Patient Decision to Initiate Therapy for Osteoporosis: The Influence of Knowledge and Beliefs

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BACKGROUND: There are effective treatments to prevent osteoporotic fractures, but these treatments are underutilized.

OBJECTIVE: To evaluate the influence of patient characteristics, perceptions, knowledge and beliefs about osteoporosis on the decision to initiate osteoporotic treatment.

PARTICIPANTS: We identified female members of a managed care plan who had a dual energy x-ray absorptiometry (DXA) bone density test and fulfilled World Health Organization criteria for osteoporosis. Patients were excluded if they received osteoporotic medications in the prior 6 months.

MEASUREMENTS: Patients were sent a questionnaire that included items assessing satisfaction with physician–patient communication, trust in the physician, osteoporosis knowledge and beliefs, beliefs about prescription medications, and perceptions of barriers to medication use. Administrative electronic health records were used to identify prescription drug use and health care utilization.

RESULTS: Two hundred and thirty-six women returned surveys and research authorization forms out of 465 contacted for participation. One hundred and thirty-five (57.2%) filled a prescription for an osteoporotic drug in the first 3 months after the DXA exam. The largest differences between initiators and non-initiators were in beliefs in the benefits of medications, and distrust of medications, with initiators believing more strongly in the benefits and effectiveness of medications ($p<.001$), and non-initiators reporting more distrust of medications ($p<.001$). Osteoporosis knowledge and the belief that osteoporosis is a serious disease were also related to therapy initiation in bivariate analysis.

CONCLUSIONS: Only 57% of patients initiated osteoporotic medication within 3 months of diagnosis. The decision to start osteoporosis treatment appeared to be related to a patient's beliefs in the effectiveness of osteoporosis medications and distrust of medications.

KEY WORDS: medication adherence; patient preferences; osteoporosis; decision-making.
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Treatment of osteoporosis is dependent upon testing to identify patients with osteoporosis, the decision to start treatment once a diagnosis is made, and adherence with therapy once treatment is started. Numerous studies have identified that testing rates for osteoporosis are suboptimal. For example, only about 20% of women ≥67 years old who suffer a fracture receive either bone density testing or pharmacologic treatment for osteoporosis within 6 months of the fracture.[1]

Once treatment with osteoporosis medication is initiated, the patient must then adhere to the medication regimen to achieve full therapeutic benefits. Studies have shown that adherence with therapy is suboptimal.[2–5] There is also an emerging body of evidence linking poor bisphosphonate adherence with poor outcomes, including higher fracture rates,[6,7] resource utilization and costs.[8,9]

While there has been much attention and research focused on long-term medication adherence,[10–19] little is known about patients' decision-making about treatment initiation. There are obvious differences between the initial decision about treatment, and the daily habit of adherence, suggesting that the two processes reflect different considerations.[20] Beliefs about disease severity, medication effectiveness, safety and side effects have been suggested as important considerations in treatment initiation.[20–25] Some patients also seem to balance trust in the physician against concerns about medications in deciding whether to initiate treatment.[21,24] With regard to prescription osteoporosis medications specifically, there is evidence that perceived susceptibility to osteoporosis, beliefs in the benefits of prescription osteoporosis medications, and perceptions of few barriers to the use of osteoporosis medications are associated with medication use.[26]

The purpose of this study was to identify factors associated with treatment initiation in previously untreated patients with osteoporosis. We hypothesized that women who were diagnosed with osteoporosis would be very likely to start treatment.

We also hypothesized that treatment initiation would be influenced by patient knowledge of osteoporosis and its effects, trust in the physician, satisfaction with physician-patient communication, and with beliefs about osteoporosis, medication efficacy and risks, and perceived barriers to treatment.

METHODS

The patient population for this study was recruited from a multispecialty group practice in central Massachusetts. Enrollment was restricted to women who were continuous members of Fallon Community Health Plan (a managed care plan) for at least 6 months prior to obtaining a bone density study and who obtained their primary care from the group practice. The group's administrative database includes records of encounters, diagnostic tests, diagnoses, and prescription drug dispensings. Bone density studies were performed using dual energy x-ray absorptiometry (DXA) (Hologic, Waltham, MA). Patients who fulfilled World Health Organization criteria for osteoporosis (T-score ≤ -2.5 at the lumbar spine, total hip, and/or femoral neck) were eligible for inclusion in the study if they had not received pharmacologic treatment for osteoporosis in the 6 months prior to the DXA

Health Care Utilization and Status. Administrative electronic health records were used to identify prescription drug dispensings, health care utilization, and inpatient and outpatient diagnoses in the 2 years prior to the bone density study through 3 months after the bone density study. Diagnoses were captured based on International Classification of Diseases 9th Revision (ICD-9) codes used by physicians for administrative purposes. All patients included in this study had prescription drug coverage through the managed care plan. The group's administrative data include all claims submitted for reimbursement for pharmaceuticals. The Charlson comorbidity index was determined based on all diagnoses recorded in the 2 years prior to the bone density study.[27,28] Initiation of osteoporosis therapy was defined as the dispensing of a bisphosphonate, estrogen, calcitonin, teriparatide or raloxifene, or the administration of an intravenous bisphosphonate within 3 months of the DXA exam. A random sample of 41 medical records of patients who did not initiate treatment were reviewed to verify findings in administrative data.

Questionnaire Administration. Within 3 weeks of the DXA exam, eligible patients were sent a letter informing them about the study. Patients were informed they could opt out of the study by contacting a toll-free number. One week after the letter, those patients who did not decline participation were sent a questionnaire along with $5 cash and a research authorization form permitting review of electronic medical records. Two reminders were sent to those not returning the questionnaire.

Questionnaire Content. The questionnaire was intended to assess patients' satisfaction with physician-patient communication, trust in the physician who had ordered the DXA test, osteoporosis knowledge, beliefs about osteoporosis, beliefs about prescription osteoporosis medications and prescription medications in general, and perceptions of potential barriers to prescription medication use. The items assessing satisfaction with physician-patient communication and trust were drawn from existing measures.[29,30] The knowledge and belief items were developed by the authors for the present study. A number of background items were included (e.g., age, education, self-rated health, and osteoporosis risk factors). Preliminary versions of the questionnaire were pre-tested using cognitive interviewing with a convenience sample of 6 patients in 1:1 sessions. A brief description of each set of items follows.

Satisfaction with Communication. Four items from the American Board of Internal Medicine satisfaction questionnaire were used to assess patients' satisfaction with physician communication. An example from this set is "How good was the doctor who ordered your bone density test at using words you could understand when explaining your problems and treatment; explaining any technical medical terms in plain language." Five response options were provided: Excellent, Very Good, Good, Fair and Poor. Responses were scored so that higher scores reflected greater satisfaction with communication; a summary satisfaction with communication score was created through taking the mean score across the four items.

Trust in the Physician Ordering the Test. The short form of the trust scale developed by Dugan and colleagues was used to assess trust.[30] An example from this set, which includes five items, is "All in all, I have complete trust in my doctor." Five response options were provided: Strongly Agree, Agree, Neutral, Disagree and Strongly Disagree. Responses were scored so that a higher score indicated higher trust; a summary trust in the physician score was created through taking the mean score across the five items.

Osteoporosis-related Knowledge. An 11-item test of osteoporosis-related knowledge was developed for this study. As noted in a recent review,[31] while a number of different instruments have been used to assess knowledge in this area, most have some shortcomings. Further, because our goal was to administer these items via a mailed questionnaire, which would also include many other items, our goal was to use a short test, but one that covered three content areas: symptoms of osteoporosis, effects of osteoporosis and treatment effectiveness. None of the instruments reviewed met both goals, so two of the authors drafted knowledge items (RAY, a rheumatologist and KMM, a psychometrician with experience in item writing). The draft items were reviewed and revised by the full team. Cognitive interviews were conducted using the draft items; these items were again reviewed and revised by the full team based on these results. The final test included nine items focused on osteoporosis symptoms and effects; an example is "People with osteoporosis do not have any symptoms, unless they break a bone." Two additional items focused on prescription osteoporosis medication efficacy. Response options were True, False and Not Sure. Each item was scored correct/incorrect ("Not Sure" responses were scored incorrect); a percent correct score was calculated. This score was transformed to a 1–5

scale for the logistic regression analysis (described below) in order to facilitate interpretation of odds ratios.

Beliefs. A total of 29 items were developed to assess beliefs about osteoporosis severity and susceptibility, osteoporosis medication efficacy, negative perceptions of prescription medications and barriers to medication use. Five items had been used in a prior study of medication initiation[32]; additional items were written to provide more comprehensive measurement of the beliefs presumed to influence health behavior under the health belief model. These additional items were written by one author (KMM) and reviewed and edited by the full team. Draft items were tested in cognitive interviews, and the full team reviewed and revised the items before inclusion on the final questionnaire. Response options for all belief items were Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree. After psychometric analyses (described below), a total of 19 belief items were retained, grouped into four scales: belief in the effectiveness of osteoporotic medications, belief that osteoporosis is a serious disease, distrust of medications and concerns about own medication use.

Analyses

Psychometric Analyses. Cronbach's alpha was computed to assess score reliability for the 11-item knowledge test, the four-item satisfaction with communication measure, and the five-item trust measure. Factor analysis was used to examine the responses on the 29 belief items, in order to form subsets of items corresponding to the constructs that we anticipated might predict treatment initiation. Maximum likelihood extraction was used, with the promax rotation. Inspection of the eigenvalues, scree plot, and factor loadings suggested four factors. Items with factor loadings of .40 or less were not grouped into scales; items with greater than .40 were selected and submitted to a second factor analysis and content review. This process resulted in four sets of items which appeared to form coherent, meaningful scales. The reliability of scores on each resulting scale was assessed using Cronbach's alpha. Scores on each belief scale were calculated as the mean of the items included in the scale, with a possible range of 1 to 5.

Statistical Analyses. Chi-square tests were used to compare treatment initiators to non-initiators on dichotomously coded personal characteristics and background variables (e.g., age, education, comorbidities). Chi-square tests were also used to compare treatment initiators to non-initiators on individual belief items that were not included in any of the four belief scales. T-tests were used to assess for differences in mean scores for initiators as compared to non-initiators on satisfaction with communication, trust, knowledge, and the four belief scales. Logistic regression analysis was used to examine the value of those nine variables that the bivariate results suggested were related to initiation (i.e., p value for the associated statistical test of .20 or less).

This study was approved by the local institutional review board.

RESULTS

From February 1, 2006 through February 28, 2007, we identified 537 consecutive women who had a bone density study fulfilling WHO criteria for osteoporosis and who reported no pharmacologic treatment for osteoporosis in the prior 6 months. Seventy-two women were excluded either because they were not continuous members of the health plan for at least 6 months or because review of pharmacy data indicated they had received a prescription for an osteoporosis medication during the 6 months prior to the bone density study. Four hundred and sixty-five women were contacted for participation in the study; 83 declined participation and 111 did not respond. Of the 271 women who returned the survey (response rate 58.3%), 31 did not return a research authorization form allowing access to their health care data and were excluded from this analysis. Four of the remaining 240 women discontinued enrollment in the health plan in the 3 months following the bone density study and were excluded. Baseline characteristics of the patient population are shown in Table 1. In the first 3 months after the DXA exam documenting osteoporosis, 135 (57.2%) patients filled a prescription for an osteoporosis drug (Table 2). Chart review of 41 patients who did not receive a pharmacy dispensing documented two patients whose physician gave them drug samples for treatment.

The relationships between treatment initiation and patient characteristics are shown in Table 2. Patients who responded that they had been told they had osteoporosis were more likely to start prescription therapy than those who reported they had not been told they had osteoporosis (p=0.020). Patients with a PCP appointment in the 3 months after the DXA study with an associated ICD-9 code for osteoporosis were more likely to initiate therapy than patients without a visit with an osteoporosis diagnosis (p=0.15).

Prior to comparing treatment initiators and non-initiators on the knowledge and belief scales, we computed Cronbach's alpha for each scale (Table 3).The relationship between treatment initiation and the various scales is shown in Table 3. The most significant differences between initiators and non-initiators were on both beliefs in the benefits of medications, and distrust of medications Of the 10 belief items that were not included in any of the 4 belief scales, a statistically significant association with initiation was found for only 1 item: "I worry about the side effects of medication," with non-initiators expressing greater worry.

The results of the multivariate logistic regression analyses are presented in Table 4. Belief in medication effectiveness, distrust of medications, alcohol consumption (two or more alcoholic drinks), and a physician visit after the bone density study with an ICD-9 diagnosis of osteoporosis were associated with treatment initiation. Table 5 reports the percentages of patients agreeing with each of the individual belief items, including the items querying potential barriers to taking prescription osteoporosis medications and other items that were not included in the four belief scales due to the factor analysis results. This table is ordered by the difference in percent agreement between initiators and non-initiators, with the items that the non-initiators were much more likely to agree with at the top, and the items that the initiators were much more likely to agree with at the bottom. The largest difference between initiators and non-initiators were on the items related to medications rather than the items related to the disease and its complications—non-initiators were much more likely to believe that medications are unnecessary, while initiators were much more likely to believe that medications are effective and beneficial.

Table 1. Characteristics of Participating Patients

Characteristic		N (%)
Age (years)	35–44	4 (1.7%)
	45–54	25 (10.6%)
	55–64	60 (25.4%)
	65–74	67 (28.4%)
	≥75	80 (33.9%)
Ethnicity	White	215 (91.1%)
Education	8th grade or less	11 (4.7%)
	Some high school	35 (14.8%)
	High school or GED	87 (36.9%)
	Some college or 2 year degree	57 (24.2%)
	College graduate	19 (8.1%)
	More than 4 years of college	26 (11.0%)
Current smoker		37 (15.7%)
Charlson comorbidity index	0	116 (49.2%)
	1	58 (24.6%)
	2	35 (14.8%)
	≥3	22 (9.2%)
Health care utilization prior to bone density study	Mammogram	171 (72.5%)
	Preventive care visit	223 (94.5%)
Self-report overall health	Poor	7 (3%)
	Fair	23 (9.7%)
	Good	107 (45.3%)
	Very good	71 (30.1%)
	Excellent	23 (9.7%)
Drugs prescribed	Bisphosphonate	128 (54.2%)
	Raloxifene	4 (1.7%)
	Calcitonin	3 (1.3%)
	None	101 (42.8%)
Month prescribed (after DXA)	Month 1	101 (42.8%)
	Month 2	28 (11.9%)
	Month 3	6 (2.5%)
	None	101 (42.8%)
Prescriber	Primary care physician (PCP)	124 (91.8%)
	Specialist or OB/GYN	11 (8.2%)
Visit with PCP post-DXA		74 (31.4%)
Visit with osteoporosis diagnosis code post-DXA		61 (25.8%)

DISCUSSION

We demonstrate that for women enrolled in a managed care plan with prescription drug coverage, only 57% of untreated patients who had osteoporosis documented on a bone density study performed as part of routine clinical care started an osteoporosis drug within 3 months. Although it has been reported that continuity of care with a primary care physician (PCP) increases adherence with therapy, we found that patients who had a visit with their PCP in the 3 months after the DXA exam were no more likely to initiate therapy.[33]

Patients who reported no days with two or more alcoholic drinks in the week prior to filling out the survey were more likely to initiate therapy (62.4% vs. 43.5%, p=0.010). It is possible that limited alcohol consumption is a marker for more healthy behavior that may be associated with better adherence with therapy.[34] However, we found no association between initiation of therapy and preventive health visits or mammograms in the 2 years prior to the DXA study, exercise frequency or calcium consumption (data not shown). Patients who reported being told they had osteoporosis by a doctor or nurse were more likely to start medication, but even in this group only 102 of 164 (62.2%) started treatment. Patients starting treatment scored higher on 11 questions testing knowledge about osteoporosis, but this difference was modest (55.5% vs. 48.3% correct).

Much more striking were differences in patient beliefs about the effectiveness and safety of osteoporosis medications and distrust of medications, as is evident from the response data reported in Table 5. Patients starting treatment were much more likely to believe in the effectiveness of osteoporosis treatment. For example, they were more likely to agree that "taking osteoporosis medication is good for me" (62.4% vs. 36.7%) or "osteoporosis medication can help my bones become stronger" (77.4% vs. 58.0%) compared with patients not starting treatment. Conversely, patients initiating treatment were much less likely to express worry about medications. For example, patients starting treatment were less likely to agree that "doctors are too quick to prescribe medications" (29.6% vs. 46.0%) or "medications often cause more problems than they solve." (30.5% vs. 49.5%) Patients who started medication were also much less likely to worry about osteoporosis medication in particular: "I worry about the side effects of

Table 2. Relationship Between Patient Characteristics and Initiation Status

Characteristic	No. (%) patients who obtained prescription therapy	
Age		
<65 years (N=89)	55 (61.8%)	
≥65 years (N=147)	80 (54.4%)	p=0.267
Education		
High school or less (N=133)	74 (55.6%)	
Some college or more (N=103)	61 (59.2%)	p=0.581
Weight		
<127 pounds (N=76)	48 (63.2%)	
≥127 pounds (N=155)	85 (54.8%)	p=0.229
Self-report overall health		
Poor, fair or good (N=137)	80 (58.4%)	
Very good or excellent (N=99)	55 (55.6%)	p=0.664
Charlson comorbidity index		
0 (N=116)	62 (53.4%)	
1 or greater (N=115)	69 (60.0%)	p=0.315
Smoker		
Current smoker (N=37)	22 (59.5%)	
Not current smoker (N=198)	112 (56.6%)	p=0.664
Alcohol		
0 days with 2 or more drinks (N=173)	108 (62.4%)	
At least 1 day with 2 or more drinks (N=62)	27 (43.5%)	p=0.010
Contacted about the results of test		
Yes (N=160)	98 (61.3%)	
No or not sure (N=74)	36 (48.6%)	p=0.070
Told by doctor or nurse had osteoporosis		
Yes (N=164)	102 (62.2%)	
No or not sure (N=70)	32 (45.7%)	p=0.020
Had a primary care physician visit post-DXA		
Yes (N=162)	95 (58.6%)	
No (N=74)	40 (54.1%)	p=0.509
Had a physician visit post-DXA with a diagnosis of osteoporosis		
Yes (N=61)	43 (70.5%)	
No (N=175)	92 (52.6%)	p=0.015

In some cases, totals do not add to 236 patients due to patient non-response to specific survey items

Table 3. Relationship Between Patient Knowledge and Beliefs and Initiation Status

Variable	Filled prescription for OP medication (N=135)	Did not fill prescription for OP medication (N=101)	Univariate analysis, p value
	Mean (SD)	Mean (SD)	
Satisfaction with communication (Alpha=.95)	3.63 (1.08)	3.66 (1.04)	.809
Trust in the physician (Alpha=.89)	4.21 (.66)	4.03 (.76)	.067
Osteoporosis knowledge (Alpha=.71)	55.45. (20.38)	48.28 (21.10)	.011
Belief in medication effectiveness (Alpha=.90)	3.81 (.61)	3.42 (.71)	<.001
Distrust of medications (Alpha=.87)	2.88 (.71)	3.32 (.78)	<.001
Belief that OP is a serious disease (Alpha=.77)	3.82 (.69)	3.62 (.67)	.027
Concern about own medication use (Alpha=.69)	2.89 (.90)	3.02 (.90)	.291

taking osteoporosis medication" (57.1% vs. 76.8%) or "there are better ways for me to treat my osteoporosis besides medications." (23.9% vs. 44.9%)

The logistic regression analysis results further highlight the importance of beliefs about medication benefits and distrust of medications in treatment initiation. Clearly the physician plays a critical role in initiation, and those patients who had a post-test visit with a diagnosis of osteoporosis were more likely to begin treatment. However, patient beliefs also played a role and influenced initiation, above and beyond this visit. The role of patient beliefs in predicting adherence has been incorporated in the health belief model.[25] As applied to osteoporosis, this model includes perceptions of the threat caused by osteoporosis based on patient perception of the likelihood and potential severity of fracture. Patients with greater threat of disease severity have been shown to be more adherent with therapy. Consistent with this model, we found that patients who said they "worry about having osteoporosis" were significantly more likely to initiate therapy (Table 5). We found, however, that, beliefs about medication seem to be more influential than beliefs about disease severity. Of particular interest is the finding that two distinct sets of beliefs appear to be import: beliefs in the benefits of osteoporosis medication which appear to influence women to initiate treatment and distrust of medications which have the opposite effect.

Practical barriers to treatment, including cost and inconvenient dosing regimens, have been shown to influence adherence with therapy once started.[4,35,36] Our findings suggest that patient perceptions of cost, ability to take medications on time, and ability to get medication refills did not function as barriers to treatment

Our study has several limitations. It was based in one managed care plan and the results may not be generalizable to a larger population. Our population was mostly white and all were insured, and the results may not apply to minority or under or uninsured patients. Because the study population was restricted to women with a recent bone density study, we could not assess the impact of gender or of a bone density study upon the decision to start treatment. Both of these factors have been shown to influence adherence with therapy once started.[33] We were also unable to evaluate whether route of administration of drug (e.g. intravenous bisphosphonates) would impact initiation of therapy. Other studies have suggested patient preferences for osteoporosis treatment are influenced by route of administration.[37] All of the patients in this study had health insurance with pharmaceutical coverage, so our finding that cost of drug did not appear to impact the decision to initiate treatment may not reflect other populations. Our study was designed to find women with untreated osteoporosis, as defined by the absence of treatment for the 6 months prior to the bone density study. Review of utilization data for up to 2 years prior to the bone density study documented that 27 of the 235 (11.5%) patients enrolled in this study had received at least one dispensing of an osteoporosis drug 6–24 months prior to the bone density study (mean 458 days). We defined initiation of therapy as the dispensing of an osteoporosis drug within 3 months of the DXA exam. It is possible that some patients began therapy after the cutoff. However, of all those who did initiate treatment, nearly 75% did so in the first month, 21% in the second month, and only 4% in the third month. Because we relied on pharmacy data, we cannot confirm whether the patient actually took the medication. It is also possible that some patients were given sample medications and therefore had no pharmacy dispensing in the first 3 months after the DXA. However, the multispecialty group practice where this study was performed discourages the use of sample medications and chart review uncovered only minimal use of a drug samples.

Table 4. Multivariate Logistic Regression Model of Treatment Initiation

Variable	Odds ratio (95% CI)	p value
Belief in medication effectiveness	2.04 (1.04, 3.98)	.038
Distrust of medications	0.57 (0.36,0.92)	.020
Alcohol use	0.50 (0.26,0.99)	.046
Physician visit post-DXA with a diagnosis of osteoporosis	1.92 (0.98,3.79)	.059
Interaction term: belief in medication effectiveness by post-DXA visit with a diagnosis	0.28 (0.10,0.79)	.016
Osteoporosis knowledge	1.24 (0.93,1.67)	.150
Trust in the physician	0.96 (0.61,1.52)	.869
Belief that OP is a serious disease	1.26 (0.78.2.03)	.351
Contacted about the results of DXA test	1.18 (0.58,2.42)	.650
Told by doctor or nurse have OP	1.40 (0.69,2.86)	.356

Table 5. Agreement with Individual Belief Items by Initiation Status

Item	Percent responding agree or strongly agree		
	Non-initiators	Initiators	
I can take care of my osteoporosis without medications (D)	26.3	4.5	••••
There are better ways for me to treat my osteoporosis besides medications (D)	44.9	23.9	••••
I worry about the side effects of taking osteoporosis medication	76.8	57.1	••••
Medications often cause more problems than they solve (D)	49.5	30.5	•••
I prefer not to take medications (D)	61.4	42.9	•••
Doctors are too quick to prescribe medications (D)	46.0	29.6	•••
Doctors often give medication when advice would be better (D)	40.4	24.2	•••
To me, osteoporosis is just part of getting older	48.0	41.0	•
I probably won't experience any problems from having osteoporosis, even if I don't take medication	11.2	7.0	
My prescriptions sometimes cost more than I can afford	39.6	36.1	
I think osteoporosis is a very serious disease (S)	85.0	83.0	
I can recognize medication side effects if I experience them	74.5	72.5	
I sometimes forget to take my medications on time	30.1	28.8	
Osteoporosis can have life-threatening complications (S)	64.0	63.4	
Having osteoporosis increases my chances of breaking my hip or wrist if I fall	94.0	96.3	
I worry about interactions between my medications (X)	49.0	53.0	
I can get my prescriptions refilled on time	88.4	92.5	
I can speak freely with my doctor about my concerns about my medications	86.6	91.0	•
I hate to spend money on prescription medications	33.0	38.6	•
If I were to break my hip, I might never fully recover (S)	49.5	56.1	•
I feel that I am already taking too many medications (X)	24.7	31.3	•
If I had a fracture or broken bone, I could end up disabled or dependent for a long time (S)	70.7	78.4	•
Taking osteoporosis medication can help protect me against a broken hip (ME)	45.5	59.3	••
Taking osteoporosis medication can help me stay active (ME)	48.0	66.2	•••
Taking osteoporosis medication can help me stay independent (ME)	46.9	66.2	•••
Taking osteoporosis medication can help my bones become stronger (ME)	58.0	77.4	•••
I worry about having osteoporosis (S)	51.0	72.3	••••
Medication can effectively treat my osteoporosis(ME)	47.5	72.4	•••••
Taking osteoporosis medication is good for me (ME)	36.7	62.4	•••••

Items are ordered according to the difference between the percentage of initiators and non-initiators endorsing the belief. • provides a visual summary of the magnitude of the difference, with each • standing for a difference of at least 5 percentage points. The absence of a • indicates that the between group difference was less than 5 percentage points. The letters in parentheses following each item reflect item groupings into the four belief scales as follows: ME = Belief in effectiveness and benefits of OP medication; S = Belief that OP is a serious disease; D = Distrust of medication; X = concerns about own medication use. Items not followed by parentheses were not grouped into scales.

Lastly, we cannot determine from our study if the physician did not prescribe the medication or if the patient chose not to fill a prescription. Review of 41 medical records of patients who did not start therapy documented that the physician discussed the results with 37 patients, and in 27 cases it was clear that the physician recommended therapy.

Our study does have several strengths. The questionnaire was sent only to women with osteoporosis recently confirmed by bone density study, rather than a general population. We had a high questionnaire response rate of nearly 58.3%, although some patients did not return the research authorization form allowing us to review utilization data. By reviewing utilization data, we were able to use objective pharmacy data to determine use of prescription therapy and to correlate other factors with the responses to the questionnaire. Our ability to review patient medical records also allowed us to document that in the large majority of cases physicians did recommend osteoporosis treatment.

Our study suggests that the decision to initiate osteoporosis treatment is strongly dependent upon patient beliefs in the effectiveness of osteoporotic medications, and patient distrust of medications. These beliefs appear to reflect basic concerns about the effectiveness and risks of pharmaceuticals in general. Whether it is possible to modify these beliefs in order to increase the likelihood of starting treatment is unknown. Further studies should be performed to evaluate interventions that attempt to address patients' beliefs and improve their understanding of the benefits and risks of pharmaceutical treatment.

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