostatic blood pressure indicating postural hypotension
- Bone loss due to:
  - Glucocorticoid use
  - Testosterone agonist therapy (leuprolide)
- Malabsorption of calcium and vitamin D (resulting from ulcer surgery)
- Poor vision
- Nocturia >2 times a night
- Weak lower extremities (on Timed Up and Go test)

**How can the primary care provider work with staff and colleagues to lower the high risk indicated by the patient’s gait and strength tests?**
The primary care provider prescribes physical therapy, noting it in the patient’s EMR so that a physical therapy assessment will be scheduled when the patient checks out. The physical therapist will design a targeted exercise program to build strength and balance, and, if appropriate, recommend referral to occupational therapy for evaluation for assistive devices (e.g. orthotics, cane, walker).

**How should this patient be followed?**
Compliance with the once-yearly zoledronic acid should not be too difficult, although follow-up for the next annual dose should be noted. The hard part will be ensuring that measures for fall prevention, exercise, and nutritional enrichment are initiated and maintained. Along with the physical therapy appointment, the patient is scheduled for a follow-up appointment in three months to measure vitamin D and assess progress. In the interval, the patient will receive email reminders of the upcoming appointment and emails containing information on calcium intake, safe movement,
Case 2. 70-Year-Old Woman with Type 2 Diabetes and Hip fracture

The second patient we will discuss is an African American woman, aged 70, who has recently recovered from hip fracture repair. She was diagnosed with osteoporosis two years prior and prescribed daily alendronate at that time. The setting is a large hospital-based multidisciplinary practice of primary care and specialty physicians, nurse practitioners, physician assistants, nurses, clinical associates, diagnostic staff and non-clinical staff.

Medical history:
- Height by stadiometer 5´4” (at baseline 5´5”)
- Weight 188 lbs (BMI 32.3)
- Positive family history for osteoporosis
- Personal history of hip fracture (from fall on ice)
- Personal history for nontraumatic wrist fracture as an adult
- Drinks fewer than 5 alcoholic beverages per week
- Does not smoke
- Takes 500 mg calcium/day as calcium carbonate and diet
- Takes 200 IU vitamin D daily
- Sedentary lifestyle
- History of hypertension, controlled by medication
- Type 2 diabetes under poor-moderate glycemic control
- Diabetes-related neuropathy in feet
- Wears glasses
- BMD by DXA at baseline (two years ago): Hip: 0.74 g/cm²; T-score -2.6; Lumbar spine 0.72 g/cm²; T-score: -2.8

Current Medications
- Alendronate 10 mg/day
- Diabetes medication (metformin)
- Antihypertensive ACE inhibitor (metopolol)
- Antihypertensive diuretic (furosemide)
- Calcium channel blocker (amlodipine)

This patient has several significant conditions that are predictive of future fracture. To start with, she has osteoporosis. In addition, she has had two fragility fractures. Her peripheral neuropathy limits normal sensation in her feet putting her at high risk of falling as does her sedentary lifestyle. She may also have orthostatic hypotension, drug-induced nocturia, and/or balance issues, calcium and vitamin D deficiency, vision problems, and diabetes-related bone quality issues that are not readily apparent.

Has this patient failed to respond to antifracture treatment?

Clearly she has failed to avoid fracture. However, it is unclear whether this is treatment related. While 50% of fractures are prevented by antifracture treatment, 50% are not. This patient may be taking the medication as prescribed and have additional underlying causes for poor bone quality.

How can the clinician uncover the cause of her continued bone loss and fracture?

We can start by confirming that she is actually compliant with the prescribed treatment.

To avoid putting her on the spot, the clinician asks the patient if she has had any concerns about taking her medication.

The patient says that she took it for a couple of weeks, but stopped after reading an article about femur fractures. She feels strongly that exercise and calcium are enough to protect her bones and dislikes taking drugs.

To identify any secondary contributors to bone loss, a comprehensive metabolic panel is ordered.

Significant laboratory results:
- 25-hydroxy-vitamin D level is deficient at 16 nmol/L (normal range 20-30 ng/mL)
- Serum C-telopeptide (CTX), a marker of bone resorption, is at the high end of normal at 990 pg/mL (normal range for postmenopausal women 104-1008 pg/mL)
- Intact parathyroid hormone (PTH) is high-normal 65 pg/mL (normal range 10-72 pg/mL)
- Urinary calcium in high range of normal
- Urinary phosphorus in high range of normal

A bone density scan by DXA is ordered.
DXA results:
Hip: 0.66 g/cm²; T-score -3.4
Lumbar spine: 0.69 g/cm²; T-score -3.1

Patient’s risk factors for fractures/falls:
• Advanced age
• Low BMD
• Antifracture medication nonadherence
• History of fracture
• History of falls
• Peripheral neuropathy in feet
• Hypertension drug metoprolol can cause light-headedness
• Potential orthostatic hypotension
• Probable muscle weakness due to lack of weight-bearing exercise
• Nocturia (diuretics)

• Potential visual impairment due to diabetes-related retinopathy/cataract or expired eyeglass prescription
• Potential physical hazards in home
• Vitamin D deficiency
• Long-standing type 2 diabetes with poor/moderate glycemic control

Which of her risk factors can potentially be modified?
Several of these risk factors can potentially be improved. First, she can start taking an antifracture medication. Concerns over side effects must first be addressed. Her hypertension drugs can potentially be adjusted to reduce dizziness and nocturia. She can begin a program of exercise

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**Consider the Following Diagnostic Studies for Causes of Secondary Osteoporosis**

**BLOOD OR SERUM:**

- Complete blood count (CBC)
- Chemistry levels (Calcium, renal function, phosphorus and magnesium)
- Liver function tests
- Thyroid-stimulating hormone (TSH) level +/- free T₄
- 25(OH)D level
- Parathyroid hormone (PTH)
- Total testosterone and gonadotropin levels in younger men
- Bone turnover markers

**Consider in selected patients**

- Serum protein electrophoresis (SPEP), serum immunofixation, serum free light chains (if multiple myeloma is suspected)
- Tissue transglutaminase antibodies (IgA and IgG, if celiac/disease is suspected)
- Iron and ferritin levels (in patients with abnormal CBC)
- Tryptase (in patient with idiopathic bone loss, to rule out systemic mastocytosis)

**URINE:**

- 24-hour urinary calcium

**Consider in selected patients**

- Protein electrophoresis (UPEP)
- Urinary free cortisol level

and safe movement to improve balance. If drug modifications do not improve her orthostatic hypotension, she can learn strategies for coping safely with it. She can have vision deficits corrected, and her home can be fall-proofed. Her dietary calcium and vitamin D intake can be increased and deficiencies corrected with supplements if needed.

Which of these factors can the primary care clinician address in this office visit?
The clinician reviews medications for potential alternatives that cause less dizziness and/or nocturia. He/She suggests alternative antifracture medications that may be less burdensome to take than daily alendronate (monthly or yearly), writes prescription for monthly alendronate and discusses the patients concerns about femoral fractures.

In addition, because falling due to poor vision is a serious risk for this patient, the clinician refers her to ophthalmology for a comprehensive eye exam.

The patient’s vitamin D supplementation is increased to 4,000/day for six weeks. This should help normalize her vitamin D and PTH. Tighter glycemic control would also be beneficial. Because obesity causes sequestering of vitamin D to fat, she will probably need this higher intake to correct her vitamin D levels. Calcium supplementation is suggested to bring her total intake (diet and supplement combines) to 1200 mg/day.

The patient’s neuropathic foot numbness increases her risk of falling and impairs her ability to be physically active. Referral is made to a podiatrist for evaluation of the patient’s feet and fitting of footwear or orthotics to improve mobility and reduce fall risk.

What roles will other care team members play in evaluating this patient and addressing known risk factors?
The primary care clinician will assign the patient to a fracture liaison (staff medical assistant) who will coordinate and schedule the assessments and referrals, as follows.

Nurse educator:
• Counsel on drug compliance, ask about drug concerns, use graphics showing risk of fracture compared to risk of adverse events
• Counsel on nutrition and supplementation
• Provide education materials on home fall-proofing

Support NOF .................
Join us in the fight against osteoporosis

NOF depends on the generosity of individuals who recognize our important work educating the public and health professionals alike on how to prevent, diagnose and treat osteoporosis.

There are many ways to support NOF in its mission to defeat osteoporosis:

Individual Giving
Your gift will help us provide better care and support for the most vulnerable — those who have suffered a fracture — and to protect future generations from this debilitating disease

Recurring Gift
By giving a little each month to sustain NOF throughout the year, you can make a big impact in our efforts to start conversations about bone health and family health history in order to elevate osteoporosis to an issue of national concern. Your support will help us reach our goals of better treating and ultimately preventing osteoporosis.

Memorial and Tribute Gifts
Give a tribute or memorial gift honoring the memory of friends and loved ones. For all gifts made, NOF will send appropriate notification to the honoree or to the family of the deceased on your behalf and you will receive acknowledgment of your gift either online or through the mail.

Planned Giving
NOF offers a variety of planned giving options. Planned giving allows supporters to leave gifts to NOF at death or to invest gifts during their lifetime. Investing during your lifetime allows you to receive the benefits while you are alive and bequest the remaining funds to NOF at the time of your death.

Visit www.nof.org today to make your tax-deductible donation.

The National Osteoporosis Foundation is a qualified 501(c)(3) tax-exempt organization and all donations to the organization are tax deductible.
and refer to home health specialist who will make home visit to inspect, assess, and make recommendations for modifications and/or assistive accommodations

Clinical staff:
- Conduct orthostatic hypotension assessment
- Administer strength and gait tests (Timed Up and Go, Four-Position Stand, 30-second Chair Rise) based on results, refer to physical therapist

Ophthalmologist:
- Comprehensive eye exam
- Make any necessary referrals or modifications to eyeglass prescription

Physical therapist:
- Assess strength, gait, and balance
- Teach safe movement
- Prescribe and teach exercises for improved strength and balance (in addition to weight reduction)

Fracture liaison/FLS coordinator:
- Monitor EMR for completion of each task, recording of results, and reporting to primary care provider
- Set up system of E-mail/phone communications
- Email or phone at one week to see if she filled prescriptions, scheduled home visit, added calcium to diet, made appointment for eye exam, etc.
- Email or phone at two weeks to encourage healthy diet with calcium calculator and list of calcium-rich foods
- Email or phone at three weeks with home safety guidelines and principles of safe movement (emailed or mailed to her home)
- Coordinate and schedule tests and return office visits with primary care provider and care team as needed
- Provide updated records to primary care provider

**Summary**

Prior fracture raises risk for future fracture, yet too many patients have multiple fractures without being diagnosed and treated with effective antifracture medications. These patients slip through the cracks for many reasons, including the complexity of bone metabolism and the complexity of our fragmented health care system.

A coordinated team approach has proven to be effective in reducing secondary fractures in at-risk patients. The Fracture Liaison Service (FLS) model of care is one such team approach, in which a designated staff member (liaison) plays a central organizing role, seeing to it that all appropriate tests, prescriptions, referrals, patient education, and follow-up are completed and accounted for. In addition to the team of primary care and specialist clinicians and clinical support staff, the FLS model makes optimal use of information technology tools including practice management software and electronic medical records to automate and streamline the multifaceted management plan.

The NBHA’s Fracture Prevention CENTRAL resource center (www.FracturePreventionCENTRAL.org) was launched online in March 2012 to assist people interested in learning more about the FLS model of care or in launching and/or operating an integrated fracture prevention program. Materials are provided by NBHA and its partners at no cost to users. By visiting Fracture Prevention CENTRAL, interested parties can gain access to everything they will need to get started: sample HEDIS performance reporting documents, reimbursement models, management algorithms, patient education publications, electronic health record reminder systems, and more.

**Resources**


**References**

3  Leibson CL, Toteson ANA, Gabriel SE, Ransom JE, Melton JL
THE CLINICIAN’S GUIDE TO PREVENTION AND TREATMENT OF OSTEOPOROSIS

Check Your Risk for Falling

<table>
<thead>
<tr>
<th>Please circle “Yes” or “No” for each statement below.</th>
<th>Why it matters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes (2)  No (0)  I have fallen in the past year.</td>
<td>People who have fallen once are likely to fall again.</td>
</tr>
<tr>
<td>Yes (2)  No (0)  I use or have been advised to use a cane or walker to get around safely.</td>
<td>People who have been advised to use a cane or walker may already be more likely to fall.</td>
</tr>
<tr>
<td>Yes (1)  No (0)  Sometimes I feel unsteady when I am walking.</td>
<td>Unsteadiness or needing support while walking are signs of poor balance.</td>
</tr>
<tr>
<td>Yes (1)  No (0)  I steady myself by holding onto furniture when walking at home.</td>
<td>This is also a sign of poor balance.</td>
</tr>
<tr>
<td>Yes (1)  No (0)  I am worried about falling.</td>
<td>People who are worried about falling are more likely to fall.</td>
</tr>
<tr>
<td>Yes (1)  No (0)  I need to push with my hands to stand up from a chair.</td>
<td>This is a sign of weak leg muscles, a major reason for falling.</td>
</tr>
<tr>
<td>Yes (1)  No (0)  I have some trouble stepping up onto a curb.</td>
<td>This is also a sign of weak leg muscles.</td>
</tr>
<tr>
<td>Yes (1)  No (0)  I often have to rush to the toilet.</td>
<td>Rushing to the bathroom, especially at night, increases your chance of falling.</td>
</tr>
<tr>
<td>Yes (1)  No (0)  I have lost some feeling in my feet.</td>
<td>Numbness in your feet can cause stumbles and lead to falls.</td>
</tr>
<tr>
<td>Yes (1)  No (0)  I take medicine that sometimes makes me feel light-headed or more tired than usual.</td>
<td>Side effects from medicines can sometimes increase your chance of falling.</td>
</tr>
<tr>
<td>Yes (1)  No (0)  I take medicine to help me sleep or improve my mood.</td>
<td>These medicines can sometimes increase your chance of falling.</td>
</tr>
<tr>
<td>Yes (1)  No (0)  I often feel sad or depressed.</td>
<td>Symptoms of depression, such as not feeling well or feeling slowed down, are linked to falls.</td>
</tr>
</tbody>
</table>

**Total**____

Add up the number of points for each “yes” answer. If you scored 4 points or more, you may be at risk for falling. Discuss this brochure with your doctor.

*This checklist was developed by the Greater Los Angeles VA Geriatric Research Education Clinical Center and affiliates and is a validated fall risk self-assessment tool (Rubenstein et al. J Safety Res; 2011:42(6)493-499). Adapted by the CDC with permission of the authors for inclusion in the patient education pamphlet: Stay Independent: Falls are the main reason why older people lose their independence. Are you at risk? Part of the STEADI (Stopping Elderly Accidents, Deaths & Injuries) Tool Kit for Health Care Providers

The Timed Up and Go (TUG) Test

**Purpose:** To assess mobility

**Equipment:** A stopwatch

**Directions:** Patients wear their regular footwear and can use a walking aid if needed. Begin by having the patient sit back in a standard arm chair and identify a line 3 meters or 10 feet away on the floor.

**Instructions to the patient:**

When I say “Go,” I want you to:

1. Stand up from the chair
2. Walk to the line on the floor at your normal pace
3. Turn
4. Walk back to the chair at your normal pace
5. Sit down again

On the word “Go” begin timing.

Stop timing after patient has sat back down and record.

**Time:** _______ seconds

*An older adult who takes ≥12 seconds to complete the TUG is at high risk for falling.*

Observe the patient’s postural stability, gait, stride length, and sway.

**Circle all that apply:**
- Slow tentative pace
- Loss of balance
- Short strides
- Little or no arm swing
- Steadying self on walls
- Shuffling
- En bloc turning
- Not using assistive device properly

**Notes:**

For relevant articles, go to: [www.cdc.gov/injury/STEADI](http://www.cdc.gov/injury/STEADI)
The 30-Second Chair Stand Test

**Purpose:** To test leg strength and endurance

**Equipment:**
- A chair with a straight back without arm rests (seat 17” high)
- A stopwatch

**Instructions to the patient:**
1. Sit in the middle of the chair.
2. Place your hands on the opposite shoulder crossed at the wrists.
3. Keep your feet flat on the floor.
4. Keep your back straight and keep your arms against your chest.
5. On “Go,” rise to a full standing position and then sit back down again.
6. Repeat this for 30 seconds.

On “Go,” begin timing.

If the patient must use his/her arms to stand, stop the test. Record “0” for the number and score.

Count the number of times the patient comes to a full standing position in 30 seconds.

If the patient is over halfway to a standing position when 30 seconds have elapsed, count it as a stand.

Record the number of times the patient stands in 30 seconds.

**Number: ___________ Score ___________ See next page.**

*A below average score indicates a high risk for falls.*

**ChAIR STAnd BELOW-AVERAGE SCORES**

<table>
<thead>
<tr>
<th>Age</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-65</td>
<td>&lt;14</td>
<td>&lt;12</td>
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<tr>
<td>65-69</td>
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<td>&lt;11</td>
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<tr>
<td>70-74</td>
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<tr>
<td>90-94</td>
<td>&lt;7</td>
<td>&lt;4</td>
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</tbody>
</table>

For relevant articles, go to: [www.cdc.gov/injury/STEADI](http://www.cdc.gov/injury/STEADI)
The 4-Stage Balance Test

**Purpose:** To assess static balance

**Equipment:** A stopwatch

**Directions:** There are four progressively more challenging positions. Patients should not use an assistive device (cane or walker) and keep their eyes open.

Describe and demonstrate each position. Stand next to the patient, hold his/her arm and help them assume the correct foot position.

When the patient is steady, let go, but remain ready to catch the patient if he/she should lose their balance.

If the patient can hold a position for 10 seconds without moving his/her feet or needing support, go on to the next position. If not, stop the test.

**Instructions to the patient:** I’m going to show you four positions.

Try to stand in each position for 10 seconds. You can hold your arms out or move your body to help keep your balance but don’t move your feet. Hold this position until I tell you to stop.

For each stage, say “**Ready, begin**” and begin timing.

After 10 seconds, say “**Stop.**”

**See next page for detailed patient instructions and illustrations of the four positions.**

For relevant articles, go to: [www.cdc.gov/injury/STEADI](http://www.cdc.gov/injury/STEADI)
Instructions to the patient:

1. Stand with your feet side by side.  
   Time: __________ seconds

2. Place the instep of one foot so it is touching the big toe of the other foot.  
   Time: __________ seconds

3. Place one foot in front of the other, heel touching toe.  
   Time: __________ seconds

4. Stand on one foot.  
   Time: __________ seconds

An older adult who cannot hold the tandem stance for at least 10 seconds is at increased risk of falling.

Notes:
Algorithm for Fall Risk Assessment & Interventions

Centers for Disease Control and Prevention National Center for Injury Prevention and Control

Patient completes Stay Independent brochure

Assess fall risk
Patient scores ≥ 4 on the Stay Independent brochure or Clinician asks key questions:
- Fell in past year?
  - If YES ask, How many times? Were you injured?
- Feels unsteady when standing or walking?
- Worries about falling?

Score ≥ 4 or YES to any key question

Evaluate gait, strength & balance
- Timed Up & Go (recommended)
- 30 Second Chair Stand (optional)
- 4 Stage Balance Test (optional)

Gait, strength or balance problem

≥ 2 falls
- Injury

1 fall
No injury

0 falls

Conduct multifactorial risk assessment
- Review Stay Independent brochure
- Falls history
- Physical exam including:
  - Postural dizziness/postural hypotension
  - Medication review
  - Cognitive screening
  - Feet & footwear
  - Use of mobility aids
  - Visual acuity check

Recommend LOW RISK fall interventions
- Educate patient
- Vitamin D +/- calcium
- Refer for strength & balance exercise (community exercise or fall prevention program)

Follow up with patient within 30 days
- Review care plan
- Assess & encourage fall risk reduction behaviors
- Discuss & address barriers to adherence
  Transition to maintenance exercise program when patient is ready

Recommend HIGH RISK fall interventions
- Educate patient
- Vitamin D +/- calcium
- Refer to PT to enhance functional mobility & improve strength & balance
- Manage & monitor hypotension
- Manage medications
- Address foot problems
- Optimize vision
- Optimize home safety

Recommend MODERATE RISK fall interventions
- Educate patient
- Vitamin D +/- calcium
- Refer to PT to improve gait, strength & balance or refer to a community fall prevention program

Score < 4 or NO to all questions

No gait, strength or balance problems

Centers for Disease Control and Prevention
Stopping Elderly Accidents, Deaths & Injuries

<table>
<thead>
<tr>
<th>Calcium-Rich Food, serving size</th>
<th>Calcium (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fortified oatmeal, 1 packet</td>
<td>350</td>
</tr>
<tr>
<td>Sardines, canned in oil, with edible bones, 3 oz.</td>
<td>324</td>
</tr>
<tr>
<td>Cheddar cheese, 1 1/2 oz. shredded</td>
<td>306</td>
</tr>
<tr>
<td>Milk, nonfat, 1 cup</td>
<td>302</td>
</tr>
<tr>
<td>Milkshake, 1 cup</td>
<td>300</td>
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<tr>
<td>Yogurt, plain, low-fat, 1 cup</td>
<td>300</td>
</tr>
<tr>
<td>Soybeans, cooked, 1 cup</td>
<td>261</td>
</tr>
<tr>
<td>Tofu, firm, with calcium, 1/2 cup</td>
<td>204</td>
</tr>
<tr>
<td>Orange juice, fortified with calcium, 6 oz.</td>
<td>200-260 (varies)</td>
</tr>
<tr>
<td>Salmon, canned, with edible bones, 3 oz.</td>
<td>181</td>
</tr>
<tr>
<td>Pudding, instant (chocolate, banana, etc.) made with 2% milk, 1/2 cup</td>
<td>153</td>
</tr>
<tr>
<td>Baked beans, 1 cup</td>
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<tr>
<td>Cottage cheese, 1% milk fat, 1 cup</td>
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<tr>
<td>Spaghetti, lasagna, 1 cup</td>
<td>125</td>
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<tr>
<td>Frozen yogurt, vanilla, soft-serve, 1/2 cup</td>
<td>103</td>
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<tr>
<td>Ready-to-eat cereal, fortified with calcium, 1 cup</td>
<td>100-1000 (varies)</td>
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<tr>
<td>Cheese pizza, 1 slice</td>
<td>100</td>
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<tr>
<td>Fortified waffles, 2</td>
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</tr>
<tr>
<td>Turnip greens, boiled, 1/2</td>
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</tr>
<tr>
<td>Broccoli, raw, 1 cup</td>
<td>90</td>
</tr>
<tr>
<td>Ice cream, vanilla, 1/2 cup</td>
<td>85</td>
</tr>
<tr>
<td>Soy or rice milk, fortified with calcium, 1 cup</td>
<td>80-500 (varies)</td>
</tr>
</tbody>
</table>

Osteoporosis International

Osteoporosis International is the leading scientific journal for clinical research in osteoporosis and related bone diseases. Published monthly, the journal is an international, multidisciplinary joint initiative of NOF and the International Osteoporosis Foundation.

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This brochure will help you better understand your osteoporosis treatment options. It provides information on the osteoporosis medicines approved by the U.S. Food and Drug Administration (FDA), discusses factors to consider when making a treatment decision and the issues you may face in staying with a treatment plan.

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