A Controlled Trial To Increase Detection and Treatment of Osteoporosis in Older Patients with a Wrist Fracture

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Background: **Despite the high risk for future fractures and the availability of effective treatments, fewer than 10% to 20% of patients who sustain a fragility fracture are tested or treated for osteoporosis.**

Objectives: **To improve rates of testing and treatment for osteoporosis in patients with wrist fractures who are seen in the emergency department.**

Design: **Nonrandomized, controlled trial with blinded ascertainment of outcomes.**

Setting: **Emergency departments in Edmonton, Alberta, Canada.**

Patients: **Persons 50 years of age or older who were treated for a wrist fracture and their physicians. Patients admitted to the hospital or treated for osteoporosis were excluded. Overall, 572 consecutive patients with fractures were screened, and 102 patients (55 intervention, 47 control) and 101 physicians were studied.**

Measurements: **The primary end point was the prescription of osteoporosis treatment 6 months after fracture. Secondary end points included rates of testing for bone mineral density and patients' knowledge, satisfaction, and quality of life.**

Intervention: **Faxed physician reminders that contained osteoporosis treatment guidelines endorsed by local opinion leaders and patient education. Control patients received usual care and information about falls and home safety.**

Results: **The median patient age was 66 years. Most patients were female (78%) and white (79%); 70% of patients reported a previous fracture, and 22% had a fall with injury in the previous year. The intervention increased the rates of testing for bone mineral density to 62% (vs. 17% for controls; adjusted relative increase, 3.6 [$P < 0.001$]) and the rates of osteoporosis treatment to 40% (vs. 10% for controls; adjusted relative increase, 3.8 [$P = 0.002$]) within 6 months of fracture. Intervention patients were more likely to report a diagnosis of osteoporosis, but other patient-reported outcomes did not differ significantly between groups.**

Limitations: **This was a small, nonrandomized, controlled study with process-based outcomes.**

Conclusions: **In a multifaceted intervention directed at patients and their physicians, the rates of testing and treatment for osteoporosis after emergency department care for a fragility fracture were more than 3 times those of controls.**

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Osteoporosis, a chronic and progressive condition that leads to decreased bone mass and skeletal fragility, may result in fractures, disability, pain, deformity, and even death (1–3). The condition is common, affecting an estimated 1.4 million Canadians and 10 million Americans (1, 2). These figures represent 25% of women and 12% of men older than 50 years of age (1, 2). In the United States, the annual cost of treating osteoporosis and its sequelae has been estimated at $13.8 billion (2), compared with $7.5 billion for congestive heart failure and $6.2 billion for asthma (3). Without better preventive strategies, the rate of osteoporotic fractures is expected to double over the next 15 years (4).

Several experts (5) and guidelines (1, 2) suggest a preventive strategy of identifying people with typical osteoporosis-related fractures (for example, fractures of the hip, spine, or wrist [often called *fragility fractures*]) and targeting them for treatment. They recommend this strategy because this population is at the greatest risk for subsequent fracture and may derive the greatest absolute benefit from treatment. Numerous safe and effective treatments can reduce the risk for recurrent fracture by 40% to 60% (1–3, 6). In addition, with the use of bisphosphonates and raloxifene, all subgroups of examined patients may obtain beneficial effects (3, 7–9) within a year (7, 8). People 50 years of age and older with a fracture of the wrist may be particularly well suited to a strategy of case finding and secondary prevention. Fractures of the wrist are the most common symptomatic fracture related to osteoporosis (3), and 70% to 80% of persons with wrist fractures have low bone mass (10, 11). Observational studies suggest that a wrist fracture is a sentinel event in the natural history of osteoporosis because this type of fracture forecasts an increased risk for fractures of the hip and spine over the next 10 to 20 years (12–14). "Best practice" (clinical practice consistent with current evidence and expert consensus) would be to identify people 50 years of age or older with a fragility fracture of the wrist, to measure their bone mineral density, and to treat those with low bone mass or osteoporosis (1, 2, 5). However, the gap between best practice and everyday clinical practice is wide. Over the past 5 to 10 years, studies from the United States (3, 15, 16), Canada

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(17, 18), and elsewhere (5, 19) report that rates of testing for and treating osteoporosis a year or longer after a fracture of the wrist are less than 10% to 20%. This is an important failure in the process of knowledge translation and indicates that benefits within our reach are not being achieved.

We designed a pragmatic, multifaceted osteoporosis intervention strategy directed at people 50 years of age or older with a fracture of the wrist and at their primary care physicians. The intervention consisted of physician reminders, treatment guidelines endorsed by local opinion leaders, and patient education. Our primary objective was to examine whether this intervention improved the diagnosis and treatment of osteoporosis in this high-risk population. Secondary objectives included examining the effect of this intervention on patients' knowledge, satisfaction, and quality of life.

Context

Many patients who sustain fragility fractures do not receive subsequent testing and treatment for osteoporosis.

Contribution

This study shows that faxed reminders to physicians, treatment guidelines endorsed by opinion leaders, and patient education about osteoporosis can increase the testing and therapy for osteoporosis among patients who present to an emergency department with wrist fracture.

Cautions

This study did not randomly assign persons to the intervention group and did not examine improvements in bone density or repeated fractures.

–The Editors

METHODS

Setting and Participants

Capital Health (Edmonton, Alberta) is one of the largest integrated health service delivery organizations in Canada (20). It provides comprehensive health services for about 1 million people and has an annual budget of almost $2 billion (Canadian) (20). Primary care is delivered by approximately 900 fee-for-service physicians. We enrolled participants from the 2 largest emergency departments in the region: the University of Alberta Hospital (a university-based teaching hospital) and the Royal Alexandra Hospital (a university-affiliated community teaching hospital). These emergency departments provide most of the fracture care and emergency orthopedic services to the region.

Consecutive patients presenting to the emergency department with a wrist fracture were potentially eligible. Inclusion criteria were as follows: age 50 years or older; any simple, closed fracture of the distal forearm; and discharge home. We excluded patients who were already taking prescription treatments for osteoporosis. Because we did not ask patients whether they had a diagnosis of osteoporosis until study closeout, a patient with a history of osteoporosis who was not being treated with prescription medication was potentially eligible for inclusion. We also excluded patients who were unable to provide consent, were unwilling to participate, were admitted to the hospital, resided in a long-term care facility, resided outside the Capital Health region, or could not read and converse in English.

Study Design and Patient Enrollment

We conducted a prospective controlled trial with blinded ascertainment of outcomes. To allocate patients to the intervention or usual care control groups, we adapted and modified an "on–off" 1-site study design for 2 sites (21). For 1 month at a time, in sequential order, the intervention was "on" at 1 emergency department while it was "off" at the other. At the end of each month, research nurses alternated intervention status from "on" to "off" or vice versa.

Patients with wrist fractures were treated, as appropriate, by emergency department physicians and then approached by research nurses or orthopedic technicians for enrollment in the study before discharge home. We obtained informed consent from each patient, and all data were maintained outside the emergency departments in a centralized secure file system. The University of Alberta Health Research Ethics Board approved the study.

Intervention

We designed an intervention to overcome the many barriers that exist for primary care physicians who are trying to adopt evidence-based treatments for their patients with osteoporosis. Each of the 3 components of the intervention had published evidence of effectiveness (22–24).

Physician Reminders

A reminder was generated for each patient and faxed to the primary care physician of record. The reminder notified physicians that their patient had recently been seen and treated in the emergency department for a wrist fracture and reminded them that their patient was now considered to be at increased risk for osteoporosis. Generating and sending the personalized and patient-specific reminder took about 6 minutes for each patient.

Treatment Guidelines Generated and Endorsed by "Opinion Leaders"

As part of the reminder, we provided brief evidence-based treatment recommendations. These guidelines were designed to fit on the same page and emphasized 3 points: 1) The patient is at very high risk for osteoporosis and needs a bone mineral density measurement if one has not been performed in the past year; 2) without treatment, the patient may be at increased risk for another fracture within

the year; and 3) bisphosphonate treatment will reduce the patient's risk for fracture by about 50%. Bisphosphonate alternatives (for example, calcitonin, raloxifene, and hormone therapy) were mentioned as second-line approved treatments because, at the time of study design, only the bisphosphonates had been demonstrated to prevent both vertebral and nonvertebral fractures. Using previously validated methods (25, 26), we recruited 5 osteoporosis "opinion leaders" who had been nominated by local primary care providers. The opinion leaders helped develop and then endorsed the guidelines by attaching their names and signatures.

Patient Education

We provided patients in the intervention group with a tailored, single-page summary of osteoporosis information that mirrored the physician materials described in the preceding paragraph. We reinforced these written materials with a brief telephone counseling session that took place within 1 week of the fracture. This counseling (approximately 4 minutes per session) reiterated the content of the written materials and encouraged patients to seek further information and counseling from their primary care physician. We did not provide intervention patients with any written materials or counseling regarding fall prevention or home safety.

Control Patients (Usual Care)

On the basis of surveys and in-depth interviews with emergency department physicians in Canada and the United States, the current standard of care for patients treated for a wrist fracture usually consists of 1) notification to the primary care physician of record that the patient was seen and treated and 2) information on follow-up plans. We ensured that such notifications occurred for all control patients. In addition, we enhanced usual care by ensuring that control patients received educational materials and telephone counseling regarding fall prevention and home safety. During the call, patients were encouraged to visit their primary care physician for more detailed advice and a medication review. They did not receive any counseling or educational materials about osteoporosis. Thus, control patients received the same amount of attention and care as the intervention patients. After the main study was completed, all control patients were crossed over to the osteoporosis intervention, and all intervention patients were provided with counseling regarding fall prevention and home safety.

Outcomes and Measurements

The primary study outcome was achieved if therapy with any 1 of the following prescription medications for osteoporosis was started within 6 months of fracture: any bisphosphonate, raloxifene, calcitonin, or hormone therapy. The primary outcome was measured by patient self-report and was confirmed by dispensing records in the community pharmacy. We obtained permission from each patient to contact the community pharmacy and confirm dispensing of the study medications; agreement between self-report and dispensing records for osteoporosis medication was 100%. The main secondary outcome was achieved if a patient had a bone mineral density test within 6 months of fracture. This outcome was measured by patient self-report and was confirmed with the primary care physician. All outcomes were ascertained without knowledge of allocation status.

We measured several patient-reported outcomes as secondary end points. Using previously validated instruments, we measured self-reported diagnosis of osteoporosis and osteoporosis-related knowledge (27), satisfaction with care (28), health-related quality of life (29), osteoporosis-specific quality of life (30), and functional outcomes related to the wrist (31, 32) 6 months after fracture. Last, we collected data on osteoporosis risk factors, comorbid conditions, and use of medications and supplements.

Statistical Analysis

We used a consensus of osteoporosis researchers (n = 23) outside the study to determine the minimal clinically important difference for our primary outcome. The final consensus was that an intervention should increase the rate of osteoporosis treatment by at least 20% over usual care. Local pilot data (18) and a literature review (3, 15–17) suggested that no more than 10% of patients were treated for osteoporosis within 6 months after wrist fracture. Using a 2-tailed α value of 0.05, a β value of 0.20, an effect size of 20%, the patient as the unit of allocation and analysis, and an allowance for loss to follow-up of 10%, we estimated that a total sample size of 160 would be required. We planned 1 independent interim analysis, with predefined stopping rules, when final outcomes were ascertained for 80 patients. At the time of the interim analysis, an additional 22 patients had already entered the study and were being followed. Thus, the final study sample consisted of 102 patients (55 intervention, 47 control).

We analyzed patients in the groups to which they were assigned. The main analysis compared the proportion of patients achieving the primary outcome in the intervention group with the proportion in the control group. A chi-square test was used for the unadjusted primary analysis, and the strength of association was estimated with relative risk ratios and 95% CIs. To control for potential confounding related to imbalances in patient characteristics at baseline, we performed multivariable logistic regression analyses that adjusted for covariates that differed between groups at a P value less than 0.10 (white race and previous fracture [**Table 1**]) and for study site (33). To generate adjusted relative risks and 95% CIs that would allow for direct comparison with the unadjusted relative risks in our primary analysis, we used binary regression models (34). We analyzed outcomes on the basis of comparisons of continuously distributed data (for example, quality of life) by using 2 sample t-tests. We used generalized linear models,

adjusted for the same covariates described earlier, to generate adjusted *P* values for between-group differences. All analyses were conducted by using SAS software, version 8.2 (SAS Institute, Inc., Cary, North Carolina).

Role of the Funding Sources

The funding sources had no role in the design and conduct of the study; the collection, analysis, or interpretation of the data; or in the decision to submit the manuscript for publication.

RESULTS

During the 20-month study period, from January 2001 through September 2002, 572 potentially eligible patients with fractures of the wrist were seen and treated at the 2 emergency departments. Overall, we excluded 470 patients from the study because they were admitted to the hospital ($n = 132$), were already taking osteoporosis medications ($n = 125$), lived outside the Capital Health region ($n = 113$), declined to participate ($n = 42$), or were missed ($n = 31$). Twenty-seven patients were also excluded for other miscellaneous reasons.

After final outcomes were ascertained and analyzed in 80 patients, the independent data monitoring and safety committee recommended stopping enrollment because of overwhelming intervention efficacy and concerns related to continuing to enroll patients into the "usual care" group. The committee recommended following all patients who had already been enrolled until their final outcomes were ascertained. Therefore, the final study sample consisted of 102 patients; 55 were allocated to the intervention group and 47 were allocated to the control group. Six patients (4 intervention, 2 control) were lost to follow-up; all were considered "treatment failures" and were included in the analyses of osteoporosis treatment and bone mineral density testing. The 102 study patients were cared for by 101 different primary care physicians.

Most patients were female (78%) and white (79%), and the median age was 66 years (range, 50 to 96 years). By study design, no patients were taking prescribed osteoporosis treatment, but 70% reported a fracture since the age of 40 years and 22% reported a fall causing injury in the previous year. The groups had similar sociodemographic and clinical characteristics (**Table 1**), although intervention patients were more likely to be white (89% vs. 68%; $P = 0.03$) and control patients were more likely to have had a previous fracture (79% vs. 62%; $P = 0.06$).

The **Figure** depicts our main results, stratified by intervention status, and **Table 2** displays our primary findings. The intervention was associated with an increase in the proportion of patients receiving a bone mineral density test within 6 months of wrist fracture compared with controls (34 of 55 [62%] vs. 8 of 47 [17%]; adjusted relative increase, 3.6 [95% CI, 1.8 to 7.0]; $P < 0.001$) (**Table 2**). Of note, 13 of 42 (31%) bone mineral density test results were reported as normal (**Figure**).

Table 1. **Baseline Characteristics of 102 Intervention and Control Patients with a Fragility Fracture of the Wrist***

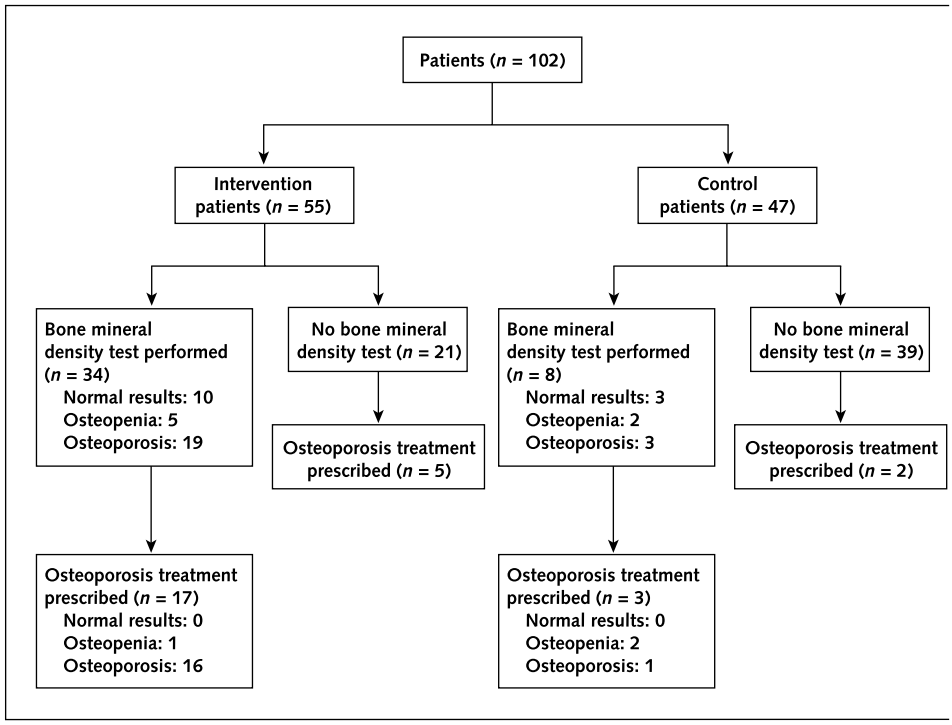
Characteristic	Intervention Patients ($n = 55$)	Control Patients ($n = 47$)
Sociodemographic		
Median age (range), *y*	66 (50–96)	66 (50–88)
Female, *n (%)*	42 (76)	38 (81)
White, *n (%)*	49 (89)	32 (68)†
Less than high school education, *n (%)*	22 (40)	19 (40)
Retired, *n (%)*	34 (62)	24 (51)
Lives alone, *n (%)*	24 (44)	16 (34)
Health status (SF-12)		
Mean mental component score ± SD	50.8 ± 12.0	52.4 ± 10.6
Mean physical component score ± SD	33.3 ± 7.2	33.1 ± 6.0
Comorbid conditions		
Heart disease, *n (%)*	8 (15)	9 (19)
Hypertension, *n (%)*	17 (31)	14 (30)
Peptic ulcer disease, *n (%)*	3 (5)	4 (9)
Osteoarthritis, *n (%)*	23 (42)	16 (34)
Depression, *n (%)*	8 (15)	5 (11)
Median conditions (range), *n*	2 (0–8)	2 (0–7)
Osteoporosis risk factors, *n (%)*		
Postmenopausal woman	39 (71)	35 (74)
Current smoking	11 (20)	6 (13)
No daily milk products	12 (22)	13 (28)
≥2 daily alcoholic drinks	4 (7)	3 (6)
Rheumatoid arthritis	3 (5)	1 (2)
Thyroid disease	10 (18)	9 (19)
Previous fracture as an adult	34 (62)	37 (79)‡
Osteoporosis treatments		
Prescription medications, *n*	0	0
Calcium supplements, *n (%)*	17 (31)	16 (34)
Vitamin D supplements, *n (%)*	11 (20)	12 (26)

* SF-12 = Medical Outcomes Study 12-item Short Form.
† $P = 0.03$ for between-group difference.
‡ $P = 0.06$ for between-group difference.

The intervention was associated with an increase in the use of prescribed osteoporosis treatments; 22 of 55 (40%) intervention patients had been treated for osteoporosis within 6 months of fracture versus 5 of 47 (10%) control patients (adjusted relative increase, 3.8 [CI, 1.5 to 9.7]; $P = 0.002$) (**Table 2**). Most intervention patients who started treatment (21 of 22) were prescribed bisphosphonates. No intervention patient with normal bone mineral density was prescribed osteoporosis treatment, but 5 of 21 (24%) intervention patients began receiving treatment without a postfracture bone mineral density test (**Figure**). Consistent with changes in prescribed treatments, intervention patients also reported greater use of over-the-counter calcium or vitamin D supplements (51% vs. 9% of controls; $P < 0.001$) (**Table 2**).

Mirroring findings regarding testing and treatment, 20 of 55 (36%) intervention patients reported that a physician had diagnosed osteoporosis by the end of the study compared with only 6 of 47 (13%) control patients ($P = 0.006$ for the between-group difference). Nevertheless, interven-

Figure. **Flow diagram of testing and treatments prescribed for osteoporosis in 102 intervention and control patients 6 months after a fragility fracture.**



tion patients did not seem to have greater knowledge about osteoporosis than did control patients; they scored 75% correct on our knowledge survey compared with 69% correct for control patients ($P > 0.2$ for the between-group difference) (**Table 3**). Satisfaction with medical care, health-related quality of life, osteoporosis-specific quality of life, and upper extremity–related function 6 months after fracture did not differ significantly between intervention and control patients (**Table 3**).

DISCUSSION

The translation of knowledge and research evidence into everyday clinical practice is often slow, is usually inconsistent, and has proven difficult to accelerate (35, 36). This is typified by the gap between evidence and practice in the testing and treatment of osteoporosis after fragility fracture (3); in this area, safe and effective treatments are available and practice guidelines have been disseminated for more than a decade. We found that a pragmatic multifaceted intervention, directed at patients and their primary care physicians, was associated with an increase in rates of bone mineral density testing to 62% (vs. 17% for usual care controls; $P < 0.001$) and an increase in rates of osteoporosis treatment to 40% (vs. 10% for controls; $P = 0.002$) within 6 months of fracture. Perhaps as important, 6 months after their fracture, intervention patients were 3 times more likely than control patients to report that they actually had a diagnosis of osteoporosis; however, other aspects of osteoporosis knowledge and other patient-reported outcomes, such as satisfaction, quality of life, or function, did not differ significantly.

Each component of our intervention, namely patient-

Table 2. **Rates of Testing and Treatment for Osteoporosis in 102 Intervention and Control Patients 6 Months after a Fracture of the Wrist**

Variable	Intervention Patients (*n* = 55), *n (%)*	Control Patients (*n* = 47), *n (%)*	Unadjusted Relative Risk (95% CI)	Adjusted Relative Risk (95% CI)*
Osteoporosis treatment prescribed	22 (40)	5 (10)	3.8 (1.5–9.1)	3.8 (1.5–9.7)
Bone mineral density test performed	34 (62)	8 (17)	3.6 (1.9–7.1)	3.6 (1.8–7.0)
Calcium or vitamin D supplement added	28 (51)	4 (9)	6.0 (2.3–14.8)	6.2 (2.3–16.6)
Calcium added	2	0		
Vitamin D added	8	1		
Both added	18	3		

* Estimates of intervention effect are adjusted for study site, white race, and previous history of a fracture as an adult.

Table 3. **Patient-Reported Outcomes 6 Months after a Fracture of the Wrist***

Outcome	Intervention Patients ($n = 55$)	Control Patients ($n = 47$)	Unadjusted *P* Value	Adjusted *P* Value†
Generic health status (SF–12), *n (%)*‡	48 (87)	42 (89)		
Mean mental component score	55.5	54.7	0.61	0.67
Mean physical component score	46.4	45.6	0.67	0.57
Functional outcome (upper-limb DASH), *n (%)*§	51 (93)	44 (94)		
Mean disability rating	22.7	23.5	0.81	0.60
Osteoporosis-related quality of life, *n (%)*‖	38 (69)	28 (60)		
Physical function score	78.0	74.5	0.52	0.20
Adaptation score	69.4	67.8	0.75	0.60
Fears score	75.1	70.0	0.45	0.39
Osteoporosis-related knowledge, *n (%)*¶	39 (71)	28 (60)		
Answered correctly, %	74.7	68.6	0.08	0.28
Satisfaction with care, *n (%)***	55 (100)	47 (100)		
At 1 wk, %	85.5	78.7	0.38	0.58
At 3 mo, %	78.2	74.5	0.66	0.86

* DASH = Disabilities of the Arm, Shoulder, and Hand; SF-12 = Medical Outcomes Study 12-item Short Form.
† Between-group differences are adjusted for study site, white race, and previous fracture as an adult.
‡ By using the SF-12 (29), physical and mental component scores were standardized to the Alberta population, with a mean score (±SD) of 50 ± 10. Higher mean scores represent better physical or mental health.
§ By using the 30-item upper-limb DASH instrument (31, 32), scores ranged from 0 to 100, with 0 representing no upper-extremity disability.
‖ As measured by the 22-item Osteoporosis-Targeted Quality of Life (OPTQoL) instrument (30). Three domains were scored separately, from 0 to 100, with higher mean scores representing better domain-specific quality of life.
¶ As measured by the 25-item Facts on Osteoporosis Quiz (27). The quiz was scored as percentage correct, with higher mean scores representing greater knowledge.
** As measured by the answer to the question "The medical care that I have received has been just about perfect" (28). A 5-point Likert scale, converted to a percentage score, was used, with higher mean scores representing greater satisfaction. Satisfaction data were not collected at the 6-month study closeout.

specific reminders, guidelines generated and endorsed by opinion leaders, and patient education, has previously been demonstrated to have small to modest effects on changing practice (22–24). More noteworthy, perhaps, was the synergy demonstrated by combining these techniques into 1 multifaceted intervention that addressed system, provider, and patient barriers to best practice. Although we cannot determine the relative contribution or importance of each component of the intervention, the literature documents that single-component interventions are unlikely to change clinical practice (22–24, 36, 37).

To our knowledge, no other published controlled studies address this clinical problem. In the only comparable study published to date, Hawker and colleagues (38) used a "before–after" design to examine an intervention delivered by orthopedic surgeons in a series of 139 outpatients (46% wrist fractures) treated in 5 fracture clinics (38). Their intervention, which consisted of patient education and a letter for patients to deliver to their primary care physician, was not associated with any increase in the treatment of osteoporosis 3 months later. It is not likely that the short follow-up time of their study was responsible for the lack of effect. In our study, 80% of intervention patients had bone mineral density testing, and osteoporosis treatment started within 3 months of fracture (data not shown). Rather, the adding of physician reminders and the educational and social influence of local opinion leaders to a patient-mediated intervention may have allowed our intervention to be more effective.

Our study has several limitations. First, although we conducted a controlled trial with blinded ascertainment of outcomes, our study did not rely on random allocation. We collected extensive data and demonstrated comparability across intervention and control patients, but our numbers were relatively small and unmeasured confounding might explain our results. For example, statistically significant imbalances were present in 2 baseline characteristics known to be associated with osteoporosis: being white (21% more common in the intervention group) and having had a previous fracture (17% more common in the control group). The former would tend to bias our study toward finding an intervention effect, whereas the latter would tend to strongly increase the likelihood of control patients being treated for osteoporosis. Nevertheless, these two potential confounders were balanced against each other, and in multivariable analyses that adjusted for both factors, neither one had any effect on the magnitude or significance of our results. Unmeasured confounding is unlikely to explain our results, and our study design is of sufficient internal validity to be included in the Cochrane Collaboration for Effective Practice and Organization of Care systematic reviews of physician practice change (39).

Second, we used a process (intermediate or surrogate) measure as our primary outcome rather than a hard clinical end point, such as recurrent fracture or changes in bone mineral density. We used this approach for several reasons. The efficacy of various osteoporosis treatments is well established (1–3, 5–9); our objective was to accelerate the translation of this knowledge into practice, not to reaffirm observations on efficacy. If allowed sufficient follow-up time, any intervention that improved detection and treatment of osteoporosis in this clinical setting would be expected to reduce rates of fracture. Of note, when processes of care are evidence-based and tightly linked to important clinical outcomes, changes in the process of care are more

sensitive indicators of improved quality than are measurable changes in clinical outcomes (22, 40).

Last, some may question whether the findings from one health care setting can be generalized to other settings in other nations. We note that the gap in osteoporosis care seems universal (3, 5, 15–19), and we would anticipate that many of the barriers and solutions to this problem might also be common across settings. The osteoporosis literature suggests a health care system failure resulting from a clinical "disconnection" between the acute care given by physicians and surgeons responsible for treating symptomatic fractures and the primary care given by physicians eventually responsible for detecting and treating osteoporosis (3).

Issues of generalizability aside, one might question why almost 40% of our intervention patients still did not receive a bone mineral density test and why most (60%) did not receive prescription osteoporosis treatments half a year after their fragility fracture. In our Canadian health region, bone mineral density testing is fully insured, and there is no appreciable waiting list. Some of these patients may have had a bone mineral density test in the previous year or two, and their physicians may have felt that this prefracture information was sufficient to make a therapeutic decision. We could not access results from prefracture bone mineral density tests, but we estimate that this might still leave 20% to 30% of intervention patients eligible for testing who did not receive a test.

More concerning might be the fact that only 40% of intervention patients were prescribed osteoporosis treatment. Given that 31% of results from bone mineral density tests were normal, it may not be surprising that primary care physicians were unwilling to start treatment in that 31% of patients. They seemed to be even more reluctant to start medication in patients without a bone mineral density test; only 24% of intervention patients began receiving therapy without a postfracture test. Many authorities would say that evidence for treating patients with fragility fractures who have normal bone density (or perhaps without a bone mineral density test) is insufficient and that the grayness and uncertainty of this evidence might lead many primary care physicians to be therapeutically conservative (36, 41, 42). Alternately, adoption of the (relatively new) practice of offering secondary prevention to patients with osteoporotic fracture may be associated with the well-documented phenomenon of clinical inertia (3, 36, 42). Finally, rather than conservatism or inertia, an element of therapeutic nihilism might exist among both providers and patients when addressing the issue of preventing the next fracture (3, 5). Until these issues are better understood and systematically addressed, the prevailing environment of conservatism, inertia, and nihilism may prevent rates of testing and treatment from rising much higher than those we observed in the intervention group of our study.

In conclusion, we found that an evidence-based multifaceted intervention, directed at fracture patients and their physicians, was associated with a tripling of rates of testing and treatment for osteoporosis within 6 months of a wrist fracture. Future studies should compare our approach to other interventions (for example, a nurse practitioner–based fracture liaison service or a system of electronic reminders with computerized decision support) and consider longer follow-up of greater numbers of patients. Although it is hard to know the "appropriate" rate of guideline adherence for any clinical condition, as a preliminary benchmark, our data suggest that it is possible for at least 60% of insured patients to undergo a bone mineral density test and for at least 40% to begin receiving proven effective treatments for osteoporosis within 6 months of a fragility fracture.

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