

Jeremy D. Close, MD;
Kristine Swartz, MD;
Rajwinder Deu, MD
Department of Family
and Community Medicine,
Thomas Jefferson
University, Philadelphia

✉ Jeremy.close@jefferson.edu

The author reported no potential conflict of interest relevant to this article.

Hip fracture in older patients: Tips and tools to speed recovery

Delirium and VTE are among the many complications that can derail rehabilitation efforts. These tips can help you keep treatment on track.

PRACTICE RECOMMENDATIONS

- › Ensure that surgical stabilization of hip fracture is performed as soon as possible—ideally within 48 hours of injury. **(A)**
- › To reduce the risk of delirium, orient the patient frequently; get her out of bed as soon as possible, and avoid prolonged catheter use. **(A)**
- › Order protein supplements for patients recovering from hip fracture and take steps to facilitate an early return to eating. **(C)**

Strength of recommendation (SOR)

- (A)** Good-quality patient-oriented evidence
- (B)** Inconsistent or limited-quality patient-oriented evidence
- (C)** Consensus, usual practice, opinion, disease-oriented evidence, case series

CASE ▶ Leah J, age 87, tripped over a loose throw rug and fell, sustaining an unstable intertrochanteric fracture of her right hip. Her son took her to the hospital. After taking a medical history and discovering that Ms. J is being treated for cardiovascular disease and hypertension, the physician on duty tells Ms. J and her family that, while surgical stabilization is the treatment of choice for her type of fracture, she might not be strong enough to withstand surgery. Yet without it, Ms. J probably won't walk again.

The patient and family request a consultation with Ms. J's primary care physician. If you were her physician, what would you advise?

Hip fracture in a frail elderly patient is an injury that, while common, can be difficult to manage. With good reason. Geriatric hip fracture is associated with increased morbidity, functional decline, and use of nursing home services, as well as a higher mortality rate: One in 5 hip fracture patients dies within a year of the injury.¹

As the population ages, we are seeing more hip fractures in the "oldest old"—those who, like Ms. J, are older than 85. While the incidence increases exponentially with age in both men and women, women are 3 times more likely than men to sustain a hip fracture.² White women ages 85 to 95 face the highest risk, with an incidence of more than 3%.³

In addition to managing the acute phase of hip fracture and helping patients and families make decisions about optimal treatment, there is much you can do to boost the likelihood of a rapid rehabilitation and a successful outcome.

What type of fracture? How best to treat it?

Two types of hip fractures are responsible for the vast majority of cases: About 45% of hip fractures are intracapsular, involving the femoral head and neck; another 45% are intertrochanteric



A recent study demonstrated that surgery within 24 hours of hip fracture minimizes the rate of chest infections, urinary tract infections, and pressure sores.

fractures. Both usually involve low-energy trauma, such as a fall from a chair or tripping over a rug. Intertrochanteric and subtrochanteric fractures (the latter accounting for the remaining 10%) are extracapsular.^{2,4,5}

Typically associated with high-energy trauma such as a motor vehicle accident, or with metastatic lesions, subtrochanteric fractures have a bimodal distribution: They are most common in individuals between the ages of 20 and 40 and those older than 60.²

Fractures involving the femoral neck can disrupt the vascular supply to the femoral head and result in avascular necrosis (AVN) or nonunion.^{2,4,5} A meta-analysis of the outcome of displaced femoral neck fractures found the rates of osteonecrosis and nonunion to be as high as 20% to 30%.⁵ Intertrochanteric fractures rarely lead to AVN or nonunion, but patients may develop complications associated with degenerative changes.^{2,4,5} Nonunion is a potential complication of subtrochanteric fracture.²

For most patients, surgical management is preferred

The main goals of treatment are to stabilize the hip, decrease pain and restore the level of

prefracture function. Surgery is the preferred treatment for hip fracture because it provides stable fixation, facilitating full weight bearing and decreasing the risk of complications. Surgery is also associated with a shorter stay in the hospital and improved rehabilitation and recovery.⁶

Surgical stabilization should be performed as soon as possible—ideally, within 48 hours.⁵ A recent study found conflicting evidence of the effect of delayed surgery on mortality, but demonstrated that surgery within 24 hours of injury minimizes the rate of chest infections, urinary tract infections, and pressure sores, as well as the duration of the hospital stay.⁷ (To learn more about surgical stabilization of hip fracture, see “What type of surgery? Age is just one consideration”^{7,8-10} on page 486.)

When surgery is contraindicated

Nonoperative management is reserved for patients who stand to gain only minimal function from surgical stabilization, because they either were not ambulatory to begin with or have severe dementia. In addition, medical management is used for patients with contraindications to anesthesia, those who

IMAGE © JOE GORMAN

What type of surgery? Age is just one consideration

The choice of surgical intervention depends on multiple factors, including the:

- type and severity of the fracture
- preference of the orthopedic surgeon
- age of the patient
- comorbid conditions
- prognosis.

For femoral neck fractures, patients younger than 65 years are candidates for internal fixation; for older individuals and those who already had limited mobility, arthroplasty should be considered.⁵ Studies of pain and functional outcomes show a modest tendency for total hip arthroplasty to have better results than internal fixation in patients older than 65.⁸

Intertrochanteric fractures can be treated with either sliding hip screws or intramedullary nails. Intramedullary nail implants are done percutaneously, resulting in a shorter duration for surgery, less blood loss, and an earlier return to full weight bearing.⁵ A recent study suggests that intramedullary nails result in more reoperations than hip screws.⁹ No evidence is conclusive about the superiority of either type of hardware.

Subtrochanteric fractures are typically repaired by hemiarthroplasty.

A Cochrane review of randomized controlled trials found insufficient evidence to determine whether replacement arthroplasty has any advantage over internal fixation for extracapsular hip fractures.¹⁰

delay seeking medical care until the fracture has begun to heal, and patients who refuse surgical fixation.^{5,11}

CASE ► After a careful review of Ms. J's health status, radiographs of the fracture (**FIGURE 1A**), and consultation with an orthopedic surgeon

and a geriatrician, you recommend surgery as soon as the patient is fully stabilized. Without it, she would be at high risk for urinary tract infection, pressure sores, and thromboembolism associated with long-term immobility.

The next day, Ms. J undergoes surgical fixation with a sliding hip screw (**FIGURE 1B**). Her Foley catheter is removed the same day, and physical therapy is begun the following day. On postoperative day 4 she is discharged to an inpatient rehabilitation facility.

Begin rehabilitation without delay

Whether a patient has surgery or is treated nonoperatively for hip fracture, the goal of rehabilitation is the same—to restore mobility as quickly as possible. A clinical review found no significant difference in mortality rates between those who underwent surgical fixation and those who were treated medically with early mobilization, consisting of immediate bed-to-chair transfer (with assistance), followed by progression to ambulation as tolerated.¹²

For patients who undergo surgery for hip fracture, increased *immobility* is linked to poorer functioning in the areas of self-care and transfers at 2 months and to higher mortality rates at 6 months.¹³ Physical therapy should be initiated on the first postoperative day and should start with bed mobility range of motion, followed by independent transfers from bed to chair, and ultimately achieving full weight bearing.⁵

Many complications are predictable, and often preventable

The term “hip fracture syndrome”¹⁴ is often used in reference to a cluster of common (and often preventable) complications of hip fracture, with delirium, venous thromboembolism (VTE), and malnutrition foremost among them.

Take steps to prevent—or treat—delirium

Delirium is among the most common complication, occurring in up to 62% of older patients with hip fracture.⁴ The highest predictor of delirium is preexisting cognitive impairment.

CONTINUED

TABLE 1

Diagnosing delirium: The Confusion Assessment Method

Consider a diagnosis of delirium if 1 and 2 and either 3 or 4 are positive

1. Acute onset and fluctuating course

- Is there evidence of an acute change in mental status from the patient's baseline?
- Does the abnormal behavior fluctuate during the day—tending to come and go or increase and decrease in severity?

2. Inattention

Does the patient have difficulty focusing (eg, being easily distractible) or keeping track of what is being said?

3. Disorganized thinking

Is the patient's thinking disorganized or incoherent (eg, with rambling or irrelevant conversation, unclear or illogical flow of ideas, or unpredictable switching from subject to subject)?

4. Altered state of consciousness

Does the patient appear to be alert?*

*A No answer is positive for No. 4.

Adapted from: Inouye SK et al. *Ann Intern Med.* 1990.¹⁷

➤ Disturbances in sleep-wake cycles, an unfamiliar environment, physical restraints, and the use of Foley catheters are less well-known factors that contribute to delirium.

Other risk factors for delirium include advanced age, vision or hearing impairment, concurrent alcohol abuse, malnutrition, comorbidity, and polypharmacy.^{4,14} Delirium is associated with increased morbidity and mortality, decreased rehabilitation potential, and poor functional recovery independent of prior frailty.^{4,15,16}

■ Hypoactive delirium is easily missed.

While agitated, or hyperactive, delirium is more easily recognized, it is crucial to be aware of hypoactive delirium, as well. Patients with hypoactive delirium tend to become more withdrawn and their delirium is easily missed, leading to worse outcomes.¹⁵ The Confusion Assessment Method (TABLE 1)¹⁷ is an easy-to-use validated tool developed to aid in the diagnosis of delirium at the bedside.

Many factors contribute to the development of delirium. Medical complications, such as infection, electrolyte and volume imbalances, hypoxia, and myocardial infarction, are obvious precipitants.¹⁵ Disturbances in sleep-wake cycles, an unfamiliar environment, physical restraints, and the use of Foley catheters—all of which can impair an older patient's sensory awareness—are less well-known contributing factors.

■ **Tips for preventing delirium.** Early mobilization, in addition to boosting physical recovery, can help prevent delirium.

Other tips:

- discontinue catheterization as soon as possible; this may help prevent delirium, and lessen the risk of urinary tract infection.
- remind nurses and family members to continuously reorient patients to their surroundings.
- treat pain aggressively.
- consult a geriatrician early on.

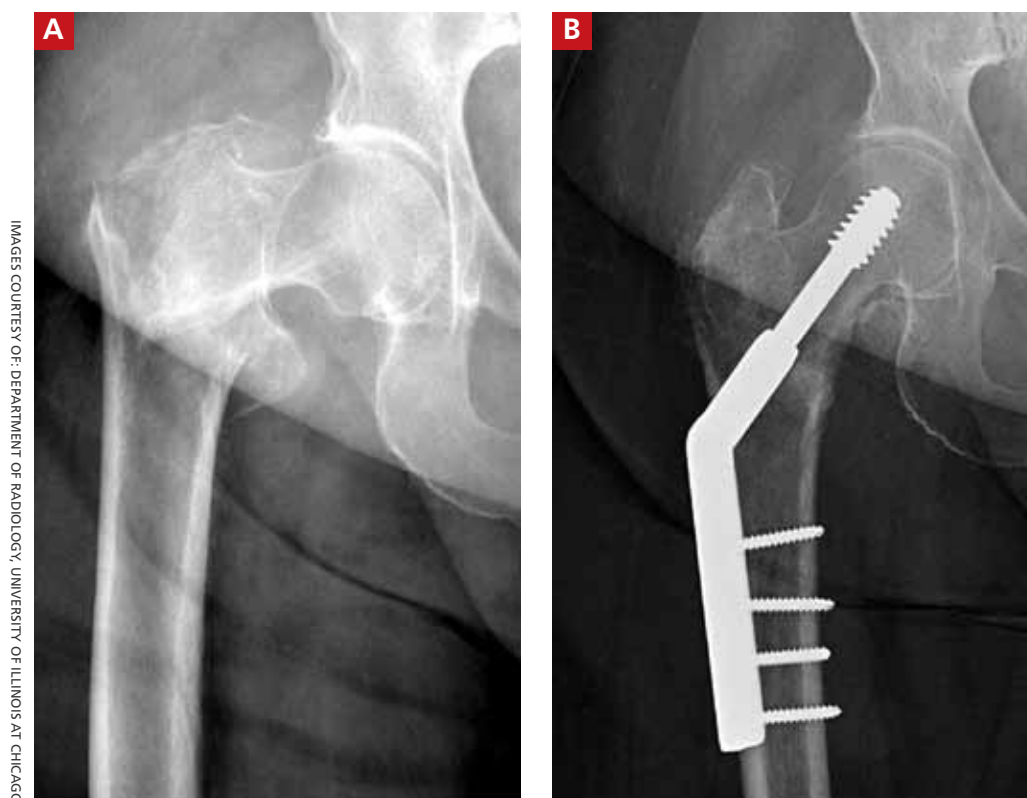
While opioids are often thought to cause delirium, several studies have shown an inverse relationship—that is, hip fracture patients who were given opioids for pain were actually less likely to develop delirium than those who did not receive opioids. This raises 2 important points:

1. untreated pain may itself be a significant risk factor for delirium,^{15,18} and
2. delirium itself is not a contraindication to opioids.¹⁸

CASE ▶ In her first week at the inpatient rehabilitation center, Ms. J requires slightly more narcotic medication for pain control. The staff notices increased confusion and a decrease in the number of bowel movements. Ms. J is started on a regimen of sennosides and docusate twice daily. Her mental status improves quickly and she has no further complications while at the rehab center.

FIGURE 1

An unstable hip fracture, pre- and postoperatively



IMAGES COURTESY OF: DEPARTMENT OF RADIOLOGY, UNIVERSITY OF ILLINOIS AT CHICAGO

An 87-year-old patient with an unstable intertrochanteric fracture of the right femur (A) underwent successful surgical fixation with a sliding hip screw (B).

Nonopioid pain medications such as acetaminophen should be scheduled at appropriate doses (eg, 1 g tid). Ensure that patients recovering from hip fracture are not given benzodiazepines, anticholinergics, or antihistamines¹⁵—which are sometimes included in a facility's PRN protocol. In clinical trials, prophylactic administration of antipsychotics or anticholinesterase therapy to high-risk patients has had conflicting results.^{19,20}

■ **Arrange for a geriatric consult before problems occur.** Several studies have shown that a geriatric consultation and concurrent management by a geriatrician using structured protocols to evaluate for common risk factors known to precipitate delirium (eg, pain, bowel/bladder function, nutrition, mobilization) can reduce the risk of delirium.¹⁶

■ **Provide supportive care.** Although treatment of the underlying cause is the de-

finitive treatment for delirium, there are times when supportive care is all that's needed. Reassurance from family members or staff is the recommended first step. Physical restraints should be avoided unless patient safety is threatened despite attempts to provide supportive care.

If treatment for delirium is needed, low-dose antipsychotics are recommended. The most studied agent is haloperidol, which can be administered intravenously (IV), intramuscularly (IM), or orally. Monitoring the corrected QT (QTc) interval is recommended for patients taking haloperidol, and discontinuation of the drug—or a cardiology consult—is recommended if the QTc interval is prolonged (>450 ms or >25% of baseline).²¹

There is a slightly higher risk of cardiac arrhythmias with IV administration of haloperidol compared with IM or oral dosing.

CONTINUED



In many cases, a catabolic state predisposes patients to protein depletion, leading to decreased wound healing and an increase in other postop complications.

Despite this risk, haloperidol IV is the treatment of choice for delirium.²¹ Newer atypical antipsychotics have also been used to treat delirium, but data are limited.²¹

Guard against VTE

Studies have shown rates of VTE to be as high as 40% to 60% after orthopedic procedures, and prophylaxis has long been the standard of care.²² In its 2012 consensus guidelines for antithrombotic therapy, the American College of Chest Physicians (ACCP) recommends fondaparinux, apixaban, rivaroxaban, dabigatran, low-molecular-weight heparin (LMWH), low-dose unfractionated heparin, aspirin, warfarin, or an intermittent pneumatic compression device (IPCD) as prophylaxis.²³ Portable battery-powered IPCDs are recommended for 18 hours postop.²³

The guideline authors prefer LMWH to the other treatments, and recommend dual prophylaxis with an IPCD and an antithrombotic agent while the patient is in the hospital and for a minimum of 10 to 14 days (and up to 35 days) after discharge. If surgery for hip fracture is delayed, the ACCP recommends that LMWH be administered after admission, but withheld for at least 12 hours before surgery. In patients with a high risk of bleeding, the ACCP recommends either an IPCD alone or no prophylaxis and notes that inferior vena cava filters should not be placed in high-risk patients.²³

Take steps to ensure ample protein intake

Malnourishment is another common complication, affecting up to 20% of hip fracture patients.²⁴ In many cases, a catabolic state predisposes patients to protein depletion, leading to decreased wound healing and an increase in other postop complications.^{24,25} Protein supplementation is associated with decreased length of stay and a reduction in postop complications.²⁶

This complication can often be avoided by encouraging an early return to eating. Specific steps: Ensure that patients have their dentures available and are able to use them; are positioned properly for eating; and receive high-caloric supplemental drinks. Nutritional assessments should also be done to ensure that their intake of calcium and vitamin D is sufficient to prevent future falls

TABLE 2

Checklist for geriatric hip fracture prevention

- ___ Incorporate physical activity program (preferably with multiple types of activities)
- ___ Review vitamin D and calcium intake
- ___ Order a DEXA scan
- ___ Consider prescribing a bisphosphonate
- ___ Review the home environment
- ___ Do a “brown bag” medication review at every visit

DEXA, dual energy x-ray absorptiometry.

and reduce fracture risk. (For more information, see “Vitamin D: When it helps, when it harms” [*J Fam Pract.* 2013;62:368-370.])

Combat hip fracture by stressing avoidance

Prevention of hip fracture, of course, is the ideal way to reduce the burden of disease for older patients. Along these lines, there are many ways you can help.

Start with fall reduction

Hip fracture is associated with a fall 90% of the time,²⁷ and care for older patients should be focused on reducing the risk for falls and improving bone health and muscular function. While a complete review of preventive measures is beyond the scope of this article, we offer some highlights here and in **TABLE 2**.

■ **Encourage physical activity.** In addition to helping to reduce falls, physical activity—particularly repetitive weight-bearing exercise—can help maintain bone density and improve muscle mass, strength, and balance.²⁸

Rather than focus on a single exercise, however, a combination of activities—Tai Chi and walking, for instance, or weight lifting and cycling—appears to have the best likelihood of fall reduction.²⁹ Whenever possible, physical activity for older patients should include challenges in executive function, as well. In a recent study comparing regular walking with trail-walking between sequentially marked flags, participants in the more complex activity had a greater decrease in fall rates.³⁰

■ Review vitamin D and calcium intake.

Elderly patients with low levels of vitamin D are at increased risk of muscle mass decline, and therefore increased risk of fracture.³¹ A systematic review and meta-analysis of vitamin D supplementation in older adults found the relative risk of falling was 0.86 (95% confidence interval [CI], 0.79-0.93) for those assigned to vitamin D therapy compared with those on placebo. Risk reduction was greater in groups taking 800 IU or more of vitamin D daily and those taking adjunctive calcium supplementation.³²

Maximizing vitamin D for falls reduction is supported by the American Geriatrics Society,³³ the Agency for Healthcare Research and Quality (AHRQ),³⁴ and the US Preventive Services Task Force (USPSTF).³⁵ The USPSTF recently released a recommendation for exercise or physical therapy and vitamin D supplementation (800 IU) to prevent falls in community-dwelling adults ages 65 and over who are at an increased risk for falls.³⁶

However, the USPSTF advises *against* daily supplementation with vitamin D and calcium at doses \leq 400 IU and 1000 mg, respectively, for noninstitutionalized postmenopausal women for primary fracture prevention. Calcium supplementation has not been shown to reduce hip fractures, but has been found to improve hip bone density.³⁷

■ **Consider bisphosphonates.** Order a dual energy x-ray absorptiometry (DEXA) scan for older patients to identify osteoporosis. Most hip fractures are osteoporotic, and patients should be started on bisphosphonates within 2 to 12 weeks of injury³⁸ to reduce the risk of mortality associated with hip fracture.³⁹ The most studied bisphosphonates in geriatric hip fracture are alendronate, risedronate, and zoledronate; all were found to have a number needed to treat of 91 to prevent one hip fracture.⁴⁰

■ Focus on the home environment.

In addition to addressing the bone and muscular health of older patients, focus should be placed on the home environment. A Cochrane review of fall prevention for those living in the community found that home safety interventions reduced the risk of falls, but only for those with severe vision impairment and a high risk of falls.²⁹ A 2010 American Geriatric Society (AGS) and British Geriatric Society (BGS) review of fall prevention gave an A recommendation—the highest rating—to home assessment and intervention by a health care professional to identify home hazards and promote safe performance of daily activities.³³

■ **Conduct brown-bag reviews.** Polypharmacy is a well-documented (and growing) problem among the elderly.⁴¹ Both the AGS and BGS encourage a review of medications (including over-the-counter products) and interactions at each office visit,³³ with specific attention paid to drugs that may cause dizziness, drowsiness, and near syncope or syncope episodes.

To reduce the risk of medication interactions and adverse effects, look for opportunities to reduce the number of drugs your elderly patients are taking. Consider involving a clinical pharmacist in medication reviews—an intervention that has been shown to be cost effective and lead to better patient outcomes.⁴²

CASE ► After 4 weeks, Ms. J is ready to return home. Rather than a return to independent living, however, her children convince her to move to an assisted living facility—a move you strongly support. You schedule a visit in 2 weeks. **JFP**

CORRESPONDENCE

Jeremy D. Close, MD, Department of Family and Community Medicine, Thomas Jefferson University, 833 Chestnut Street #301, Philadelphia, PA 19107; jeremy.close@jefferson.edu



VTE prophylaxis with an intermittent pneumatic compression device and an antithrombotic agent is recommended during hospitalization and for at least 10 to 14 days after discharge.

References

- Leibson CL, Totoson ANA, Gabriel SE, et al. Mortality, disability, and nursing home use for persons with and without hip fracture: a population-based study. *J Am Geriatr Soc.* 2002;50:1644-50.
- Brunner LC, Eshlian-Oates L, Kuo TY. Hip fractures in adults. *Am Fam Physician.* 2003;67:537-542.
- Jacobsen SJ, Goldberg J, Miles TP, et al. Hip fracture incidence among the old and very old: a population-based study of 745,435 cases. *Am J Public Health.* 1990;80:871-873.
- Auron-Gomez M, Michota F. Medical management of hip fracture. *Clin Geriatr Med.* 2008;24:701-719.
- Jackman JM, Watson JT. Hip fractures in older men. *Clin Geriatr Med.* 2010;26:311-329.
- Handoll HH, Parker MJ. Conservative versus operative treatment for hip fractures in adults. *Cochrane Database Syst Rev.* 2008;(3):CD000337.
- Leung F, Lau W, Kwan K, et al. Does timing of surgery

➤
Rather than focus on a single exercise, a combination of activities—eg, Tai Chi and walking, or weight lifting and cycling—have the greatest likelihood of fall reduction.

- matter in fragility hip fractures? *Osteoporos Int*. 2010; 21(suppl 4):S529-S534.
8. Butler M, Forte ML, Joglekar SB, et al. Evidence summary: systematic review of surgical treatments for geriatric hip fractures. *J Bone Joint Surg Am*. 2011;93:1104-1115.
 9. Matre K, Havelin LI, Gjertsen JE, et al. Intramedullary nails result in more reoperations than sliding hip screws in two-part intertrochanteric fractures. *Clin Orthop Relat Res*. 2013;471:1379-1386.
 10. Parker MJ, Handoll HH. Replacement arthroplasty versus internal fixation for extracapsular hip fractures in adults. *Cochrane Database Syst Rev*. 2006;(2):CD000086.
 11. Cummings-Vaughn LA, Gammack JK. Falls, osteoporosis, and hip fractures. *Med Clin North Am*. 2011;95:495-506.
 12. Jain R, Basinski A, Kreder HJ. Nonoperative treatment of hip fractures. *Int Orthop*. 2003;27:11-17.
 13. Siu A, Penrod J, Boockvar K, et al. Early ambulation after hip fracture: effects on function and mortality. *Arch Intern Med*. 2006;166:766-771.
 14. Juliebo V, Bjoro K, Krogseth M, et al. Risk factors for preoperative and postoperative delirium in elderly patients with hip fracture. *J Am Geriatr Soc*. 2009;57:1354-1361.
 15. Flinn DR, Deihl KM, Seyfried LS, et al. Prevention, diagnosis, and management of postoperative delirium in older adults. *J Am Coll Surg*. 2009;209:261-268.
 16. Marcantonio ER, Flacker JM, Wright RJ, et al. Reducing delirium after hip fracture: a randomized trial. *J Am Geriatr Soc*. 2001;49:516-522.
 17. Inouye SK, van Dyck CH, Alessi CA, et al. Clarifying confusion: the confusion assessment method. A new method for detection of delirium. *Ann Intern Med*. 1990;113:941-948.
 18. Sieber FE, Mears S, Lee H, et al. Postoperative opioid consumption and its relationship to cognitive function in older adults with hip fracture. *J Am Geriatr Soc*. 2011;59:2256-2262.
 19. Prakanrattana U, Prapaitrakool S. Efficacy of risperidone for prevention of postoperative delirium in cardiac surgery. *Anaesth Intensive Care*. 2007;35:714-719.
 20. Sampson EL, Raven PR, Ndhlovu PN, et al. A randomized, double-blind, placebo-controlled trial of donepezil hydrochloride (Aricept) for reducing the incidence of postoperative delirium after elective total hip replacement. *Int J Geriatr Psychiatry*. 2007;22:343-349.
 21. Jacobi J, Fraser GL, Coursin DB, et al. Clinical practice guidelines for the sustained use of sedatives and analgesics in the critically ill adult. *Crit Care Med*. 2002;30:119-141.
 22. Geerts WH, Pineo GF, Heit JA, et al. Prevention of venous thromboembolism: the Seventh ACCP Conference of Antithrombotic and Thrombolytic Therapy. *Chest*. 2004;126(suppl):338S-400S.
 23. Guyatt GH, Akl EA, Crowther M, et al. Executive summary: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. *Chest*. 2012;141(suppl):7S-47S.
 24. Garcia Lazaro M, Montero Perez-Barquero M, Carpintero Benitez P. The role of malnutrition and other medical factors in the evolution of patients with hip fracture [article in Spanish]. *An Med Interna*. 2004;21:557-563.
 25. Lavernia CJ, Sierra RJ, Baerga L. Nutritional parameters and short term outcome in arthroplasty. *J Am Coll Nutr*. 1999;18:274-278.
 26. Huddleston JM, Whitford KJ. Medical care of elderly patients with hip fractures. *Mayo Clin Proc*. 2001;76:295-298.
 27. Cummings SR, Kelsey JL, Nevitt MC, et al. Epidemiology of osteoporosis and osteoporotic fractures. *Epidemiol Rev*. 1985;7:178-208.
 28. Nelson ME, Fiatarone MA, Morganti CM, et al. Effects of high-intensity strength training on multiple risk factors for osteoporotic fractures: a randomized controlled trial. *JAMA*. 1994;272:1909-1914.
 29. Gillespie LD, Robertson MC, Gillespie WJ, et al. Interventions for preventing falls in older people living in the community. *Cochrane Database Syst Rev*. 2009;(2):CD007146.
 30. Yamada M, Tanaka B, Nagai K, et al. Trail-walking exercise and fall risk factors in community-dwelling older adults: preliminary results of a randomized controlled trial. *J Am Geriatr Soc*. 2010;58:1946-1951.
 31. Visser M, Deeg DJ, Lips P; Longitudinal Aging Study Amsterdam. Low vitamin D and high parathyroid hormone levels as determinants of loss of muscle strength and muscle mass (sarcopenia): the Longitudinal Aging Study Amsterdam. *J Clin Endocrinol Metab*. 2003;88:5766-5772.
 32. Kalyani RR, Stein B, Valiylil R, et al. Vitamin D treatment for the prevention of falls in older adults: systematic review and meta-analysis. *J Am Geriatr Soc*. 2010;58:1299-1310.
 33. The American Geriatrics Society. Prevention of falls in older persons [clinical practice guideline]. 2010. Available at: http://www.americangeriatrics.org/health_care_professionals/clinical_practice/clinical_guidelines_recommendations/2010/. Accessed August 16, 2013.
 34. Cranney A, Horsley T, O'Donnell S, et al. Effectiveness and safety of vitamin D in relation to bone health. *Evid Rep Technol Assess (Full Rep)*. 2007;(158):1-235.
 35. Michael YL, Whitlock EP, Lin JS, et al. Primary care-relevant interventions to prevent falling in older adults: a systematic evidence review for the U.S. Preventive Services Task Force. *Ann Intern Med*. 2010;153:815-825.
 36. USPSTF. Prevention of falls in community-dwelling older adults. US Preventive Services Task Force recommendation statement. May 2012. Available at: www.uspreventiveservices.org/uspstf11/fallsprevention/fallsprevsr.htm. Accessed August 19, 2013.
 37. Jackson RD, LaCroix AZ, Gass M, et al; Women's Health Initiative Investigators. Calcium plus vitamin D supplementation and the risk of fractures. *N Engl J Med*. 2006;354:669-683.
 38. Lyles KW, Colón-Emeric CS, Magaziner JS, et al; for the HORIZON Recurrent Fracture Trial. Zoledronic acid and clinical fractures and mortality after hip fracture. *N Engl J Med*. 2007;357:1799-1809.
 39. Beaupre LA, Morrish DW, Hanley DA, et al. Oral bisphosphonates are associated with reduced mortality after hip fracture. *Osteoporos Int*. 2011;22:983-991.
 40. Ringe JD, Doherty JG. Absolute risk reduction in osteoporosis: assessing treatment efficacy by number needed to treat. *Rheumatol Int*. 2010;30:863-869.
 41. Veehof L, Stewart R, Haaijer-Ruskamp F, et al. The development of polypharmacy. A longitudinal study. *Fam Pract*. 2000;17:261-267.
 42. Choe HM, Farris KB, Stevenson JG, et al. Patient-centered medical home: developing, expanding, and sustaining a role for pharmacists. *Am J Health Syst Pharm*. 2012;69:1063-1071.

WE WANT TO HEAR FROM YOU!

Have a comment on an article, editorial, or department? You can send it by:

1. **E-MAIL:** jfp.eic@gmail.com
2. **FAX:** 973-206-9251 or
3. **MAIL:** The Journal of Family Practice, 7 Century Drive, Suite 302, Parsippany, NJ 07054

LETTERS SHOULD BE 200 WORDS OR LESS. THEY WILL BE EDITED PRIOR TO PUBLICATION.

THE JOURNAL OF
FAMILY
PRACTICE