

# A Telephone-Based Intervention for Increasing the Use of Osteoporosis Medication: A Randomized Controlled Trial

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**Objective:** To evaluate the effectiveness of a telephone-based “virtual” osteoporosis clinic in increasing the use of osteoporosis medication assessed at 1 year after receipt of a prescription.

**Study Design:** Randomized controlled trial.

**Methods:** Women 60 years and older with previously undiagnosed osteoporosis were randomized to evaluation and treatment by a dedicated telephone-based osteoporosis clinic with monthly telephone follow-up until medication was successfully started (intervention) or to usual care provided by their primary care physician (control). A successful outcome was defined as having filled a prescription for a 3-month supply of medication within 130 days, marking 1 year and 30 days since enrollment.

**Results:** A total of 235 women underwent randomization, and 211 received the allocation. Of 109 women in the telephone-based osteoporosis clinic group, 75 (68.8%) were using osteoporosis medication at 1 year compared with 46 of 102 women (45.1%) in the usual care group ( $P < .001$ ). A poststudy questionnaire showed no significant differences between the groups in regard to knowledge about osteoporosis or attitude toward their osteoporosis care provider. The significant increase in osteoporosis medication use with the telephone intervention occurred at the same time that an independent health maintenance organization-wide program promoting osteoporosis treatment seemed to improve overall rates of use.

**Conclusions:** The use of osteoporosis medication among women with newly diagnosed osteoporosis may be significantly improved by a simple intervention based on monthly telephone follow-up. Overall use of osteoporosis medication in this trial may have been increased by a systemwide initiative to improve osteoporosis care conducted concurrently with the trial. (ClinicalTrials.gov Identifier: NCT00145067.)

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Osteoporosis is one of the most common diseases of the geriatric population, affecting more than 10 million persons 50 years and older in the United States. It is estimated that up to one-half of American women and one-quarter of American men will experience a fracture caused by osteoporosis in their lifetimes.<sup>1</sup> Despite the high prevalence of the disease and the increased media attention it has received in recent years, less than one-quarter of patients who would benefit from drug therapy for osteoporosis are offered treatment.<sup>2-4</sup>

Further adding to low treatment rates, adherence to medication use is poor among patients who are prescribed osteoporosis therapy. Observational studies<sup>5,6</sup> report persistence with treatment at 12 months (defined as continuing to fill prescriptions) to be in the range of 30% to 50% as determined by pharmacy records.

Adherence to medication use is generally defined as having 2 components, namely, compliance (taking medication as prescribed) and persistence (period over which prescriptions continue to be filled).<sup>7</sup> Both components have been associated with improved outcomes in chronic diseases in general<sup>8</sup> and specifically in regard to osteoporosis medication use, for which studies<sup>9-11</sup> have shown that increased adherence is directly associated with decreased risk of fractures. Despite this, few interventions designed to increase adherence to osteoporosis medication use have been studied. The use of weekly rather than daily dosing of osteoporosis medication has been associated with better adherence to bisphosphonate use in some studies<sup>12-15</sup> but not in others,<sup>16,17</sup> although overall adherence remained suboptimal regardless of dosing frequency. In other studies,<sup>18,19</sup> increased direct contact with osteoporosis care providers through additional clinic visits has improved adherence.

Telephone-based interventions have also shown promise in increasing adherence to osteoporosis medication use in combination with increased clinic visits<sup>20</sup> or decreased medication dosing frequency<sup>21</sup> in randomized trials. Monthly telephone counseling alone achieved adherence rates that were significantly higher than historical rates in a recent nonrandomized trial.<sup>22</sup>

The use of a telephone consultation protocol to encourage the use of medication among women diagnosed as having uncomplicated osteoporosis has been previously described.<sup>23</sup> The protocol involved telephone follow-up of patients until initiation of prescribed osteoporosis medication was

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confirmed. Given the promising results of the protocol, we conducted a study to compare the use of medication 1 year after prescription among women randomized to this “virtual” osteoporosis clinic with the use among women randomized to usual care for osteoporosis delivered in a staff-model not-for-profit health maintenance organization (HMO).

We hypothesized that women receiving telephone follow-up would have a higher rate of medication use at 1 year than women receiving usual care.

## METHODS

### Study Design

The study was conducted at Kaiser Permanente San Diego Department of Preventive Medicine from January 2004 to March 2007 and was approved by the Kaiser Permanente Southern California Institutional Review Board. Women were eligible for the study who were 60 years and older, met the National Osteoporosis Foundation guidelines for uncomplicated osteoporosis (by having a T score of  $-2.5$  or lower or by having sustained an osteoporotic fracture), and were not previously identified as having osteoporosis. Most patients were referred to the study through the Health Appraisal Center of the Department of Preventive Medicine or from the Orthopedics Department. Baseline laboratory values for creatinine, thyroid-stimulating hormone, calcium, parathyroid hormone, and 25-hydroxyvitamin D levels were obtained. Patients were excluded from participating if they had secondary osteoporosis other than vitamin D deficiency, were unable to provide informed consent, or spoke a language that precluded a conversation by telephone with the study staff. Recruitment occurred over the first 2 years of the 3-year study. Patients meeting entry criteria who gave informed consent were randomized by sequential enrollment according to a computer-generated list to usual care or to care provided by the osteoporosis clinic. The random assignment was performed by the physician assistant (ALB) who staffed the osteoporosis clinic.

Patients randomized to usual care received a referral to their usual primary care physician. Standard paper or electronic referrals were issued by the Health Appraisal Center, and the primary care physician was not informed of the patient’s participation in the study. The patient was advised that she would be contacted by her primary care physician for follow-up. All subsequent evaluation and treatment were performed by the primary care physician, and no further contact with the patient was initiated by the osteoporosis clinic until

### Take-Away Points

Adherence to osteoporosis medication use is suboptimal, with most observational studies reporting persistence rates of 30% to 50% after 1 year. In this randomized controlled trial, we found that simple monthly telephone calls until the use of osteoporosis medication was confirmed significantly increased the use of medication 1 year after trial entry compared with usual care by a primary care physician.

- The use at 1 year among women randomized to receive monthly telephone calls was 68.8% compared with 45.1% among women randomized to usual care.
- The simple protocol in this study has been readily adopted into a disease management “virtual” clinic serving approximately 6000 patients with osteoporosis.

the end of the study. Baseline laboratory values were available to the primary care physician through electronic laboratory records.

Patients randomized to the osteoporosis clinic received care from the physician assistant under the supervision of a preventive medicine physician (EMB). The clinic was staffed by a provider (ALB) working full-time for the first 2½ years of the 3-year study and part-time thereafter. Patients with 25-hydroxyvitamin D levels below 30 ng/mL (to convert 25-hydroxyvitamin D level to nanomoles per liter, multiply by 2.496) were given a prescription for vitamin D (50,000 IU orally weekly). All other patients were advised to take vitamin D (800-1200 IU) and calcium (1000-1500 mg) daily. Patients received educational handouts in a one-time mailing and were contacted by telephone for an open-ended discussion with the osteoporosis clinic provider about osteoporosis treatment. Patients were then given a prescription for osteoporosis treatment with a second-generation bisphosphonate to be taken weekly. All prescriptions were for a 3-month supply of medication.

Four to 6 weeks after osteoporosis medication was prescribed, the patient received a standardized follow-up telephone call from the clinic provider. Each call lasted approximately 5 minutes. The patient was asked the following 3 basic questions: (1) if they had filled the prescription for the osteoporosis medication; (2) if they had started taking the medication; and (3) if they answered no to the second question, why they were not taking the medication. Patients were also invited to ask questions, which typically involved concerns about the cost of medication and the potential adverse effects detailed in the medication insert. Strategies for remembering to take the medication such as designating 1 day of the week as “bone day” were discussed. Patients who indicated they would have trouble paying for the medication were assisted in obtaining the drug at no cost from the study sponsor (Merck & Co, Inc, Whitehouse Station, NJ). If a patient had problems with the medication or had not begun therapy, a second telephone call was planned for the following month. Two to 3 telephone calls per patient per month were required on average to make contact with the patient. Monthly tele-

■ **Table 1.** Baseline Characteristics of the Randomized Groups

Characteristic	Usual Care (n = 110)	Osteoporosis Clinic (n = 125)	P
<b>Age, mean (SD), y</b>	70.5 (12.6)	71.3 (7.3)	.55
<b>Race/ethnicity, No. (%)</b>			.13
White	108 (98.2)	114 (91.2)	
Hispanic	1 (0.9)	3 (2.4)	
Asian	1 (0.9)	7 (5.6)	
Black	0	1 (0.8)	
<b>Incident fracture, No. (%)</b>	48 (43.6)	53 (42.4)	.90
<b>Documented T score</b>	<b>(n = 94)</b>	<b>(n = 113)</b>	
<b>T score of -2.5 or lower, No. (%)</b>	<b>72 (76.6)</b>	<b>95 (84.1)</b>	.18
Heel ultrasonography	34	42	
Dual-energy x-ray absorptiometry	35	50	
Both heel ultrasonography and dual-energy x-ray absorptiometry	3	3	

phone calls were continued only until the patient reported that she had filled a prescription for the medication, was taking the medication, and was not having any problems with the medication. No further contact was initiated by the osteoporosis clinic provider.

During the time of the study, an independent HMO-wide program to improve osteoporosis treatment was launched. Endocrinologists identified as thought leaders met with primary care physicians, obstetrician/gynecologists, and orthopedists to emphasize the importance of osteoporosis treatment. Screening and treatment guidelines were promulgated, with brochures and Web sites targeted toward the same physician groups.

The use of medication was measured at 1 year and 30 days from entry into the study by querying the Kaiser pharmacy database. A successful outcome was defined as having filled a prescription for a 3-month supply of osteoporosis medication within 130 days preceding the query. Assessment of prescriptions filled was facilitated by the fact that most Kaiser enrollees fill all prescriptions through a Kaiser pharmacy. Patients who did not seem to be filling prescriptions at Kaiser were contacted by telephone to ascertain if they were filling medication at an outside pharmacy.

After 1 year and 30 days from enrollment, all patients in the study were sent a validated questionnaire to assess their understanding of osteoporosis and their satisfaction with their osteoporosis care (McHorney et al<sup>24</sup>; and T. W. Weiss, DrPH, personal written communication). The questionnaire was designed to evaluate osteoporosis treatment in the osteoporosis clinic group or the usual care group and not fracture care in the Orthopedics Department.

A sample size was not calculated a priori. The decision to stop the trial was based on results of a preplanned 2-year interim analysis demonstrating highly significant differences in the use of medication at 1 year between the study groups.

#### Statistical Analysis

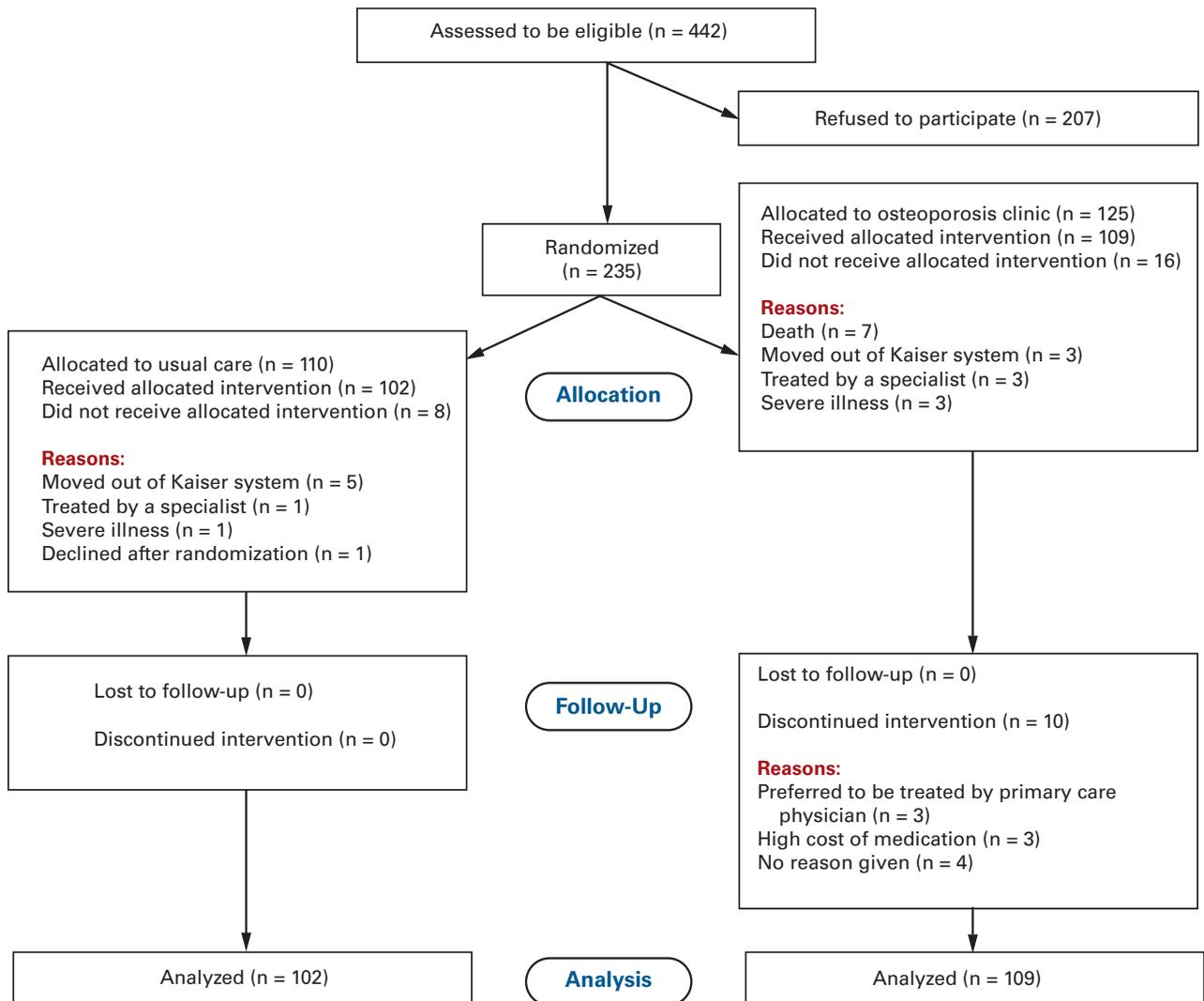
$\chi^2$  Test and *t* test were used to test for differences in categorical variables and continuous variables, respectively. All statistical tests were 2-sided and had an  $\alpha$  level of .05. Baseline variables and the use of medication at 1 year were compared between the treatment groups in the intent-to-treat analysis, as well as among the subset of subjects who filled at least 1 osteoporosis medication prescription during the trial. Comparisons of knowledge and attitudes between the treatment groups were limited to questionnaire respondents. All analyses were performed using SAS 9.1 (SAS Institute, Inc, Cary, NC).

## RESULTS

A total of 442 women were referred to the study and identified as eligible over the 2-year enrollment period. Of these, 207 patients (46.8%) declined to participate, most frequently because of a preference to be treated by their primary care physician (61 patients), followed by having other medical conditions (18 patients), already starting treatment for osteoporosis (13 patients), having insufficient time (12 patients), and moving out of the Kaiser San Diego system (11 patients).

Of 235 patients undergoing randomization, 110 were assigned to usual care and 125 to the osteoporosis clinic. The 2 randomized groups were similar in age, provider-recorded race/

■ **Figure 1.** Flowchart of the Study Cohort



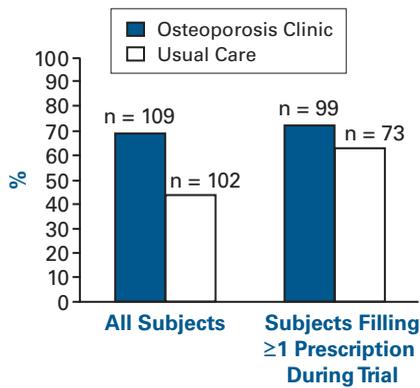
ethnicity, percentage with incident fracture, and percentage with a documented T score of  $-2.5$  or lower at baseline (Table 1). Of the randomized subjects, 24 did not complete the study, primarily because of moving out of the Kaiser system or death (Figure 1). The outcome was measured in 211 patients (102 patients in the usual care group and 109 patients in the osteoporosis clinic group). Of 109 patients randomized to the osteoporosis clinic who did not move out of the Kaiser system, 10 requested to be dropped from the study at the first telephone call but were included in the intent-to-treat analysis.

Once-weekly alendronate sodium accounted for 80.2% of prescriptions filled by the usual care group and 92.9% of prescriptions filled by the osteoporosis clinic group. Estrogen and selective estrogen receptor modulators accounted for an additional 10% of prescriptions in both groups, and risendronate sodium was taken by another 10% of the usual care group. Eight

subjects in the osteoporosis clinic group received assistance in obtaining the medication at no cost from the study sponsor.

Of 109 women in the telephone-based osteoporosis clinic group, 75 (68.8%) were using osteoporosis medication at 1 year compared with 46 of 102 women (45.1%) in the usual care group ( $P < .001$ ). Patients in the usual care group who were not using osteoporosis medication at the end of 1 year included 29 (28.4%) who never filled a prescription for any osteoporosis medication during the study period. A similar proportion of patients in the osteoporosis clinic group reported not filling their prescription at the 1-month intervention telephone call, with most reporting compliance at 1 month and not requiring additional follow-up calls. All 99 patients in the osteoporosis clinic group who completed the trial filled at least 1 prescription sometime during the year. There was no statistically significant difference in the use of osteoporosis

■ **Figure 2.** Use of Osteoporosis Medication at 1 Year



medication at 1 year between patients who completed the study and filled at least 1 prescription during the trial in the osteoporosis clinic group (72 of 99 [72.7%]) compared with the usual care group (46 of 73 [63.0%]) ( $P = .17$ ) (Figure 2). Only 2 of 8 patients in the osteoporosis clinic group who received sponsor-supplied free medication were still using it at 1 year.

A completed poststudy questionnaire was returned by 136 subjects (73 [67.0%] in the osteoporosis clinic group and 64 [62.7%] in the usual care group) (Table 2). For both treatment groups, the use of osteoporosis medication at 1 year in women who responded to the questionnaire was higher than that in the overall sample (80.8% in the osteoporosis clinic group and 54.0% in the usual care group). No statistically significant differences were seen between the 2 groups in regard to knowledge about osteoporosis or self-reported health behaviors (Appendix Table 1 and Appendix Table 2). More patients in the osteoporosis clinic group reported that their healthcare provider was knowledgeable all or most of the time (91.9% vs 81.5% in the usual care group,  $P = .04$ ) (Appendix Table 3). No other differences in attitude toward the provider were found.

## DISCUSSION

Our study was performed among women with newly diagnosed uncomplicated osteoporosis. Women who were followed up by the telephone-based osteoporosis clinic had a rate of use of osteoporosis medication at 1 year after diagnosis that was 52.5% higher than that of women undergoing usual care.

Our osteoporosis clinic used a structured follow-up protocol designed to ensure that patients who were prescribed medication filled the prescription and initially took the medication without complications. All women who completed the trial in the osteoporosis clinic group filled at least 1 prescription

during the 1-year period. By contrast, approximately 28% of subjects in the usual care group did not fill any prescription for osteoporosis medication during the period. We do not know if failure to fill a prescription was due to the woman not keeping the appointment with her primary physician or due to osteoporosis medications not being offered by the primary care physician. Therefore, usual care patients categorized as not using osteoporosis medication at 1 year may include patients who never received a prescription and did not have the opportunity to be “adherent.” However, a similar initial rate of not filling the prescription occurred in the intervention group (approximately one-fourth reported not having filled the prescription at the first monthly telephone call) and has been reported by others for osteoporosis<sup>25</sup> and other asymptomatic diseases such as hyperlipidemia and hypertension.<sup>26</sup> Therefore, the primary effect of the intervention is a combination of ensuring that medication is prescribed and that at least 1 prescription is filled.

In addition to the structured follow-up, several other factors likely contributed to the success of the osteoporosis clinic compared with usual care. Patients were given a telephone number that enabled them to directly contact the osteoporosis clinic provider. By contrast, telephone calls made to primary care physicians generally went through a large centralized call center. As a specialty clinic, the osteoporosis clinic may also have been perceived by patients as more authoritative and robust.

Despite these provisions, the poststudy questionnaire (returned by approximately 65% of women in both groups) showed no statistical difference between the osteoporosis clinic and usual care groups in patient satisfaction with their ability to reach a physician or provider by telephone. Patient satisfaction did not significantly differ between the groups, except for a greater percentage of women in the osteoporosis clinic group reporting that their provider was knowledgeable all or most of the time.

The effect of the intervention also did not seem to be related to improved knowledge about osteoporosis among patients in the osteoporosis clinic arm. Despite the increased educational efforts by the osteoporosis clinic, knowledge about osteoporosis, as assessed by our poststudy questionnaire, was similar between the 2 groups of patients. This apparent lack of effect of patient education is in agreement with findings of others who have reported little or no increased adherence to or persistence with medication use among those receiving more robust patient education,<sup>27,28</sup> including a study<sup>29</sup> specific to osteoporosis.

Our findings are consistent with other studies of interventions that were found to improve adherence to or persistence with osteoporosis medication use, which have generally in-

**Table 2.** Demographic and Health Behavior Characteristics of Women Responding to the Poststudy Questionnaire by Treatment Group<sup>a</sup>

Characteristic	Usual Care (n = 64)	Osteoporosis Clinic (n = 73)	P
<b>Age, mean (SD), y</b>	73.1 (7.4)	72.9 (7.6)	.87
<b>Race/ethnicity, No. (%)</b>			
White	61 (96.8)	68 (93.2)	.26
Hispanic	2 (3.2)	2 (2.7)	
Asian	0	3 (4.1)	
<b>Body mass index, mean (SD)<sup>b</sup></b>	24.9 (4.3)	23.7 (3.6)	.08
<b>Highest level of education, No. (%)</b>			
Postgraduate degree	12 (19.0)	12 (16.7)	.79
College degree	13 (20.6)	15 (20.8)	
High school degree	36 (57.1)	40 (55.6)	
<Grade 12	2 (3.2)	5 (6.9)	
<b>Self-rated general health, No. (%)</b>			
Very good to excellent	27 (42.9)	35 (47.9)	.77
Good	26 (41.3)	29 (39.7)	
Fair to poor	10 (15.9)	9 (12.3)	
<b>Smoke cigarettes on daily basis, No. (%)</b>			
All or most of the time	3 (4.7)	4 (5.5)	.83
Some of the time	0	0	
A little or none of the time	61 (95.3)	69 (94.5)	
<b>Drink alcoholic beverages on daily basis, No. (%)</b>			
All or most of the time	6 (9.7)	3 (4.1)	.41
Some of the time	9 (14.5)	13 (17.8)	
A little or none of the time	47 (75.8)	57 (78.1)	

<sup>a</sup>The number of subjects who completed each question varied and may be less than the total number.

<sup>b</sup>Calculated as weight in kilograms divided by height in meters squared.

cluded some form of direct patient contact after receipt of a prescription. Successful interventions have included additional in-person clinic visits,<sup>19,20</sup> which some have combined with less frequent dosing<sup>21</sup> or intensive education programs.<sup>18</sup>

The effectiveness of the intervention in this study has led to adoption of the protocol by the Kaiser San Diego Department of Population-Based Medicine to manage approximately 6000 patients with osteoporosis in its “Healthy Bones” program. The protocol may also be adapted for improving the use of medications in other chronic diseases for which adherence is low<sup>5</sup> and for which other interventions have had mixed success. In a comprehensive review of these efforts,<sup>30,31</sup> it was noted that most interventions that were effective for increasing adherence to medication use for chronic diseases were complex and often labor intensive and did not lead to large improvements in adherence and treatment outcomes. In addition, most studies of successful complex interventions

have not assessed the separate effects of the components, so it is unknown which components are required. However, interventions that included telephone contact were most often successful in increasing adherence to medication use for hyperlipidemia,<sup>32</sup> diabetes mellitus,<sup>33</sup> and hypertension,<sup>34</sup> conditions like osteoporosis that are largely asymptomatic. Two of these protocols included automated calls from computer-linked systems with<sup>33</sup> or without<sup>34</sup> telephone follow-up from a healthcare provider.

Although not formally evaluated by our study, it is our opinion that the personalized encouragement and answers to questions provided by a conversation with the clinician would be more effective than automated telephone calls. This concept is supported by Cook et al,<sup>22</sup> who used monthly telephone calls from nurses trained in motivational interviewing to encourage adherence among women who were prescribed risedronate for treatment or prevention of osteoporosis and

achieved rates of use similar to ours of 69% at 6 months compared with 40% among historical control subjects.

A limitation of our study is that we were unable to calculate the medication possession rate, a standard measure of persistence with medication use. Therefore, we are unable to directly compare our results with those of other studies using these standard definitions. An additional limitation is that patients in the intervention group were explicitly assisted in obtaining study medication at no cost from the study sponsor. The provision of this assistance was not measured in the usual care group and may have been less easily obtained. However, given that only 2 of 8 patients in the osteoporosis clinic group who received assistance were still using the medication at 1 year, it is unlikely that this assistance was a major factor in the success of the intervention. Finally, interpretation of the results is complicated by the fact that a HMO-wide effort to increase osteoporosis treatment by primary care physicians occurred concurrently with our intervention. Although this program may have increased baseline rates of osteoporosis medication use (estimated to be approximately 25% before the trial), our intervention seemed to have an additional effect.

Therefore, we have demonstrated that a simple protocol based on monthly telephone calls until a prescription is filled was effective in increasing rates of the use of osteoporosis medication at 1 year by 52.5%, from 45.1% under usual care to 68.8% with the intervention. If combined with medications requiring less frequent dosing, the protocol may be even more effective at ensuring that patients at high risk for fracture will receive adequate osteoporosis treatment.

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## REFERENCES

- National Osteoporosis Foundation.** *Osteoporosis: Physician's Guide to Prevention and Treatment of Osteoporosis.* Washington, DC: National Osteoporosis Foundation; 2003.
- Freedman KB, Kaplan FS, Bilker WB, Strom BL, Lowe RA.** Treatment of osteoporosis: are physicians missing an opportunity? *J Bone Joint Surg Am.* 2000;82-A(8):1063-1070.
- Bahl S, Coates PS, Greenspan SL.** The management of osteoporosis following hip fracture: have we improved our care? *Osteoporos Int.* 2003;14(11):884-888.
- Andrade SE, Majumdar SR, Chan KA, et al.** Low frequency of treatment of osteoporosis among postmenopausal women following a fracture. *Arch Intern Med.* 2003;163(17):2052-2057.
- Gold DT, Silverman S.** Review of adherence to medications for the treatment of osteoporosis. *Curr Osteoporos Rep.* 2006;4(1):21-27.
- Papaioannou A, Kennedy CC, Dolovich L, Lau E, Adachi JD.** Patient adherence to osteoporosis medications: problems, consequences and management strategies. *Drugs Aging.* 2007;24(1):37-55.
- Badamgarav E, Fitzpatrick LA.** A new look at osteoporosis outcomes: the influence of treatment, compliance, persistence, and adherence. *Mayo Clin Proc.* 2006;81(8):1009-1012.
- Simpson SH, Eurich DT, Majumdar SR, et al.** A meta-analysis of the association between adherence to drug therapy and mortality. *BMJ.* 2006;333(7557):e15.
- Siris ES, Harris ST, Rosen CJ, et al.** Adherence to bisphosphonate therapy and fracture rates in osteoporotic women: relationship to vertebral and nonvertebral fractures from 2 US claims databases. *Mayo Clin Proc.* 2006;81(8):1013-1022.
- Seeman E, Compston J, Adachi J, et al.** Non-compliance: the Achilles' heel of anti-fracture efficacy. *Osteoporos Int.* 2007;18(6):711-719.
- Adachi J, Lynch N, Middelhoven H, Hunjan M, Cowell W.** The association between compliance and persistence with bisphosphonate therapy and fracture risk: a review. *BMC Musculoskelet Disord.* 2007;8:e97.
- Recker RR, Gallagher R, MacCosbe PE.** Effect of dosing frequency on bisphosphonate medication adherence in a large longitudinal cohort of women. *Mayo Clin Proc.* 2005;80(7):856-861.
- Cramer JA, Amonkar MM, Hebborn A, Altman R.** Compliance and persistence with bisphosphonate dosing regimens among women with postmenopausal osteoporosis. *Curr Med Res Opin.* 2005;21(9):1453-1460.
- Ettinger MP, Gallagher R, MacCosbe PE.** Medication persistence with weekly versus daily doses of orally administered bisphosphonates. *Endocr Pract.* 2006;12(5):522-528.
- Brankin E, Walker M, Lynch N, Aspray T, Lis Y, Cowell W.** The impact of dosing frequency on compliance and persistence with bisphosphonates among postmenopausal women in the UK: evidence from three databases. *Curr Med Res Opin.* 2006;22(7):1249-1256.
- Weycker D, Macarios D, Edelsberg J, Oster G.** Compliance with drug therapy for postmenopausal osteoporosis. *Osteoporos Int.* 2006;17(11):1645-1652.
- Richards JB, Cherkas LF, Spector TD.** An analysis of which anti-osteoporosis therapeutic regimen would improve compliance in a population of elderly adults. *Curr Med Res Opin.* 2007;23(2):293-299.
- Newman ED, Matzko CK, Olenginski TP, et al.** Glucocorticoid-Induced Osteoporosis Program (GIOP): a novel, comprehensive, and highly successful care program with improved outcomes at 1 year [published correction appears in *Osteoporos Int.* 2006;17(11):1706]. *Osteoporos Int.* 2006;17(9):1428-1434.
- Clowes JA, Peel NF, Eastell R.** The impact of monitoring on adherence and persistence with antiresorptive treatment for postmenopausal osteoporosis: a randomized controlled trial. *J Clin Endocrinol Metab.* 2004;89(3):1117-1123.
- Robbins B, Rausch KJ, Garcia RI, Prestwood KM.** Multicultural medication adherence: a comparative study. *J Gerontol Nurs.* 2004;30(7):25-32.
- Cooper A, Drake J, Brankin E; PERSIST Investigators.** Treatment persistence with once-monthly ibandronate and patient support vs. once-weekly alendronate: results from the PERSIST study. *Int J Clin Pract.* 2006;60(8):896-905.
- Cook PF, Emiliozzi S, McCabe MM.** Telephone counseling to improve osteoporosis treatment adherence: an effectiveness study in community practice settings. *Am J Med Qual.* 2007;22(6):445-456.

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23. **Blau EM, Gordon SJ, Benton LK, Weiss TW, Chen YT.** Establishment of an innovative clinic for postmenopausal women at high risk for fragility fracture. *Drug Benefit Trends.* 2003;15(pt 10):41-46.
24. **McHorney CA, Schousboe JT, Cline RR, Weiss TW.** The impact of osteoporosis medication beliefs and side-effect experiences on non-adherence to oral bisphosphonates [published correction appears in *Curr Med Res Opin.* 2008;24(3):707]. *Curr Med Res Opin.* 2007;23(12):3137-3152.
25. **Lo JC, Pressman AR, Omar MA, Ettinger B.** Persistence with weekly alendronate therapy among postmenopausal women. *Osteoporos Int.* 2006;17(6):922-928.
26. **Chapman RH, Benner JS, Petrilla AA, et al.** Predictors of adherence with antihypertensive and lipid-lowering therapy. *Arch Intern Med.* 2005;165(10):1147-1152.
27. **McDonald HP, Garg AX, Haynes RB.** Interventions to enhance patient adherence to medication prescriptions: scientific review [published correction appears in *JAMA.* 2003;289(24):3242]. *JAMA.* 2002;288(22):2868-2879.
28. **Schroeder K, Fahey T, Ebrahim S.** How can we improve adherence to blood pressure-lowering medication in ambulatory care? Systematic review of randomized controlled trials. *Arch Intern Med.* 2004;164(7):722-732.
29. **Guilera M, Fuentes M, Grifols M, Ferrer J, Badia X; OPTIMA Study Investigators.** Does an educational leaflet improve self-reported adherence to therapy in osteoporosis? The OPTIMA study. *Osteoporos Int.* 2006;17(5):664-671.
30. **Haynes RB, McDonald HP, Garg AX.** Helping patients follow prescribed treatment: clinical applications. *JAMA.* 2002;288(22):2880-2883.
31. **Haynes RB, Yao X, Degani A, Kripalani S, Garg A, McDonald HP.** Interventions to enhance medication adherence [update appears in *Cochrane Database Syst Rev.* 2008;(2):CD000011]. *Cochrane Database Syst Rev.* 2005;(4):CD000011.
32. **Márquez Contreras E, Casado Martínez JJ, Corchado Albalat Y, et al.** Efficacy of an intervention to improve treatment compliance in hyperlipidemias [in Spanish]. *Aten Primaria.* 2004;33(8):443-450.
33. **Piette JD, Weinberger M, McPhee SJ, Mah CA, Kraemer FB, Crapo LM.** Do automated calls with nurse follow-up improve self-care and glycemic control among vulnerable patients with diabetes? *Am J Med.* 2000;108(1):20-27.
34. **Friedman RH, Kazis LE, Jette A, et al.** A telecommunications system for monitoring and counseling patients with hypertension: impact on medication adherence and blood pressure control. *Am J Hypertens.* 1996;9(4, pt 1):285-292. ■

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Appendix Tables follow on next page.

■ **Appendix Table 1.** Knowledge About Osteoporosis Among Women Responding to the Poststudy Questionnaire by Treatment Group<sup>a</sup>

Statement	No. (%)		P
	Usual Care (n = 62)	Osteoporosis Clinic (n = 73)	
<b>Age-related height loss is a symptom of osteoporosis</b>			
Agree	57 (93.4)	70 (95.9)	.79
No opinion	3 (4.9)	2 (2.7)	
Disagree	1 (1.6)	1 (1.4)	
<b>The risk of having osteoporosis is higher after menopause</b>			
Agree	57 (93.4)	66 (90.4)	.61
No opinion	4 (6.6)	6 (8.2)	
Disagree	0	1 (1.4)	
<b>I have a greater chance of having osteoporosis if my mother has/had it</b>			
Agree	52 (85.2)	57 (80.3)	.22
No opinion	5 (8.2)	12 (16.9)	
Disagree	4 (6.6)	2 (2.8)	
<b>Eating food high in calcium and vitamin D can help slow the rate of bone loss</b>			
Agree	61 (98.4)	68 (97.1)	.63
No opinion	1 (1.6)	2 (2.9)	
Disagree	0	0	
<b>Daily exercise can help slow the rate of bone loss</b>			
Agree	61 (98.4)	67 (93.1)	.14
No opinion	1 (1.6)	5 (6.9)	
Disagree	0	0	
<b>There is no way to prevent osteoporosis</b>			
Agree	20 (32.3)	25 (37.3)	.65
No opinion	11 (17.7)	14 (20.9)	
Disagree	31 (50.0)	28 (41.8)	
<b>A woman may have osteoporosis for years, but not know this until she breaks a bone</b>			
Agree	54 (87.1)	66 (91.7)	.67
No opinion	7 (11.3)	5 (6.9)	
Disagree	1 (1.6)	1 (1.4)	
<b>If a woman has osteoporosis, something as simple as lifting a bag of groceries can break a bone</b>			
Agree	53 (85.5)	55 (76.4)	.39
No opinion	7 (11.3)	12 (16.7)	
Disagree	2 (3.2)	5 (6.9)	
<b>Once they thin from osteoporosis, bones cannot be rebuilt</b>			
Agree	18 (30.0)	19 (26.8)	.89
No opinion	8 (13.3)	11 (15.5)	
Disagree	34 (56.7)	41 (57.7)	
<b>The health problems caused by osteoporosis can be life-threatening</b>			
Agree	45 (72.6)	53 (74.6)	.95
No opinion	9 (14.5)	9 (12.7)	
Disagree	8 (12.9)	9 (12.7)	

<sup>a</sup>The number of subjects who completed each question varied and may be less than the total number.

■ **Appendix Table 2.** Self-Reported Health Behaviors Among Women Responding to the Poststudy Questionnaire by Treatment Group<sup>a</sup>

Behavior	No. (%)		P
	Usual Care (n = 63)	Osteoporosis Clinic (n = 73)	
<b>Take daily calcium supplement</b>			
All or most of the time	56 (88.9)	68 (94.4)	.40
Some of the time	2 (3.2)	2 (2.8)	
A little or none of the time	5 (7.9)	2 (2.8)	
<b>Eat foods high in calcium</b>			
All or most of the time	50 (82.0)	67 (93.1)	.12
Some of the time	10 (16.4)	5 (6.9)	
A little or none of the time	1 (1.6)	0	
<b>Participate in aerobic exercise ≥3 times/wk for 20 min/ session</b>			
All or most of the time	34 (54.0)	49 (67.1)	.15
Some of the time	11 (17.5)	13 (17.8)	
A little or none of the time	18 (28.6)	11 (15.1)	
<b>Perform strength building exercises ≥3 times/wk</b>			
All or most of the time	30 (47.6)	28 (39.4)	.17
Some of the time	10 (15.9)	21 (29.6)	
A little or none of the time	23 (36.5)	22 (31.0)	

<sup>a</sup>The number of subjects who completed each question varied and may be less than the total number.

■ **Appendix Table 3.** Attitudes About Healthcare Providers Among Women Responding to the Poststudy Questionnaire by Treatment Group<sup>a</sup>

Healthcare provider(s) who treated me:	No. (%)		P
	Usual Care (n = 58)	Osteoporosis Clinic (n = 74)	
<b>Was (were) knowledgeable</b>			.04
All or most of the time	44 (81.5)	68 (91.9)	
Some of the time	8 (14.8)	2 (2.7)	
A little or none of the time	2 (3.7)	4 (5.4)	
<b>Explained my therapy well</b>			.63
All or most of the time	43 (87.8)	61 (84.7)	
Some of the time	5 (10.2)	7 (9.7)	
A little or none of the time	1 (2.0)	4 (5.6)	
<b>Was (were) courteous</b>			.74
All or most of the time	48 (87.3)	63 (88.7)	
Some of the time	3 (5.5)	2 (2.8)	
A little or none of the time	4 (7.3)	6 (8.5)	
<b>Was (were) easy to reach by phone</b>			.37
All or most of the time	33 (75.0)	50 (76.9)	
Some of the time	6 (13.6)	12 (18.5)	
A little or none of the time	5 (11.4)	3 (4.6)	
<b>Promptly helped me when I had a problem or question with my care</b>			.77
All or most of the time	39 (84.8)	49 (80.3)	
Some of the time	3 (6.5)	4 (6.6)	
A little or none of the time	4 (8.7)	8 (13.1)	
<b>Overall my treatment for osteoporosis has been a good experience</b>			.17
All or most of the time	52 (89.7)	58 (85.3)	
Some of the time	0	4 (5.9)	
A little or none of the time	6 (10.3)	6 (8.8)	

<sup>a</sup>The number of subjects who completed each question varied and may be less than the total number.