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# INTERVENTIONS TO IMPROVE OSTEOPOROSIS TREATMENT FOLLOWING HIP FRACTURE

## A PROSPECTIVE, RANDOMIZED TRIAL

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**Background:** Treatment of osteoporosis following a hip fracture has been notoriously poor. Many efforts have been made to improve treatment rates. The purpose of this study was to determine whether a perioperative inpatient intervention program, involving patient education and providing a list of questions for the primary care physician, increased the percentage of patients in whom osteoporosis was addressed following a hip fracture.

**Methods:** A prospective, randomized trial involving eighty patients who had been admitted to an academic medical center with a low-energy hip fracture was conducted. During their hospitalization, the study group patients were engaged in a fifteen-minute discussion regarding the association between osteoporosis and hip fractures, the efficacy of dual-energy x-ray absorptiometry scans in the diagnosis of osteoporosis and of bisphosphonates in its treatment, and the importance of medical follow-up for osteoporosis management. These patients were also provided with five questions regarding osteoporosis treatment to be given to their primary medical physician, and they were reminded about the questions during a follow-up telephone call six weeks later. The patients in the control group received a brochure describing methods for preventing falls. Both groups were contacted by telephone at six months after discharge to determine whether osteoporosis had been addressed. Positive indicators of intervention included assessment of bone mineral density with dual-energy x-ray absorptiometry and initiation of antiresorptive therapy.

**Results:** The average age in each group was eighty-two years, and 78% of the patients were female. Four patients in each group did not survive through the six-month follow-up period and were excluded from the trial. Fifteen (42%) of the thirty-six patients who had been randomized to the study group, compared with only seven (19%) of the thirty-six patients in the control group, had their osteoporosis addressed by their primary physician. This difference between the groups was significant ( $p = 0.036$ ).

**Conclusions:** Patients who were provided with information and questions for their primary care physician about osteoporosis were more likely to receive appropriate therapeutic intervention than were patients who had not received the information and questions. Orthopaedic surgeons have a unique opportunity to improve the rate of osteoporosis treatment in the perioperative period following a hip fracture by educating patients and directing them toward channels for long-term osteoporosis management.

**Level of Evidence:** Therapeutic study, Level I. See Instructions to Authors for a complete description of levels of evidence.

Osteoporosis is a growing problem worldwide that is related to the aging of the population as well as to increasing numbers of patients treated with medications that are detrimental to bone health. Accompanying this epidemic is an increasing incidence of the most serious consequence of osteoporosis, hip fractures<sup>1</sup>. There were an estimated 1.7 million hip fractures worldwide in 1990, and it has been projected that up to 6.3 million hip fractures will occur annually by 2050<sup>2</sup>. In the United States alone, an estimated 340,000 hip frac-

tures occur each year<sup>3</sup>. Patients who have a hip fracture are at greater risk of a second osteoporosis-related fracture<sup>4,6</sup>, including a fracture of the contralateral hip<sup>7,8</sup>, vertebrae, distal part of the radius, and proximal part of the humerus. In addition, the one-year mortality rate following hip fracture has been reported to be between 17% and 31%, concentrated in the first six months, which corresponds to a relative risk of between 3 and 4 compared with subjects who never sustained a hip fracture<sup>9-11</sup>.

Despite the known relationship between osteoporosis and

hip fractures, patients who sustain a hip fracture are grossly underdiagnosed and undertreated for osteoporosis. A previous study from our institution, of 300 patients with a low-energy hip fracture treated at three medical centers, revealed that only 6% received prescription antiresorptive medication at the time of discharge<sup>12</sup>. In a report on 311 patients who had been admitted to the hospital for treatment of a fragility hip fracture, Juby and De Geus-Wenceslau<sup>13</sup> found that some type of osteoporosis treatment had been started for only 9.7% by the time of discharge from the hospital and for an additional 10.2% by the time of discharge from a rehabilitation facility. These findings concur with those of other studies<sup>14-21</sup>. Clearly, additional interventions are needed to improve the diagnosis and treatment of osteoporosis following a hip fracture.

In this study, we evaluated the efficacy of an intervention designed to improve attention to osteoporosis following a low-energy hip fracture by means of patient education and by directly addressing the individual primary care physicians caring for the patients. Our hypothesis was that this education and follow-up program in the immediate postoperative period would increase patient awareness and self-advocacy and thereby result in higher rates of osteoporosis treatment.

### Materials and Methods

Consecutive patients admitted to a single tertiary care university medical center with a low-energy femoral neck or intertrochanteric hip fracture were considered for inclusion in this study. Patients who were currently taking antiresorptive prescription medication for osteoporosis (bisphosphonates, selective estrogen receptor modulators, calcitonin, teriparatide, or estrogen targeted specifically to osteoporosis) were excluded from the study. Patients in whom the mechanism of injury was not clearly low-energy were also excluded. Finally, patients who were younger than sixty-five years of age, had a history of alcoholism, or had dementia were excluded as well. In order to provide consent and be enrolled in the study, patients were required to pass a Mini-Mental State examination, a scale used to judge general cognitive status on the basis of orientation, registration, attention, and the ability to carry out several simple tasks<sup>22</sup>. The study was explained to the remaining, eligible patients, and informed consent was obtained.

The patients were randomly enrolled into two groups by means of sealed envelopes, which were divided equally into "control group" and "study group" designations. Following group assignment, the appropriate intervention was undertaken for each patient. This intervention was carried out at any time during the hospitalization but was typically performed on the second or third postoperative day. Prior to discharge from the hospital, the patients in the control group were given a two-page pamphlet on fall prevention, entitled "Creating a Fall Proof Home," based on a National Osteoporosis Foundation publication. The pamphlet outlined home safety tips and mentioned osteoporosis once in the introduction as follows: "osteoporosis can increase your chances of experiencing fractures of the hip, wrist or vertebrae," but it did not expand on the topic. These control group patients were

contacted by telephone six months postoperatively to assess whether osteoporosis had been addressed with a dual-energy x-ray absorptiometry scan or bisphosphonate therapy.

Prior to discharge from the hospital, the patients in the study group received a fifteen-minute visit by a clinical research coordinator who had been trained regarding the discussion of the role of osteoporosis in hip fractures, the importance of preventing future fractures, and the effectiveness of currently available therapies. Instead of a fall-prevention brochure, the study group patients were given a printed copy of five questions to bring to their primary medical physician after discharge. The five questions were as follows:

1. When are you going to address my osteoporosis?
2. What kind of osteoporosis do I have, and how bad is it?
3. When are you going to perform a DEXA scan?
4. When are you going to give me calcium, vitamin D, exercise, and fall prevention?
5. What drugs are you going to prescribe to treat my osteoporosis?

Study group patients were contacted by telephone at six weeks postoperatively and reminded about the importance of follow-up with their primary care physician and the need for management of the osteoporosis. Messages were not left; patients were considered to have been contacted only if they were spoken to directly. Patients were mailed another copy of the questions for their primary physician if necessary. As was done for the control group, the patients in the study group were contacted by telephone six months postoperatively to assess if the osteoporosis had been addressed. This protocol was approved by the institutional review board at our hospital.

### Statistical Methods

A Fisher exact test was used to determine the significance of the difference between groups with regard to the ratio of the number of patients in each group to the number of patients in whom the osteoporosis had been addressed by their primary physician. A significance level was set at  $p < 0.05$ .

### Results

The enrollment period for the study was from 2001 to 2003. Only approximately 20% of the patients who were approached were eligible and included in the study. Thirty percent of the patients who were treated for a hip fracture were ineligible for the study because they had received antiresorptive therapy previously, and another 30% were not considered mentally competent to enroll in the study even if a diagnosis of dementia or delirium had not been previously documented. Finally, approximately 40% of the patients who were deemed eligible for inclusion in the study declined to be entered into the trial because they thought that the hip fracture had no relationship to osteoporosis. Eighty patients were enrolled in the study. Sixty-two (78%) of them were women, and the average age was eighty-two years.

Forty patients were randomized to the control group. Four of them died before the six-month follow-up call and were excluded from the analysis, and five patients were lost to follow-

up and were considered not to have been treated for osteoporosis. The remaining subjects were contacted six months postoperatively. Seven patients (19%) had had the osteoporosis addressed with a dual-energy x-ray absorptiometry scan (one patient) or bisphosphonate therapy (one), or both (five).

Forty patients were randomized to the study group. Four of them died within six months after the surgery and were excluded, and two patients were lost to follow-up and were considered not to have been treated for osteoporosis. Fifteen patients (42%) in this group received attention for the osteoporosis, provided by their primary physician: five had a dual-energy x-ray absorptiometry scan, three had bisphosphonate therapy, and seven had both. The difference between the study and control groups was significant ( $p = 0.036$ ). We made no attempt to analyze the reason why the other 58% of the patients in the study group were not treated.

### Discussion

Our data showed that discussing osteoporosis with a patient during hospitalization following a hip fracture, providing him or her with a list of questions to be given to the primary care physician, and following up with a reminder telephone call at six weeks increased the percentage of patients in whom osteoporosis was addressed. We considered a positive outcome in this study to be a discussion taking place between the patient and the primary physician as evidenced by either the performance of a dual-energy x-ray absorptiometry scan or the initiation of antiresorptive therapy, or both. Interestingly, six patients (8%) underwent dual-energy x-ray absorptiometry scanning without initiation of pharmacotherapy. One possible reason for this is that antiresorptive therapy is medically contraindicated for some patients<sup>23</sup>. In such cases, the risk of hip fractures has been shown to be decreased by other interventions, including nutritional and metabolic screening, muscle strengthening, balance training, hip-protector pads, and fall-prevention counseling<sup>24-27</sup>. However, it is unknown whether the primary physician chose these interventions or decided against prescribing antiresorptive medication on the basis of the bone mineral density measured by the dual-energy x-ray absorptiometry. In addition, 58% of the patients in the study group remained untreated. This may have been because the patients did not ask the provided questions of their primary physician, the physician decided not to treat the patient, or the patient did not follow through on the medical advice.

A dual-energy x-ray absorptiometry scan is recommended for patients who have sustained a hip fracture. It is most appropriately used to establish a baseline score and to monitor response to therapy. It has been shown to be a better predictor of survival than either blood pressure or cholesterol<sup>28</sup>. Even if the bone mineral density is not within the osteoporotic range (T-score  $> -2.5$  [i.e., not more than 2.5 standard deviations below the mean for young adults]), a prior fragility fracture is itself a strong risk factor for a second fracture as a result of factors other than bone density, such as worsening vision or balance, confusion, or other predispositions to falls<sup>5,6,29-32</sup>. The guidelines of the National Osteoporosis Foundation indicate

that, following a fragility hip fracture, active anti-osteoporotic medication should be initiated, whether or not a dual-energy x-ray absorptiometry scan is performed<sup>33</sup>. Some primary care physicians have reported that they do not necessarily require a dual-energy x-ray absorptiometry scan before initiating osteoporosis therapy<sup>30</sup>. A recent study showed that antiresorptive therapy following a hip fracture reduces not only the risk of a second fracture but also overall mortality<sup>34</sup>. In the United States, the National Committee for Quality Assurance, an organization that sets health-care standards that are used by almost 90% of managed-care plans to measure their performance, recently released the 2004 edition of the Health Plan Employer Data and Information Set (HEDIS). One of the key parameters under these guidelines is the percentage of women sixty-seven years of age and older who receive either a bone mineral density test or prescription treatment for osteoporosis within six months after sustaining a fracture<sup>35</sup>.

Much research has been devoted to osteoporosis treatment following fragility fractures. It has been unequivocally demonstrated that pharmacotherapy decreases the risk of hip fracture in high-risk patients<sup>6,36-38</sup> and that these interventions are underutilized in this patient group<sup>12,13,15-18,20,21,39</sup>. The reasons for the gap between evidence-based treatment guidelines and treatment rates remain unclear, although several barriers have been suggested and explored. One potential barrier has been confusion regarding which physician is responsible for treating osteoporosis following a hip fracture. Simonelli et al.<sup>30</sup> conducted a survey of both orthopaedic surgeons and primary care physicians, and both groups agreed that treatment falls under the domain of the primary care physician because of the medical nature of the disease and the greater likelihood of long-term follow-up by the primary physician. Other potential barriers to treatment are adverse effects and the high cost of medications, patient transportation issues, and a lack of awareness by patients and physicians of the treatment guidelines and efficacy of medications for osteoporosis following hip fracture<sup>14,23,40,41</sup>.

Increased education of and participation by primary care physicians may be a key component to improving treatment rates. In the past ten years, primary care physicians have assumed the major role in addressing osteoporosis<sup>42</sup>. Recent studies have demonstrated that between 70% and 90% of family physicians wished to be more informed about the management of osteoporosis<sup>30,43,44</sup> and that the occurrence of a fragility fracture is not currently viewed as a substantial risk factor for osteoporosis<sup>18,43</sup>. Printed guidelines may be necessary to disseminate information, but they are unlikely to change practice patterns<sup>45</sup>; outlining recommendations in professional journals has not led to their implementation<sup>46</sup>. In contrast, there have been substantial improvements when information and reminders have been brought to the clinician's attention at the time of a consultation when decisions are being made<sup>46,47</sup>. This finding was the basis for the present study.

Another factor that we think contributed to the success of this program was the direct patient education regarding osteoporosis, its intimate relationship to the fracture, and the effective available treatments. This was accomplished by a nurse

practitioner or another member of our research group, and it took approximately fifteen minutes during the patient's hospitalization. Patient education and self-advocacy are essential components of osteoporosis management, particularly because it is a clinically silent disease. A general lack of patient insight and understanding has been cited as a cause of low treatment rates<sup>18,19,48,49</sup>. Mauck et al.<sup>48</sup> found that 65% of their elderly patients who had sustained a hip fracture had dementia or delirium, and the majority of the remaining patients were not psychologically ready to accept pharmacologic therapy for osteoporosis. In our study, a disturbingly high percentage (40%) of the patients who were approached refused to participate in the study because they thought that the hip fracture was unrelated to osteoporosis. This finding emphasizes that patient education is a crucial component of an osteoporosis intervention program.

Several interventions have been previously attempted to improve osteoporosis treatment rates following hip fracture. Orwig et al.<sup>50</sup> sent bone densitometry results and National Osteoporosis Foundation guidelines to primary care physicians, but the resulting treatment rates remained extremely low (13%). Blalock et al.<sup>41</sup> distributed educational packets about osteoporosis to patients but found no effect on behavior. Inpatient medical consultation also has not affected the rates of osteoporosis diagnosis or treatment<sup>21,39</sup>. Hawker et al.<sup>51</sup> employed an intervention similar to the one in the present study; they recruited patients from a fracture clinic, told the patients that they were at risk for osteoporosis, and then provided them with a letter to give to their primary physician. They found higher rates of follow-up in the intervention group but no higher rates of osteoporosis treatment, exercise programs, or fall-prevention counseling. They concluded that better patient education was essential to a successful program.

Our study has several limitations. First, we relied on the patient's self-report, by telephone, of whether a dual-energy x-ray absorptiometry scan had been performed or medication had been prescribed. There was no verification that an interaction or lack thereof actually occurred. While these are generally considered to be relatively major events that a patient is likely to recall, this is still a potential source of error. Even though we are relatively sure that if patients reported that they had had a dual-energy x-ray absorptiometry scan they actually did, there is no way to judge if the scan was performed because of our intervention program. However, any other factors that led to dual-energy x-ray absorptiometry scans or prescriptions were likely to have been present in both the study and the control group and to have offset each other. Thus, the differences in the study group may be attributed to the study variable—the intervention program. In addition, because this intervention was implemented and studied in one university-affiliated medical center, the patient population may not be a representative cross section of all elderly patients who have sustained a hip fracture. Also,

the management patterns of local primary care physicians may not reflect those in other regions.

In summary, this simple, systematic approach to educating and following patients in the immediate postoperative period after a hip fracture increased the percentage of patients in whom the osteoporosis was addressed. However, despite the greater than twofold increase observed in this study, there appears to be much room for improvement. Some patients in both groups underwent dual-energy x-ray absorptiometry scanning but were not prescribed osteoporosis medication, and while this may have been due to medical reasons, it may still be considered suboptimal treatment. Targeting high-risk patients such as those who have sustained a fragility hip fracture is cost-effective and medically important, and a multidisciplinary patient-centered approach to osteoporosis management may be necessary to bolster awareness and self-advocacy. The urgent need to address osteoporosis in the postoperative period following a hip fracture is evidenced by the morbidity and mortality associated with future fragility fractures. Orthopaedic surgeons have a unique opportunity in the perioperative period to educate patients and their families and to direct patients toward appropriate clinical pathways for long-term osteoporosis management. ■

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